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Returns to College Education: Evidence from the 1990, 1995, and 2000 National Graduates Surveys

REPORT

Torben Drewes

Prepared under contract for

Learning Policy Directorate

Strategic Policy

September 2006

Human Resources and Social Development Canada

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Torben Drewes
Department of Economics
Trent University

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Executive Summary

- Canada's community colleges play a significant role in producing human capital. In 1998-99, full-time college enrolment was 408,800 compared to 580,400 in universities.

- This report examines the earnings of recent college graduates using the 1990, 1995 and 2000 National Graduates Surveys (NGS). The intention is to measure those earnings, track changes through the decade, compare them across fields of study and compare them to the earnings of university graduates.

- Past studies using NGS data have found real earnings of college graduates to be fairly stable from the 1985 through to the 1995 cohort, and to be in the order of 78 to 82% of university earnings. The literature examining internal rates of return have found these rates to vary considerably across fields of study but to be comparable to those generated by university studies on average.

- The NGS data are not able to produce estimates of rates of return since they do not provide information on earnings of individuals who have not invested in post-secondary education. Analysis is also hampered by a change in the definition of earnings beginning with the 1995 NGS.

- There are differences across provinces in the mandates and programming of community colleges. The great majority of Quebec college students graduate between the ages of 20 and 24 and spend 25 to 36 months in college. They are also much more likely to continue on to university. Colleges in western provinces serve a considerable number of mature students and the majority of programs are 24 months or less, although these colleges also have a significant role in university transfer programs. In the Atlantic Provinces, programs tend to be shorter than elsewhere. Engineering and applied sciences, technologies and trades is the single largest field of study for men. Women are concentrated in business and health fields.

- Median earnings in most regions fell from 1992 to 1997 for men and women, which might reflect the change in the definition of earnings. These earnings grew from 1997 to 2002, although the growth was not uniform across fields. For men, graduates of technological programs grew steadily and robustly through the entire period. There was little growth in their next most important field, business. For women, the health and business fields predominate and while there was a slight increase in earnings in the latter, health earnings fell through the decade.

- There are consistent patterns in earnings across fields of study. As is the case in the existing literature, there is a premium for the technological content of the field.

- Average earnings are significantly lower for college than university graduates. However, once account is taken of the different costs, the internal rates of return to investments in college and university education are quite similar.

1. Introduction

Canada's community colleges play what is, by international standards, an exceptionally large role in the production of the nation's human capital. In the 1999/2000 academic year, 408,781 full-time students were attending community colleges, including trade colleges, technical institutions and CEGEP's. By way of comparison, full-time university enrolment in that year was 592,745. Despite their central role, Canada's community colleges have been largely neglected in academic and policy research, certainly relative to universities. In part, this may reflect the difficulty of analyzing a system that is complex and heterogeneous, with mandates that differ across provinces in terms of vocational preparation versus university transfer functions. College systems are also becoming more complicated within provinces as colleges move towards a more comprehensive mandate that includes, in several jurisdictions, the granting of baccalaureate degrees. Recognizing the diversity of the college sector while drawing general conclusions about the labour market outcomes of their graduates is a challenge.

Nevertheless, a close examination of the outcomes of college graduates is well warranted. Given the significant role played by this sector in preparing a skilled labour force, educational and labour market policy-making requires a better understanding of Canada's colleges. As well, colleges typically have an explicit mandate to prepare students for the labour market and therefore invite analysis of their success in doing so. This is a particularly interesting question during the 1990's when labour markets were rapidly changing in response to technological progress and a new international trade environment. Finally, there are interesting puzzles that have been raised in recent research about the relatively small earnings benefits of a college education when compared to those received by university graduates. If we regard colleges and universities as two possible post-secondary paths available to high school graduates and if individuals base their choices on financial benefits, it is natural to ask why so many individuals choose the former.

This report looks at graduates from Canadian community colleges using results from the National Graduate Surveys of the 1990, 1995, and 2000 cohorts. The early labour market experiences of these graduates is explored to address the following questions:

- How well do college graduates fare in terms of earnings?
- How has their labour market success changed during the 1990's?
- Do earnings of college graduates differ systematically by field of study?
- How much earnings dispersion exists between college graduates?
- How do the earnings of college graduates compare to those of their university counterparts?

The following section reviews the existing literature on returns to college education. The report then discusses the data used in the following analysis and highlights important data issues and limitations imposed by the National Graduates Surveys (NGS). Provincial differences in the mandates of college systems may produce systematic differences in the earnings of graduates that reflect those mandates rather than differences across provinces in the success of their colleges in preparing students for the labour market. Section 4 explores what evidence can be obtained through the NGS data that might help in understanding the diversity of colleges across provinces. The 1990's witnessed substantial labour market change attributable to technological progress and international trade adjustments, as well as to changes in the macroeconomic environment. Section 5 provides an overview of basic earnings trends for college graduates over the decade. College programs can be wildly diverse even within the walls of a single institution and section 6 explores differences in earnings by field of study. To put college graduate earnings into perspective, to address the issue of choice between college and university streams, and to introduce the important concept of rate of return, section 7 compares college and university earnings. Conclusions are drawn and reported in the final section of the report.

2. Literature Review

Canadian and American colleges differ in important respects but there are enough similarities that it is informative to review results from studies of the latter. American two-year, or junior, colleges were originally focussed on a transfer function role. This, coupled with early estimates of the returns to college education that were quite small, resulted in limited interest in the labour market outcomes of holders of associate degrees. American research has also been severely hampered by a lack of data, since educational attainment questions in the U.S. census inquire about years of schooling completed (or, more recently, degrees received), not about the type of institution attended. Nevertheless, as American colleges have expanded their mandates to include terminal vocational programs and increased their share of post-secondary education enrolment, greater attention has been paid to their graduates.

Kane and Rouse (1999) provide a summary of research on the labour market payoffs to community college. Using either the National Longitudinal Study of the Class of 1972 or the National Longitudinal Survey of Youth, these studies provide evidence of a substantial earnings impact from college. For example, an average community college entrant who does not complete an associate degree earns 9 to 13% more than a similar high school graduate. Each year of credit at a college generates a 5 to 8% increase in annual earnings, which is approximately equal to the earnings gain associated with a year of university study. Completion of a community college degree is associated with an annual earnings differential (relative to high school graduates) of as much as 27% (Kane and Rouse (1995)).

The thinness of the data precludes an analysis of returns by field of study for a representative sample of community college graduates. However, Jacobson, Lalonde and Sullivan (1997) examine data from a displaced worker survey that is richer in detail and find that, while a year of community college coursework generates a 2 to 5% earnings gain, this return varies significantly across fields of study. The gain is as much as 15% per year in quantitative and technical courses (such as technical trade or science courses) but negligible in non-quantitative courses like social sciences, humanities, non-technical vocational courses.

Canadian researchers interested in returns to post-secondary education and the way in which those returns vary across types of institutions have an advantage in that Census data provide detailed information on the type of post-secondary institution attended. Vaillancourt (1995) was one of the first to use Census data to examine college outcomes and one of only two authors to calculate internal rates of return (as opposed to earnings differentials). Using 1986 Census data and comparing community college completion to completed high school, Vaillancourt estimated a private internal rate of return of 6.6% for men and 17.3% for women. The corresponding returns for university graduates were 8.3% and 18.8%, respectively. Unfortunately, rates of return by field of study are reported only for university graduates. Vaillancourt estimated a human capital earnings function to develop the age-earnings profiles that are required to calculate a rate of return. Boothby and Rowe (2002) used simulation techniques, calibrated on 1991 Census data,

to generate the required life cycle earnings streams. Estimated median rates of return for college (university) were 15.7% (12.3%) for men and 17.8% (12.8%) for women[1]. They report unpublished results from Vaillancourt estimating rates of return from 1991 Census data as 16.3 and 18.4% for men and women, respectively, while returns to university education were 14.6 and 16.2%. The most significant finding here is that returns to college education are higher than the returns to a university degree, a point to which we will return in Section 7.

Boothby and Rowe estimate returns to college by selected fields of study (where sufficient data exist) finding median returns ranging from 0% to approximately 20%. For men, the American results reported above tend to be mimicked, with technological fields tending to have higher returns and the humanities and arts tending to low returns. For women, there is no clear pattern between returns and technological content. Applied and fine arts have the lowest returns while nursing, medical laboratory, computer programming and journalism have the highest. Boothby and Rowe's technique allows them to calculate individual-specific rates of return and they can therefore look at the dispersion of these rates across individuals within any defined cell. Although there is a clear pattern of average rates of return by field of study, there is a great deal of dispersion of returns within fields. It would be quite unremarkable for a graduate from a field of study with a low average rate of return to be doing better than a large number of graduates from a more highly paid field.

All other available analyses of the economic impact of college education estimate that impact in terms of either the level of earnings or the annual earnings differential between college graduates and high school completers. The latter measure, the so-called earnings premium to college, is often referred to as the "return" to college education but should not be confused with the internal rate of return to that education.[2] Allen (1998) found a college premium in the order of 15% among British Columbia males at various ages in the 1991 Census data and a slightly smaller premium for women. Female bachelor's degree holders earned more than those with college training. Younger men gained less from bachelor's degrees than their college counterparts but overtook them at later ages by a large margin. Using synthetic cohorts built from the 1971, 1981, and 1991 Censuses, Riddell and Sweetman (2000) also find greater relative earnings growth for university graduates than for college graduates. College earnings differentials (over completed high school) are moderate and in the range of 6 to 8% for the male cohort born in the 1940's and 9 to 12% for women in that cohort. These moderate returns to college certificates are confirmed by Ferrer and Riddell (2002) using an econometric approach that permits the estimation of sheepskin effects. Using 1996 Census data, they find the weekly earnings differential (over high school) to be 12 and 14% for men and women, respectively, when years of schooling are not controlled for, but only 5 and 3% when both credentials and years of schooling (as well as other covariates such as age) are included in the regression. This is in contrast to the gains from a Bachelor's degree which were about 21% for both genders. Earnings gains from college diplomas in the social sciences and humanities are generally insignificant as are diplomas in health for

[1] Boothby and Rowe's technique generates rates of return specific to individuals. Hence the need to report median rates.
[2] The distinction between the earnings premium and the rate of return is addressed in Section 7.

men and sciences for women. Business and engineering fields tend to produce larger gains for both sexes with health producing the largest weekly earnings premium for college women.

The earnings premium for college education appears to be growing, particularly for men. Boothby and Drewes (2005), using a regression approach similar to Ferrer and Riddell, estimate an earnings differential of about 11% for men in the 1981 Census, growing to almost 19% in 2001. For women, the college premium grew from 17% to 20%. Again, these apparent gains from college are significantly lower than those attributable to a Bachelor's degree, typically only about one third of the value. Interestingly, the college earnings premium is significantly larger in Quebec than it is outside that province, reflecting provincial differences in the college systems. As in Ferrer and Riddell, arts and science fields of study produce lower earnings premia for men, while engineering and business fields produce substantially higher earnings effects. There is less variation in the college earnings premium among female college graduates, but health fields produce the largest gains, followed by engineering. Arts fields produce the smallest gains.

In addition to Census data, Canadian researchers have available a rich source of information on post-secondary graduates in the National Graduates Surveys (NGS). A number of research papers analyzing labour market outcomes of college graduates have been produced using these datasets but there is a fundamental difference between the NGS's and Censuses that produces an important difference in the research questions addressed. Census based research generally attempts to answer the question of returns to educational investment by comparing the earnings of those who have made the investment with those who have not. The latter provide a proxy for the counterfactual: what college graduates would have earned had they stopped at high school completion. Since the population universe of the NGS's consists only of graduates of post-secondary institutions, there is no reference point within the data to provide the counterfactual. Although it is possible to construct the counterfactual from other data sources[3], doing so is problematic and most NGS based research tends to restrict research questions to those concerning the earnings levels of college graduates, how these levels are changing through time, how they differ across fields of study or gender, and so on.

NGS data also hampers research on rates of return by looking at graduates with only two or five years of potential experience. Rate of return calculations require estimates of the entire lifetime earnings profiles which are poorly approximated using these data. This point will be discussed further in section 7.

A series of descriptive reports[4] have summarized the sequence of National Graduate Surveys and provide a profile of college earnings through time. These earnings have been remarkably stable. In constant 1995 dollars, the median earnings of college graduates working full-time two years after graduation were $26,000, $27,100, $27,100, and $24,900 for the 1982, 1986, 1990, and 1995 graduates, respectively. The latest available estimate of median income among college graduates (Vaillancourt (2005)) would suggest very little change. This stability through the 1982, 1986 and 1990 cohorts is confirmed by Finnie

[3] See, for example, Little and Lapierre (1996).
[4] See, for example, Little and LaPierre (1996) and Taillon and Paju (1999).

(1999b) who estimates their mean earnings two years after graduation to be $29,700, $29,400 and $29,700 for men and $24,900, $25,100, and $27,000 for women, again in constant 1995 dollars. These values tend to be in the order of 78 to 82% of the earnings of university graduates.

These summary reports also find a consistent pattern in earnings by field of study. Among college graduates, the highest earning field was engineering and applied sciences, followed by health sciences and natural sciences and primary industries. Business fields follow with social sciences and service and arts fields completing the ranking.

The NGS based research discussed so far has been descriptive. Although cross-tabulations can be applied when comparisons between categories of individuals are required, multivariate methods are necessary if such comparisons are to adequately control for earnings covariates that differ systematically between these categories. Walters (2004) is the most recent regression based approach, exploring the 1982 through 1995 Surveys to examine earnings differences by level of schooling and field of study. Using constant 1992 dollars, Walters reports annual earnings to be approximately 25,000 thousand for the 1982 cohort with slightly declining values for the following cohorts. The log earnings equation estimates indicate college earnings to be from 9 to 11% below those of university bachelor's graduates, a gap that has remained fairly constant across the cohorts. Field effects are not separated out by level of schooling but show, among all post-secondary graduates, that engineering and health professions have the highest earnings and fine arts and humanities the lowest.

3. Data

This report uses data from the 1990, 1995, and 2000 National Graduates Surveys which are conducted by Statistics Canada to examine the labour market outcomes of graduates from Canadian public universities, colleges and trade schools. Graduates from private institutions, continuing education programs, vocational programs lasting less than three months or other than in the skilled trades, and apprenticeship programs are excluded. The surveys are conducted two and five years after graduation so that labour market data for the 1995 cohort, for example, refers to a job held during a reference week in 1997 or in 2000. The NGS's use a stratified sampling scheme and all estimates produced in this report use sample weights to infer population values.

The Surveys are not entirely consistent in population definitions, variable definitions and coding practices. The two most important inconsistencies for this report are changes in the definition of income and in the coding of field of study. The 1990 NGS reports earnings based on respondents' answers to the question, "Working your usual hours, approximately what would be your annual earnings before taxes and deductions at that job?". The 1995 and 2000 NGS's report an estimate of gross annual earnings for the reference week job that was derived from an individual's reported salary, how it was paid and the usual number of hours worked. The effect of this change on the behaviour of the earnings measure is unclear but the definitional change must be borne in mind in the following analysis.

Fields of study definitions in the 1990 and 1995 NGS's are based on the Community College Student Information System (CCSIS) codes for college graduates and the University Student Information System (USIS) codes for university graduates. The 2000 NGS uses the new Classification of Instructional Programs (CIP) coding. We have, then, both issues of cross-sectional consistency between USIS and CCSIS codes and longitudinal consistency between USIS/CCSIS and CIP codes. The first issue is resolved by using so-called harmonization codes that standardize the USIS and CCSIS codes into 11 major groups. These codes are available for the 1990 cohort in the 1995 follow-up survey,[5] although using the follow-up survey will sacrifice sample size in order to achieve consistency in coding. Program descriptions were used to assign harmonization codes to CIP codes. The assignments are provided in Table A1 of the Appendix.[6] Table A2 in the Appendix provides an indication of available sample sizes by harmonization code and region based on the Public Use Microdata File for the 1995 NGS.

[5] The FOG 1990 repeats the 1992 job labour market information for those respondents recontacted in 1995

[6] Attempts to link CIP codes to harmonization codes using USIS/CCSIS to harmonization code concordances in the 1995 NGS and then USIS/CCSIS to CIP conversion tables proved unsuccessful.

4. Profile of College Graduates

Colleges in Canada are creations of provincial governments and, as such, reflect the specific human resource and higher education policies of those governments.[7] We would therefore expect that colleges differ across provinces in ways that may well impact on the questions being addressed in this report. For example, Quebec's Collèges d'Enseignement Général et Professionel (CEGEP) provide a two-year prerequisite for admission to Quebec universities. While they also offer three year career preparation programs, CEGEP's are a distinct model compared to Ontario's Colleges of Applied Arts and Technology (CAAT's), which were primarily charged with a mandate for vocational training with direct labour market entry at the time graduates being analyzed in this report were attending college.[8] Colleges in Alberta and British Columbia are more comprehensive than in Ontario in the sense that labour market entry programs are augmented by university transfer programs. The university transfer function is much less important in Manitoba, New Brunswick and Newfoundland.

Any evaluation of the labour market outcomes of college graduates must then be conducted with an appreciation of the provincial differences in college mandates, particularly when the primary data sources are surveys conducted just two years after graduation. At this stage, a graduate of a college primarily engaged in a university transfer function may just have entered the labour market after completing two years of university. A graduate of a vocational, labour market entry program will have had two years of potential labour market experience. On a related point, studies using National Graduate Surveys (NGS) data often restrict attention to graduates who have not pursued education beyond that which caused them to be included in the NGS. Graduates of university transfer programs who have not subsequently attended university could be considered to be failures of the system but, under this sample selection design, would be the only college graduates from transfer programs included in the analysis.

The NGS's do not report whether the college program taken was of a vocational training nature or intended as academic preparation for further studies. Differences in this regard across provinces must be inferred by an analysis of age, pre- and post-program activity, length of program, and so on. In order to preserve sample sizes at the field of study level, the province in which the graduate's college was located has been aggregated into four regions: Atlantic Provinces, Quebec, Ontario, and Western Provinces and Territories. Table 1 provides basic demographic information on college graduates by these regions.

As is the case for universities, women form the majority of recent college graduates. This is consistent with the finding in the literature of higher returns for women. On a national level, there is a very slight increase in the proportion of male graduates but a reversal in the rankings by region in terms of the gender composition. There is not a great deal of variation in the median age at graduation, but Quebec graduates tend to be younger and Western

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[7] Skolnik (2004) provides an excellent overview of the Canadian community college system.

[8] In recent years, Ontario's colleges have become more comprehensive and, as is the case in the western provinces, have begun offering baccalaureate degrees.

time normally required to complete the program if undertaken full-time and is reported by intervals in the NGS data.[9] Using mid-points of the intervals and a maximum length of 60 months yields an approximate length in months.[10] As the table shows, there are significant differences in the length of program that are consistent through the cohorts. Graduates from western colleges spent the least amount of time in their programs, less than half the time their Quebec counterparts did in the 1995 cohort. Programs in Atlantic and Ontario colleges tend toward a stereotypical two-year length associated with applied arts and sciences colleges, but programs in Quebec are almost three years long on average. Western colleges have the most significant part-time base of students while the rest of the country appears to have only a small percentage of part-time students.

For the purposes of this report, the most significant regional differences occur in median age at graduation and average program length. Individuals graduating from Quebec's colleges are the youngest group, appreciably younger than those in the Western provinces. They also undertake the longest length of studies, on average, and the table illustrates a first regional difference to be recalled in later analyses of earnings. One obtains the impression that academically oriented college programming dominates in Quebec with direct labour market entry programs being of greater relative importance in the Western provinces.

Table 1
Profile of College Graduates

	Atlantic Region	Quebec	Ontario	Western Provinces
1990 Cohort				
Percent Male	45.2	39.4	43.4	45.2
Median Age at Graduation	22	22	23	24
Mean Age at Graduation	24.5	25.0	26.4	27.4
Avg. Length of Program (mo's)	15.7	31.8	19.3	13.9
Percent Part-Time Studies	3.0	2.4	7.1	5.6
1995 Cohort				
Percent Male	47.9	42.8	43.4	39.2
Median Age at Graduation	23	23	23	24
Mean Age at Graduation	24.9	24.2	26.5	16.5
Avg. Length of Program (mo's)	19.4	34.0	22.6	16.5
Percent Part-Time Studies	1.5	2.2	5.0	10.3
2000 Cohort				
Percent Male	50.0	43.5	41.7	41.7
Median Age at Graduation	23	21	23	25
Mean Age at Graduation	26.0	22.9	27.0	28.4
Percent Part-Time Studies	2.7	1.3	9.5	10.8

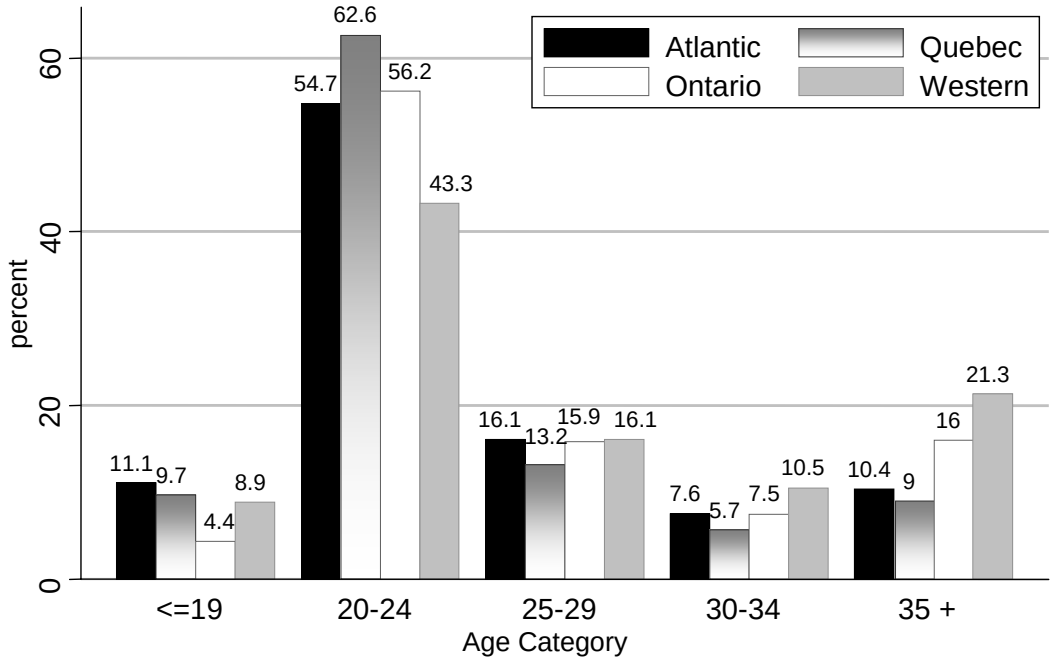
Source: Author's calculations based on 1990 FOG, 1995 and 2000 NGS files.

[9] This question was not asked of the 2000 cohort.

[10] There is likely some bias in this conversion but the bias should be constant by region and the interregional difference then becomes meaningful.

Median age at graduation and average program length may be overly aggregated as a description of the diverse population of college graduates. Figure 1 provides a more detailed examination of the distribution of ages at graduation for each of the four regions.[11] The majority of college graduates appear to have been prototypical post-secondary students in the sense that studies are completed before the age of 25. This is particularly true for Quebec where, as will be seen in Table 2, the majority of college students enter the system directly from school. Colleges in the Western provinces and, to a somewhat lesser extent, Ontario serve a significant number of older students. Figure 2 expands our understanding of the length of program by region and illustrates clearly why the average length of programs in Quebec is so much greater. Graduates from Quebec colleges are almost exclusively from 25-36 month programs. A substantial number of Ontario and Atlantic Region graduates report programs greater than two years in length, but almost no respondents from Western Region colleges did so.

Figure 1
Distribution of Graduation Age: 1995 Cohort



[11] Only the results for the 1995 cohort are reported to provide a cleaner exposition. Results are not appreciably different for the 1990 and 2000 cohorts.

Figure 2
Length of Program: 1995 Cohort

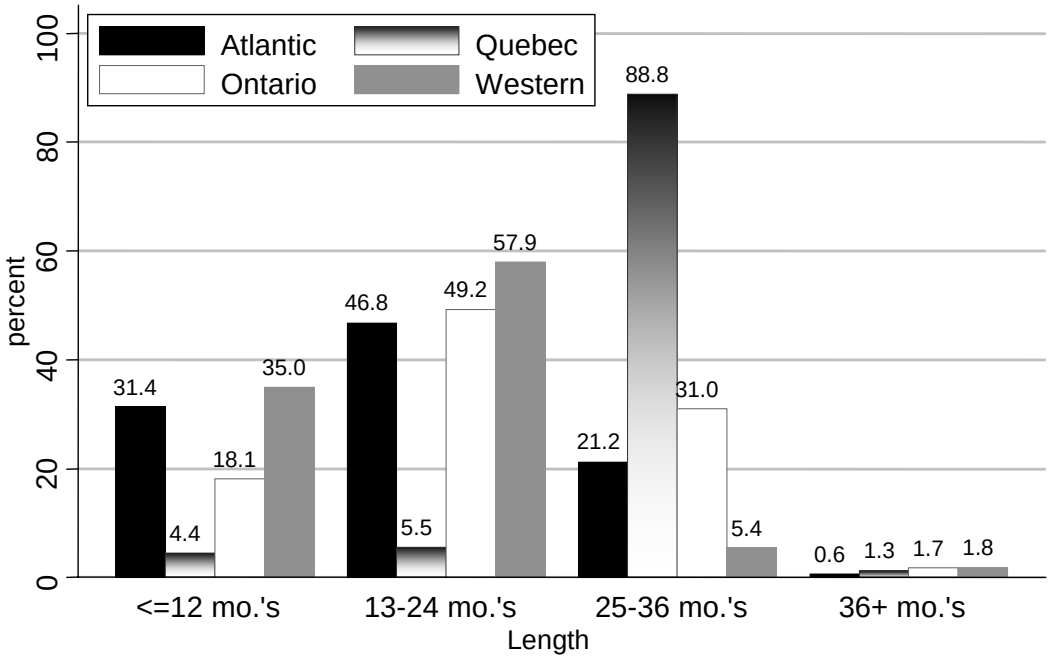


Table 2 reports comparisons of pre-program and post-program activity by region. Once again, Quebec stands out from the other regions with the highest proportion of graduates whose major activity prior to enrolling in college was attending school. Colleges in the Western Provinces are much more likely to attract students from the labour force while Ontario and the Atlantic Region colleges fall between these two extremes. Taken together with the evidence on program lengths and age at graduation, the evidence is suggestive of a college system in Quebec that is an integral part of the larger educational process from K-12 through to university. Interestingly, Quebec had the lowest proportion of college graduates with completed university degrees two years after leaving college. The province takes the lead in producing future university graduates when five years are allowed for completion. In the 2000 NGS, respondents were asked to report not only further completed programs of study but also current participation in such programs. Fully twenty-five percent of college graduates in Quebec report current enrolment in a university level program, whether a Bachelor's program, another university level certificate, or a first professional degree.

Table 2
Pre- and Post-Program Activities of College Graduates

	Atlantic Region	Quebec	Ontario	Western Provinces
1990 Cohort				
Pre-Program Major Activity				
School	42.8	68.3	45.0	29.7
Working or Unemployed	52.6	27.1	48.8	60.8
Post-Program				
Percentage completing university in 2 yrs.	7.0	2.6	5.9	8.7
Percentage completing university in 5 yrs.	5.5	10.2	8.8	8.7
Percentage in labour force	96.3	95.2	95.7	95.8
1995 Cohort				
Pre-Program Major Activity				
School	39.3	67.8	42.7	29.1
Working or Unemployed*	41.7	20.1	39.7	56.7
Post-Program				
Percentage completing university in 2 yrs.	6.0	3.4	8.9	8.1
Percentage in labour force	95.0	92.2	93.9	94.4
2000 Cohort				
Pre-Program Major Activity				
School	38.3	74.6	35.7	27.6
Working or Unemployed	47.8	14.8	43.4	54.0
Post-Program				
Percentage completing university in 2 yrs.	7.8	4.4	13.2	12.4
Percentage attending university in 2 yrs.	5.5	25.4	7.0	11.9
Percentage in labour force	94.5	93.8	96.2	94.2

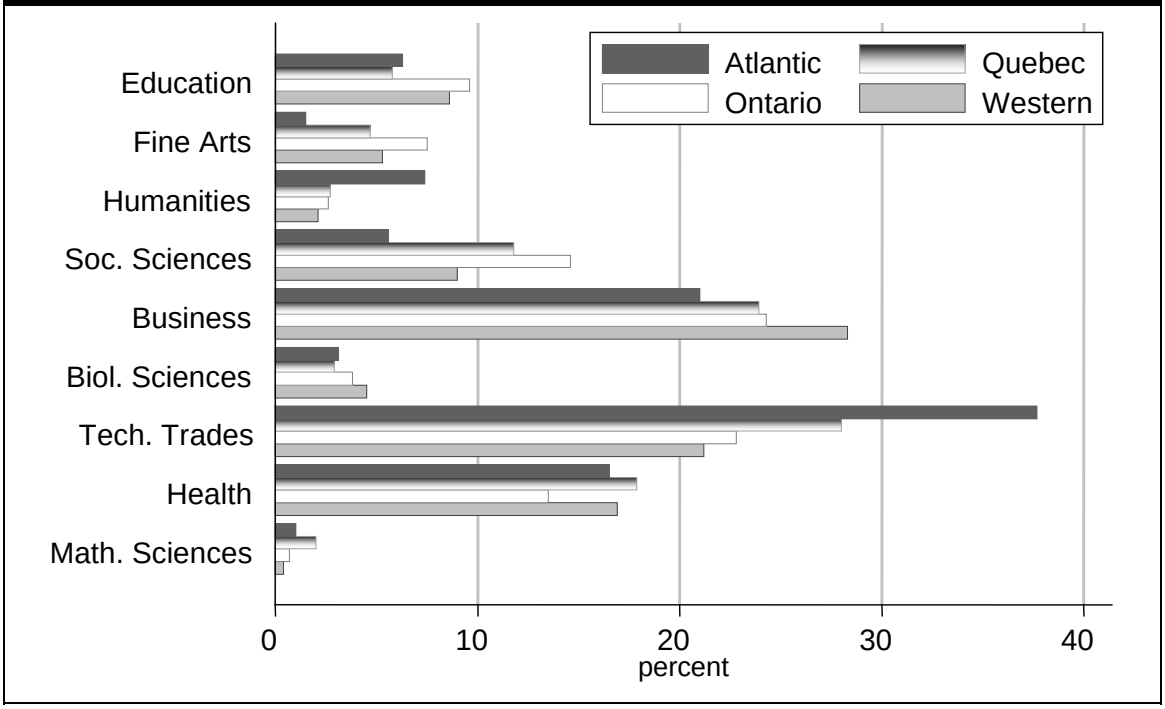
* In the 1995 and 2000 NGS, respondents could report working and going to school as a single major activity. Table 2 reports only single activities for the 1995 cohort.

Source: Author's calculations based on the 1990 FOG, 1995, and 2000 NGS.

In the Western Provinces, on the other hand, colleges draw the majority of their students from the labour force and this, coupled with the findings on shorter program lengths, suggests a greater role in vocational training. There is, however, a significant amount of university transfer programming taking place in the western provinces, as indicated by the relatively high percentage of graduates completing university within the two years after graduation across all cohorts and the relatively high number of 2000 graduates participating in university education in the 2002 reference week. Thus, there is diversity within regions as well as between them.

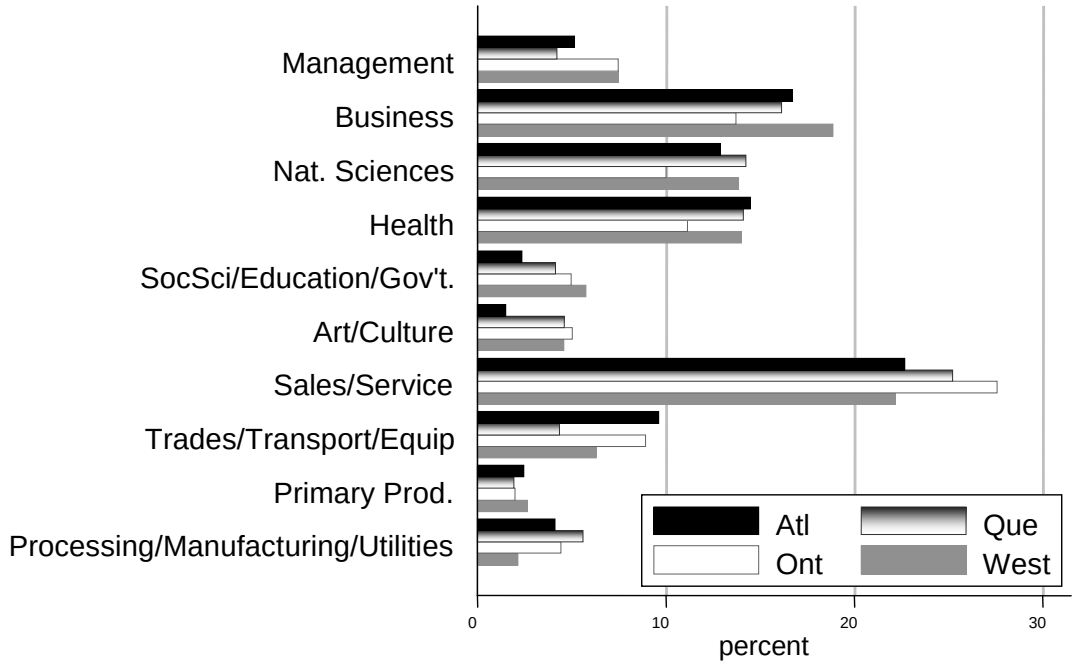
With much of the interest in this report focussed on differences in outcomes across fields of study, it is useful to understand what those fields are and how enrolment in them differs across fields and across regions. Figure 3 describes fields of study by the nine harmonization codes for the representative 1995 cohort. Note that the sample sizes for Engineering and Applied Sciences are extremely small and this category has been merged with Engineering and Applied Sciences Technologies and Trades in the rest of this report. Table A1 in the appendix provides a detailed list of fields within the aggregate field names used in this report.

Figure 3
Fields of Study: 1995 Cohort



In the Atlantic Region, Engineering and Applied Sciences Technologies and Trades is the most important college field of study by a considerable margin over Business. But moving westward, the relative importance of these two fields becomes reversed. In any region, these fields account for the majority of college graduates when taken together. All regions produce considerable numbers of graduates in Health fields but there is significant variation in the area of Social Science.

Figure 4
Occupational Destinations: 1995 Cohort



As a final check of regional differences in college systems, Figure 4 provides relative frequency distributions of occupations[12] held by their graduates two years after graduation. Once again, only the results for the 1995 cohort are reported. As was the case in Figure 3, there appear to be no dramatic differences across the regions but it is interesting to note the dominance of sales and service occupations as destinations for college graduates.

What, then, are the lessons for the subsequent analysis of earnings? College graduates tend to be quite similar across regions in terms of field of study choice and occupational destinations. There are, however, important differences between graduates from Quebec colleges and those in other regions, particularly in the West. Quebec graduates tend to be younger at graduation and much less likely to have had prior labour market experience. The opposite is true for their counterparts in the West, while Ontario and Atlantic Region graduates fall somewhere between these two extremes. If labour market experience gained prior to college education retains currency in the labour market, we can expect the earnings of Western college graduates to exceed those in other regions quite independently of the impact of that education. Whether or not a more vocationally oriented college education generates greater benefits than one which is academic in nature is an empirical question.

[12] Occupations are defined according to 1991 Standard Occupational Classification major groups.

This section has discussed regional differences in college graduates. It should also be borne in mind that there are likely to be substantial differences between college graduates within each region as well. Within any college system there is typically a highly diverse set of program offerings.

5. An Overview of Earnings Trends

The three cohorts studied in this report entered the labour market under quite different macroeconomic conditions. National unemployment rates in 1992, 1997, and 2002, the years in which earnings were surveyed in the NGS's, were 11.2, 9.1, and 7.7% respectively. The 1990's was also a decade that saw significant technological change and responses to shifting international trade patterns. It might therefore be useful to provide a brief environmental scan of labour market conditions and aggregate earnings trends before proceeding to disaggregated analysis by field of study.

Table 3 reports unemployment rates for each cohort for the reference week of the respective surveys and Labour Force Survey derived annual unemployment rates in the respective regions for all individuals ages 20 to 29. College graduates usually fare better than the general population of similar age, but are not immune from the labour market conditions of their region. Across regions, their unemployment rates reflect differences in labour market tightness and, to the extent that labour supply and demand affect wages, one should expect corresponding regional differences in earnings. Unemployment rates in the general population and among college graduates fell through the 1990's as is to be expected given the continuous growth in overall economic activity during the decade.

Table 3
Unemployment Rates of College Graduates Two Years After Graduation

	Atlantic Region	Quebec	Ontario	Western Provinces
1990 Cohort (in 1992)	19.2%	11.3%	11.9%	11.9%
Regional rate for ages 20-29	20.3	15.3	13.7	12.1
1995 Cohort (in 1997)	14.4	9.9	10.3	6.8
Regional rate for ages 20-29	17.7	13.4	10.7	8.5
2000 Cohort (in 2002)	11.1	6.5	7.3	8.0
Regional rate for ages 20-29	14.1	9.3	9.5	7.8

Source: Author's calculations based on 1990 FOG, 1995 NGS, 2000 NGS files, and Labour Force Survey data

We now begin a descriptive overview of earnings among college graduates over the 1990's. The sample is restricted to those working full-time during the survey reference week. Recall, as well, that all graduates are included in the analysis whether or not they undertook further studies after completing their college programs. Figures 5a and 5b provide medians and interquartile ranges of constant 1997 dollar annual earnings by region and by gender for the three cohorts of graduates.[13] Where common years of observation exist, the medians reported in these figures are consistent with the findings of Little and Lapierre (1996), Paju (1997) and Finnie (1999b). The tendency for median incomes to decline from the 1990 to the 1995 cohort among women and Quebec males is also consistent with Walters' (2004) regression based results that show national average earnings among college graduates declining over this period. Given the brightening

[13] The results are provided in tabular form in the Appendix, Table A3.

macroeconomic picture from 1990 to 1995, the tendency for median incomes among women to fall during this period is puzzling unless it is an artefact of the change in the earnings measures in the two surveys. If attention is restricted to the latest two survey periods for which consistent definitions of earnings were used, median earnings grow among all eight demographic groups of college graduates.

Earnings dispersion, as measured by the interquartile range, tends to be larger in the Western Provinces and smaller in Quebec for men. This may reflect the greater dispersion in ages and program lengths (and therefore diversity among graduates) in the former region reported in Figures 1 and 2. A similar pattern is evident for women, although for this group the significant decline in median earnings from 1992 to 1997 is the most interesting finding.

Figure 5a
Medians and Interquartile Ranges: Males

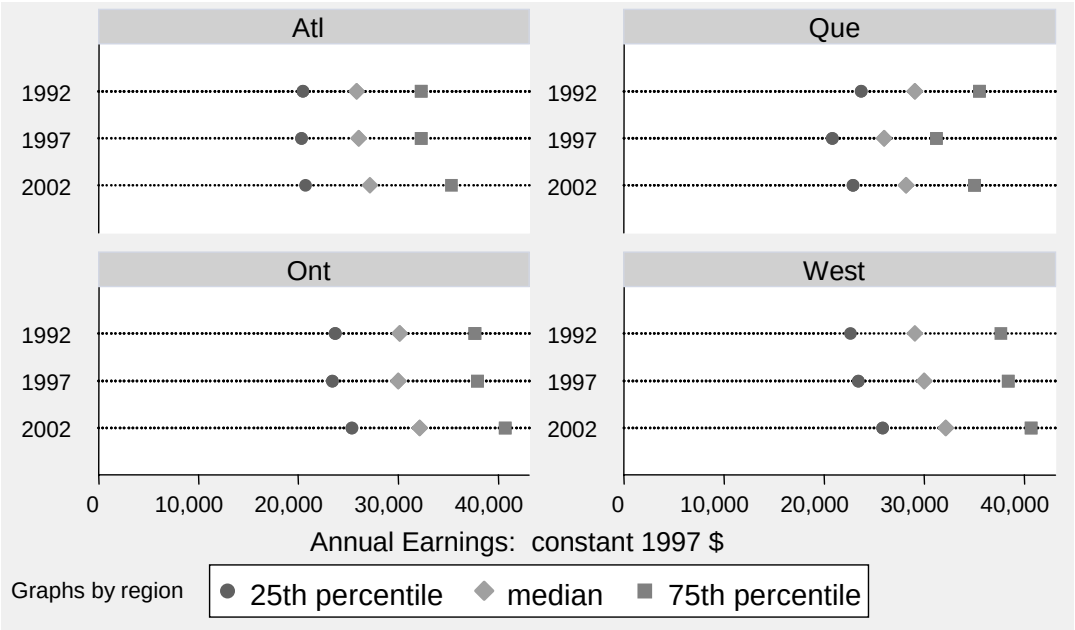
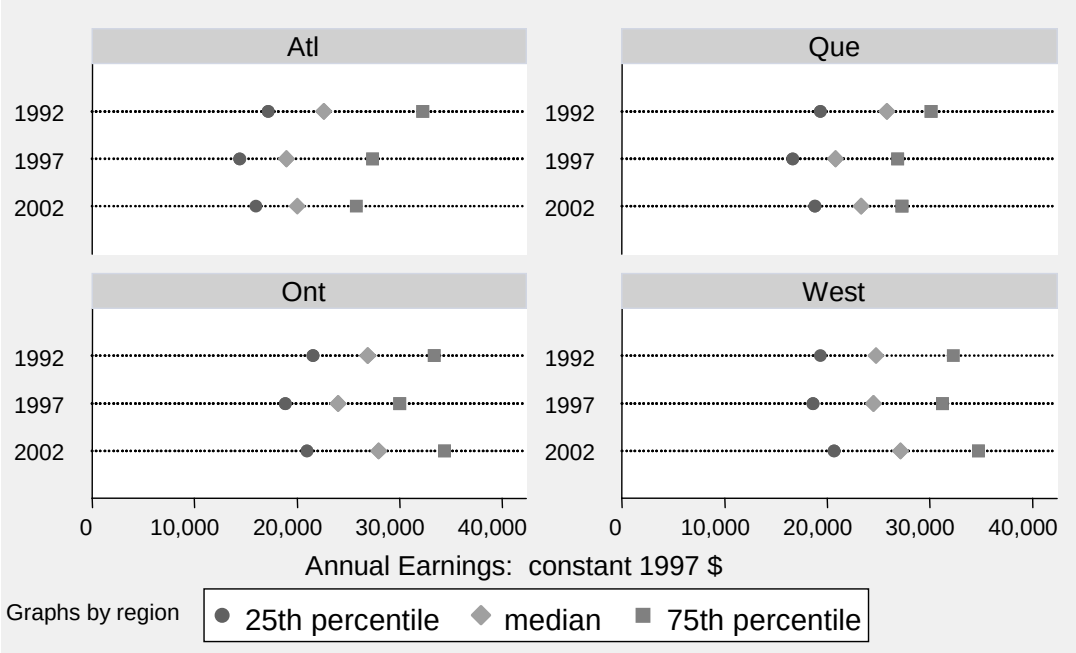


Figure 5b
Medians and Interquartile Ranges: Females



The earnings in Figure 5 display significant variation across individuals within regions as well as changes in medians over the decade. The following section explores the extent to which field of study contributes to both of these phenomena.

6. Earnings by Field of Study

To assess the impact of changes in earnings by field of study on trends and differences noted in Figure 5, Table 4 reports median earnings on a national basis[14] by field of study harmonization codes. With the majority of male college graduates emerging with certificates in the engineering and applied sciences, technologies and trades area, the behaviour of male earnings described in Figure 5a is driven by the dynamics of earnings in this field. Through the decade, these earnings have risen from fairly average values relative to other fields to the second highest earnings. Technological advances in the 1990's appear to have generated robust growth in the demand for technologists. Except for the surprisingly high median earnings among male college graduates in the humanities, the pattern of earnings across fields tends to corroborate the finding of a positive correlation between technological content and earnings in the literature, as discussed in section II.

The decline in overall earnings for women from 1992 to 1997 reported in Figure 5a is the result of a decrease almost across the board in terms of fields. While there was an increase in Technologies and Trades and in Mathematical Sciences, the number of women in these fields is quite small and, as a result, earnings developments in them have little overall impact. The majority of female graduates are in the fields of Business and Health, both of which suffered significant earnings declines from 1992 to 1997. Both of these fields recovered from 1997 to 2002, but graduates in the Health field saw median earnings still below the level experienced in 1992. Note that the positive correlation between technological content and earnings is less pronounced for women than it is for men. Moreover, women do not appear to have benefited from growth in the demand for technological fields.

Table 4
Median Earnings of College Graduates, by Field of Study (constant 1997 $)

	Males			Females		
Field	**1992**	**1997**	**2002**	**1992**	**1997**	**2002**
Education	$26,362	$19,924	$26,329	$21,520	$20,103	$22,604
Fine Arts	21,520	24,148	26,893	20,444	17,716	24,476
Humanities	25,824	21,646	31,501	22,596	20,180	24,412
Social Sciences	32,280	26,454	27,834	26,900	20,753	26,221
Business	27,976	26,842	28,210	23,672	20,490	25,389
Biol. Sciences	25,824	24,182	28,868	21,520	18,454	24,955
Tech. Trades	27,976	30,615	32,550	26,900	27,084	25,703
Health	35,508	27,740	32,911	32,280	23,802	29,069
Math. Sciences	30,128	34,871	31,971	23,672	30,323	27,478

[14] Small cell count problems arise in producing reliable median estimates for disaggregated field of study, gender and region groups. See Table A2 for an illustration of these cell counts. Distribution by field of study is reported at the national level in Table A5.

The median earnings reported in Table 4 are purely descriptive statistics. Before attributing observed differences across fields of study to some sort of causal influence of field it is important to control for group characteristics that both differ systematically across fields of study and are related to earnings quite independently of field of study. Regression analysis provides an appropriate framework for developing statistical inferences about field effects while controlling for observable individual characteristics. Invoking regression with only categorical variables for each field of study estimates differences in raw mean earnings across fields prior to controlling for other earnings-related factors. The model is then:

$$\ln W = \alpha_o + \alpha_1 D_1 + \alpha_2 D_2 + \cdots + \alpha_{n-1} D_{n-1} + \varepsilon$$

where D_i is a dummy variable taking the value 1 if the field of study is i,
i=1, …, n-1, and
n is the number of fields of study.

The constant term estimates the mean earnings in the omitted field of study, while the rest of the coefficients provide estimates of the difference in the mean natural logarithm of earnings in each field of study relative to the omitted category which, in the following estimates, is education. Also, the mathematics of logarithms means that the coefficients are approximations to the percentage difference in earnings in any field relative to the omitted field. The results of estimating this equation for each cohort are reported in Table 5:

Table 5
Regression Results: Relative Mean Earnings by Field of Study

Males						
	1992		1997		2002	
Field	Coeff.	*t*	Coeff.	*t*	Coeff.	*t*
Fine Arts	-0.2340	11.34	0.0894	4.27	0.0435	2.41
Humanities	-0.1404	6.74	0.1261	5.16	0.2356	9.41
Social Sciences	0.0448	2.60	0.2314	12.29	0.0870	4.65
Business	-0.0066	0.40	0.2145	12.05	0.1334	8.48
Biol. Sciences	-0.1467	8.34	0.1246	5.74	0.1186	6.71
Technical Trades	0.0164	1.09	0.3784	22.15	0.2506	16.55
Health	0.2025	11.82	0.2370	11.62	0.2818	14.93
Math Sciences	0.0278	1.70	0.4319	16.99	0.2527	15.83
Constant	3.341	227.85	9.913	589.20	10.12	682.91
R^2	0.04		0.06		0.03	

Table 5 (continued) Regression Results: Relative Mean Earnings by Field of Study						
Females						
	1992		**1997**		**2002**	
Field	**Coeff.**	***t***	**Coeff.**	***t***	**Coeff.**	***t***
Fine Arts	-0.0504	4.55	-0.0403	3.43	0.0697	7.18
Humanities	0.0573	4.06	0.0507	3.03	0.0210	1.15
Social Sciences	0.1549	17.35	0.0707	7.57	0.1053	12.28
Business	-0.0092	1.22	0.0715	8.74	0.1233	18.38
Biol. Sciences	-0.0692	6.25	0.0091	0.66	0.0661	5.28
Technical Trades	0.1362	13.75	0.2890	25.09	0.1299	15.71
Health	0.2556	33.21	0.1953	23.20	0.2653	37.20
Math Sciences	0.0248	2.89	0.2980	10.62	0.1856	19.96
Constant	3.123	487.81	9.825	1,467.75	10.01	1,714.16
R^2	0.08		0.04		0.04	

As expected, the behaviour of mean earnings relative to education mimic the differences in medians reported in Table 4. Relative earnings differences among men in business, technical trades and mathematical sciences are not, however, statistically significant in 1992. Otherwise, and with only several exceptions, field of study effects matter statistically for earnings. They do not, however, account for much of the variation in earnings across individuals, as evidenced by values for the coefficients of determination that are low even by the standards of cross-sectional wage equations estimated with microdata.

The results in Table 5 are raw differences in means and should be regarded in the same way as field differences in median incomes reported in the previous section. To isolate true field effects, an extended human capital model is used that adds controls to the equation above.[15] The following sets of control variables are used:

- Region of the institution, with the Atlantic Provinces as the reference case;
- Demographic variables: age at time of interview, an indicator for education of father to capture socioeconomic class, marital status, visible minority status;
- Previously acquired human capital: indicators for educational attainment prior to graduation from the college as well as an indicator for individuals who had worked full-time prior to completing college;
- Length of program: categorical indicators for normal length of program.

[15] The human capital earnings function estimates provide true field effects only to the extent that all earnings-related factors are observable in the data.

Full regression results are reported in Appendix tables A4a and A4b. Field effects continue to be differences in means relative to graduates in the education field but coefficients should now be interpreted as average differences for observationally equivalent individuals. Generally speaking, the sign patterns observed for raw mean relative earnings by field reported in Table 5 are preserved, although magnitudes are frequently changed. Rather than interpreting these differences relative to education, however, it may be more illuminating to normalize the estimated field differentials as deviations from the overall mean earnings. The omitted field variable in the earnings equation is treated as having no effect on wages (beyond that picked up by the constant), the weighted (by population estimates) average of earnings differentials for all fields is calculated, and finally, the difference between the field differential and the overall weighted mean differential is calculated. The results are illustrated in Figures 6a and 6b.

With much of the enrolment among male graduates in the technical trades, earnings in this field receive a large weight and tend to centre earnings in other fields. The lack of growth in the relative earnings in this field may, at first, seem counterintuitive given the previous results that their wages grew at a robust rate relative to other fields. Recall, however, that in this presentation the large weight the field receives tends to compare earnings in the field with itself. With that understanding, we see the same tendencies in earnings by field of study that were previously reported, with the surprisingly large increase in the humanities in 2002 and the significant drop in health fields in 1997. Also, the fields in Figure 6a tend to be ranked from less to more technological content as one moves downwards and the figure then conveys visually the positive correlation between the degree of such content and earnings estimates.

Figure 6a
Relative Earnings Differential: Males

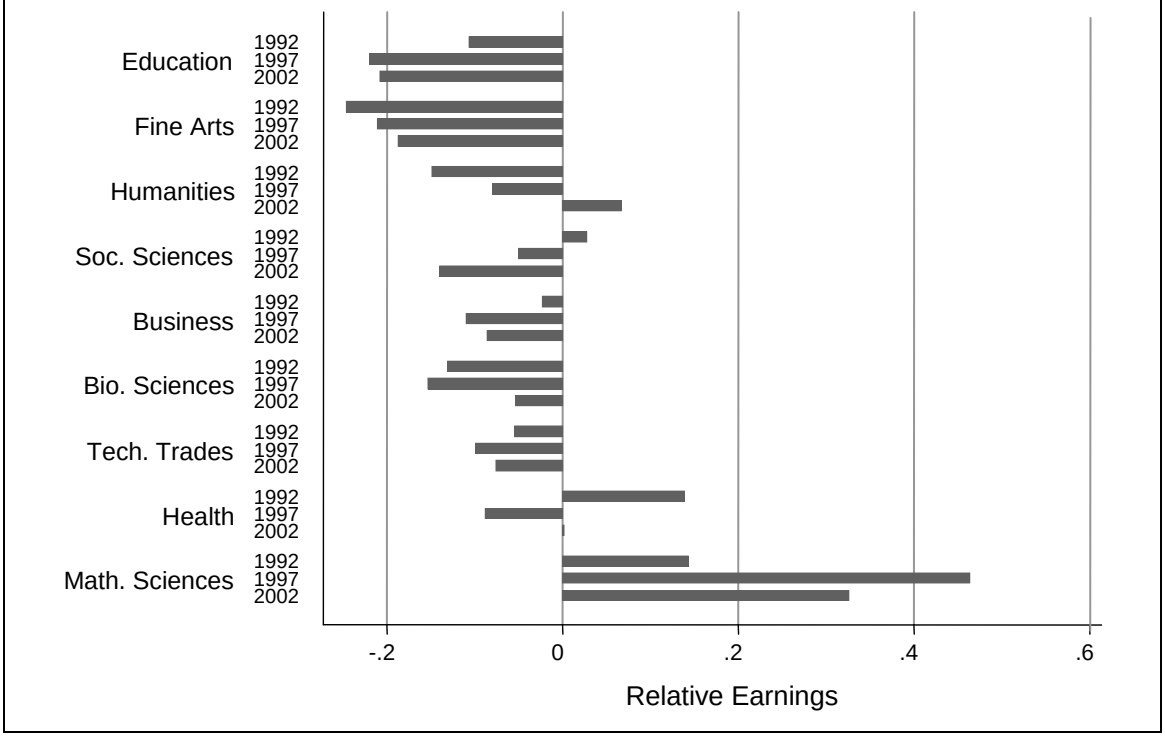
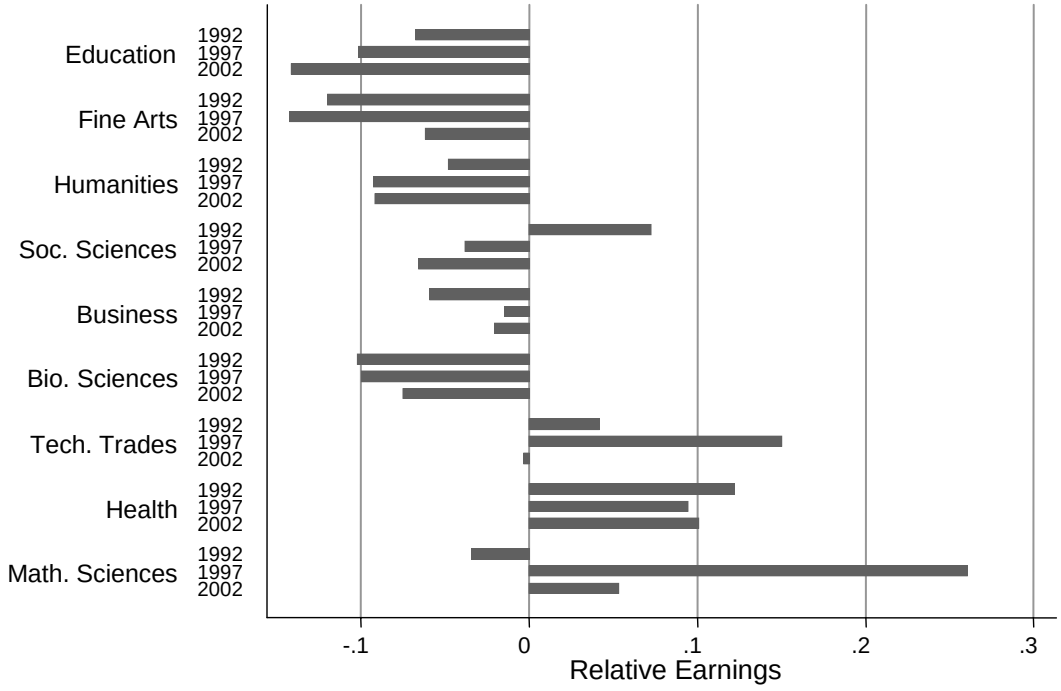


Figure 6b
Relative Earnings Differential: Females



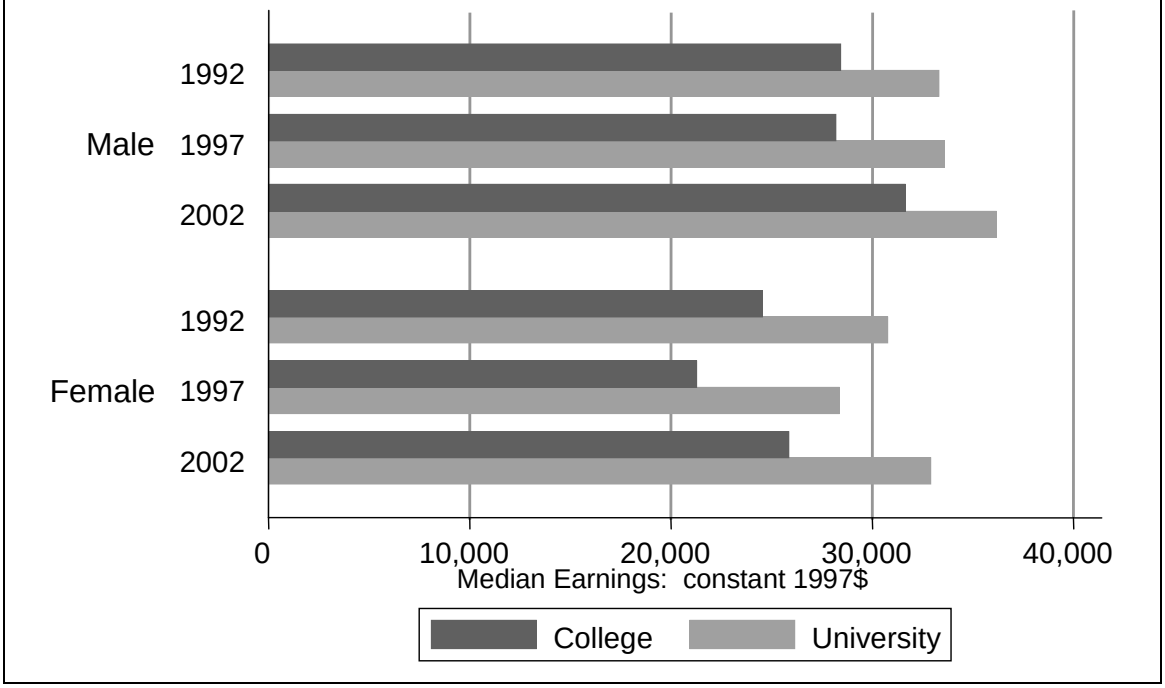
A similar impression is had by an inspection of Figure 6b, with exception of Biological Sciences where female earnings are substantially below the weighted average across fields. As is the case for men, earnings in social sciences experienced a constant decline through the decade and mathematical science graduates enjoyed a large earnings premium in 1997. The rather erratic behaviour of earnings in this field for women may be the consequence of small sample sizes for this cell. No single field of study dominates the sample as it did for men so the weights are more evenly distributed across fields. Earnings among business graduates then tend to be similar to the overall average across females and earnings in the health field are consistently above average.

7. College vs. University Earnings

To this point, the earnings of college graduates have been discussed without context. In this section, that context is provided by comparing their earnings to those of university graduates of Bachelor's level programs. Such a comparison provides a point of reference for assessing the magnitude of college graduate earnings and is interesting if we believe individuals leaving high school make choices between college and university streams of post-secondary education by comparing their relative financial attractiveness.

We begin with a broad overview. Figure 7 reports median earnings by cohort and by gender for college and university bachelor's degree graduates. The remarkable feature of Figure 7 is the consistent relationship of college to university earnings. For both genders, the former appear to be a constant proportion of the latter, changing together to maintain that proportion. There is a sense of equilibrium in their relationship of the type to be expected if individuals entering the post-secondary education sector react to changes in the relative attractiveness of the university and college options. We return to this point below after discussing the rates of return to university and college education.

Figure 7
Median Earnings: College vs University



As was the case for differences in earnings by field of study, there is potential for confounding earnings impacts of the different levels of study with other wage related factors that differ systematically between university and college graduates. To control for these factors, the human capital earnings function has been estimated for the sample containing college and university graduates, with the same controls used as was the case in the previous section. The full results are reported in Tables A6a and A6b of the appendix. The premia for university graduates over college graduates produced by these estimates are reproduced in Table 6 both as coefficient values from the regression model and converted to percentage differences.[16] Note that the estimates in this table refer to differences in mean earnings.

Table 6
Percentage Earnings Premia of University Graduates Compared to College Graduates

Males			Females		
1992	**1997**	**2002**	**1992**	**1997**	**2002**
0.174	0.224	0.231	0.244	0.335	0.299
(35.03)	(45.96)	(63.26)	(57.64)	(83.37)	(107.86)
19.0%	25.1%	26.0%	27.6%	39.8%	34.9%

t-statistics in parentheses

The relatively large premia in median incomes for women illustrated in Figure 7 is confirmed by the estimates in the table and are consistent with results found in Walters and in Boothby and Drewes.

The substantial differences in earnings between college and university graduates raise the question of why so many individuals choose the former path over the latter. Certainly, it may be the case that individuals possess and pursue comparative advantage and that the earnings of university graduates do not then accurately reflect what college students would have earned with a university degree. But there is a more immediate explanation. Educational choices are normally modelled in economics as being driven by the rate of return to the investment, not by what has been termed so far the "earnings premium". The rate of return can be used to evaluate the benefit to the investment in education in the same manner as any financial investment and is defined as the discount rate that would make the present value of the stream of benefits and costs equal to zero. For any individual, the rate of return, r, is implicitly defined by the following formula:

$$\sum_{t=1}^{n} \frac{(E_t^c - E_t^h)}{(1+r)^t} - C = 0$$

where $E_t^{c,h}$ are earnings at time t with a college education and without, respectively. We can suppose the alternative to a college education is high school only.

[16] The coefficient on a categorical variable is only approximately equal to the proportionate effect of that variable when earnings are used in natural logarithmic form. With values in the range reported in Table 6, the approximation becomes poor and the actual percentage impact of the variable must be calculated as exp(b)-1, where b is the coefficient estimate.

n is the potential length of the working life, and
C is the total out-of-pocket cost of tuition, books, etc. For simplicity, these are not discounted.

Calculation of the rate of return for a college graduate then requires information on the life-cycle of his or her earnings, information on what his/her earnings would have been had the educational investment stopped at high school, and the costs of acquiring a college diploma. The National Graduate Survey provides information only on the earnings of college graduates two years after graduation and is therefore unable to produce rate of return estimates. Obviously, the same problem exists for university graduates. External data sources on provincial tuition rates might be used to estimate out-of-pocket costs for each respondent in the NGS. A much more difficult problem arises when we try to estimate what college graduates would have earned had they not pursued post-secondary education.

No dataset exists that can produce this counterfactual since we can never really observe what might have been. But sources such as Census data do provide earnings information for both college and high school graduates and the latter is typically used as the counterfactual. The National Graduate Survey does not contain information on high school earnings and can therefore not even provide a proxy counterfactual. Moreover, the National Graduate Surveys provides us with no ability to estimate life cycle earnings, as required by the rate of return formula, even for college graduates alone.

It is unorthodox to explore one dataset by introducing another and we run a risk of using inconsistent concepts and measurements. Nevertheless, the importance of the role of the rate of return in understanding the earnings differences between college and university graduates found in this section is so critical that a brief analysis of the 1996 Census data is necessary.[17]

Restricting attention to young workers in the Census between the ages of 20 and 29, median earnings of full-time male workers were $20,745, $26,000 and $29,000 for high school, college, and university graduates, respectively. When inflated to 1997 dollars, these values are reasonably close to those produced by the NGS surveys for college and university graduates. This is also true for women. We can then use Census results with some degree of confidence that they will provide estimates that are acceptable alternatives to what the NGS might have produced. Having a counterfactual for earnings in the absence of post-secondary educational investment (high school earnings) and a cross-section of earnings across ages, we can produce the three required earnings profiles. To do this, a cubic equation in experience is fitted to the annual earnings of full-time workers in each educational group, by gender. Results for men are illustrated in Figure 8.

The following assumptions are made in order to calculate representative rates of return:

[17] The following analysis is intended for illustrative purposes only. For a more careful statistical approach to rates of return for universities and colleges, see Boothby and Rowe (2002) and Vaillancourt (1995).

- we are considering an 18 year old high school graduate facing three choices: labour market entry, enrolment in college, or enrolment in university. The individual will work until age 65;

- college requires two years of study, while university requires four years. These represent the modal lengths of study in the 1995 NGS data at the national level, as reported in Table 8. Thus, the direct labour market entrant begins gaining experience immediately, the college graduate only at age 20, and the university graduate, not until age 22;

- the average college tuition in 1993-94 an 1994-95 was 704 constant 1995 dollars. The average university tuition in the four years leading up to 1995 was 2,021 constant 1995 dollars. These values are derived from national average tuition rates as reported in Junor and Usher (2004), table 4.II.1;

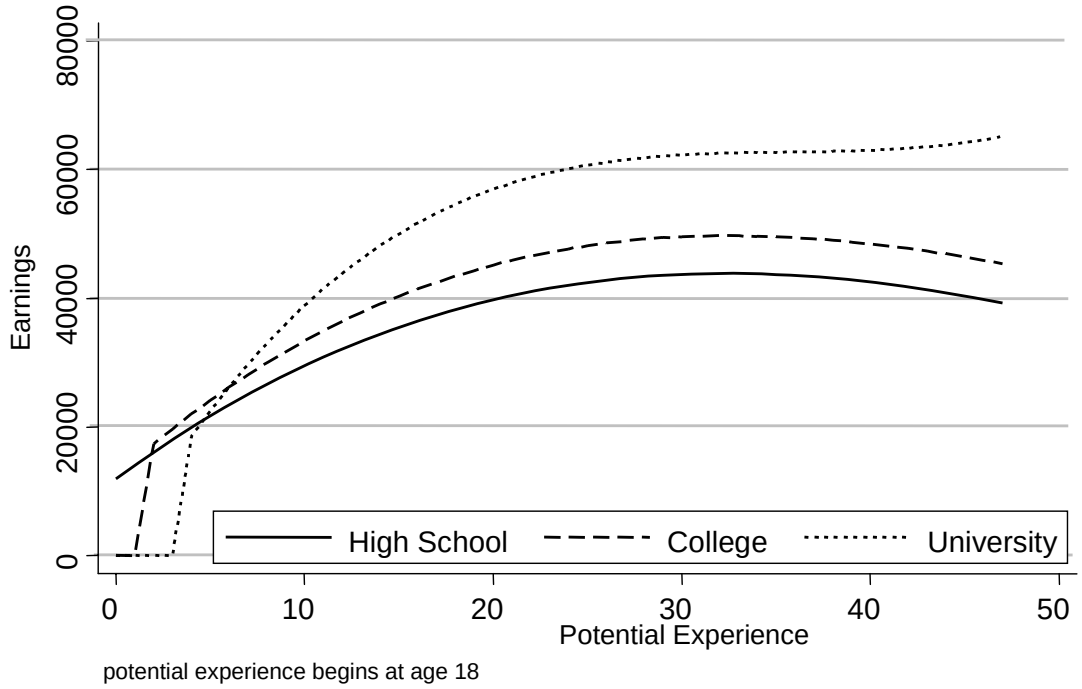
- there are no other out-of-pocket costs incurred while attending college or university that would otherwise not have been incurred.

Table 7
Distribution of Program Lengths: College vs. University (1995 Cohort)

Length	College	University (Bachelor's)
3 to 5 months	2.5%	0%
6 months – 1 year	23.2	6.3
13 months – 2 years	47.2	6.6
3 years	24.6	22.2
4 years	1.2	55.3
5 years	0.1	7.7
more than 5 years	0.0	0.7
no normal length	0.3	0.3
don't know	0.9	0.9

The time profile of earnings is illustrated in Figure 8 for men. Note that there is a substantial difference between the annual earnings of college and university graduates. For example, at age 45, the cubic function generates annual earnings that are more than $12,000 higher for the university graduate. In absolute terms, the earnings gap is similar for women and the simple parameterization of the profiles generates magnitudes that appear to be reasonable relative to NGS outcomes.

Figure 8
Earnings-Experience Profiles: Men



The values required for the rate of return calculation are now available and, when inserted into the formula produce the following results:

Table 8
Simulated Rates of Return to College and University

	College	University
Males	11.8%	11.4%
Females	11.4%	12.8%

The observation of very large earnings differences between university and college graduates can now be reconciled with the observation that young individuals continue to invest in a college education … the return to the investment is larger for women and almost as large for men. When rates of return in the order of 11 – 13% are estimated, earnings gaps in the future, though large, are heavily discounted and rates are more sensitive to events early in the life cycle. The additional two years required to obtain a Bachelor's degree instead of a college diploma, at a cost of foregone earnings, weigh heavily against the future earnings benefits. Note that estimates are not particularly sensitive to tuition levels. If college tuition is raised to the same level as university tuition, the rate of return estimate for men falls from 11.8% to 11.0%.

8. Conclusions

The focus of this report has been the earnings of college graduates early in their careers; how those earnings have changed over the 1990's, how they differ across fields of study, and how they compare to the earnings of university graduates. The diversity of college programs across and within provinces must be borne in mind when generalizing the findings, but some broad conclusions can be drawn.

Median earnings of college graduates tended to fall from 1992 to 1997, although this decline may have had more to do with a change in the definition of earnings used in the NGS than with real underlying changes. From 1997 to 2002, overall earnings changes were moderately positive, fuelled by substantial increases for male graduates of education and humanities fields and for female graduates of the business and health fields in which they tend to congregate. For both genders, there is a consistent pattern of differences in earnings across fields of study that appears to reward the technological content of programs. Earnings of university graduates are substantially larger than those of college graduates, as much as forty percent higher among women in 1997. Once account is taken of the lower costs of acquiring a college diploma, especially the shorter program lengths, rates of return to the two post-secondary education options are very similar.

The policy implications of these findings flow from the recognition that earnings represent prices for skill sets obtained by college graduates. As such, they act as signals of labour market imbalances and as incentives for individuals to act in a way that will correct those balances. Unfortunately, the NGS's exclude graduates of apprenticeship programs and we cannot, therefore, address the currently topical issue of skilled trades shortages. Nevertheless, graduates of Canadian colleges play important roles in the skilled labour market and we can use earnings as a barometer of market conditions. The overall growth in real earnings from 1997 to 2002 (using consistent measures of earnings) suggests continued demand for graduates of Canadian colleges. There is considerable variation in earnings growth within specific fields but much of this might be attributable to small sample sizes in some of them. In the more popular fields, we find continued growth in the earnings of men in the engineering and applied sciences, technologies and trades which is consistent with technology-driven growth in the demand for their skills and suggests additional enrolment may be warranted in this field. Women, on the other hand, tend to graduate from business and health programs. During the 1990's, they have seen only moderate growth in the former field and a decline in the latter, possibly due to government retrenchment in health care spending over that time. Should that spending recover, earnings patterns for women do not suggest an obvious need for changes in enrolment patterns.

Post-secondary education policy requires that choices to be made about the allocation of resources to different sectors and such public policy choices should be driven by the social return to investments. While this report has not estimated these returns, it has suggested that, despite substantial differences in earnings between college and university graduates, the private internal rates of return to investments in the two types of post-secondary education are likely to be quite similar. If the difference between the private and social return in one sector is comparable to that in the other, then one might conclude that social rates of return to investments in the college sector are also similar to the social returns generated by investments in the university sector.

An examination of earnings can provide important information about the quality, quantity, and labour market currency of skills acquired by students in the college system. This indirect evidence could be augmented by further analysis of NGS data. For example, although self-reported information may not be optimal, it would be of considerable interest to analyze graduates' perceptions of how important their acquired skill sets are in getting and doing their jobs. An analysis of occupational destinations would also be of considerable interest, particularly since college graduates tend to concentrate in the sales and service area despite the fact that the most prominent fields of study are in applied sciences and technologies, business and health. Does this indicate, for example, a mismatch between skills and labour market needs? If it does, is there opportunity for occupational mobility by college graduates or does the college focus on occupational skills as opposed to generic skills limit their ability to transition between jobs?

This report has asserted that the Canadian college sector has been relatively under-researched. That remains true and a considerable scope for further research remains, research that is warranted by the importance of the college sector in the development of a skilled labour force.

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Appendix Tables

Table A1 **Field of Study Categories: Harmonization Codes**	
Category MNEMONIC	Detailed Field of Study *Classification of Instructional Program Codes*
Education, Recreational and Counselling Services EDUCATION	Teaching; Educational Support; Physical Education and Recreation; Travel and Tourism; Counselling Services; Personal Development; Other *13. , 31.*
Fine and Applied Arts FINE ARTS	Fine Arts; Music; Performing Arts; Commercial and Promotional Arts; Graphic Arts, Audiovisual Arts and Design; Other *50.*
Humanities and Related Fields HUMANITIES	Classics, Classical and Dead Languages; History; Library and Records Science; Mass Media Studies; English Language and Literature; French Language and Literature; Other Languages and Literature; Philosophy; Religious Studies; Other Humanities; Second Language Training *16., 23., 24., 38., 39., 54., 30.13, 30.21, 30.22, 55.*
Social Sciences and Related Fields SOC. SCIENCES	Anthropology; Archeology; Area Studies; Economics; Geography; Law and Jurisprudence; Man/Environmental Studies; Political Science; Psychology; Sociology; Social Work and Social Services; Other *05., 09., 19., 22, 30.05, 30.10, 30.11, 30.14, 30.15, 30.17, 30.20, 30.23, 30.25,42., 45*
Commerce, Management and Business Administration BUSINESS	Specialized Administration Studies; Commerce/Business/Management; Secretarial Science- general fields *30.16, 44., 52.*
Agricultural and Biological Sciences/Technologies BIOL. SCIENCES	Agricultural Science; Agricultural Technology; Animal Science Technologies; Biochemistry; Biology; Biophysics; Botany; Household Science and Related Fields; Veterinary Medicine/Science; Zoology; Other Natural Resource Technologies; Food Processing Technologies *01., 03., 26, 30.01, 30.19, 30.24*
Engineering and Applied Sciences Technologies and Trades TECH. TRADES	Architecture; Aeronautical and Aerospace Engineering; Chemical Engineering; Civil Engineering; Design/systems Engineering; Electronic and Electrical Engineering; Industrial Engineering; Mechanical Engineering; Mining and Metallurgical Engineering; Engineering – Other; Engineering Science; Forestry, fisheries and Wildlife Management; Landscape Architecture, Architectural Technology; Chemical Technology; Building Technologies; Data Processing and Computer Science Technologies; Electronic and Electrical Technologies; Environmental and Conservation Technologies; General and Civil Engineering Technologies; Industrial Engineering Technologies; Mechanical Engineering Technologies; Primary Industries/Resource Processing Technologies; Transportation Technologies *04., 10., 12., 14., 15., 28., 29., 30.12, 41., 43., 46., 47., 48., 49.*

Table A1 (continued) Field of Study Categories: Harmonization Codes	
Health Professions, Sciences and Technologies HEALTH	Dentistry; Medicine – General; Medicine – Basic Medical Science; Medical Specialities; Paraclinical Sciences; Surgery and Surgical Specialities; Nursing; Nursing Assistance; Optometry; Pharmacy and Pharmaceutical Sciences; Public Health; Rehabilitation Medicine and Therapy; Medical Laboratory and Treatment Technologies; Medical Equipment and Prosthetics; Other *51., 60.*
Mathematics and Physical Sciences MATH. SCIENCES	Computer Science; Chemistry; Geology; Mathematics, Actuarial Science and Applied Mathematics; Metallurgy and Materials Science; Meteorology; Oceanography; Physics *11., 25., 27., 30.06, 30.08, 30.18, 30.19, 30.24, 40.*

Table A2
Sample Sizes by Field of Study and Region: 1995 College Graduates Working Full-Time During Reference Week in 1997

	Atlantic Provinces	Quebec	Ontario	Western Provinces
	Males			
Educational, Recreational and Counselling Services	15	9	9	53
Fine and Applied Arts	11	20	31	70
Humanities and Related Fields	50	13	16	28
Social Sciences and Related Fields	64	65	43	82
Commerce, Mgt. and Business Adm.	57	47	100	356
Agricultural and Biological Sciences	44	28	47	108
Engineering and Applied Sciences Technologies and Trades	559	340	405	1,376
Health Professions, Sciences and Technologies	25	17	18	104
Mathematics and Physical Science	16	19	15	28
Interdisciplinary/no spec./unknown	0	3	4	29
	Females			
Educational, Recreational and Counselling Services	94	40	66	202
Fine and Applied Arts	33	49	42	86
Humanities and Related Fields	52	16	14	58
Social Sciences and Related Fields	54	61	62	222
Commerce, Mgt. and Business Adm.	236	161	136	614
Agricultural and Biological Sciences	40	41	32	110
Engineering and Applied Sciences Technologies and Trades	48	65	75	250
Health Professions, Sciences and Technologies	146	58	79	381
Mathematics and Physical Science	25	10	4	14
Interdisciplinary/no spec./unknown	0	4	6	36

NOTE: Sample sizes are derived from the 1995 NGS Public Use Microdata File

Table A3
Median Earnings and Interquartile Ranges (1997$)

		Atlantic Provinces	Quebec	Ontario	Western Provinces
	Males				
1992	75th Percentile	32,280	35,508	37,660	37,660
	Median	25,824	29,052	30,128	29,052
	25th Percentile	20,444	23,672	23,672	22,596
1997	75th Percentile	33,280	31,200	37,900	38,400
	Median	26,000	26,000	30,000	30,000
	25th Percentile	20,280	20,800	23,400	23,400
2002	75th Percentile	35,262	35,074	40,687	40,687
	Median	27,125	28,210	32,098	32,159
	25th Percentile	20,687	22,873	25,316	25,859
	Females				
1992	75th Percentile	32,280	30,128	33,356	32,280
	Median	22,596	25,824	26,900	24,748
	25th Percentile	17,216	19,368	21,520	19,368
1997	75th Percentile	27,387	26,894	30,000	31,200
	Median	19,000	20,800	24,000	24,461
	25th Percentile	14,400	16,640	18,850	18,600
2002	75th Percentile	25,769	27,269	34,358	34,720
	Median	20,043	23,327	27,928	27,125
	25th Percentile	15,986	18,807	20,946	20,687

Table A4a
Regression Results: Earnings by Field of Study with Controls: Males

	1992		1997		2002	
Explanatory Variable	**Coeff.**	***t***	**Coeff.**	***t***	**Coeff.**	***t***
Fine Arts	-0.1397	5.90	0.0085	0.40	0.0201	1.16
Humanities	-0.0552	2.26	0.1275	5.13	0.2244	9.33
Social Sciences	0.1339	6.64	0.1693	8.82	0.0680	3.79
Business	0.0832	4.33	0.1091	6.02	0.1216	8.07
Biol. Sciences	-0.0250	1.21	0.0657	3.00	0.1535	9.05
Technical Trades	0.1277	7.21	0.2909	16.60	0.2488	17.12
Health	0.2448	12.16	0.1310	6.36	0.2090	11.48
Math. Sciences	0.0834	4.35	0.3285	13.04	0.2486	16.17
Quebec	0.0165	1.21	-0.0852	5.92	0.0829	9.99
Ontario	0.1221	10.24	0.1160	8.98	0.1714	23.93
West	0.0951	8.08	0.1521	11.39	0.1594	20.52
Age	0.0014	1.98	0.0052	10.64	0.0071	19.66
Trade Before	0.1015	7.05	0.1149	4.72	0.0727	5.13
College Before	0.0898	9.18	0.0907	8.53	0.0684	8.05
University Before	0.1357	11.77	0.1590	13.03	0.1065	13.13
Full-Time Before	0.0005	6.71	0.0767	12.75	-0.0557	11.15
Visible Minority	-0.0404	4.41	-0.0534	5.27	-0.0612	10.16

Table A4a (continued)
Regression Results: Earnings by Field of Study with Controls: Males

	1992		1997		2002	
Explanatory Variable	**Coeff.**	***t***	**Coeff.**	***t***	**Coeff.**	***t***
Tenure (months)	0.0014	20.11	-0.0029	1.77	0.0013	1.03
Married	0.0901	15.86	0.0759	9.93	0.0587	10.11
Father's Ed.	0.0020	0.26	-0.0083	1.12	0.0231	4.79
Length 2	0.0919	14.62	-0.2587	12.53		
Length 3	0.1336	15.72	-0.1956	9.93		
Length 4	0.2683	14.20	-0.1056	5.23		
Constant	2.949	113.16	9.878	309.43	9.732	525.67
R^2	0.14		0.13		0.12	
No. of Observations	4,303		4,120		4,309	

For a description of mnemonics, see Table A4c

Table A4b
Regression Results: Earnings by Field of Study with Controls: Females

	1992		1997		2002	
Explanatory Variable	**Coeff.**	***t***	**Coeff.**	***t***	**Coeff.**	***t***
Fine Arts	-0.0523	3.79	-0.0408	3.47	0.0799	8.79
Humanities	0.0168	1.00	0.0005	0.03	0.0279	1.65
Social Sciences	0.1399	12.70	0.0633	6.88	0.0757	8.68
Business	0.0086	0.91	0.0871	10.69	0.1208	19.31
Biol. Sciences	-0.0349	2.55	0.0016	0.12	0.0666	5.69
Technical Trades	0.1195	10.05	0.2751	24.10	0.1457	18.85
Health	0.1896	18.97	0.1960	22.50	0.2422	36.24
Math. Sciences	0.0098	0.093	0.3065	11.21	0.1577	17.90
Quebec	-0.0069	0.50	0.0129	0.97	0.1591	20.39
Ontario	0.1718	13.88	0.1757	14.64	0.2651	38.44
West	0.1363	11.05	0.1810	14.71	0.2561	34.48
Age	-0.0029	6.66	0.0042	12.03	0.0033	12.57
Trade Before	-0.0214	1.22	0.1408	6.50	-0.0396	2.48
College Before	0.1502	18.73	0.0987	12.07	0.0690	11.23
University Before	0.1148	10.97	0.2319	23.93	0.2750	44.85
Full-Time Before	0.0005	8.52	0.1120	22.18	0.0537	13.57
Visible Minority	-0.0109	1.26	0.0160	1.77	-0.0359	6.93
Tenure (months)	0.0016	21.97	0.0025	1.74	0.0117	11.03
Married	-0.0058	1.13	0.0015	0.25	0.0188	4.04
Father's Ed.	0.0679	9.21	0.0241	3.65	0.0563	11.61
Length2	0.1247	20.27	-0.0076	-0.57		
Length 3	0.1936	23.46	0.0521	4.01		
Length 4	0.0773	2.77	0.0794	5.73		
Constant	2.928	164.80	9.419	437.38	9.583	881.66
R^2	0.17		0.11		0.18	
No. of Observations	4,339		4,187		4,885	

For a description of mnemonics, see Table A4c

Table A4c
Description of Explanatory Variables

Explanatory Variable	Description	Mean in 1995
Fine Arts	0,1 indicator variable for field of study.	0.063
Humanities	"	0.032
Social Sciences	"	0.123
Business	"	0.247
Biol. Sciences	"	0.039
Technical Trades	"	0.239
Health	"	0.155
Math. Sciences	"	0.013
Quebec	0,1 indicators for region of residence. Reference region is Atlantic Provinces	0.205
Ontario		0.470
West		0.275
Age	Age at time of interview	28.4
Trade Before	0,1 indicator for having a trades certificate prior to college graduation	0.013
College Before	0,1 indicator for having a college diploma prior to college graduation	0.093
University Before	0,1 indicator for having a university degree/certificate/diploma prior to college graduation	0.067
Full-Time Before	0,1 indicator for having worked full-time prior to college graduation	0.591
Visible Minority	0,1 indicator for visible minority status	0.096
Tenure (months)	Number of months in job held at time of interview	2.86
Married	0,1 indicator for marital status (=1 if married, =0 otherwise)	0.258
Father's Ed.	0,1 indicator for father's education (=1 if university, =0 otherwise)	0.165
Length2	0,1 indicator for normal program length (=1 if 1-2 yrs., =0 otherwise)	0.176
Length 3	0,1 indicator for normal program length (=1 if 3 yrs., =0 otherwise)	0.416
Length 4	0,1 indicator for normal program length (=1 for 4 or more yrs., =0 otherwise)	0.365

Reference case for normal length of program is 12 months or less.

Table A5
Distribution by Field of Study

	1990	1995	2000
	Males %		
Educational, Recreational and Counselling Services	2.56	2.91	2.44
Fine and Applied Arts	3.53	5.42	5.03
Humanities and Related Fields	2.34	3.21	1.32
Social Sciences and Related Fields	5.53	9.87	3.68
Commerce, Mgt. and Business Adm.	9.33	19.99	18.04
Agricultural and Biological Sciences	5.51	3.95	4.61
Engineering and Applied Sciences Technologies and Trades	57.12	46.70	46.90
Health Professions, Sciences and Technologies	5.19	5.87	3.62
Mathematics and Physical Science	8.89	2.07	14.36
	Females		
Educational, Recreational and Counselling Services	10.46	13.06	10.54
Fine and Applied Arts	6.75	6.92	6.62
Humanities and Related Fields	2.66	3.18	1.94
Social Sciences and Related Fields	10.20	14.11	6.35
Commerce, Mgt. and Business Adm.	24.66	28.28	32.08
Agricultural and Biological Sciences	5.55	3.96	2.67
Engineering and Applied Sciences Technologies and Trades	7.51	7.13	10.30
Health Professions, Sciences and Technologies	19.05	22.69	22.68
Mathematics and Physical Science	13.14	0.67	6.82

Based on F90G, NGS 1995, NGS 2000

Table A6a
Regression Results: Earnings by Level of Study with Controls: Males

	1992		1997		2002	
Explanatory Variable	**Coeff.**	***t***	**Coeff.**	***t***	**Coeff.**	***t***
University Degree	0.1741	35.03	0.2238	45.96	0.2314	63.26
Fine Arts	-0.3146	27.88	-0.1294	11.29	-0.1085	10.75
Humanities	-0.2097	26.49	-0.1430	16.36	-0.0471	4.95
Social Sciences	0.0199	3.10	-0.0306	4.34	0.0985	12.51
Business	0.0749	11.80	0.2195	32.16	0.1934	25.97
Biol. Sciences	-0.1088	12.91	-0.0014	0.14	0.0561	6.33
Technical Trades	0.1111	17.94	0.2938	42.63	0.3060	41.97
Health	0.2490	29.70	0.2154	22.00	0.3217	32.42
Math. Sciences	0.0708	9.85	0.2012	23.00	0.2760	34.09
Quebec	0.0708	10.14	0.0208	2.75	0.0764	11.95
Ontario	0.1592	27.09	0.1117	15.83	0.1579	28.35
West	0.0840	13.98	0.1013	13.74	0.1053	17.91
Age	0.0082	30.90	0.0121	38.97	0.0078	26.46
Trade Before	0.0858	7.77	0.0595	3.19	0.0900	7.16
College Before	0.0292	5.36	-0.0274	4.61	0.0348	6.66
University Before	0.1670	34.24	0.1414	25.78	0.1364	24.53
Full-Time Before	0.0311	8.82	0.0775	20.07	0.0784	21.40

Table A6a (continued) Regression Results: Earnings by Level of Study with Controls: Males						
	1992		1997		2002	
Explanatory Variable	**Coeff.**	***t***	**Coeff.**	***t***	**Coeff.**	***t***
Visible Minority	-0.0150	2.97	-0.0508	8.78	-0.0267	6.25
Tenure (months)	0.0015	40.69	-0.0010	0.99	-0.0033	3.51
Married	0.1016	30.92	0.0793	17.88	0.0387	9.10
Father's Ed.	0.0182	5.14	-0.0035	0.87	0.0275	7.72
Length2	0.1027	21.86	-0.1858	14.17		
Length 3	0.0717	13.39	-0.1422	11.20		
Length 4	0.1031	17.57	-0.1774	14.32		
Constant	2.765	254.56	9.692	540.74	9.684	833.08
R^2	0.27		0.20		0.17	
No. of Observations	9,508		11,563		7,892	

Table A6b Regression Results: Earnings by Level of Study with Controls: Females						
	1992		1997		2002	
Explanatory Variable	**Coeff.**	***t***	**Coeff.**	***t.***	**Coeff.**	***t***
University Degree	0.2442	57.64	0.3346	83.37	0.2992	107.86
Fine Arts	-0.1206	15.28	-0.1087	12.96	-0.0326	5.04
Humanities	-0.1403	24.07	-0.1292	21.12	-0.0673	11.33
Social Sciences	-0.0226	4.94	-0.0276	5.71	-0.0071	1.63
Business	0.0002	0.03	0.1414	28.54	0.1222	29.76
Biol. Sciences	-0.0762	11.17	-0.0110	5.23	-0.0273	4.58
Technical Trades	0.1213	15.95	0.3315	39.75	0.2026	35.51
Health	0.2216	44.21	0.2724	51.40	0.2704	60.14
Math. Sciences	0.0085	1.37	0.2222	19.75	0.1713	26.40
Quebec	0.0513	8.19	0.0984	15.02	0.1027	19.55
Ontario	0.1582	28.62	0.1752	28.04	0.2160	47.42
West	0.0629	11.39	0.1382	21.17	0.1809	37.39
Age	0.0029	14.58	0.0117	53.98	0.0069	34.68
Trade Before	-0.0574	4.33	0.0927	6.02	-0.0072	0.55
College Before	0.0336	7.46	-0.0094	2.04	0.0383	9.85
University Before	0.1792	39.86	0.1733	37.40	0.1531	39.37
Full-Time Before	0.0737	24.42	0.0896	28.11	0.0541	20.35
Visible Minority	0.0015	0.31	0.0194	3.59	-0.0112	3.29
Tenure (months)	0.0013	43.45	0.0001	0.14	0.0029	3.85
Married	0.0116	4.13	0.0360	10.05	0.0273	8.63
Father's Ed.	0.0236	7.09	0.0149	4.30	0.0534	18.76
Length 2	0.1120	26.67	-0.0446	4.87		
Length 3	0.0564	11.68	0.0414	4.59		
Length 4	0.0735	13.78	-0.0381	4.29		
Constant	2.812	332.04	9.265	703.91	9.570	1,257.16
R^2	0.25		0.23		0.23	
No. of Observations	10,083		12,468		9,388	