

Human Capital Formation in a Period of Rapid Change

W. Craig Riddell
University of British Columbia and CIAR

Arthur Sweetman
University of Victoria

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Introduction

Issues relating to human capital formation are at the forefront of current policy debates. This prominence arises because of the increasingly widespread view that the skills, knowledge and competencies of the labour force are more important today than they have been in the past. A variety of inter-related factors -- globalization, technological change, increased international trade, and greater economic integration -- account for the increased emphasis being given to education, training and other forms of human capital acquisition. It is frequently argued that, as a result of these forces, achieving real income growth in countries like Canada will require more emphasis on human resources and less on physical capital and natural resources in the production process, and that the skills and knowledge of the workforce will increasingly become a major source of comparative advantage and economic growth.¹ For these reasons the development of human capital is generally viewed as a central ingredient in national economic policy.

The greater emphasis on human capital formation has led to increased scrutiny of our education and training system. Virtually every part of this "system" -- primary and secondary education, post-secondary education, private sector training, and government-sponsored training -- is currently the subject of public debate and policy development. Yet despite the increased attention to education and training in recent years, there has been only a modest amount of Canadian empirical research on these questions. For this reason, we devote much of this paper to documenting some of the key trends and developments in human capital formation.

We begin in the next section by examining how the educational attainment of the Canadian population and labour force compares with that of other countries. Subsequently we turn to a more detailed examination of the current Canadian situation, followed by an analysis of Canada's experience over the past several decades.

As our examination of recent developments will document, the educational attainment of the Canadian population has increased substantially during the past several decades. By commonly employed measures, recent cohorts of young adults are among the most highly educated in the world. Two sharply contrasting views are held about this development. One is that there has taken place – as a consequence of increased globalization of production and technological change associated with the information and computer revolution – an increase in demand for highly skilled workers and a decline in demand for the less skilled.² The result has been growing employment opportunities for those with high levels of education and declining opportunities for the less educated. The response of Canadian youths, their parents, and the educational system has been to place greater emphasis on education than would have been the case in the absence of these shifts in labour demand.

The alternative view is that rising educational attainment is principally due to poor labour market conditions facing youths and young adults. Canada experienced, during the early 1980s and early 1990s, recessions that were severe by both historical and international standards. As is generally the case during downturns in economic activity, young workers were among those most adversely affected. The slow recovery from the 1990-92 recession and downsizing and restructuring in many sectors further contributed to limiting the prospects for those seeking to establish themselves in the labour market. According to this view, many young Canadians are investing heavily in education because their alternative opportunities are poor and because employers, facing a glut of applicants for most jobs, are upgrading their workforce. Proponents of this view argue that there is substantial unemployment and under-employment among the well educated – as typified by anecdotal accounts of university graduates working as baristas and taxi drivers.³

These different perspectives differ substantially in their policy implications. According to the “relative demand shift” story, increases in educational attainment are needed to meet the growing demand for more skilled workers as well as to prevent the rising unemployment that would otherwise be associated with declining demand for the less skilled. In contrast, the “over-education/under-employment” view implies that the rising educational attainment of many Canadians is a waste of their and society’s time and money. According to this thesis, many college and university graduates end up working in jobs suitable for high school graduates. Because of the crucial importance of these contrasting perspectives we devote considerable attention in this paper to assessing which view is more consistent with the Canadian experience.

A related policy issue is the appropriate balance between broad-based educational programs that emphasize generic skills – such as arts and science programs at universities – and more narrowly focused technical and vocational programs that prepare individuals for specific occupations and trades – such as those provided in many community colleges. Again there are differing views. One is that the widespread use of information and computer technologies in the workplace requires many individuals with highly technical skills. According to this view, Canada should invest more heavily in vocational and technical colleges and in programs such as computer science and engineering in universities.⁴ The alternative view is that the “new economy” will increase the need for individuals with broad-based skills and knowledge. According to this perspective, more resources should be devoted to general arts and science programs in universities as well as to the development of generic skills such as literacy, numeracy, analytic ability, problem-solving, and similar “life skills”.

Although it is not possible in this paper to examine this issue in detail, we contribute to this debate by comparing the employment and earnings of the graduates of college programs -- many of

which are vocational and technical in nature -- with graduates of university programs -- many of which provide general rather than specialized and technical skills.

Throughout the paper our emphasis is on documenting the developments that have taken place with respect to human capital formation in Canada and on examining the labour market outcomes associated with these developments.

Human Capital Investments: Canada in International Perspective

In this section we assess how Canadian investments in formal education compare to those in other countries as of the mid-1990s. The consequences of these expenditures – both for educational attainment and for the skills and competencies of the labour force are also briefly examined. The purpose is to put the Canadian situation in international perspective.

Countries differ widely in their primary, secondary and post-secondary educational systems. For example, some countries “stream” students into academic and vocational programs at an earlier stage than is the case in Canada. Similarly, there are important differences in the extent to which educational systems provide a “second chance” for those who may have dropped out at some stage – such as high school drop-outs who later wish to return to complete their secondary education. Because of these and numerous other differences across countries, it is important to keep in mind the institutional and cultural differences in educational systems when interpreting cross-country statistics.

The first section of Table 1 contains information on the resources devoted to formal education in Canada and several countries that provide relevant comparisons. The (unweighted) OECD average is also shown. As is indicated, Canada spent 7.2% of GDP on education in 1994, highest in the G7 countries and fourth highest in the OECD (exceeded only by Sweden, Denmark

and Finland). The OECD average was 6.3%. Canada also stands out in the extent to which educational expenditures come from the public sector – 6.7% of GDP in 1994, well above the OECD average of 5.2% and very similar to the other top-ranked countries in this dimension (Norway, Sweden, Finland and Denmark, all of which have public expenditures on education in the 6.6 to 6.8% of GDP range).

Although the fraction of total national income devoted to education is a useful summary measure, this proportion may vary because of differences in the quantity of education being provided and because of differences in the quality or intensity of education. The quantity of education depends to an important extent on the age structure of the population, especially the fraction of the population in the ages 5-25. To obtain some indication of the quality of education, we look first at international differences in expenditures per student. Unfortunately, in the OECD statistics this information is available for Canada only at the post-secondary level so it is not possible to provide a complete picture.⁵ Nonetheless, the available information does indicate that Canada ranks near the top in expenditure per post-secondary student – fourth highest in the OECD, exceeded only by the U.S., Sweden and Switzerland. Canadian per student expenditure is much higher than the OECD average albeit substantially below the U.S. and Sweden.

The bottom panel of Table 1 provides various measures of the educational attainment of the population. In general these indicate that one consequence of Canada's substantial investment in education is a labour force with high levels of measured educational attainment. In 1995, three-quarters of Canadians had completed high school or better, versus the OECD average of 62% -- a level similar to the UK and Sweden but significantly below the U.S. and Germany. However, where Canada stands out very clearly is in the fraction of the population with completed post-secondary education. In 1995, forty-seven percent of Canadians had completed either a university

degree or college diploma or certificate, a proportion that is more than double the OECD average and substantially above that of the next highest country (the US at 33%). This large gap between Canada and other OECD countries in the extent of post-secondary education is principally due to the dramatic growth of (non-university) college diploma and certificate programs in Canada. When attention is restricted to university graduates, Canada ranks well above the OECD average but is still substantially below the U.S.

The average number of years of completed education varies less across countries than the proportions of the population with various levels of educational attainment. Nonetheless, here again Canada is well above the OECD average and among the highest in the OECD – exceeded only by the U.S. and Germany.

In summary, Canada spends a substantial amount on education relative to other industrialized countries. One consequence of this high level of human capital investment is a population that is among the most highly educated in the OECD countries, according to various alternative measures of educational attainment. Canada is particularly unique in the substantial fraction of the population with post-secondary (or tertiary) education. This feature of the Canadian situation results in part from the substantial fraction of the population with university degrees – second only to the US in the OECD countries. However, the main reason for this unique feature is the huge proportion of graduates of college certificate and diploma programs.

Does this substantial expenditure on education translate into a population with significant skills and competencies? Table 2 provides some evidence on this question. The data come from the International Adult Literacy Survey (IALS), an important advance in skills assessment that provides measures of document, prose and quantitative literacy on a comparable basis across countries.⁶

The top panel of Table 2 shows the fraction of the adult population with low literacy skills in Canada and selected OECD countries. For the adult population as a whole, Canada is in the middle of the pack, below Germany and Sweden but above Australia, the UK and the U.S. However, for those aged 16-25, Canada does better than all countries except Sweden. In contrast, among those aged 46-55, Canadians' literacy skills are the worst of these countries. Clearly recent cohorts of Canadians rank more highly against other countries than is the case for earlier cohorts. One possible explanation for the improvement in the relative performance of Canadians is that the quantity and/or quality of education received by recent age cohorts is much higher than that received by previous generations.

Further evidence on this issue is shown in the bottom panel of Table 2. Again, for the adult population as a whole, Canada ranks above Australia, the UK and the U.S. but below Germany and Sweden. However, among post-secondary graduates Canadian literacy skills are exceeded only by those of Sweden. This result is especially noteworthy given the fact that the fraction of the population completing post-secondary is much higher in Canada than other OECD countries. In contrast, among those with less than high school education, Canadian literacy skills rank near the bottom, below all countries except the United States.

Together the two panels in Table 2 suggest that Canada's substantial investment in education is reflected, at least to some extent, in degrees of literacy that are among the highest of the countries examined here. The Canadian groups with particularly low literacy skills by international standards are those over 45 years of age and those with low levels of education.

This evidence on how Canada compares to other countries raises several questions. Has Canada been one of the international leaders in terms of investment in education and a highly educated workforce for a long time, or is this situation a recent development? Given that Canada

is unique in the importance of non-university post-secondary educational programs, how do the graduates of these programs fare in the labour market? These and other related questions are examined in what follows.

Trends and Developments in Human Capital Formation

A snap-shot of the present situation

This section begins by looking at the current distribution of educational attainment and labour market outcomes. Using data from the June 1998 Labour Force Survey (LFS), Table 3 reports educational attainment in ten year age groups for male and female Canadians aged 20-59.⁷ It also provides unemployment rates and average wages for each of these groups. The upper panel of Table 3 presents the percentage of each age group whose highest level of education falls into each of the seven educational categories listed: elementary (0-8 years), incomplete or some secondary (Some HS), high school graduate (HS grad), incomplete or some postsecondary (Some PS), college diploma or certificate (College), university graduate with a bachelor's degree (Univ Bach), and university graduate with a graduate degree (Univ Grad). In interpreting the data in this table, keep in mind that not all of the groups, especially the younger groups, have necessarily completed their education at the survey date. Furthermore, many individuals may return to school, perhaps on a part time basis, later in life and such increases in educational attainment are not necessarily captured in a survey taken at a point in time. We return to these issues subsequently.

Successively younger age groups of each sex exhibit a clear, and massive, reduction in the fraction of the population with only elementary education, as can be seen across the top row of Table 3. About five to seven times fewer individuals terminated their education at this low level among those who are now in their 20s compared to those in their 50s. Further, there has also been a reduction across age groups in the percentage of the population with incomplete high school. Those with less than completed high school drop quickly from about 30% of the population for those in their 50s, to just under 20% for those a decade younger. The fraction continues to fall, albeit more slowly, across the subsequent generations and is under 15% for those currently in their 20s.

This dramatic increase in basic grade school education is, as will become evident, the largest numerical change in educational attainment over the period. As is evident in this table, much of the increase in educational attainment occurred across the groups who are now in their 40s and 50s – those born between 1940 and 1960. It is probably associated with the various significant educational reforms that occurred in Canada in the 1960s and 1970s.⁸ This trend suggests that the grade school environment may have changed considerably over the period as those with less interest and ability now stay in school longer. Of course, many members of older groups may have also left school because of family-related and financial reasons rather than because of a lack of interest or ability. Thus part of the expansion over this period of secondary school enrollment and completion reflects individuals with high interest and ability becoming increasingly able to continue in school relative to previous generations. Such changes reflect various factors, including growth in real incomes, declining family size, and the continuing shift in employment and population out of agriculture and rural communities into manufacturing and services and urban communities.

The proportion of those graduating with a community college diploma or certificate rises across the age groups from about 30% to just over 35%. This increase is very similar for men and women. The community college system was created in the 1960s and 1970s and significantly increased post-secondary educational opportunities for those not university bound.⁹ Thus those in their 50s in 1998 were among the first cohort to enroll in the community college system. As these data indicate, Canada's unique (by international standards) feature of having a very substantial proportion of the labour force with completed non-university post-secondary education is not a new phenomenon, but has existed for several decades.

The increased importance of university education across the generations was associated with an expansion of the universities in the late 1960s and early 1970s. In contrast to the experience with colleges, the increase in university completion is much larger for females than males. The fraction of females whose highest level of education is either a graduate or undergraduate degree rises from about 12% of 50-59 year olds, to 19.5% for those aged 30-39, and 18.1% for those in their 20s. This last group probably includes a substantial number of individuals who have not completed their education. Across the same period, however, male educational attainment increases only modestly – the fraction of males with a university degree increases from 19 % for those aged 50-59 to 20 % for those aged 30-39.

We turn next, in the lower panels of Table 3, to the associated labour market outcomes across these educational categories. The unemployment rate, average hourly wage of all employed workers, and average hourly wage of full time workers are presented in turn. The general pattern is quite clear: as education increases, unemployment decreases and wages increase for both sexes and for all groups. Inter-group comparisons can be more clearly seen in Figure 1 which shows the relative unemployment rates and wages of full time workers aged 30-59. To facilitate comparisons in these bar graphs, and those that follow, the means are normalized by the mean of the group whose highest level of education is a high school diploma (i.e. the high school graduate group is set to one, and the other groups are measured relative to it). It is clear from Figure 1 that females have a greater return to education in terms of wages than males. However, the unemployment rate profile, while steeper than that for males at low levels of education, is flatter at higher levels. Additionally, within each sex, the educational wage premium is remarkably constant across ages; even though there are far fewer (more) younger workers with low (high) levels of education relative to older groups, they obtain the same wage premium. As might be expected, the unemployment rate ratios have a higher variance across age groups. One notable feature is that highly educated males aged 50-59 have unemployment rates that are much higher than younger workers with the same education, and for this age group there is not a clear pattern of decreasing unemployment with increasing education.

The diversity of labour market outcomes within the post-secondary education category is worth noting. For both males and females, those with incomplete post-secondary education generally earn a modest amount (usually 5 to 10%) more than do high school graduates who did not pursue post-secondary studies. However, those in the “Some post-secondary” group also have unemployment rates that are typically the same as or higher than high school graduates. Thus it is not clear that their overall labour market outcomes are superior to those of high school graduates. In contrast, college and university graduates clearly do better in the labour market on all dimensions. Those with a college certificate or diploma earn about 10 to 20 percent more per hour than high school graduates across all age and gender groups. With the exception of the 50-59 year age group, they also have lower unemployment rates. University bachelor’s graduates earn 35-60 percent more than high school graduates and have much lower unemployment rates (with the exception of 50-59 year old males). Those with graduate university degrees earn an even larger wage premium and have substantially lower unemployment.

This evidence suggests that each of the components of the post-secondary education system earns a return in terms of higher wages and lower unemployment relative to counterparts that require less of an investment in the form of time in school. The most unique aspect (by international standards) of the Canadian post-secondary education system – the relatively large size of college certificate and diploma programs – does appear to pay off for participants. Most of these programs last 1-2 years, and yield average hourly wages 10-20 higher than high school graduates of the same age and gender. In terms of their impact on earnings and employability, this group is an intermediate category relative to university graduates who earn substantially more and have higher employability but who spend longer in school.

The evolution over the last few decades

We next describe some of the salient trends and developments relevant to human capital formation in Canada in recent decades by looking at the evolution of educational attainment over time using information extracted from the 1971, 1981 and 1991 Censuses. These provide a broad assessment of changes in educational attainment and labour market outcomes over an extended period. Subsequently we turn to a more detailed examination of the decades of the 1980s and 1990s using annual information from the Survey of Consumer Finances (SCF). These allow examination of more recent developments, as well as permitting some distinction between trends and cyclical changes.

Tables 4 to 8, and Appendix Tables 1 and 2, report information organized by age group (21-30 year olds, 31-40 year olds, 41-50 year olds and 51-60 year olds, hereafter referred to as 20, 30, 40 and 50 year olds respectively), birth cohort, and gender. They are organized to provide a substantial amount of information in as succinct a manner as possible and can be read in three ways: down a column (age), across a row (birth cohort), and along a diagonal (census year). To facilitate identifying census years, results from the 1971 census are in regular type, those from the 1981 census are in bold type, and those from 1991 are italicized.

Table 4 shows the distribution of the population by the highest level of education attained. It allows us to compare and contrast between the sexes, and follow trends over the life-cycle and across cohorts. To conform with the LFS, we have chosen to report the same seven levels of educational attainment as in Table 3. Unfortunately, in the 1971 Census it is not possible to distinguish between incomplete high school and high school graduates so the total for both groups is shown in the “HS Grad” row. The delineation between university undergraduate and graduate degrees is also problematic in the 1971 Census. In that year undergraduate is defined as 4 or less

years of university with a degree, while graduate is 5 or more years with a degree; thus the proportion of individuals with graduate degrees is overestimated, and that with undergraduate ones underestimated. The sum of the two university categories can, however, be reliably compared across censuses.

Although we do not tabulate them, it is possible to observe in the later Censuses the fractions of the “some postsecondary” groups that attended university and/or college, and it appears that the majority have some university, rather than college, education. Further, although the cohorts do not align perfectly (given the nature of the public use data from the LFS, matching cohorts with the census is not straightforward), the 1998 LFS data shown in Table 3 and 1991 Census education distributions differ somewhat. For example, the 31-40 age group in the 1991 Census can be (approximately) compared to the 40-49 age group in the 1998 LFS, as can the subsequent age groups in each. While the general pattern of changes across the cohorts is similar, the college certificate and university graduate degree groups are much larger in the LFS. The “some post-secondary” groups are noticeably smaller. Some individuals may have obtained additional education in the seven year period between the two surveys, but more importantly, the classification of those with high school trades certificates or diplomas, and university degrees and certificates both below and above the bachelor’s level, appears to differ. An important point arises from this comparison: depending upon the details of the classification system employed, the education distribution can appear to alter quite substantially. This is important for comparisons over time and across jurisdictions. The censuses appear, however, to provide a consistent series for comparisons over time.

Turning to Table 4, moving down a column shows how a specific age group differs from one birth cohort to the next. For example, among 30 year olds the percent with elementary

education has fallen from 30% and 29% for males and females respectively for the 1931-40 birth cohort, to 12% and 14% for the 1941-50 birth cohort, to 5% each for the 1951-60 birth cohort. As in the LFS data for a single cross-section, throughout the table there is evidence of dramatic declines in the fraction of the population with only elementary education and equally dramatic increases in the proportion with university degrees (Bach plus Grad). At the extremes, almost 40% of those born in the 1920s had less than a grade eight education by the time they reached their 40s. In contrast, only about 3-4% of those born in the 1960s had not completed grade eight by age 30. For university, looking at successive cohorts of 30 year olds, the fraction with a bachelor's degree increases from 4% to 13% for men, and 2% to 12% for women, between 1971 and 1991. Further, the gap between men and women in the fraction with a university degree is essentially eliminated over this time period. In older cohorts about four times as many men hold university degrees as women, but by the more recent cohorts, the number is virtually identical. It will be seen below that cohorts of women younger than those described here have, in fact, surpassed men in undergraduate enrolment, but still lag at the graduate level. For each successive cohort, the fraction in the high school category is affected by two offsetting influences: the decline in the proportion of the population with only elementary education and the growth in the proportion going on to post-secondary education. From the 1981 and 1991 censuses, it appears that increasing fractions are completing high school. The college certificate group almost doubles across cohorts for women, and increases by about a third for men. The gender gap in college certificate/diploma programs, like that for university programs, is essentially eliminated during the period. Further, because of the questionnaire design, the 1971 Census almost certainly includes in the college category informal apprenticeship training that the later Censuses do not capture, so the increase in formal college training is likely even larger than indicated in the table.

Moving across a row shows the changes over time in the distribution of educational attainment as a birth cohort ages. Of course, these distributions are affected to some degree by differential death rates, and differential immigration and emigration across educational categories. Appendix Table 1 presents the comparable information, but with immigrants removed to allow the role of the Canadian education system to be seen more clearly. As inspection of this table shows, the results are largely similar.

Most educational upgrading occurs when individuals are in their 20s; only very modest changes are evident after age 30, and no significant change is observed between the 40s and the 50s. This is consistent with the idea that large investments in human capital are best made early in life when the expected remaining time in the labour force, and hence return on the investment, is greatest. As will be confirmed below, there is little evidence in these data that recent cohorts participate in "life-long" learning in a formal educational setting to a greater extent than earlier cohorts.

Table 5 reports unemployment rates by educational attainment for these age-sex-birth cohort groups. The most striking trends are those toward higher unemployment rates for labour force participants with less education, and higher unemployment across successive birth cohorts. In accord with expected life-cycle phenomena, unemployment is also higher for those in the youngest and oldest age groups. Further, unemployment is almost everywhere higher for women than men.

The trend among educational groups is particularly interesting when one considers the massive changes in the supply of each group outlined in Table 4. Unemployment among those with less than grade 8 education increases dramatically across cohorts despite a massive drop in the supply of these workers. One interpretation of this phenomenon is that the demand for the less

skilled is falling even faster than is their supply. We revisit this issue below when we examine trends in relative wages. Another interpretation has to do with changes in the composition of the less educated group. As discussed previously, in the early part of the period under examination (for example, for those born in the 1920s and 1930s) the elementary education category is likely to have included many individuals with high levels of ability and initiative who left school at an early age for various family and personal reasons. Given their ability, these individuals are likely on average to do reasonably well in the labour market. Over time such individuals become less likely to leave school early, so the elementary education category becomes more dominated by those with limited ability or aptitude. Thus on average the “quality” of this group is expected to diminish, and the group’s unemployment rate is expected to rise and average wage to decline.

Conversely, the unemployment rate of more educated groups remains much more stable over time than that of less educated ones despite increases in the number of workers with more education. Thus most of the increase in the unemployment rate over time is driven by increases in the less educated groups.

Changing patterns of weeks worked during the census year (Table 6) show some striking developments over this period. Averages presented in this table are for the entire population, thus zeros are used for those who did not work in the census year. Among females there are large increases from one birth cohort to the next in weeks worked, with some evidence of a slightly larger increase among those with college and bachelor’s degrees relative to the high school and less category. Males with low levels of education experience a decline in weeks worked, in some cases substantially so, from one birth cohort to the next. However, for males with high levels of education, weeks worked is generally stable from earlier to later birth cohorts. Some evidence of early retirement becoming more common can also be observed for those in their 50s. Within

cohorts the common life cycle pattern, with weeks peaking when workers are in their 30s and 40s, is observed. Overall, the total number of weeks of labour supplied in the formal labour market increases across the period. It increases quite substantially among more educated workers largely as a result of the increased labour force participation of women but also because of declining weeks worked among less educated men combined with stable or increasing weeks of work among more educated males.

The data on weeks worked (for the population -- Table 6) and unemployment (for those in the labour force -- Table 5) provide an interesting contrast. Unemployment rises across cohorts in tandem with labour supply, except for males with less than a grade 8 education whose labour supply drops, but this is, as discussed previously, a small and probably lower “quality” group by 1991. It appears that the economy generated substantially more market work in 1991 than 1971, but the supply of labour increased even more. Moreover, as we will see next, this increase in unemployment among the 21-30 age group occurred despite a substantial increase in full time educational attendance.

Full- and part-time educational attendance by age is presented in Figure 2. In the top panels are the fraction of individuals, by sex of each age, who attend school full- time in the census years 1981 and 1991. Full-time elementary and high school attendance in 1971 is not plotted because it is not well measured; it appears that many respondents misread the question which was, therefore, amended for the 1981 census. Dramatic increases in school attendance between 1981 and 1991 are evident in Figure 2. For example, women age 20 increase their full-time attendance rate from 25% to over 50% between 1981 and 1991. The increases for men are not quite as great, but they are nonetheless substantial. Even in 1991, however, full-time school attendance drops off rapidly after about age 17 and is quite low by age 25.

Part-time attendance is depicted in the lower panels of Figure 2 for individuals between the ages of 21 and 60. The census question intends to capture not courses taken for pleasure, but those in recognized educational institutions that may be, at least potentially, used to qualify for a degree, certificate or diploma. For both men and women, part-time attendance reaches its maximum, with about 12% of the population taking such courses, when individuals are in their mid- to late 20s. However, at older ages the behaviour of men and women is quite different. Part time attendance of women remains at a high level until about age 40, and then declines rapidly. For men, part time attendance declines steadily after it peaks in the mid-20s.

The most remarkable feature of the part time school attendance plots is that this measure of women's' continuing human capital accumulation increased dramatically between the 1970 and 1980 censuses, whereas that for men changed little. In 1971 male part time school attendance substantially exceeded that of women. Between 1971 and 1981 the women's' rate increased relative to that of men, and even surpassed it slightly in the 30-40 age group.

Thus both the full time and part time school attendance data displayed in Figure 2 provide further evidence that women have been increasing their human capital at a greater rate than their male counterparts.

Perhaps surprisingly, the relatively high level of part-time attendance observed here for those in their 30s and older does not translate into substantial increases in educational attainment within cohorts over time as was noted previously in Table 4. The reasons for this are unclear. Perhaps most older part-time students do not obtain sufficient courses to complete certification, or the certification is at a level equal to or below that they already have, so it is not observed as an increase in educational attainment in broad categories such as those in Table 4.

Given that we have observed the supply of more educated workers has increased, and that the number of weeks of work supplied by those more educated workers has increased, what has happened to wages for the same period? Tables 7 and 8 present different measures of monetary income from the censuses in a format similar to Table 4. Earnings in the censuses are reported for the calendar years 1970, 1980 and 1990. Table 7 lists the annual employment income of full-time, full-year workers. We focus primarily on this measure since it provides the closest estimate of the price of time obtainable from census data. Table 8 contains estimates of annual employment income for the entire population.¹⁰ All monetary values are reported in 1990 dollars using the national consumer price index (CPI).¹¹

Several important trends stand out in Table 7. First, as is well known from other evidence, females in every category earn less than males. However, this inter-cohort analysis allows us to see that while the gender earnings gap declines across cohorts, it does not change much within cohorts over time. It is also evident that, in most cases, real wages of full-time men increased from 1970 to 1980, but then decreased from 1980 to 1990. For females there were increases in real earnings throughout both decades, but they were larger in the earlier period.

Also evident in Table 7 is a steep wage profile across educational categories for both sexes. To facilitate observing this profile, histograms based on Table 7 are plotted in Figure 3. Three educational categories are shown: less than grade eight, high school (the combined incomplete and high school graduate, to allow comparability with the 1970 census), and those with a university bachelor's degree. Note that by combining the incomplete high school and high school graduate categories, comparability with the histograms presented earlier based on the LFS data is not possible. To allow us to focus on relative differences across groups, all of the group averages are normalized relative to the mean annual earnings of the high school group.

Figure 3 thus plots the education premium of each cohort at certain ages in accord with Table 6. The figure contains a substantial amount of information, which can be obtained in several ways. Each of the six panels shows the movements in the returns to education across birth cohorts for a given age and gender group. Note here that we are also comparing 1970, 1980 and 1990 in that the left plot in each panel uses the 1971 Census, the middle plot the 1981 Census and the right panel the 1991 Census. Comparing the upper and lower panel in a given column shows differences between men and women. Finally, comparing the three panels in a given row shows how the educational premium changes with age for a given gender.

Perhaps the most striking feature of Figure 3 is the fact that females have a substantially higher education premium than males at all ages and in all cohorts. Focusing first on the right-most plots, which depict the premia of those born in the 1920s, 30s and 40s when they are aged 41-50, for both men and women there is a clear decrease in the return to a university degree between those born in the 1920s and the 1930s, which is coincident with the previously observed large increase in educational attainment across these two groups. In the middle two plots, when those born in the 1930s were in their 30s, the average female with a bachelor's degree received over twice that of the average high school graduate while for men the same ratio is only slightly over 1.5. By the time those born in the 1950s reached their 30s, the return had declined somewhat reflecting the greater supply of graduates, but females still had a higher premium than males: ratios of university to high school earnings of 1.7 and 1.4 respectively. Relatedly, at the same point in their life cycle, cohorts born in the 1920s and 1930s had higher returns to university than younger cohorts reflecting the lower fraction of graduates in the earlier period.

When we look at the earnings of all workers in Table 8 the means are, as expected, less than those of full-time, full-year workers. But the profiles, although somewhat similar, are

substantially steeper; that is, the returns to education are greater, reflecting the greater number of weeks (and although not shown, also hours per week) worked by those with higher education. If the education premium includes both wages and employment, then Table 7 suggests it will be larger than that in Figure 3. That is, comparing the hourly (or weekly) wage of high school and university graduates understates the economic return to a university education because post-university graduates work more hours per week and weeks per year than their high school counterparts. Of course, the time away from work may have a positive value to some individuals which is not captured in the earnings numbers. Related evidence is shown in Appendix Table 2, which presents the fractions of each cell that work full-time, full-year. Males are more likely to work full-time, full-year and the percentage doing so within each sex increases substantially with increasing education. Similar to the weeks of work evidence presented earlier, more recent cohorts of males with low levels of education are much less likely to work full-time, full-year than earlier ones, but the fraction is more stable at higher levels of education, especially at the university level. Overall there is a decline during the period, especially from 1970 to 1980. For females there is a substantial increase over the entire period.

Enrolment Rates

University enrolment rates give us some idea of students' (and parents') opinion of the private return to education. Additionally, if individuals stay in school simply because they are constrained by poor labour market opportunities, then one might expect that enrolment rates would fluctuate with the business cycle and more students would stay in school in busts than booms. Compared to the U.S., the enticement to stay in school during the recessions of 1981-82 and 1991-92 would have been particularly strong since those recessions were more severe in Canada.

To explore these issues, and to get a general sense of the pattern of university enrolment rates over the last 25 years, we first plot undergraduate and graduate full-time enrolment series, by sex, for the entire country in Figure 4. Enrolment rates are in the upper two panels, and the actual number of students enrolled is below. Rates are calculated by dividing university enrollees by the population aged 18 to 24.

The most striking feature is the strong upward trend in both the enrolment rate and level for females, and the weaker, but nonetheless upward, trends for men. These accord with the census data examined earlier. For undergraduates, the female rate is just over half that of males in the early 1970s; by 1986-87 the two are the same, and by 1995 females have substantially higher university enrolment. Given that, as seen earlier, females have a higher wage premium associated with education, this is not unexpected. Graduate enrolment, although much smaller than undergraduate, displays a similarly strong upward trend for both sexes over the period. Females are at a lower level in 1971 and increase relative to males in the 1970s, but the two have been increasing at roughly the same rate over the 1980s and early 1990s. Despite the male rate declining somewhat in the last few years of the period, while the female one does not, female graduate enrolment remains below that of males. While there are some fluctuations in the series, the movements do not coincide nicely with the business cycle. There is some evidence of a modest increase in enrolment associated with the 1980 recession in some of the plots, but no other features have an obvious business cycle pattern.

Overall, the enrolment series are consistent with that observed with the census data. Recent cohorts are accumulating more human capital than their earlier counterparts, and women are increasing their educational attainment more quickly than are men but from a lower initial level. With respect to fluctuations concurrent with the business cycle, none are clearly evident. Although

this evidence is far from conclusive, based on the lack of cyclical responses in the educational enrolment series, we find no support for the contention that students today are staying in school simply because their job opportunities are poor.

We next explore the variation in university enrolment rates across provinces using data taken from various issues of the Statistics Canada publication Education in Canada.¹² Plots for females are presented in Figure 5, and those for males in Figure 6. Clearly there are large differences across the provinces. That Nova Scotia has the highest enrollment rate among the provinces also points to an important issue in looking at province-level data; many students attend university in a province other than their “home base.” Nova Scotia, for instance, has developed a well-known, and apparently deserved, reputation for having “destination” universities. Additionally, some of the differences can be explained by heterogeneity in provincial educational systems. For example, British Columbia has an integrated “university-college” system in which students can attend a college for the first two years before switching to one of the province’s universities for third year and higher. However, in the data university-bound college enrolment is included in college rather than university enrolment. As a consequence, the number of students in first and second year university programs is understated in the B.C. data, a situation that is not characteristic of most other provinces.

Despite the ways in which the provincial data are not comparable, it appears that large differences remain in university enrolment that we can think of as “true” provincial effects. Perhaps more importantly, there are also differences in the timing of changes in the levels over time. For example, Saskatchewan’s rate increases dramatically in the mid- to late 1980s, and Alberta experienced a very significant dip in enrolment, especially for men, in the late 1970s and early 1980s. Also, British Columbia, and, especially at the beginning of the period, Quebec and

Newfoundland, have quite low enrolment rates. As pointed out by Card and Lemieux (1998),¹³ however, Quebec has historically had much lower levels of educational attainment than Ontario. Since Canada's regional economies experience quite different business cycles at times, it is also interesting to look at these plots to see if any business cycle is evident that might have been masked in the aggregate national numbers. For example, while the 1981-82 recession was more severe in western Canada, the 1990-92 downturn was mostly experienced in central Canada. There is, however, once again no obvious evidence of cyclical patterns.

Figures 7 and 8 perform a similar exercise to Tables 6 and 7, but they focus on graduate enrolment. In an age of rapidly advancing technology, graduate enrolment might be increasingly crucial to the performance of the economy. Most of the provinces' graduate enrolment rates are increasing rapidly over the period, but there is also substantial heterogeneity that cannot be attributed to differences in educational systems. However, the undergraduate patterns are not simply replicated. First, Quebec and British Columbia do not exhibit low graduate enrolment rates, as was the case for their undergraduate rates. Indeed, by the end of the sample period both provinces' graduate enrolment rate exceeds Ontario's for both sexes. Second, some provinces, for example Manitoba and Saskatchewan reverse their rankings quite significantly which might be attributable to each province placing a different value on the relative importance of graduate and undergraduate education in the allocation of educational funding. Again, no obvious fluctuations coincident with the business cycle are obvious.

Developments in the 1980s and 1990s

We turn now to an examination of behavior during the 1980s and 1990s using information from the Labour Force Survey (LFS) and the Survey of Consumer Finances (SCF), an annual supplement to the LFS which provides retrospective information on such outcomes as annual earnings and weeks worked during the previous year. The LFS classification of educational attainment is used in this analysis; however, because the questions relating to education changed substantially in 1990 in a manner that makes the pre-and post-1990 measures difficult to compare, some caution is required in comparing pre- and post-1990 outcomes.¹⁴

Both decades began with sharp recessions, the two most severe downturns of the post-war period in Canada. Both recessions were also relatively severe by international standards; for example, in each downturn the decline in employment and output in Canada was substantially greater than that experienced in the U.S. We note the severity of these downturns in economic activity in part because of the possible influence of these cyclical factors on school attendance.

Despite the 1981-82 recession, employment growth was quite robust by international standards during the 1980s, reflecting the substantial and protracted expansion during the latter part of that decade. Specifically, employment growth averaged 1.74% per annum over the 1980-89 period, modestly below the 1.97% per annum rate experienced in the U.S. but substantially above that of most OECD (in particular, European) countries. However, as reported in Table 9, underlying this economy-wide average growth rate are substantial differences in the rate of employment growth by educational attainment. Employment among those with some or completed post-secondary education grew by 53 to 76 percent during the decade -- corresponding to annual rates of employment growth of 4.8 to 6.5 percent -- while that of those with elementary education declined by 3.8 percent per year -- a drop of 30% over the decade. Employment of those with

some or completed high school increased modestly. These figures apply to all those of working force age, and thus are affected by differences in educational attainment between retiring and entering cohorts as well as the movement through the labour force of the relatively well educated baby boom generation. The bottom part of Table 9 shows that substantial differences in employment growth by educational attainment are also evident among those 15-24 years of age, many of whom are making the transition from school to work.

These differences in employment growth across educational groups are even more pronounced in the 1990s, a period characterized by a lengthy recession and a slow recovery in both output and employment. Indeed, all employment growth during the 1990-95 period was concentrated among those with post-secondary education. Employment among those with elementary, incomplete high school and high school graduation declined during the 1990s -- both for the labour force as a whole and for those in the 15-24 age bracket. During the same period, employment of university graduates increased by 28% and that of college graduates by 20%.

Despite the substantial growth in the number of well-educated workers, and the decline in the supply of those with low levels of education, the relative earnings of university and college graduates did not fall relative to the less well-educated groups.¹⁵ We interpret this evidence to suggest that the demand for more educated workers has increased substantially over this period, sufficiently to absorb the large increase in their supply which would otherwise have lowered their relative earnings.

Education and Work

Another approach to looking at whether the massive increase in the supply of human capital to the labour market is superfluous, or whether it is motivated by, for example, skill biased technological change, is to ask workers directly about their jobs and education, and the impact of technology on their labour market prospects. A sequence of questions does this in the 1994 Canadian General Social Survey conducted by Statistics Canada. The question "How closely is your job related to your education?" is asked in two contexts: first it is asked of the respondent's first job following the completion of her highest degree, and second it is asked of her current job. Responses were captured in three categories: closely, somewhat and not at all related. Table 11 tabulates these responses by level of education and post secondary field of study where applicable. Over 70% of those with a university degree or college / trades certification reply that their education was closely related to their first job. In contrast only 20%, and 6%, respectively, of those with high school, and less than high school, respond similarly. For the current job, the number drops somewhat for college/trades graduates. Further, the differences across fields of study suggest some heterogeneity exists. Among university-educated social science and fine arts/ humanities graduates, only about 60% report that their job is closely related to their education. The percentage whose first or current job is in the "not related at all" category is much higher for arts and social science graduates. In contrast, the percentages are considerably higher for science, engineering and education graduates. Further stratification by sex and age (25-45 and 46-50) gives very similar results to those in Table 11, and the same question, posed in 1989 in an earlier General Social Survey also produced an almost identical response.

Table 12 includes "job related" dummy variables in a standard wage regression with economically and statistically significant results. Equation (1), which includes all educational

groups, suggests that having a job closely related to one's education is associated with wages that are about 46% higher than those whose job is unrelated to their education.¹⁶ A somewhat related job is associated with a 28% larger wage. Even larger coefficient estimates are obtained in equations (2) and (3) which exclude those without post secondary certification. For each field of study the associated wage premium is also very large except for fine arts / humanities where it is essentially zero. While this statistical relationship points to the economic importance of one aspect of the school to work transition, and it is potentially relevant for thinking about the coordination of education and labour market demands, it is very difficult to interpret these conditional correlations. While the point estimates are very large, suggesting a very large wage effect might follow from the relationship between the content of one's education and the requirements of one's job, they could arise for one or more reasons. Some obvious candidates are: first, by luck or design, obtaining a job for which a person is well prepared by virtue of having studied closely related material at school increases the person's productivity and wage; second, within each subject field individuals who are at the top of their respective classes are much more likely to obtain a job in their field of study, but the wage premium primarily reflects the fact that they were at the top of their class; finally, there may exist high paying sub-fields within each broad field that have tighter education-work connections than the average. Understanding the origin of this economically large relationship should be a topic for future research. Depending upon its source, it could have quite different implications for the links between educational institutions and the labour market.

Technological change, education, and employment are also closely related to the issues under study, and Tables 13 and 14 present the responses to several questions, stratified by the highest level of education attained, about technology and the worker's current job in 1989 and 1994 respectively. Looking at Table 13, column (1) reports the percentage of workers that use a

computer at work. Clearly highly educated workers are much more likely to use this technology: the numbers range from a high of 82% for those with a graduate degree, to a low of 18% for those with less than high school. As has been pointed out by DiNardo and Pischke (1997),¹⁷ this correlation may simply arise from job heterogeneity rather than any increase in productivity associated with computerized technologies.

Columns (2) and (3) of Table 13 report answers to the direct question: "In the last five years, how much has your work been affected by the introduction of computers or automated technology?" Permitted responses are: greatly, somewhat, hardly, and not at all. Clearly, as with computer use, more highly educated workers had jobs substantially more affected by technological change than less educated workers. To those who answered "greatly" or "somewhat" a third question was asked: "In the last five years has the skill level required to perform your work increased, decreased, or stayed the same as a result of the introduction of computers or automated technology?" Columns (4) and (5) report that most workers clearly felt that the skill requirements of their job had increased as a result of the new technology, and very few felt that it had decreased (stayed the same being the third alternative).

A subsequent question asks all employed workers: "Considering your experience, education and training, do you feel that you are overqualified for your job?" Column (6) reports the fraction who deem themselves overqualified. On average 21% believe they are overqualified, with the lowest percentage, 15, in the less than high school group. While this is a large number, a clear majority replied "no," feeling that they were either appropriately-, or under-qualified, for their job.

A final question asks all workers: "In the last five years, has the job security increased, decreased, or stayed the same as a result of the introduction of computers or automated

technology?" For more highly educated workers a small, and about equal, number of workers believe that they were experiencing positive and negative shocks to their job security as a result of the new technology, but the negative side dominates slightly for those with less education. In every education group, however, the majority answer that their job security is unaffected by new technology. In response to a later question to those who had lost jobs in the last 5 years, less than one per cent responded that the loss was attributable to technological change. Each respondent was allowed a maximum of three reasons, and eight possibilities, including "other," are listed as permissible responses.

Comparing the years 1989 and 1994 in Tables 13 and 14, it is clear that over the five year period the fraction of workers both using computers, or affected by technological change, has increased substantially. Usage has increased 40%, from 35% to 49% of workers. Further, slightly more workers report that the level of skill required to do their job has increased (although the difference is not statistically significant at conventional levels), and a (statistically significant) increase in the fraction of workers who feel less job security as a result of technological change has occurred.

Overall, technological change appears to be common in the workplace, particularly for more highly educated workers. It seems to be inducing a requirement for greater skill amongst workers, but it is not evidently generating massive numbers of layoffs. Alternatively, workers may not understand the source of the technological change that caused their job loss. A vast majority of workers feel that their education is related to their job and that they are not overqualified.

Summary and Conclusions

Several conclusions emerge from this review of the Canadian experience over the past several decades.

1. Based on our examination of data from the decennial censuses, it is clear that more recent cohorts of Canadians are accumulating substantially more human capital, as measured by educational attainment, than were earlier cohorts at the same stage of the life cycle. For example, almost 40% of men and women who were in their 40s in 1971 had less than a grade eight education, whereas only 3 to 4% of those in their 20s in 1991 had this level of education. A similar comparison for university graduates shows that their proportion has doubled, and the proportionate increase in college and trades certification has been almost as large. Full-time school attendance has also become much more common among those in their late teens and early 20s.
2. Underlying aggregate employment behavior there are markedly different employment growth rates by educational attainment. Throughout the 1980s and 1990s, high positive rates of employment increase have occurred for those with post-secondary education while employment has generally declined for those with elementary and secondary schooling. These dramatic differences in employment growth by education do not simply reflect differences in educational attainment of entering and retiring cohorts, but are evident among entering cohorts alone.

3. Despite the massive increase in the availability of more educated workers, which is compounded by the demographics of the baby boom and women's increased labour force participation, the unemployment rate of highly educated workers remains substantially below that of their less educated counterparts. Indeed, during a period in which unemployment increased for the labour force as a whole, the unemployment rates of the well educated rose less than those of the less educated, so that the gap between the groups widened.

4. Furthermore, the amount of labour provided — measured by weeks of work during the year — declined for men with low levels of education, but stayed reasonably stable for those with high levels. Women have contributed more weeks of market work in all education categories, but the extent of the increase was largest for those with higher levels of education. Thus, not only has the number of individuals with high levels of educational attainment increased substantially, but also the gap between more and less educated workers in the amount of labour (weeks of work) that each is providing has widened.

5. Perhaps surprisingly, the increased supply of highly educated workers during the 1980s did not result in a drop in their relative wages or earnings. However, there was a decrease in relative earnings, particularly for women, in the 1970s. Although we do not carry out a formal test of this hypothesis, the overall behavior of the Canadian labour market during the period examined here appears consistent with a steadily increasing demand for more skilled labour together with declining demand for less skilled workers. The evidence is consistent with the view that during the 1970s the growth in supply of more educated workers outstripped the growth in demand, whereas during the 1980s demand and supply grew at similar rates. In terms of the policy issues raised in the introduction, we thus interpret the above evidence as supporting the 'relative demand shift' view and as contradicting the 'over-education/under-employment' story.

6. According to our interpretation of the Canadian experience, the combined actions of students, their parents, and educational institutions resulted in a substantial increase in the supply of more skilled labour -- a supply response that was sufficiently large to offset the growth in demand for more skilled workers. Because of this substantial supply response, the earnings differential between more and less educated individuals changed only modestly. As a consequence, earnings inequality did not increase as much in Canada as has occurred in countries such as the U.S. where the increasing education premium is an important factor contributing to growing income inequality. In this context, it is important to emphasize that the supply response not only increased the number of more educated workers but decreased the supply of the less educated, thus reducing what would otherwise be downward pressure on their earnings and employment opportunities.

7. Looking at trends in university enrolment rates, there is little evidence that periods of buoyant economic activity "draw students away" from school, nor is there clear evidence that recessions increase the size of the student body. Though this simple examination of the time series patterns in the data is not conclusive, it does suggest that students are not simply increasing their school attendance because their labour market opportunities are poor.

8. When Canadians are asked directly about the relationship between their education and work, those with high levels of education reply that the two are closely related. Further, those with a close education-work relationship seem to experience a large wage premium. Additionally, large numbers of well-educated workers have jobs that are being affected by technological change that is increasing the skill requirements of those jobs.

9. The diversity of Canada's educational system produces individuals with histories that are not easily captured in a short series of standard questions. Combinations of college and trades enrolment with all levels of schooling from elementary through graduate work is evidence of this.

More effort should be devoted to understanding this variety, and in particular the sequence in which it is obtained and its impact on labour market outcomes.

10. There is substantial heterogeneity across provinces in university enrollment rates, with undergraduate enrollment in Nova Scotia (the highest province) being two to three times that in B.C., the lowest province. The sources of these differences and their implications need to be better understood.

11. Women have been increasing their educational attainment at a more rapid rate than have men. Indeed, female participation in post-secondary education went from below to above that of male participation during the period examined here. Rising educational levels of women, together with higher rates of return to women than to men, have contributed to narrowing the earnings gap between the genders.

12. There is some evidence in the data examined here of increased attention to "lifelong learning" in that both part-time and full-time school attendance has increased substantially at ages beyond usual school completion levels. This tendency is most evident for women, who have high levels of part-time school attendance until age 40. However, this apparent increase in "lifelong learning" does not yet translate into noticeable gains over time in broad measures of educational attainment such as those used in Census or Labour Force Survey data.

13. By international standards, Canada devotes substantial resources to human capital formation. One consequence of these expenditures is a labour force that is very well educated compared to other countries. The literacy skills of well-educated Canadians also rank well by international standards.

14. An especially noteworthy feature of the Canadian experience is the importance of non-university post-secondary programs, many of these being delivered by CEGEPs in Quebec and

'community colleges' in the rest of Canada. This is not a new feature of the Canadian approach, but it is one that has endured. The fraction of the labour force completing such college diploma and certificate programs is much higher in Canada than in other countries -- more than triple the OECD average. As a consequence, Canada's proportion of the adult population with post-secondary education (college certificate/diploma or university degree) -- almost one-half in 1995 -- is highest in the OECD and substantially above the United States (one-third in 1995), the next highest country. Our analysis indicates that, on average, graduates of these non-university post-secondary programs earn 10 to 20 percent more per hour than high school graduates but much less than university graduates (whose hourly earnings are typically 35 to 60 percent above those of high school graduates). Relative to university, college diploma and certificate programs are an intermediate category both in terms of the duration of the program and the impact on earnings and employability.

Table 1
Educational Expenditure and Attainment in Canada and Selected OECD Countries

(a) Expenditure on education per student and relative to national income, 1994

| | Canada | Australia | France | Germany | Sweden | UK | US | OECD average |
|---|--------|-----------|--------|---------|--------|-------|--------|--------------|
| Percent of GDP devoted to education | | | | | | | | |
| Public & private | 7.2 | 6.2 | 6.7 | 6.0 | 9.0 | - | 6.8 | 6.3 |
| Public | 6.7 | 4.8 | 5.6 | 4.5 | 6.6 | 4.9 | 4.9 | 5.2 |
| Post-secondary educational expenditure per student, US \$ | | | | | | | | |
| | 11,471 | 10,590 | 6,569 | 8,897 | 13,168 | 7,225 | 16,262 | 8,134 |

(b) Measures of educational attainment, 1995

| | Canada | Australia | France | Germany | Sweden | UK | US | OECD average |
|---|--------|-----------|--------|---------|--------|------|------|--------------|
| Proportion of population with educational attainment: | | | | | | | | |
| High school | 75 | 53 | 68 | 84 | 75 | 76 | 86 | 62 |
| Non-university post-secondary | 30 | 10 | 8 | 10 | 14 | 9 | 8 | 9 |
| University | 17 | 14 | 11 | 13 | 14 | 12 | 25 | 13 |
| Post-secondary | 47 | 24 | 19 | 23 | 28 | 21 | 33 | 22 |
| Average completed years of schooling: | | | | | | | | |
| | 13.2 | 11.9 | 11.2 | 13.4 | 12.1 | 12.1 | 13.5 | 11.9 |

Sources:

1. OECD, *Education at a Glance: OECD Indicators 1998*. Paris: OECD, 1998.
2. OECD, *Human Capital Investment: An International Comparison*. Paris: OECD, 1998

Table 2

Literacy Skills in Canada and Selected OECD Countries

(a) Percent of adults with low literacy skills¹

| | Canada | Australia | Germany | Sweden | UK | US |
|------------|--------|-----------|---------|--------|------|------|
| Ages 16-65 | 42.9 | 44.9 | 41.7 | 25.1 | 50.4 | 49.6 |
| Ages 16-25 | 32.6 | 38.1 | 34.2 | 19.7 | 44.4 | 55.5 |
| Ages 46-55 | 54.0 | 51.1 | 42.4 | 26.6 | 52.7 | 49.6 |

1. Percent of age group at literacy levels 1 or 2 on document literacy

(b) Literacy skills and educational attainment¹

| | Canada | Australia | Germany | Sweden | UK | US |
|-------------------------|--------|-----------|---------|--------|-----|-----|
| Less than high school | 227 | 244 | 276 | 281 | 247 | 200 |
| High school graduate | 288 | 288 | 295 | 308 | 286 | 266 |
| Post-secondary graduate | 318 | 293 | 315 | 331 | 312 | 303 |
| All adults | 279 | 273 | 285 | 306 | 268 | 268 |

1. Average document literacy scores for persons aged 16-65, on a scale with a range 0 to 500.

Source: OECD, Human Capital Investment: An International Comparison. Paris: OECD, 1998.

Table 3 - Education, Unemployment and Wages, June 1998

| Educ/Age | 20-29 | | 30-39 | | 40-49 | | 50-59 | |
|--------------------------------------|-------|--------|-------|--------|-------|--------|-------|--------|
| | Male | Female | Male | Female | Male | Female | Male | Female |
| Educational Distribution | | | | | | | | |
| 0-8 years | 2.6 | 2.0 | 3.5 | 3.1 | 5.3 | 5.9 | 13.8 | 14.8 |
| Some HS | 12.3 | 10.6 | 12.7 | 11.0 | 14.2 | 12.6 | 16.2 | 17.0 |
| HS grad | 21.4 | 18.7 | 20.6 | 22.1 | 19.3 | 24.0 | 16.0 | 20.7 |
| Some PS | 18.6 | 17.1 | 7.6 | 8.7 | 7.0 | 7.8 | 5.0 | 6.1 |
| College | 30.1 | 33.6 | 35.7 | 35.6 | 34.0 | 32.6 | 30.1 | 29.3 |
| Univ Bach | 12.2 | 15.0 | 13.6 | 14.4 | 12.3 | 11.8 | 10.4 | 8.4 |
| Univ Grad | 2.8 | 3.1 | 6.4 | 5.1 | 8.0 | 5.3 | 8.6 | 3.7 |
| N | 7739 | 8040 | 10219 | 10802 | 9984 | 10424 | 7343 | 7437 |
| Unemployment Rates | | | | | | | | |
| 0-8 years | 18.7 | 29.6 | 15.3 | 17.6 | 10.6 | 11.0 | 9.9 | 13.5 |
| Some HS | 16.9 | 21.2 | 12.4 | 11.0 | 8.4 | 10.1 | 6.8 | 7.4 |
| HS grad | 11.8 | 12.2 | 6.5 | 6.9 | 6.8 | 5.5 | 4.8 | 5.5 |
| Some PS | 11.3 | 11.6 | 6.3 | 9.8 | 6.7 | 7.3 | 6.0 | 6.4 |
| College | 8.4 | 8.1 | 5.7 | 6.3 | 5.1 | 5.1 | 6.7 | 6.0 |
| Univ Bach | 3.1 | 5.5 | 3.6 | 5.2 | 3.8 | 4.2 | 4.9 | 3.1 |
| Univ Grad | 9.6 | 4.7 | 1.7 | 4.8 | 2.0 | 2.0 | 3.2 | 4.1 |
| Average | 10.2 | 10.0 | 6.5 | 7.1 | 5.8 | 5.8 | 6.2 | 6.4 |
| Hourly Wage of All Workers | | | | | | | | |
| 0-8 years | 10.64 | 8.81 | 12.80 | 9.49 | 14.80 | 10.01 | 15.50 | 10.60 |
| Some HS | 10.91 | 8.56 | 14.53 | 10.44 | 16.49 | 11.06 | 17.34 | 11.84 |
| HS grad | 11.55 | 9.80 | 16.20 | 12.78 | 18.42 | 13.98 | 19.38 | 14.26 |
| Some PS | 10.81 | 10.06 | 17.41 | 14.32 | 19.32 | 14.95 | 19.00 | 15.25 |
| College | 13.32 | 11.84 | 18.49 | 15.27 | 20.56 | 16.32 | 21.37 | 16.29 |
| Univ Bach | 16.85 | 14.82 | 21.69 | 19.36 | 25.63 | 22.20 | 25.41 | 21.57 |
| Univ Grad | 19.79 | 17.16 | 25.42 | 21.99 | 27.78 | 24.39 | 30.25 | 25.63 |
| Average | 12.84 | 11.68 | 18.27 | 15.18 | 20.48 | 16.02 | 20.97 | 15.79 |
| Hourly Wage Full-time Workers | | | | | | | | |
| 0-8 years | 10.88 | 9.33 | 12.92 | 9.48 | 15.02 | 9.97 | 15.60 | 10.40 |
| Some HS | 11.16 | 8.71 | 14.75 | 10.80 | 16.57 | 11.30 | 17.54 | 12.26 |
| HS grad | 11.79 | 10.07 | 16.37 | 13.20 | 18.57 | 14.34 | 19.58 | 14.76 |
| Some PS | 11.33 | 10.55 | 17.57 | 14.88 | 19.50 | 15.48 | 19.36 | 16.06 |
| College | 13.66 | 12.19 | 18.59 | 15.47 | 20.69 | 16.62 | 21.57 | 16.99 |
| Univ Bach | 17.04 | 14.99 | 21.74 | 19.53 | 25.96 | 22.22 | 25.80 | 21.55 |
| Univ Grad | 20.14 | 17.39 | 25.57 | 22.57 | 27.90 | 24.72 | 30.41 | 26.71 |
| Average | 13.22 | 12.09 | 18.40 | 15.58 | 20.64 | 16.37 | 21.19 | 16.37 |

Source: Statistics Canada, Labour Force Survey, June 1998 and authors' calculations

Table 4 - Educational Attainment by Age, Cohort and Sex in 1971,1981 and 1991

| year born\age educ | 21-30 | | 31-40 | | 41-50 | | 51-60 | |
|-----------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | Male | Female | Male | Female | Male | Female | Male | Female |
| 1921-30 | | | | | | | | |
| 0-8 years | — | — | — | — | 38.5 | 37.6 | 34.2 | 34.6 |
| Some HS | — | — | — | — | — | — | 21.0 | 27.1 |
| HS grad | — | — | — | — | 34.6 | 46.7 | 14.3 | 12.2 |
| Some PS | — | — | — | — | 3.7 | 3.4 | 9.8 | 11.2 |
| College | — | — | — | — | 15.7 | 9.6 | 12.1 | 11.3 |
| Univ Bach | — | — | — | — | 3.1 | 1.6 | 5.6 | 2.7 |
| Univ Grad | — | — | — | — | 4.3 | 1.0 | 3.1 | 0.8 |
| N | — | — | — | — | 12328 | 12187 | 23205 | 24314 |
| 1931-40 | | | | | | | | |
| 0-8 years | — | — | 30.2 | 29.1 | 24.8 | 25.7 | 24.6 | 24.4 |
| Some HS | — | — | — | — | 20.8 | 27.7 | 21.0 | 25.4 |
| HS grad | — | — | 38.5 | 50.9 | 15.9 | 14.2 | 17.9 | 17.4 |
| Some PS | — | — | 4.5 | 4.5 | 11.1 | 12.9 | 9.8 | 12.9 |
| College | — | — | 17.4 | 11.9 | 16.1 | 14.3 | 14.7 | 13.6 |
| Univ Bach | — | — | 3.7 | 2.3 | 7.0 | 4.1 | 7.3 | 4.9 |
| Univ Grad | — | — | 5.8 | 1.3 | 4.4 | 1.0 | 4.8 | 1.5 |
| N | — | — | 12880 | 12682 | 25605 | 25143 | 36973 | 37608 |
| 1941-50 | | | | | | | | |
| 0-8 years | 16.2 | 16.4 | 12.2 | 13.5 | 11.6 | 11.6 | — | — |
| Some HS | — | — | 18.4 | 22.5 | 17.4 | 20.0 | — | — |
| HS grad | 45.9 | 55.5 | 16.0 | 18.4 | 18.8 | 21.5 | — | — |
| Some PS | 10.1 | 7.1 | 15.4 | 15.8 | 14.1 | 15.9 | — | — |
| College | 16.7 | 14.4 | 19.9 | 19.4 | 19.0 | 18.1 | — | — |
| Univ Bach | 5.5 | 4.6 | 12.5 | 8.6 | 12.5 | 10.1 | — | — |
| Univ Grad | 5.6 | 2.1 | 5.7 | 2.0 | 6.6 | 2.9 | — | — |
| N | 16618 | 16667 | 35415 | 35375 | 53199 | 53530 | — | — |
| 1951-60 | | | | | | | | |
| 0-8 years | 5.5 | 5.3 | 5.0 | 4.7 | — | — | — | — |
| Some HS | 23.9 | 22.7 | 19.7 | 18.5 | — | — | — | — |
| HS grad | 19.0 | 22.8 | 19.6 | 22.6 | — | — | — | — |
| Some PS | 20.7 | 18.8 | 16.6 | 18.7 | — | — | — | — |
| College | 18.5 | 19.4 | 21.7 | 20.3 | — | — | — | — |
| Univ Bach | 10.4 | 9.9 | 12.9 | 12.4 | — | — | — | — |
| Univ Grad | 1.9 | 1.1 | 4.5 | 2.9 | — | — | — | — |
| N | 44350 | 44449 | 68347 | 70204 | — | — | — | — |
| 1961-70 | | | | | | | | |
| 0-8 years | 3.7 | 2.8 | — | — | — | — | — | — |
| Some HS | 20.1 | 16.7 | — | — | — | — | — | — |
| HS grad | 20.2 | 19.8 | — | — | — | — | — | — |
| Some PS | 22.6 | 23.0 | — | — | — | — | — | — |
| College | 19.9 | 22.7 | — | — | — | — | — | — |
| Univ Bach | 12.0 | 13.7 | — | — | — | — | — | — |
| Univ Grad | 1.7 | 1.4 | — | — | — | — | — | — |
| N | 64128 | 64860 | — | — | — | — | — | — |

Table 5 - Unemployment Rates by Age, Cohort, Sex and Education in 1971, 1981 and 1991

| year born\age | educ | 21-30 | | 31-40 | | 41-50 | | 51-60 | |
|---------------|-----------|-------------|-------------|-------------|-------------|------------|-------------|------------|------------|
| | | Male | Female | Male | Female | Male | Female | Male | Female |
| 1921-30 | le 8 | — | — | — | — | 6.6 | 6.2 | 8.8 | 9.3 |
| | Some HS | — | — | — | — | — | — | 5.1 | 7.4 |
| | Comp HS | — | — | — | — | 3.8 | 5.5 | 4.9 | 6.7 |
| | Some PS | — | — | — | — | 3.0 | 4.2 | 4.1 | 5.9 |
| | Coll Cert | — | — | — | — | 3.7 | 6.1 | 4.9 | 5.1 |
| | Bach | — | — | — | — | 0.5 | 3.9 | 1.7 | 4.4 |
| | Grad | — | — | — | — | 1.2 | 3.1 | 1.7 | 4.5 |
| | Avg | — | — | — | — | 4.5 | 5.6 | 5.8 | 7.0 |
| 1931-40 | le 8 | — | — | 7.3 | 7.0 | 8.4 | 12.2 | 11.8 | 13.9 |
| | Some HS | — | — | — | — | 5.9 | 7.9 | 8.2 | 8.8 |
| | Comp HS | — | — | 4.3 | 5.8 | 4.6 | 7.6 | 7.6 | 8.1 |
| | Some PS | — | — | 3.1 | 3.1 | 3.8 | 6.0 | 6.7 | 6.8 |
| | Coll Cert | — | — | 3.7 | 7.4 | 3.2 | 6.1 | 7.3 | 6.1 |
| | Bach | — | — | 2.0 | 1.3 | 1.8 | 3.6 | 4.0 | 3.3 |
| | Grad | — | — | 1.0 | 4.3 | 1.0 | 3.3 | 2.3 | 3.5 |
| | Avg | — | — | 4.7 | 5.9 | 5.0 | 7.8 | 7.9 | 8.3 |
| 1941-50 | le 8 | 10.1 | 11.7 | 11.0 | 12.7 | 14.7 | 15.7 | — | — |
| | Some HS | — | — | 6.5 | 9.6 | 9.7 | 9.8 | — | — |
| | Comp HS | 7.0 | 8.4 | 5.3 | 8.6 | 6.5 | 7.3 | — | — |
| | Some PS | 9.2 | 7.8 | 5.0 | 7.4 | 6.3 | 6.1 | — | — |
| | Coll Cert | 7.7 | 7.5 | 4.8 | 7.3 | 6.4 | 6.5 | — | — |
| | Bach | 6.0 | 6.8 | 2.7 | 5.1 | 3.2 | 3.9 | — | — |
| | Grad | 5.4 | 7.9 | 2.0 | 5.6 | 2.4 | 4.9 | — | — |
| | Avg | 7.7 | 8.4 | 5.5 | 8.3 | 7.2 | 7.6 | — | — |
| 1951-60 | le 8 | 21.3 | 19.4 | 20.7 | 21.1 | — | — | — | — |
| | Some HS | 12.7 | 16.9 | 12.5 | 13.4 | — | — | — | — |
| | Comp HS | 9.3 | 11.3 | 8.2 | 9.2 | — | — | — | — |
| | Some PS | 10.4 | 12.9 | 8.0 | 8.6 | — | — | — | — |
| | Coll Cert | 8.3 | 9.7 | 7.8 | 8.8 | — | — | — | — |
| | Bach | 7.4 | 9.7 | 3.7 | 6.3 | — | — | — | — |
| | Grad | 5.8 | 7.8 | 3.7 | 6.6 | — | — | — | — |
| | Avg | 10.5 | 12.3 | 8.6 | 9.6 | — | — | — | — |
| 1961-70 | le 8 | 27.1 | 26.5 | — | — | — | — | — | — |
| | Some HS | 19.1 | 19.3 | — | — | — | — | — | — |
| | Comp HS | 13.0 | 11.8 | — | — | — | — | — | — |
| | Some PS | 13.2 | 12.5 | — | — | — | — | — | — |
| | Coll Cert | 10.4 | 9.9 | — | — | — | — | — | — |
| | Bach | 8.5 | 8.8 | — | — | — | — | — | — |
| | Grad | 8.5 | 10.3 | — | — | — | — | — | — |
| | Avg | 13.5 | 12.2 | — | — | — | — | — | — |

Table 6 - Weeks Worked by Age, Cohort, Education and Sex in 1971, 1981, and 1991

| year born\age educ | 21-30 | | 31-40 | | 41-50 | | 51-60 | |
|-----------------------|-------|--------|-------|--------|-------|--------|-------|--------|
| | Male | Female | Male | Female | Male | Female | Male | Female |
| 1921-30 le 8 | - | - | - | - | 40.9 | 15.2 | 36.0 | 14.0 |
| Some HS | - | - | - | - | - | - | 41.9 | 20.7 |
| Comp HS | - | - | - | - | 45.8 | 22.1 | 43.3 | 22.4 |
| Some PS | - | - | - | - | 46.9 | 25.4 | 44.0 | 27.3 |
| Coll Cert | - | - | - | - | 46.2 | 25.4 | 44.5 | 27.8 |
| Bach | - | - | - | - | 48.5 | 23.9 | 46.2 | 30.9 |
| Grad | - | - | - | - | 48.0 | 32.3 | 46.4 | 39.9 |
| Avg | - | - | - | - | 44.2 | 20.0 | 41.0 | 20.5 |
| 1931-40 le 8 | - | - | 41.0 | 13.1 | 39.1 | 19.0 | 31.9 | 16.3 |
| Some HS | - | - | - | - | 44.5 | 26.5 | 37.7 | 24.1 |
| Comp HS | - | - | 45.9 | 18.9 | 46.0 | 28.7 | 39.9 | 27.7 |
| Some PS | - | - | 46.4 | 25.5 | 46.6 | 32.5 | 40.3 | 30.4 |
| Coll Cert | - | - | 46.5 | 21.9 | 46.8 | 32.4 | 41.4 | 32.2 |
| Bach | - | - | 47.4 | 23.6 | 48.9 | 37.3 | 43.8 | 35.0 |
| Grad | - | - | 47.0 | 30.2 | 48.8 | 39.7 | 46.1 | 39.9 |
| Avg | - | - | 44.7 | 18.1 | 44.5 | 27.1 | 38.3 | 25.5 |
| 1941-50 le 8 | 36.4 | 13.4 | 37.7 | 17.5 | 34.8 | 22.6 | - | - |
| Some HS | - | - | 44.0 | 24.3 | 41.3 | 31.2 | - | - |
| Comp HS | 41.7 | 24.6 | 45.5 | 26.7 | 45.1 | 36.6 | - | - |
| Some PS | 32.9 | 28.2 | 46.1 | 30.7 | 44.5 | 38.2 | - | - |
| Coll Cert | 41.9 | 28.9 | 46.5 | 29.6 | 45.5 | 38.6 | - | - |
| Bach | 35.4 | 28.0 | 47.9 | 33.9 | 47.5 | 41.3 | - | - |
| Grad | 37.1 | 27.5 | 48.0 | 37.2 | 48.1 | 42.7 | - | - |
| Avg | 39.4 | 23.9 | 45.0 | 26.9 | 43.7 | 35.2 | - | - |
| 1951-60 le 8 | 30.1 | 15.5 | 30.6 | 20.5 | - | - | - | - |
| Some HS | 38.9 | 23.0 | 40.0 | 28.9 | - | - | - | - |
| Comp HS | 42.5 | 31.5 | 44.0 | 34.3 | - | - | - | - |
| Some PS | 37.8 | 31.8 | 43.9 | 35.9 | - | - | - | - |
| Coll Cert | 42.2 | 34.4 | 45.1 | 36.8 | - | - | - | - |
| Bach | 39.2 | 34.4 | 47.2 | 38.7 | - | - | - | - |
| Grad | 40.4 | 35.9 | 46.9 | 40.5 | - | - | - | - |
| Avg | 39.5 | 29.7 | 43.3 | 34.2 | - | - | - | - |
| 1961-70 le 8 | 26.1 | 15.4 | - | - | - | - | - | - |
| Some HS | 35.9 | 25.4 | - | - | - | - | - | - |
| Comp HS | 40.4 | 33.5 | - | - | - | - | - | - |
| Some PS | 36.0 | 33.4 | - | - | - | - | - | - |
| Coll Cert | 41.9 | 37.4 | - | - | - | - | - | - |
| Bach | 38.1 | 36.7 | - | - | - | - | - | - |
| Grad | 38.1 | 34.9 | - | - | - | - | - | - |
| Avg | 38.0 | 33.0 | - | - | - | - | - | - |

Table 7 - Annual Employment Earnings of Full-Time Employed Workers by Age, Cohort, Education and Sex in 1971, 1981, and 1991

| year born\age | educ | 21-30 | | 31-40 | | 41-50 | | 51-60 | |
|---------------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | Male | Female | Male | Female | Male | Female | Male | Female |
| 1921-30 | le 8 | - | - | - | - | 22,656 | 12,026 | 25,473 | 17,278 |
| | Some HS | - | - | - | - | - | - | 32,633 | 20,096 |
| | Comp HS | - | - | - | - | 31,813 | 16,900 | 36,587 | 22,542 |
| | Some PS | - | - | - | - | 40,135 | 23,003 | 41,875 | 26,699 |
| | Coll Cert | - | - | - | - | 33,491 | 19,568 | 38,655 | 25,069 |
| | Bach | - | - | - | - | 53,894 | 36,233 | 57,482 | 38,711 |
| | Grad | - | - | - | - | 54,896 | 43,487 | 58,585 | 52,074 |
| | Avg | - | - | - | - | 31,445 | 17,170 | 35,918 | 23,269 |
| 1931-40 | le 8 | - | - | 23,551 | 11,758 | 27,348 | 16,504 | 25,151 | 15,668 |
| | Some HS | - | - | - | - | 33,183 | 20,606 | 31,876 | 19,640 |
| | Comp HS | - | - | 30,062 | 17,026 | 37,851 | 22,383 | 36,823 | 22,642 |
| | Some PS | - | - | 37,666 | 23,625 | 43,645 | 26,471 | 41,797 | 26,729 |
| | Coll Cert | - | - | 32,663 | 19,252 | 38,990 | 24,882 | 38,172 | 25,427 |
| | Bach | - | - | 46,842 | 35,676 | 54,184 | 38,502 | 52,883 | 38,956 |
| | Grad | - | - | 46,095 | 38,537 | 57,600 | 45,020 | 58,519 | 43,094 |
| | Avg | - | - | 31,040 | 17,843 | 38,246 | 23,427 | 37,353 | 23,861 |
| 1941-50 | le 8 | 20,476 | 12,092 | 26,029 | 15,651 | 26,177 | 16,027 | - | - |
| | Some HS | - | - | 31,982 | 19,742 | 31,981 | 20,686 | - | - |
| | Comp HS | 25,067 | 16,592 | 35,050 | 22,527 | 37,329 | 23,658 | - | - |
| | Some PS | 27,290 | 20,411 | 38,026 | 27,358 | 42,083 | 28,951 | - | - |
| | Coll Cert | 27,043 | 18,610 | 37,074 | 24,290 | 39,565 | 25,775 | - | - |
| | Bach | 33,231 | 26,824 | 45,883 | 37,875 | 50,804 | 39,306 | - | - |
| | Grad | 32,924 | 29,452 | 50,753 | 41,852 | 55,756 | 45,137 | - | - |
| | Avg | 25,733 | 17,569 | 37,249 | 25,119 | 40,238 | 26,898 | - | - |
| 1951-60 | le 8 | 21,966 | 14,193 | 22,272 | 14,559 | - | - | - | - |
| | Some HS | 26,306 | 18,772 | 28,883 | 19,578 | - | - | - | - |
| | Comp HS | 28,404 | 20,757 | 32,719 | 22,782 | - | - | - | - |
| | Some PS | 28,992 | 22,627 | 36,209 | 26,762 | - | - | - | - |
| | Coll Cert | 31,002 | 22,781 | 36,320 | 25,195 | - | - | - | - |
| | Bach | 35,304 | 29,007 | 44,692 | 36,172 | - | - | - | - |
| | Grad | 35,421 | 32,324 | 45,909 | 40,356 | - | - | - | - |
| | Avg | 29,272 | 22,208 | 35,818 | 26,041 | - | - | - | - |
| 1961-70 | le 8 | 18,505 | 12,694 | - | - | - | - | - | - |
| | Some HS | 23,204 | 16,880 | - | - | - | - | - | - |
| | Comp HS | 25,192 | 19,046 | - | - | - | - | - | - |
| | Some PS | 25,637 | 20,954 | - | - | - | - | - | - |
| | Coll Cert | 28,849 | 21,708 | - | - | - | - | - | - |
| | Bach | 32,873 | 28,464 | - | - | - | - | - | - |
| | Grad | 33,766 | 31,236 | - | - | - | - | - | - |
| | Avg | 26,838 | 21,550 | - | - | - | - | - | - |

Table 8 - Annual Employment Earnings of All Workers by Cohort and Sex in 1971, 1981, and 1991

| year born\age | educ | 21-30 | | 31-40 | | 41-50 | | 51-60 | |
|---------------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | Male | Female | Male | Female | Male | Female | Male | Female |
| 1921-30 | le 8 | -- | -- | -- | -- | 19,049 | 3,453 | 18,894 | 4,215 |
| | Some HS | -- | -- | -- | -- | -- | -- | 26,383 | 7,107 |
| | Comp HS | -- | -- | -- | -- | 28,470 | 6,546 | 30,922 | 8,572 |
| | Some PS | -- | -- | -- | -- | 30,320 | 9,027 | 35,397 | 12,512 |
| | Coll Cert | -- | -- | -- | -- | 36,638 | 10,579 | 33,517 | 11,848 |
| | Bach | -- | -- | -- | -- | 50,442 | 15,018 | 50,364 | 21,086 |
| | Grad | -- | -- | -- | -- | 52,009 | 24,734 | 50,372 | 36,700 |
| | Avg | -- | -- | -- | -- | 27,146 | 6,083 | 28,289 | 8,057 |
| 1931-40 | le 8 | -- | -- | 19,786 | 3,045 | 21,957 | 5,827 | 16,881 | 4,843 |
| | Some HS | -- | -- | -- | -- | 29,126 | 9,451 | 23,949 | 8,617 |
| | Comp HS | -- | -- | 27,234 | 5,700 | 34,029 | 11,253 | 28,650 | 11,070 |
| | Some PS | -- | -- | 30,134 | 7,644 | 38,766 | 15,117 | 32,292 | 14,339 |
| | Coll Cert | -- | -- | 33,471 | 11,149 | 35,633 | 14,062 | 30,797 | 14,419 |
| | Bach | -- | -- | 44,156 | 14,856 | 51,333 | 25,797 | 43,746 | 23,696 |
| | Grad | -- | -- | 42,953 | 20,130 | 52,528 | 31,469 | 50,413 | 31,276 |
| | Avg | -- | -- | 27,300 | 5,804 | 32,813 | 11,060 | 27,573 | 10,720 |
| 1941-50 | le 8 | 15,250 | 3,118 | 20,622 | 5,238 | 18,870 | 6,803 | -- | -- |
| | Some HS | -- | -- | 27,976 | 8,357 | 26,027 | 11,593 | -- | -- |
| | Comp HS | 20,370 | 7,777 | 31,266 | 10,481 | 32,580 | 15,399 | -- | -- |
| | Some PS | 22,442 | 10,287 | 33,741 | 14,961 | 35,159 | 19,523 | -- | -- |
| | Coll Cert | 16,679 | 11,002 | 33,966 | 12,767 | 34,693 | 17,701 | -- | -- |
| | Bach | 21,294 | 13,865 | 42,021 | 22,739 | 45,820 | 28,980 | -- | -- |
| | Grad | 22,758 | 15,300 | 45,489 | 27,356 | 50,782 | 35,024 | -- | -- |
| | Avg | 19,701 | 8,042 | 32,430 | 11,825 | 33,480 | 16,663 | -- | -- |
| 1951-60 | le 8 | 13,823 | 4,234 | 14,812 | 5,892 | -- | -- | -- | -- |
| | Some HS | 20,268 | 7,687 | 22,765 | 10,123 | -- | -- | -- | -- |
| | Comp HS | 23,604 | 11,887 | 27,907 | 13,889 | -- | -- | -- | -- |
| | Some PS | 20,491 | 12,892 | 29,852 | 16,936 | -- | -- | -- | -- |
| | Coll Cert | 25,291 | 14,467 | 31,322 | 16,533 | -- | -- | -- | -- |
| | Bach | 24,961 | 17,590 | 39,667 | 24,689 | -- | -- | -- | -- |
| | Grad | 25,585 | 20,958 | 39,520 | 27,995 | -- | -- | -- | -- |
| | Avg | 22,111 | 11,877 | 29,352 | 15,671 | -- | -- | -- | -- |
| 1961-70 | le 8 | 10,192 | 4,059 | -- | -- | -- | -- | -- | -- |
| | Some HS | 16,348 | 7,812 | -- | -- | -- | -- | -- | -- |
| | Comp HS | 19,793 | 11,583 | -- | -- | -- | -- | -- | -- |
| | Some PS | 16,673 | 12,340 | -- | -- | -- | -- | -- | -- |
| | Coll Cert | 22,854 | 14,949 | -- | -- | -- | -- | -- | -- |
| | Bach | 22,262 | 18,403 | -- | -- | -- | -- | -- | -- |
| | Grad | 23,199 | 18,976 | -- | -- | -- | -- | -- | -- |
| | Avg | 19,011 | 12,716 | -- | -- | -- | -- | -- | -- |

TABLE 9 - Employment Changes by Educational Attainment, 1980-95
(a) All individuals 15 or more years of age

| Education | <u>Employment change (percent)</u> | | | |
|--|--|-----------------|--|-----------------|
| | 1980-89 | | 1990-95 | |
| | compound annual average growth rate | total change | compound annual average growth rate | total change |
| Elementary | -3.8 | -29.7 | -6.7 | -29.2 |
| Some high school | +1.1 | +10.6 | -2.3 | -10.8 |
| Incomplete high school | | | -4.1 | -18.8 |
| High school graduate | | | -0.8 | -4.1 |
| Some post-secondary | +4.8 | +52.6 | +0.2 | +0.9 |
| Post-secondary certificate or diploma | +6.5 | +76.3 | +3.6 | +19.6 |
| University degree | +6.1 | +69.8 | +5.1 | +28.4 |

(b) Individuals 15-24 years of age

| Education | <u>Employment change (percent)</u> | | | |
|--|--|-----------------|--|-----------------|
| | 1980-89 | | 1990-95 | |
| | compound annual average growth rate | total change | compound annual average growth rate | total change |
| Elementary | -3.3 | -25.8 | -10.2 | -41.7 |
| Some high school | -2.4 | -19.5 | -5.0 | -22.6 |
| Incomplete high school | | | -5.3 | -23.7 |
| High school graduate | | | -4.6 | -21.1 |
| Some post-secondary | +3.6 | +37.7 | +0.2 | +0.9 |
| Post-secondary certificate or diploma | +3.6 | +37.9 | -0.3 | -1.4 |
| University degree | +3.1 | +31.4 | +3.6 | +19.6 |

Source: Statistics Canada, The Labour Force, various issues, Labour Force Annual Averages, various issues, and calculations by the authors.

Table 10 - Relationship between education and current job (1994)

| EDUCATION | Closely | | Somewhat | | Not at all | | N | |
|-------------|---------|------|----------|------|------------|------|------|------|
| | 1st | Curr | 1st | Curr | 1st | Curr | 1st | Curr |
| | (%) | (%) | (%) | (%) | (%) | (%) | | |
| University | 71 | 69 | 14 | 17 | 15 | 14 | 1135 | 1091 |
| Science | 77 | 76 | 10 | 12 | 12 | 12 | 257 | 248 |
| Eng. | 77 | 68 | 17 | 25 | 6 | 8 | 108 | 105 |
| Soc. Sci. | 59 | 58 | 17 | 22 | 24 | 19 | 212 | 200 |
| Business | 68 | 67 | 21 | 25 | 11 | 8 | 168 | 171 |
| Educ. | 83 | 77 | 8 | 12 | 9 | 11 | 219 | 216 |
| Arts/Hum. | 60 | 64 | 12 | 12 | 28 | 24 | 171 | 151 |
| Coll/Trades | 72 | 61 | 12 | 18 | 16 | 21 | 1868 | 1628 |
| Science | 83 | 73 | 7 | 10 | 10 | 17 | 371 | 338 |
| Eng. | 70 | 63 | 10 | 18 | 19 | 19 | 590 | 545 |
| Soc. Sci. | 69 | 59 | 13 | 15 | 18 | 26 | 67 | 54 |
| Business | 67 | 53 | 18 | 24 | 15 | 24 | 558 | 467 |
| Educ. | 82 | 57 | 6 | 20 | 12 | 23 | 93 | 75 |
| Arts/Hum. | 63 | 53 | 10 | 16 | 27 | 31 | 189 | 149 |
| High School | 20 | 22 | 23 | 31 | 57 | 47 | 1653 | 1380 |
| Less HS | 6 | 10 | 13 | 24 | 81 | 66 | 1475 | 914 |

Notes: From the General Social Survey, cycle 9, 1994.

| Table 11 - Wage regressions coefficients | | | |
|--|----------------|----------------|----------------|
| for closeness of education to job | | | |
| Hourly Wage) | (1) | (2) | (3) |
| closely | 0.38 (.026) | 0.49 (.036) | -- |
| somewhat | 0.25 (.025) | 0.37 (.046) | -- |
| JR*Science | -- | -- | 0.30 (.063) |
| JR*Eng | -- | -- | 0.22 (.050) |
| JR*SocSci | -- | -- | 0.30 (.062) |
| JR*Bus | -- | -- | 0.17 (.061) |
| JR*Educ | -- | -- | 0.29 (.105) |
| JR*FineArt / Hum. | -- | -- | 0.03 (.089) |
| R2 | 0.28 | 0.24 | 0.23 |
| N | 5887 | 2284 | 2276 |

Notes: Included in regressions (1),(2) and (3)are the variables: female, age age2, single, 5 regional and 3 educational dummy variables. Further, in regression (1), which includes all educational groups, there are 2 additional education dummy variables, and in equation (2), which like (3) includes only postsecondary graduates, there are 5 field dummy variables (engineering omitted). All coefficients displayed are significant in excess of the 1% level, except for fine arts/ humanities which is not significant at conventional levels. Standard errors are heteroskedasticity consistent. "JR" stands for "Job Related" and is an indicator variable that is set to 1 if the job is "closely related." From the General Social Survey, cycle 9, 1994.

Table 12 - Technological Change and Current Employment Questions (1994)

Use

| | Yes (%) (1) | Greatly (%) (2) | Somewhat (%) (3) | Increase (%) (4) | Decrease (%) (5) |
|-----------|-------------------|-----------------------|------------------------|------------------------|------------------------|
| Grad. | 82 | 51 | 25 | 69 | 3 |
| Bach | 74 | 47 | 26 | 72 | 1 |
| College | 56 | 41 | 20 | 72 | 2 |
| Trade/Voc | 47 | 38 | 18 | 76 | 1 |
| High Sch. | 46 | 35 | 19 | 72 | 2 |
| Less HS | 18 | 15 | 12 | 55 | 5 |
| Average | 49 | 35 | 19 | 71 | 2 |

* "hardly" and "not at all" residual groups.

| | Over-qualified? | Job Security & Tech. Change | |
|-----------|-------------------|-----------------------------|--------------------|
| | Yes (%) (6) | Inc. (%) (7) | Dec. (%) (8) |
| Grad. | 27 | 13 | 12 |
| Bach | 24 | 14 | 17 |
| College | 22 | 15 | 23 |
| Trade/Voc | 20 | 14 | 19 |
| High Sch. | 21 | 14 | 20 |
| Less HS | 15 | 11 | 17 |
| Average | 21 | 14 | 19 |

Notes: From the General Social Survey, cycle 9, 1994.

Table 13 - Technological Change and Current Employment Questions (1989)

| | Computer at work? | by Technological Change?* | | Skill Changed? | |
|-----------|----------------------|------------------------------|-----------------|-------------------|-----------------|
| | Yes (%) | Greatly (%) | Somewhat (%) | Increase (%) | Decrease (%) |
| | (1) | (2) | (3) | (4) | (5) |
| Grad. | 56 | 40 | 25 | 68 | 1 |
| Bach | 57 | 40 | 22 | 69 | 1 |
| College | 40 | 35 | 15 | 68 | 4 |
| Trade/Voc | 40 | 33 | 18 | 71 | 2 |
| High Sch. | 37 | 31 | 17 | 68 | 2 |
| Less HS | 12 | 13 | 12 | 55 | 4 |
| Average | 35 | 29 | 17 | 67 | 2 |

* "hardly" and "not at all" residual groups.

| | Over- qualified? | Job Security & Tech. Change | |
|-----------|---------------------|--------------------------------|-------------|
| | Yes (%) | Inc. (%) | Dec. (%) |
| | (6) | (7) | (8) |
| Grad. | 20 | 17 | 8 |
| Bach | 24 | 16 | 8 |
| College | 24 | 15 | 9 |
| Trade/Voc | 22 | 23 | 11 |
| High Sch. | 26 | 19 | 11 |
| Less HS | 17 | 18 | 19 |
| Average | 22 | 18 | 11 |

Notes: From the General Social Survey, cycle 4 1989.

Appendix Table 1 -Educational Attainment Distributions by Cohort and Sex in 1971, '81 and '91 for Non-Immigrant Canadians

| year born\age educ | 21-30 | | 31-40 | | 41-50 | | 51-60 | |
|--------------------|-------|--------|-------|--------|-------|--------|-------|--------|
| | Male | Female | Male | Female | Male | Female | Male | Female |
| 1921-30 le 8 | — | — | — | — | 40.6 | 37.8 | 36.0 | 34.4 |
| Some HS | — | — | — | — | — | — | 22.4 | 27.6 |
| Comp HS | — | — | — | — | 36.1 | 47.5 | 14.5 | 12.5 |
| Some PS | — | — | — | — | 3.5 | 3.3 | 9.0 | 11.3 |
| Coll Cert | — | — | — | — | 13.0 | 8.9 | 10.0 | 10.9 |
| Bach | — | — | — | — | 3.0 | 1.7 | 5.6 | 2.8 |
| Grad | — | — | — | — | 3.9 | 0.8 | 2.6 | 0.6 |
| N | — | — | — | — | 9447 | 9562 | 17371 | 18448 |
| 1931-40 le 8 | — | — | 31.0 | 27.9 | 25.4 | 24.2 | 25.1 | 21.9 |
| Some HS | — | — | — | — | 23.1 | 29.5 | 23.4 | 27.6 |
| Comp HS | — | — | 41.5 | 53.8 | 16.8 | 14.9 | 18.8 | 18.0 |
| Some PS | — | — | 4.1 | 4.2 | 10.8 | 13.1 | 9.3 | 13.2 |
| Coll Cert | — | — | 15.3 | 10.9 | 14.1 | 13.8 | 12.7 | 13.4 |
| Bach | — | — | 3.5 | 2.2 | 6.5 | 3.7 | 6.8 | 4.7 |
| Grad | — | — | 4.7 | 1.0 | 3.4 | 0.8 | 3.8 | 1.1 |
| N | — | — | 10009 | 10009 | 19085 | 19215 | 27116 | 28280 |
| 1941-50 le 8 | 16.2 | 15.50 | 12.4 | 12.7 | 11.8 | 10.5 | — | — |
| Some HS | — | — | 19.8 | 23.8 | 19.1 | 21.5 | — | — |
| Comp HS | 47.8 | 57.7 | 16.9 | 19.4 | 19.9 | 22.4 | — | — |
| Some PS | 9.6 | 6.7 | 14.9 | 15.6 | 13.6 | 15.6 | — | — |
| Coll Cert | 16.0 | 14.1 | 19.4 | 19.3 | 18.4 | 18.1 | — | — |
| Bach | 5.3 | 4.3 | 12.0 | 7.8 | 11.9 | 9.6 | — | — |
| Grad | 5.0 | 1.7 | 4.6 | 1.4 | 5.4 | 2.4 | — | — |
| N | 13885 | 13872 | 27618 | 27684 | 40327 | 40739 | — | — |
| 1951-60 le 8 | 5.3 | 4.6 | 4.5 | 3.8 | — | — | — | — |
| Some HS | 24.7 | 23.4 | 20.7 | 19.2 | — | — | — | — |
| Comp HS | 19.7 | 23.4 | 20.6 | 23.6 | — | — | — | — |
| Some PS | 20.2 | 18.5 | 16.1 | 18.4 | — | — | — | — |
| Coll Cert | 18.4 | 19.6 | 21.9 | 20.6 | — | — | — | — |
| Bach | 10.1 | 9.7 | 12.3 | 12.0 | — | — | — | — |
| Grad | 1.7 | 1.0 | 3.8 | 2.5 | — | — | — | — |
| N | 39003 | 38686 | 56708 | 57848 | — | — | — | — |
| 1961-70 le 8 | 3.4 | 2.4 | — | — | — | — | — | — |
| Some HS | 20.6 | 17.0 | — | — | — | — | — | — |
| Comp HS | 20.5 | 20.0 | — | — | — | — | — | — |
| Some PS | 22.0 | 22.6 | — | — | — | — | — | — |
| Coll Cert | 20.4 | 23.4 | — | — | — | — | — | — |
| Bach | 11.7 | 13.4 | — | — | — | — | — | — |
| Grad | 1.5 | 1.2 | — | — | — | — | — | — |
| N | 55399 | 55833 | — | — | — | — | — | — |

Appendix Table 2 - Percentage of the Population Working Full Time/Full Year

| year born\age | educ | 21-30 | | 31-40 | | 41-50 | | 51-60 | |
|---------------|-----------|-------|--------|-------|--------|-------|--------|-------|--------|
| | | Male | Female | Male | Female | Male | Female | Male | Female |
| 1921-30 | le 8 | — | — | — | — | 57.3 | 15.8 | 43.1 | 12.2 |
| | Some HS | — | — | — | — | — | — | 57.3 | 19.4 |
| | Comp HS | — | — | — | — | 74.7 | 25.7 | 59.8 | 23.9 |
| | Some PS | — | — | — | — | 79.1 | 29.8 | 65.2 | 29.0 |
| | Coll Cert | — | — | — | — | 75.0 | 30.2 | 64.0 | 29.3 |
| | Bach | — | — | — | — | 80.3 | 30.5 | 69.0 | 35.6 |
| | Grad | — | — | — | — | 76.8 | 42.5 | 65.3 | 49.5 |
| | Avg | — | — | — | — | 68.5 | 22.8 | 55.3 | 20.3 |
| 1931-40 | le 8 | — | — | 56.3 | 12.5 | 47.1 | 17.5 | 36.4 | 14.6 |
| | Some HS | — | — | — | — | 62.9 | 26.9 | 49.9 | 23.7 |
| | Comp HS | — | — | 74.5 | 20.6 | 67.0 | 31.0 | 54.5 | 28.8 |
| | Some PS | — | — | 76.8 | 27.1 | 70.2 | 35.4 | 57.5 | 32.6 |
| | Coll Cert | — | — | 74.5 | 24.0 | 69.0 | 33.5 | 57.2 | 34.1 |
| | Bach | — | — | 78.4 | 26.7 | 76.9 | 42.0 | 64.8 | 38.5 |
| | Grad | — | — | 75.7 | 32.1 | 73.7 | 45.6 | 66.2 | 46.3 |
| | Avg | — | — | 69.3 | 19.3 | 62.9 | 27.9 | 51.1 | 26.0 |
| 1941-50 | le 8 | 44.3 | 13.0 | 45.2 | 15.1 | 40.5 | 21.1 | — | — |
| | Some HS | — | — | 59.3 | 23.3 | 56.7 | 34.2 | — | — |
| | Comp HS | 58.6 | 29.8 | 64.7 | 27.3 | 65.8 | 43.6 | — | — |
| | Some PS | 39.5 | 27.2 | 67.1 | 31.4 | 66.8 | 44.8 | — | — |
| | Coll Cert | 58.9 | 33.3 | 68.3 | 28.9 | 66.9 | 44.4 | — | — |
| | Bach | 43.1 | 25.6 | 74.9 | 37.0 | 75.3 | 51.3 | — | — |
| | Grad | 45.9 | 25.4 | 72.5 | 41.8 | 73.0 | 54.8 | — | — |
| | Avg | 52.8 | 27.1 | 64.1 | 26.8 | 63.3 | 40.6 | — | — |
| 1951-60 | le 8 | 28.4 | 11.7 | 32.4 | 18.5 | — | — | — | — |
| | Some HS | 44.4 | 20.9 | 51.1 | 29.1 | — | — | — | — |
| | Comp HS | 54.7 | 35.0 | 62.0 | 38.4 | — | — | — | — |
| | Some PS | 44.1 | 31.5 | 63.0 | 39.8 | — | — | — | — |
| | Coll Cert | 54.3 | 35.9 | 64.9 | 40.2 | — | — | — | — |
| | Bach | 49.7 | 33.3 | 75.1 | 44.3 | — | — | — | — |
| | Grad | 50.6 | 36.9 | 70.4 | 45.6 | — | — | — | — |
| | Avg | 47.9 | 29.9 | 61.3 | 37.3 | — | — | — | — |
| 1961-70 | le 8 | 24.6 | 11.4 | — | — | — | — | — | — |
| | Some HS | 38.5 | 22.9 | — | — | — | — | — | — |
| | Comp HS | 48.9 | 34.6 | — | — | — | — | — | — |
| | Some PS | 39.2 | 31.5 | — | — | — | — | — | — |
| | Coll Cert | 54.7 | 40.3 | — | — | — | — | — | — |
| | Bach | 48.3 | 38.3 | — | — | — | — | — | — |
| | Grad | 47.1 | 34.2 | — | — | — | — | — | — |
| | Avg | 44.8 | 33.1 | — | — | — | — | — | — |

Endnotes:

¹ Examples of this view include Premier's Council of Ontario, *People and Skills in the New Global Economy*. Toronto: Premier's Council, 1990; Steering Group on Prosperity, *Inventing Our Future: An Action Plan for Canada's Prosperity*. 1992; and OECD, The OECD Jobs Study. Paris: OECD, 1994.

² There is a vast literature on this topic. See, for example, L. Katz and K.M. Murphy, "Changes in Relative Wages, 1963-1987: Supply and Demand Factors" Quarterly Journal of Economics vol. 107 (February 1992) pp. 35-78, K. M. Murphy, W. C. Riddell and P.M. Romer "Wages, Skills and Technology in the United States and Canada" in E. Helpman (ed.) General Purpose Technologies and Economic Growth, Cambridge: MIT Press, 1998, and W. C. Riddell "Canadian Labour Market Performance in International Perspective" Canadian Journal of Economics, forthcoming, November 1999.

³ For an example of this perspective in the Canadian context see D. W. Livingstone, The Education-Jobs Gap: Underemployment or Economic Democracy, Boulder, Co.: Westview Press, 1997. In the United States, see D. E. Hecker, "Reconciling conflicting data on jobs for college graduates" Monthly Labor Review, July 1992, pp. 3-12 and J. Tyler, R.J. Murnane and F. Levy, "Are Lots of College Graduates Taking High School Jobs: A Reconsideration of the Evidence" NBER Working Paper 5127, May 1995.

⁴ See, for example, British Columbia Labour Force Development Board, Training For What? (Victoria: British Columbia Labour Force Development Board), 1995 for a policy document that takes this position. This perspective also seems to have substantial public support. For example, a recent poll found that 52 per cent of Canadians would advise young people to attend a community college to learn a trade or skill versus only 36 per cent who would recommend attending a university for a general education. See "More prefer college to university: poll" Globe and Mail June 22, 1999.

⁵ Earlier research by the Economic Council of Canada concluded that Canadian expenditure per student is especially high at the primary and secondary levels, second only to Japan among the G7 countries and among the highest in the OECD (Economic Council of Canada, *Education and Training in Canada*, Ottawa: Minister of Supply and Services, 1992).

⁶ See OECD and Statistics Canada, Literacy, Economy and Society: Results of the first International Adult Literacy Survey. Paris and Ottawa: OECD and Statistics Canada, 1995.

⁷ We use the June 1998 LFS because this lines up well with the Census data employed subsequently, the Census being taken in June of each Census year.

⁸ During the 1950s and 1960s there was substantial government involvement in secondary education, massive reorganization and consolidation. In addition to a major expansion of the high school system, there was also increased spending per pupil (R. Manzer, *Public Schools and*

Political Ideas: Canadian Education Policy in Historical Perspective. Toronto: University of Toronto Press, 1994.)

⁹ J.D. Dennison (ed.) *Challenge and Opportunity: Canada's Community Colleges at the Crossroads*. Vancouver: UBC Press, 1995.

¹⁰ We also examined income from all sources; the results were very similar and thus are not reported.

¹¹ For confidentiality reasons, the public use Census data contains an upper bound on reported wage and salary income. However, Statistics Canada increases the "cap" on the released income data each census. Sensitivity analysis suggests that the cap is approximately constant in real terms and its existence is not likely to affect our results.

¹² Statistics Canada. *Education in Canada*. Ottawa: Ministry of Supplies and Services, various years 1971-1998.

¹³ Card, D., and T. Lemieux. "The Canadian 'G.I. Bill'." Mimeo, Universite de Montreal, 1998.

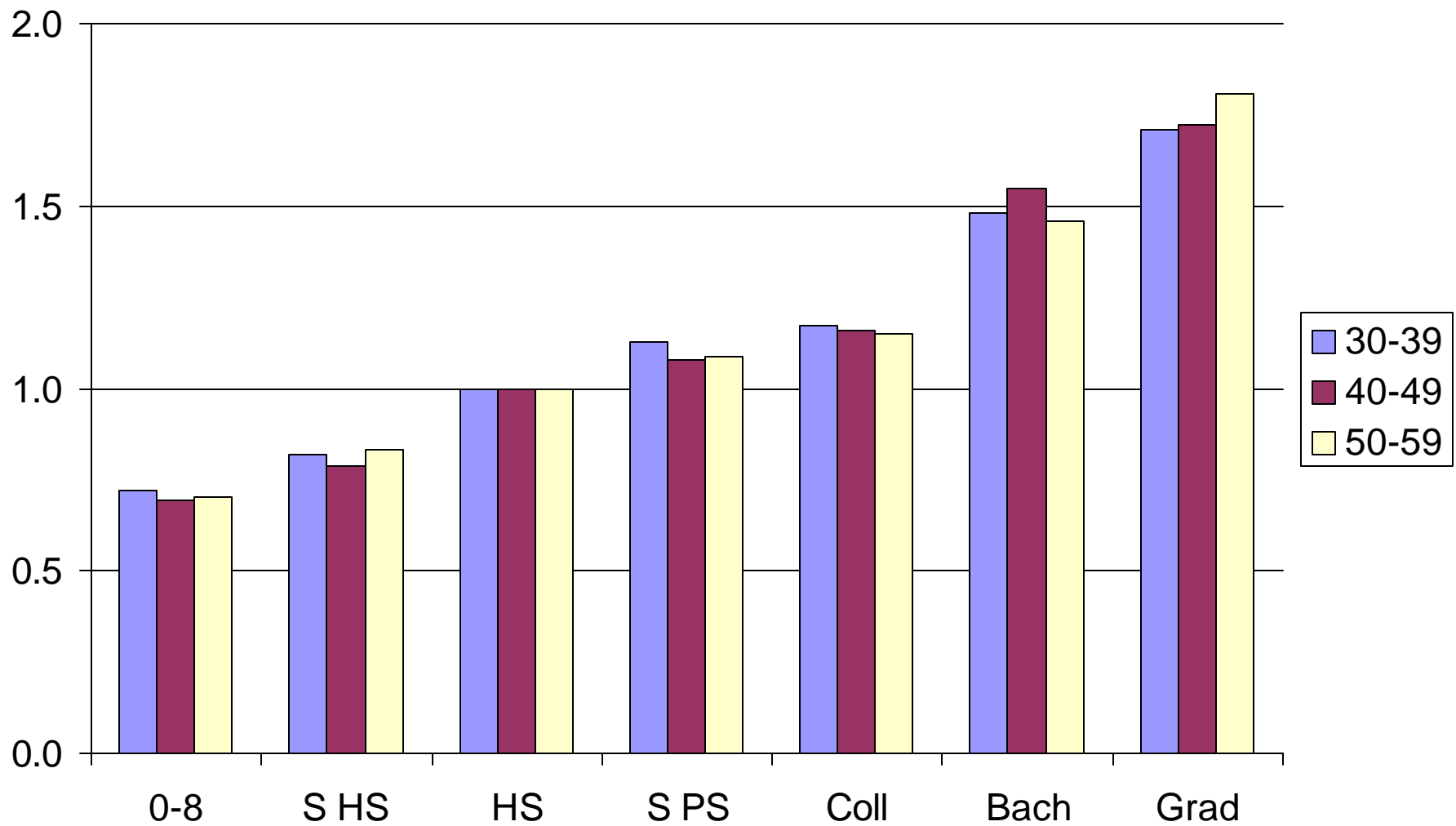
¹⁴ add note re 1990 changes

¹⁵ See K.M. Murphy, W.C. Riddell and P.M. Romer, "Wages, Skills and Technology in the United States and Canada" in E. Helpman (editor) General Purpose Technologies and Economic Growth. Cambridge: MIT Press, 1998.

¹⁶ The percentage wage gain is obtained from the estimated coefficient b reported in the table using the transformation: $\exp(b) - 1$. Thus, in column (1), $\exp(.38) - 1 = 0.46$

¹⁷ DiNardo, J.E., and J-S, Pischke. "The returns to computer use revisited: have pencils changed the wage structure too?" *Quarterly Journal of Economics* 112 (February 1997).

Relative Wage Females



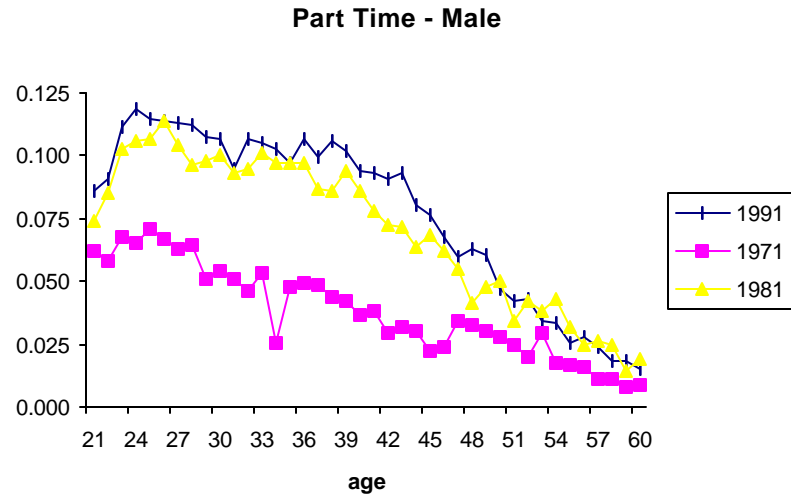
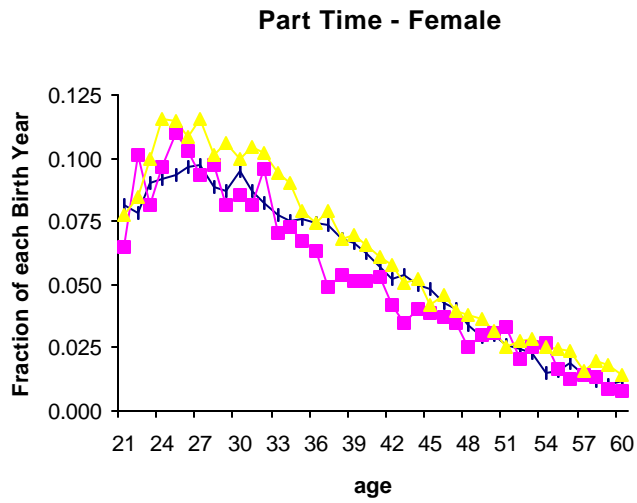
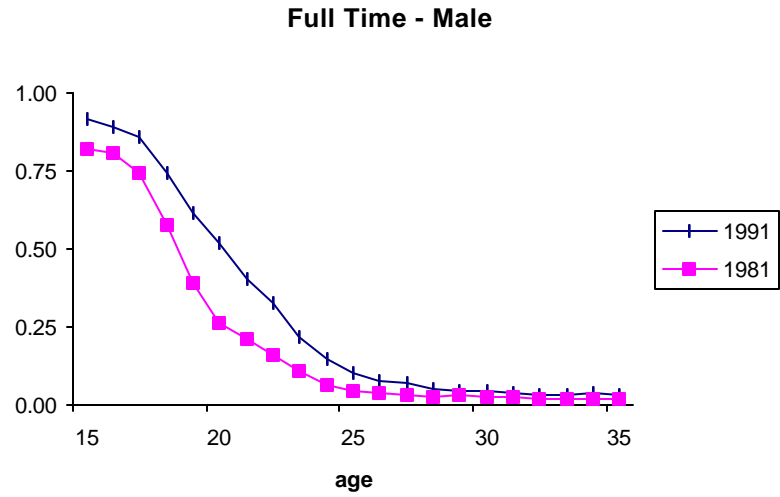
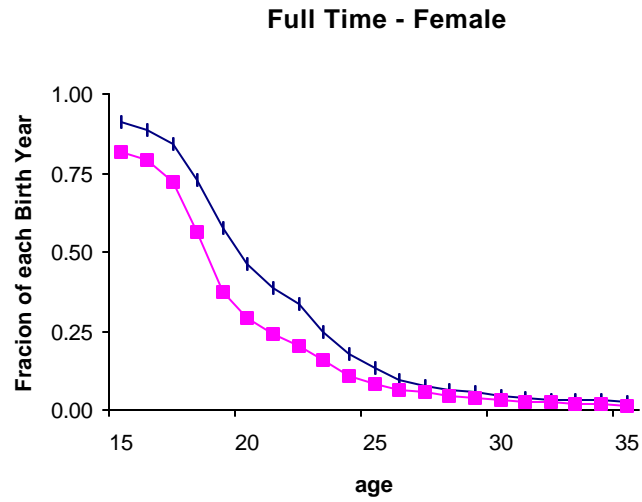
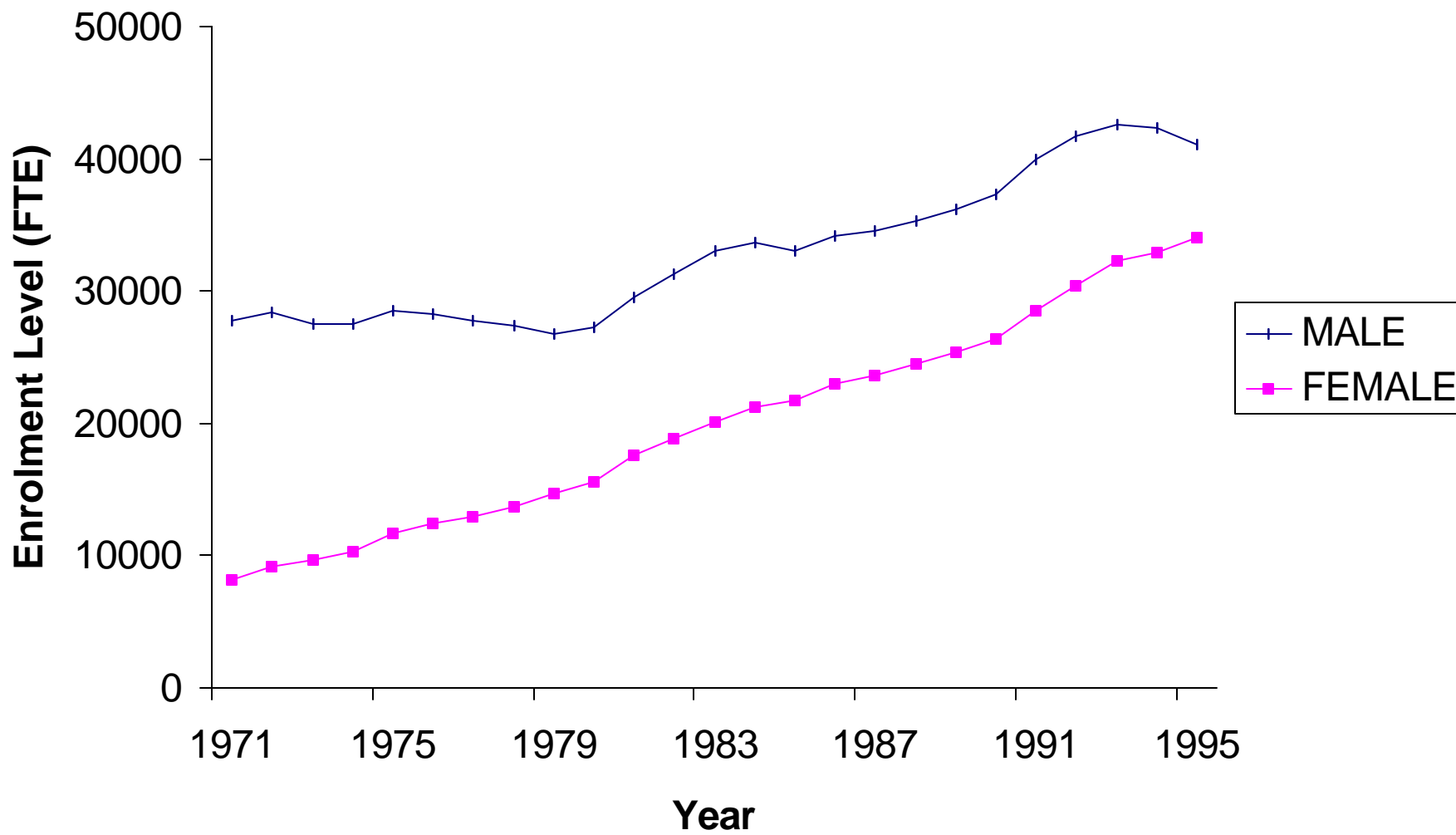


Figure 2 - Educational Attendance by Age

Graduate Enrolment Level



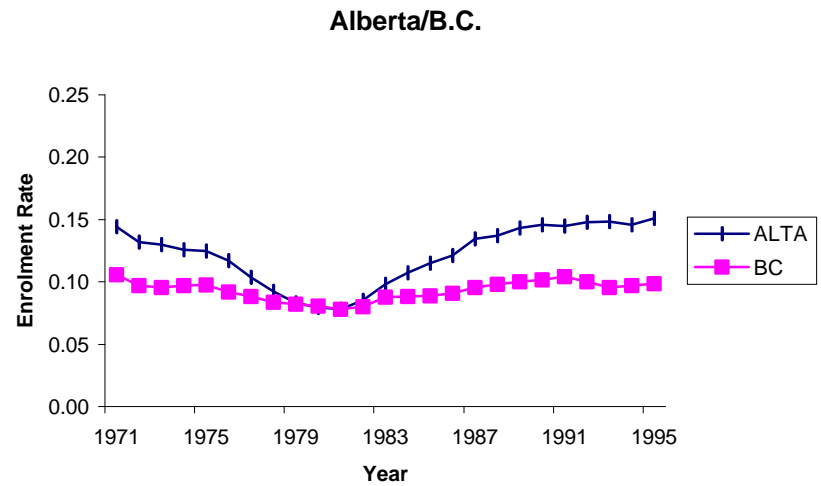
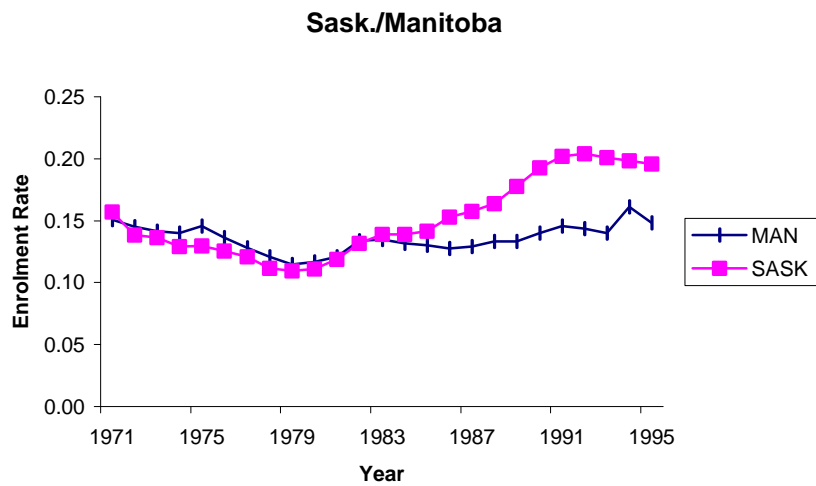
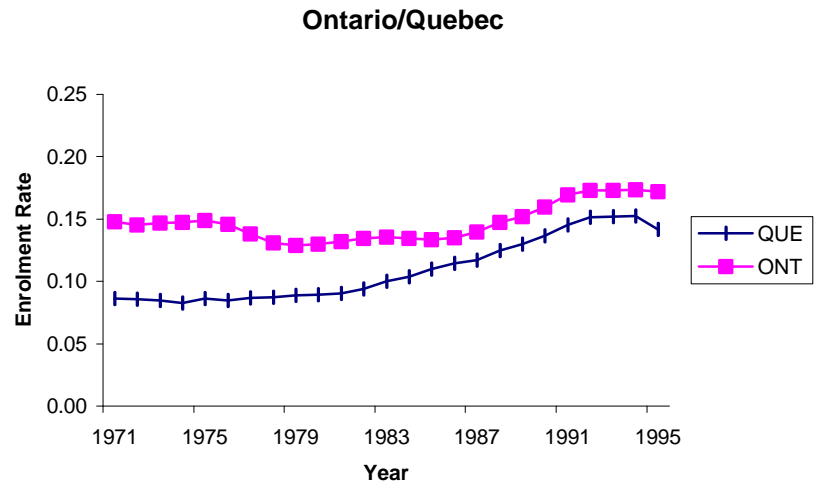
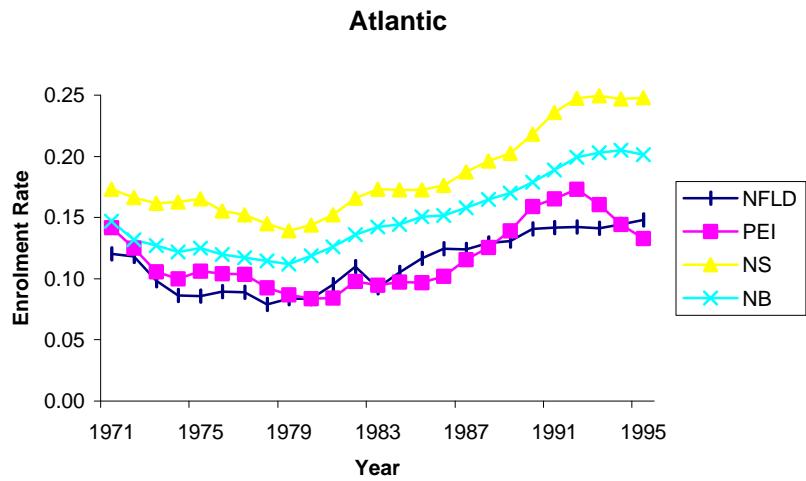


Figure 6 - Male Provincial Undergraduate Enrolment Rates