Is There Under- or Over-Investment in Education?*

W. Craig Riddell
Department of Economics
University of British Columbia
and
Canadian Institute for Advanced Research

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Abstract

Canada invests heavily in education. Expenditure per student on elementary and secondary schooling is near the top of the OECD and second highest (after the U.S.) among the G7 countries. Expenditure per student at the post-secondary level is also among the highest in the OECD and second highest among the G7, albeit substantially below the U.S. Expenditure on education as a percentage of GDP is the highest in the G7 countries, and among the highest in the OECD. However, despite this substantial expenditure many policy analysts argue that increased attention needs to be devoted to education in the current environment, suggesting that we need to either devote more resources to education or obtain improved outcomes from existing resources. Devotees of this 'under-investment view' point to the rising demand for education and skills due to such forces as the ICT revolution, globalization of production, and the knowledge-based economy.

At the same time, however, others are skeptical of this perspective, arguing that there is too much emphasis on the supply of skills and knowledge. These proponents of the 'over-investment view' suggest that many Canadians are over-qualified for their jobs and that their skills are under-utilized.

The purpose of this paper is to assess the empirical evidence relating to these competing perspectives and to discuss the implications for public policy.

Introduction

It is only 25 years ago that Richard Freeman published his famous book *The Over-Educated American,* and only 15 years since a paper was published in the *Canadian Journal of Economics* titled "The Over-Educated Canadian?" (Dooley, 1986). These and related studies documented the substantial decline in the economic returns to a college degree in the U.S. and university degree in Canada that took place during the 1970s. This decline raised questions about the private and social benefits to the existing investments in post-secondary education in the two countries.

Times have changed. Now most policy analysts in governments, the private sector, and international agencies call for increased attention to human capital and skill formation, suggesting that society may be under-investing in education and training or perhaps not investing in the right way.

Nonetheless, there are dissenting views. Some are skeptical of this perspective, arguing that there is too much emphasis on the supply of skills and knowledge. Proponents of the 'over-investment view' argue that there is substantial under-employment of well-educated workers, that many Canadians are over-qualified for their jobs, and that their skills are under-utilized.[1] According to this view, there is sufficient supply of highly skilled workers; if labour market problems exist they arise because of insufficient demand or inappropriate utilization of the skills of Canadian workers.

The purpose of this paper is to assess the empirical evidence relating to these competing perspectives about the current state of education, training and skills in the Canadian labour market. The paper is organized as follows. As background the first section discusses the reasons behind the increased emphasis on human capital formation in both economic and social policy. Several of these factors – not only those related to economic policy, but also related to social policy – are relevant to the over-investment versus under-investment debate. Additional background information is provided in section two which summarizes data on the extent of Canadian investment in education and some of the consequences of that investment.

[1] See Livingstone (1999) and Lowe (2001) for leading statements of this view.

Section three addresses some key conceptual issues. These provide guidance on the kind of evidence that may enable us to determine whether society is investing too little or too much in education. The remainder of the paper examines empirical evidence on the returns to education and the implications of this evidence for the under-investment hypothesis. The final section summarizes the main conclusions and discusses their implications for public policy.

Reasons for increased emphasis on human capital

Education, training and skill formation have become prominent public policy issues in Canada and in many other countries. Several factors account for the increased attention being paid to the knowledge, skills and competencies of the population and workforce. Technological change -- especially advances in information and computer technologies -- and the globalization of production have resulted in growing demand for highly skilled workers and changes in the nature of skills needed in the workplace. These same forces also appear to have contributed to widening inequality between more- and less-skilled workers in employment, wages and other labour market outcomes. In addition, there is growing concern about future skills shortages, in part due to the fact that the leading cohorts of the well educated 'baby boom' generation are now approaching retirement age and are being replaced by the entry into the labour force of much smaller (though even better-educated) cohorts. Finally, within the economics profession there has been a resurgence of interest in the determinants of long-term growth, and 'new growth theory' emphasizes the importance of human capital in the creation of new knowledge and in the growth of living standards over time.

These factors explain the increased emphasis on skills and knowledge in economic policy. However, as economic activity becomes more knowledge-based and less dependent on natural resources and physical capital, human capital is also increasingly being viewed as a central component of social policy. Many of our current social programs were shaped during the expansion of the welfare state that took place during the early post-war period. As substantial changes to the economic and social environment have occurred, a major reassessment of these programs has been underway. Governments have begun to move away

from 'passive' income maintenance programs toward 'active' labour market and social policies that facilitate adjustment to change, assist the jobless to find work, and encourage labour force participation. Associated with this shift has been greater emphasis on individual responsibility and on providing those in need of assistance with the opportunity to improve their economic situation -- providing a 'hand up' rather than a 'handout'. Investing in the human capital of those with limited marketable skills is a key component of such an approach. As stated by the federal Finance Minister Paul Martin, "Providing security and opportunity for Canadians in the future means investing in their skills, in their knowledge and capacity to learn....good skills are an essential part of the social safety net of the future."[2]

The increased emphasis being placed on human capital as a component of social policy also reflects the view that education and training may ameliorate pressures for widening inequality in economic and social outcomes. According to this perspective, policies that promote additional investment in education should increase the supply of more skilled workers -- thus reducing upward pressure on their wages -- and reduce the supply of the less skilled -- thus reducing downward pressure on their earnings and employment opportunities. In periods in which the demand for more educated workers is growing rapidly, making higher education more accessible may prevent increases in income inequality that would otherwise occur.

Education is also often regarded as a mechanism for promoting equality of opportunity and social mobility. Productivity and economic growth are enhanced if the talents of the population are more fully utilized. The efficient allocation of talent requires that those with high ability should be able to pursue productive and rewarding careers whatever their family background. Thus promoting equality of opportunity should be a major objective of economic policy, especially in an environment in which success is increasingly dependent on human resources and knowledge. From the perspective of social policy, equality of opportunity may contribute to social cohesion and a belief in common interests among citizens.

In summary, a variety of developments have resulted in human capital policy becoming high on the public policy agenda. Two of these factors are particularly important for this paper.

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[2] Hon Paul Martin, "Presentation to the House of Commons Standing Committee on Finance, November 2, 1999. Http://www.fin.gc.ca/update99/speeche.html.

The first is that the tendency toward widening inequality between more-educated and less-educated workers. If this rising inequality is due to the rising demand for skilled workers, it supports the under-investment view because it suggests that the growth in demand for skilled workers may be outstripping the growth in supply. Similarly, rising inequality that is due to falling demand for unskilled workers also supports the under-investment hypothesis because it indicates that growth in demand for the unskilled is falling short of growth in their supply so that measures that reduce the supply of the less-educated could offset the downward pressure on the earnings of the less skilled. The second is the role education may play in enhancing equality of opportunity. If some individuals with high potential returns from education also face significant financial or other barriers to acquiring education, this may result in under-investment in education among these individuals and a socially inefficient allocation of talent.

Expenditure on education

Relative to other developed countries, Canada invests a substantial amount on education. Most of this expenditure is publicly financed. Table 1 shows a number of measures of educational expenditure in Canada and other G-7 countries, as well as the OECD country average. The top panel reports educational expenditure per student in PPP-adjusted U.S. dollars, an input-based indicator of the quality of education. At both the elementary and secondary and post-secondary levels, Canadian expenditure per student is second highest (after the U.S.) among the G-7 countries and substantially above the OECD average. The gaps between the U.S. and Canada and other OECD countries are especially large at the post-secondary level. Although not shown in the table, Canadian per student expenditure also ranks among the highest in the OECD at both the elementary/secondary and post-secondary levels (OECD, 2001).

The bottom panel reports expenditure on education as a percentage of GDP. This measure reflects both expenditure per student and the number of students. It indicates the fraction of total output devoted to the consumption of and investment in education. Even among the G-7 countries, large differences are evident in the relative share of national resources devoted to formal education. These differences are much more substantial at the post-

secondary than at the elementary and secondary levels. Canada's educational expenditure of 7.0% of GDP in 1995 is highest in the G-7 countries and (although not shown) among the highest in the OECD.[3] In Canada and the U.S., the share of GDP devoted to formal post-secondary education is more than double that of all other G-7 countries, and substantially higher than the OECD country average.

Canada's relatively high percentage of GDP spent on education reflects both the substantial per-student expenditures on education at all levels, as illustrated in Table 1(a), and Canadian's comparatively high participation rates in education, especially at the post-secondary level, which are described in more detail below.

Educational Attainment

Several measures of the educational attainment of the adult population in Canada and other G-7 countries are reported in Table 2. The top panel shows the highest level of educational attainment for the population 25-64 years of age. Also shown is the unweighted OECD country average. The bottom panel reports average years of schooling.

By these measures, Canadian educational attainment is high by international standards, reflecting the substantial expenditure on formal education. Eighty percent of Canada's adult population has completed upper secondary (referred to as 'high school' in North America) or post-secondary education, much higher than the OECD average of 64%. Canada's proportion is similar to that of Germany, Japan and the U.K., but substantially below the U.S. where 87% of the adult population have at least a high school diploma.[4] Average completed years of schooling are also among the highest in the OECD, albeit somewhat below Germany and the U.S.[5]

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[3] The Scandinavian countries and Canada are typically ranked at the top of the OECD in terms of the percentage of GDP devoted to education (OECD, *Education at a Glance*, various issues).

[4] The comparison of Canada and the U.S. with several European countries is quite sensitive to the definition of 'upper secondary education'. For example, France and the U.K. have both short duration and long duration upper secondary schooling, whereas these are rare in North America. If the short upper secondary programs are excluded, the U.K.'s proportion with upper secondary or higher drops from 82 to 62 percent and the French figure falls from 62 to 34 percent. See OECD (2001).

[5] The measurement of years of completed schooling is problematic in countries like Germany where there are extensive apprenticeship programs that combine work and school.

Canada stands out in terms of the fraction of the adult population with completed post-secondary education. Canada's proportion (52%) is not only more than double the OECD average of 25%, but is also the highest in the OECD countries and substantially higher than the U.S., the country ranked second (where 35% have completed post-secondary education). Canada's extremely high ranking on this dimension arises principally because of the very substantial fraction of the population with non-university post-secondary education -- at 33%, triple the OECD average and more than double any other G-7 country. At the university level, Canada is above the OECD average (19% versus the OECD average of 14%) and similar to Japan and the U.K., but substantially below the U.S. where 27% have graduated from university.

Canada's ranking at the top of the OECD in terms of the fraction of the population with completed post-secondary education has lead several analysts to comment that Canada's population is among the most highly educated in the world -- even surpassing the U.S., the country traditionally regarded as having the most highly educated population. However, it is important to keep in mind that Canadian educational attainment ranks below the U.S. in two key dimensions: the fraction of the population with completed secondary education and the proportion with a university degree. Thus at the two extremes of the educational attainment distribution -- roughly the bottom 20 percent and top 20 percent -- Canada ranks significantly below the U.S. It is in the middle of the distribution where Canadian educational attainment dominates according to these standard measures. In both countries, approximately 60 percent of the adult population have completed high school or a non-university post-secondary program. However, the composition of this middle group differs substantially between the two countries: in Canada more than half (33 percent out of 61 percent) have completed non-university post-secondary education, whereas less than one-sixth (8 percent out of 65 percent) of Americans are in this category.

Assessing the over-investment versus under-investment debate

The focus of this paper is on education as an investment. As is the case for other forms of human capital accumulation, individuals incur time and financial costs in the present in the

expectation of benefits in the future. These "returns" from the investment may take the form of higher earnings, more varied and fulfilling careers, and a greater range of opportunities.

The focus on the investment aspects of education is a narrow but nonetheless important one. Schooling may have numerous consequences for individuals and society. For many people, there is some consumption value from the educational process. Human beings are curious creatures and enjoy learning and acquiring new knowledge. Even focusing on the investment aspects, education may enable people to more fully enjoy life, appreciate literature and culture, and be more informed and socially-involved citizens. Although these and other potential consequences of schooling are important and should not be ignored, the consequences of education for employability and earnings are of substantial importance for both economic and social policy.

In choosing among alternative possible investments, an important consideration is the rate of return that may be expected on each investment.[6] Just as is the case for individuals and firms, societies that wish to make the best use of their resources should choose the investment projects with the highest expected returns. These may take the form of investments in physical capital (such as infrastructure) of human capital (such as education, training, health, and early childhood development). Evidence of over-investment in education would thus exist if the rate of return to investments in schooling is lower than the rate of return on competing expenditures in physical or human capital.

It is also important to distinguish between the average return and the marginal return. The average return compares the earnings (or other outcome of interest) of a highly educated group to the earnings of a group with less education. For example, a commonly employed measure of the return to obtaining a university degree is the percentage difference between the average earnings of university graduates and the average earnings of those whose highest educational attainment is a high school diploma. This average return reflects the difference in the human capital or educational attainment of the two groups plus any differences in unobservable

[6] When, as will generally be the case, the rate of return on each investment is uncertain, individuals will take into account both the expected return and the degree of risk associated with each investment.

factors that influence earnings -- such as motivation or ability. The important issue of how to take account of these unobserved factors is discussed later in the paper.

The marginal return refers to the gain in earnings if an individual (or group of individuals) acquires additional schooling. For example, if an individual who would otherwise have a high school diploma completes a university degree, the earnings gain from doing so is the marginal return on the post-secondary education investment. In principle, the marginal return may be less than, equal to, or greater than the average return. The case in which the marginal return is less than the average return -- i.e. a situation in which there are 'diminishing returns' to education -- is generally viewed as being most likely to prevail. This situation may arise if the most able or most highly motivated individuals in the population are already pursuing higher education, so that any additional individuals that choose to do so will have lower ability of motivation. If their subsequent labour market success depends on both educational attainment and ability or motivation, the marginal return will be below the average return. In addition, diminishing returns may arise because the extra supply of more highly educated workers drives down the wages of those with a university degree. This source of diminishing returns can prevail even if there is no difference in ability or motivation between the average university graduate and the marginal university graduate.

The distinction between the average and marginal returns is important because educational policy interventions operate at the margin. For example, more generous student loans or the introduction of a scholarship program for post-secondary education may result in some individuals who would otherwise not pursue higher education deciding to obtain a post-secondary degree. In assessing whether the policy intervention is justified compared to other expenditures that could be made, the appropriate rate of return is the marginal return because it reflects the impact of the policy intervention on educational attainment. The average return reflects the decisions of individuals who would have pursued higher education even in the absence of the policy intervention.

The situation in which the marginal return exceeds the average return -- i.e. in which there are 'increasing returns' to education -- may arise if individuals for whom additional

education would have a high payoff do not acquire additional education because of limited financial resources or inability to borrow to finance additional schooling.

Evidence on returns to education

As many studies have documented, schooling is one of the best predictors of 'who gets ahead'. Better-educated workers earn higher wages, have greater earnings growth over their lifetimes, experience less unemployment, and work longer. Higher education is also associated with longer life expectancy, better health and reduced participation in crime (Haveman and Wolfe, 1984).

Figure 1 illustrates the relationship between education and earnings for full-year, full-time Canadian workers using data from the 1996 Census. The Census has the advantage of providing not only large sample size but also providing information on years of completed schooling as well as degrees, diplomas and certificates received. Most Canadian data sources do not provide information on years of completed schooling, but rather report highest level of educational attainment.

This figure plots mean log earnings and years of completed schooling for males and females aged 40-55.[7] Because the logarithm of earnings is plotted on the y-axis, the slope of the relationship shows the percentage increase in earnings for an unit increase in years of schooling. The fitted lines are those for a regression of log earnings on a constant and years of schooling using all of the individual observations in the sample. Thus points for which there are very few underlying observations (such as 22 and 23 years of schooling) receive much less weight than points for which there are many observations (such as 12 years of schooling).

Several features of this plot are noteworthy. First, the returns to years of schooling are positive for both men and women up to 19 years of completed schooling and are significantly higher for women than for men. Second, the relationship between mean log earnings and years of schooling is approximately linear up to 19 years of education. Each additional year of schooling is associated with an increase in weekly earnings of females of approximately 9% and

of males of approximately 6%. Ferrer and Riddell (2001) use the same data used to generate Figure 1 to estimate the relationship between log earnings and years of schooling, after controlling for other influences on earnings, and obtain estimates of the slope of the relationship of approximately 6% and9% for men and women respectively. These OLS estimates of the return to schooling correspond approximately to estimates of the real rate of return on the investment.[8]

The Ferrer and Riddell (2001) and other Canadian studies obtain OLS estimates of the 'return to schooling' that are similar to those obtained in many studies carried out in the U.S. and other countries: approximately 8-10 percent rate of return when the analysis is based on annual earnings and 6-9 percent when the analysis is based on weekly earnings.[9] Such estimates compare favourably with rates of return on physical capital investments.

Many social scientists have, however, been reluctant to interpret the positive correlation between education and earnings as evidence that education exerts a causal effect on earnings. According to human capital theory, schooling raises earnings because it enhances workers' skills, thus making employees more productive and more valuable to employers. However, according to the alternative signaling/screening theory, the positive relationship between earnings and schooling may arise because both education and earnings are correlated with unobserved factors such as ability, perseverance and ambition (hereafter generally simply referred to as 'ability'). If there are systematic differences between the less- and well-educated that affect both schooling decisions and labour market success, then the correlation between education and earnings may reflect these other factors as well. In that case, standard OLS estimates of the return to schooling are likely to be biased upwards because they do not take into account unobserved 'ability'.

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[7] I focus on this age group in order to abstract form the role of experience (the age-earnings profiles of different education groups are approximately parallel after age 40). however, the relationship for all age groups is very similar.

[8] Mincer (1974) showed that the estimated coefficient of the 'years of schooling' variable in a log earnings equation equals the rate of return on education if the cost of an additional year of schooling equals the opportunity cost of foregone earnings. Because foregone earnings constitute the main cost of additional years of education, the estimated coefficient on the 'years of schooling' variable is frequently referred to as the estimated 'return to education'.

This 'omitted ability bias' issue is of fundamental importance not only for the question of how we should interpret the positive relationship between earnings and schooling, but also for the emphasis that should be placed on education in economic and social policy. To the extent that estimates of the return to schooling are biased upwards because of unobserved factors, the economic case for investing in education is weakened. Those with higher average ability, perseverance or ambition would be more productive and more successful financially even in the absence of additional schooling. The economic case for investing in education must be made on the basis of the true causal effect of schooling on productivity and earnings.[10]

Perhaps less well understood is the point that the social policy case for investing in education is also weakened if the signaling/screening perspective is a more accurate description of reality than the human capital perspective. The reason is that estimated average rates of return to education may substantially over-estimate the economic benefits that a less-educated person would receive if he/she acquired additional schooling. The estimated average rates of return in the population reflect both the causal effect of schooling on productivity and earnings and the average return to the unobserved ability of the well-educated. However, if those with low levels of education are also, on average, those with low ability or ambition, they can only expect to receive from any additional schooling the return associated with the causal effect of schooling on earnings. That is, average rates of return in the population reflect the causal effect of schooling on earnings and the return to unobserved factors. The marginal return -- the impact of additional schooling for someone with low levels of education -- may be substantially below the average return. In these circumstances, education may not be very effective in improving the employment or earnings prospects of relatively disadvantaged groups. Similarly, investing in additional education may not be an effective way of offsetting pressures for widening income inequality.

Unbiased estimates of the causal effect of education on earnings are thus very important for current debates about economic and social policy. How can such estimates be obtained? The most reliable method would be to conduct an experiment. Individuals randomly assigned to

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[9] Estimates of the impact of schooling on annual earnings exceed those of the impact on weekly or hourly earnings because those with more education also work more weeks per year.

[10] The economic case for investing in education should also incorporate any social returns to education that may not be captured by the individual receiving the education.

the treatment group would receive a larger 'dose' of education than those assigned to the control group. By following the two groups through time we could observe their subsequent earnings and obtain an unbiased estimate of the impact of schooling on labour market success. Random assignment would ensure that, on average, treatment and control groups will be equally represented by 'high ability' and 'low ability' individuals.

In the absence of such experimental evidence, economists have tried to find 'natural experiments' which isolate the influence of education from the possible effects of unobserved ability. A large number of such studies have now been carried out, using data on identical twins or on sources of variation in education such as those implied by compulsory schooling laws or proximity to a college or university. Card (1999, 2000) provides a thorough discussion of the issues in this literature as well as a review of empirical findings. Table 3 reports the key findings of several of these studies. A consistent result is that conventional OLS estimates of the return to schooling tend, if anything, to *under-estimate* rather than over-estimate the causal impact of education on earnings.

Why do OLS estimates generally understate the true return to schooling, when the presence of 'omitted ability bias' should cause the OLS estimate to be upward biased? The reason appears to be that there are two additional sources of bias that operate in the opposite direction. First is the presence of measurement error in educational attainment (especially years of completed schooling). Measurement error in an explanatory variable causes the estimated coefficient to be biased toward zero. Second is what is sometimes referred to as 'discount rate bias'. The returns to schooling are not the same for all individuals in the population; rather there is a distribution of such returns. Consider the case of individuals with high potential returns to education who do not pursue higher education -- perhaps because of low family income, limited ability to borrow to finance human capital formation, or a family background in which the importance of education is not emphasized. For these 'high potential return' individuals, a policy intervention that results in increased educational attainment would have a substantial payoff. Indeed, the marginal return to the investment may exceed the average return in the population. In these circumstances, the average return from existing investments in education may understate the payoff to incremental investments.

Two recent Canadian studies -- whose findings are summarized in Table 3 -- have pursued this 'natural experiment' approach. Lemieux and Card (2001) study the impact of the Veterans Rehabilitation Act -- the Canadian 'G.I. Bill'. In order to ease the return of World War Two veterans into the labour market, the federal government provided strong financial incentives for veterans to attend university or other sorts of educational programs. Because many more young men from Ontario than Quebec had served as soldiers, those from Ontario were significantly more likely to be eligible for these benefits. Lemieux and Card estimate that the VRA increased the education of the veteran cohort of Ontario men by 0.2 to 0.4 years. Further, they estimate the rate of return to schooling to be 14 to 16 percent, substantially higher than the OLS estimate with their data of 7 percent.

Sweetman (1999) investigates the impact on education and earnings of the education policy change in Newfoundland that raised the number of years of schooling required for high school graduation from 11 to 12. He estimates that this intervention increased educational attainment of affected Newfoundland cohorts by 0.8 to 0.9 years. Estimated rates of return to the additional schooling are substantial: 17.0% for females (versus an OLS estimate of 14.6%) and 11.8% for males (compared to an OLS estimate of 10.8%).

As with this growing body of research, these Canadian studies conclude that conventional OLS estimates of the return to schooling are likely, if anything, to be biased downwards, as opposed to being inflated by unobserved ability.

Two principal conclusions follow from this body of research. First, rates of return to investments in education are high -- and probably higher than has generally been believed on the basis of previous studies of the impact of education on earnings. Second, the payoff to marginal investments in duration may exceed the average return in the population. There is no evidence that investments in higher education are experiencing diminishing returns because they require society to 'reach lower into the ability barrel'. Policy interventions that result in additional schooling being acquired by individuals from disadvantaged backgrounds or those who face other barriers to acquiring human capital appear likely to yield a substantial return in the form of enhanced employability and earnings, in addition to contributing to equity objectives.

During the 1980s and 1990s, the educational attainment of young Canadians increased dramatically (Card and Lemieux, 2000; Riddell and Sweetman (2000)). Particularly large increases were observed in university attendance. Despite this substantial increase in the supply of more educated workers, the rate of return to university education did not decline (Murphy, Riddell and Romer, 1998; Riddell and Sweetman, 2000). In contrast to the U.S., the earnings differential between high school and university graduates did not increase in Canada. This suggests that the growth in supply of more educated workers in Canada was sufficient to meet the growth in demand, so that there was neither upward or downward pressure on the high school - university earnings differential. Murphy, Riddell and Romer (1998) analyse the experience of Canada and the U.S. and conclude that observed outcomes are consistent with a steady (and common) rate of increase in demand for more skilled workers in both countries. Because the supply of university-educated workers grew much more rapidly in Canada, the earnings differential between the more-educated and less-educated did not widen, as occurred in the U.S. This time series evidence thus supports the view that there has not been over-investment in education in Canada. Rather, there has been an increase in investment in education that has been sufficient to meet the growing demand for more highly skilled workers.

Conclusions

This paper has assessed evidence relating to the debate as to whether there is over-investment or under-investment in education in Canada. Several conclusions follow from the analysis:

- Canada invests heavily in education. Relative to other G-7 or OECD countries, Canada ranks near the top in terms of expenditure per student or the fraction of GDP devoted to elementary, secondary and post-secondary education. This substantial investment raises the question of whether additional investments are warranted.
- One consequence of this substantial expenditure is a population that is well educated by international standards. Canada compares favourably with other G-7 and OECD countries in terms of most measures of educational attainment. Compared to the U.S. Canada has lower educational attainment at both the bottom (less than completed high school) and top

(university degree) of the education distribution. Where Canada stands out is in the middle of the distribution -- those who have completed high school or a non-university secondary program. The proportion of Canada's population with a non-university post-secondary education is much higher than that of any other OECD country. However, standard measures may overstate Canadian educational attainment in this dimension to some extent because not all those with a college diploma or trade certificate have completed high school and because of the unique features of Quebec's CEGEP system.

- Plots of the relationship between education and earnings, and OLS estimates of this relationship that control for other observable determinants of earnings, indicate that the rate of return to education is high in Canada -- in the order of 6% for men and 9% for women when based on weekly earnings, and higher when based on annual earnings. There is no evidence of diminishing returns, at least up to 19 years of completed schooling.
- Important recent advances have taken place in our understanding of the relationship between education and labour market success. Conventional estimates of the return to schooling appear, if anything, to be biased downward -- so the causal effect of education on earnings appears to be higher than previously believed. Further, the marginal return to incremental investments in education may exceed the average return from previous investments. There is no evidence that investments in schooling are running into diminishing returns. These results suggest that investments in human capital remain an important potential source of economic growth and equality of opportunity.
- Despite the dramatic growth in educational attainment of Canadians during the 1980s and 1990s, the rate of return to higher education has not fallen. This suggests that educational attainment has been increasing at a rate sufficient to meet the increased demand for more highly skilled workers.
- None of the evidence supports the view that there is currently over-investment in education in Canada. Despite the high level of educational attainment of Canadians and the recent substantial increases in educational attainment, the rate of return to education remains high.

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Table 1

Educational Expenditures in G-7 Countries, 1995

(a) Expenditure per student from public and private sources, by level of education, in thousands of U.S. dollars converted using PPP exchange rates[1]

	Canada	France	Germany	Italy	Japan	U.K.	U.S.	OECD average[2]
Elementary & secondary	5,401	5,041	4,690	5,099	4,282	3,810	6,281	4,162
Post-secondary	11,471	6,569	8,897	5,013	8,768	7,225	16,262	8,134
All levels of education[3]	6,396	5,001	6,057	5,157	4,991	4,222	7,905	4,717

(b) Educational expenditure from public and private sources for educational institutions as a percentage of GDP, by level of education, Canada and G-7 countries, 1995

	Canada	France	Germany	Italy	Japan	U.K.	U.S.	OECD average[2]
Elementary & secondary	4.3	4.4	3.8	3.2	3.1	-	3.9	3.7
Post-secondary	2.5	1.1	1.1	0.8	1.0	1.0	2.4	1.3
All levels of education[3]	7.0	6.3	5.8	4.7	4.7	-	6.7	5.6

Notes: 1. Purchasing power parity (PPP) exchange rates are calculated to equalize the purchasing power of different currencies.
2. Unweighted country average.
3. Includes pre-primary (pre-elementary) and undistributed expenditures.

Source: Council of Ministers of Education, Canada and Statistics Canada (2000).

Table 2
Educational Attainment in Canada and G-7 Countries

(a) Proportion of the population aged 25-64 years by highest level of educational attainment, 1999

	Canada	France	Germany	Italy	Japan	U.K.	U.S.	OECD average
Less than upper secondary	20	38	19	57	19	18	13	36
Upper secondary graduate	28	41	53	30	49	57	51	40
Non-university post-secondary	33	10	15	4	13	8	8	11
University graduate	19	11	13	9	18	17	27	14

Source: OECD (2001).

(b) Average completed years of schooling of the population aged 25-64 years, 1995

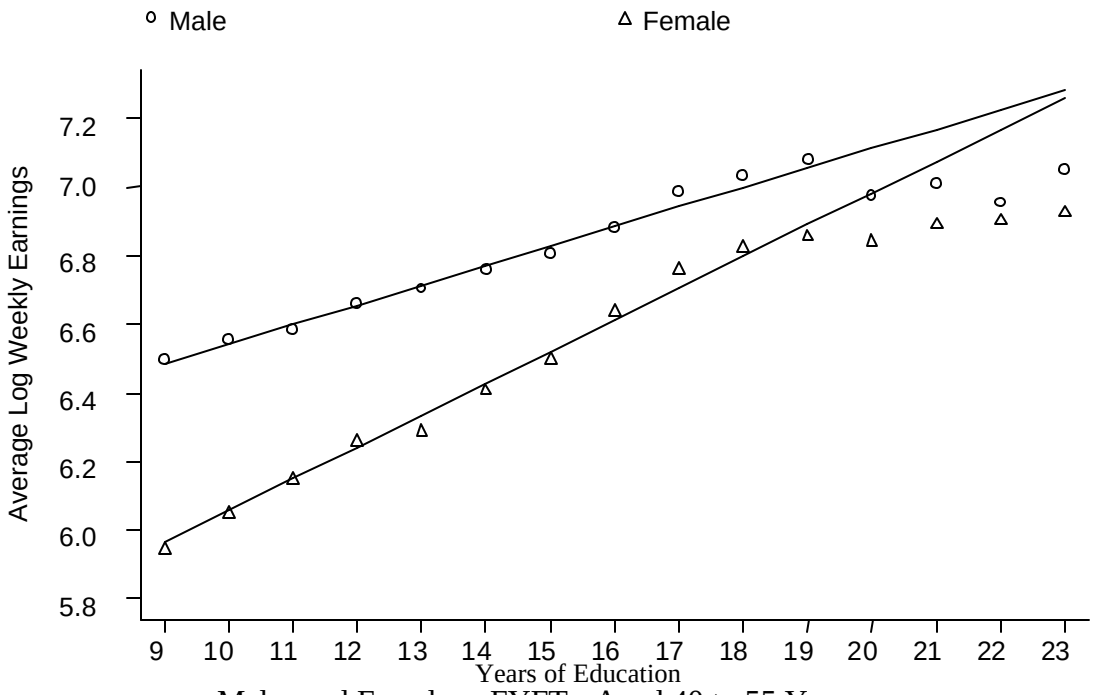
Canada	France	Germany	Italy	Japan	U.K.	U.S.	OECD average
13.2	11.2	13.4	10.0	-	12.1	13.5	11.9

Source: OECD (1998).

Table 3
OLS and IV Estimates of the Return to Education

Study	Country, instruments	Returns to schooling	
		OLS	IV
Angrist & Kreuger (1991)	U.S. compulsory schooling laws	0.070 0.063 0.052	0.101 0.060 0.078
Staiger & Stock (1997)	U.S. compulsory schooling laws	0.063 0.052	0.098 0.088
Harmon & Walker (1995)	UK compulsory schooling laws	0.061	0.153
Kane & Rouse (1993)	U.S. tuition, distance to college	0.080 0.063	0.091 0.094
Card (1995)	U.S. distance to nearest college	0.073	0.132 0.097
Conneely & Uusitalo (1997)	Finland, living in university town	0.085 0.083	0.110 0.098
Lemieux & Card (2001)	Canada, WWII Veterans Rehabilitation Act	0.070 0.062	0.164 0.076
Meghir & Palme (2000)	Sweden education reforms	0.028	0.036
Sweetman (1999)	Canada, Newfoundland education reform		
	females	0.146	0.170
	males	0. 108	0.221

Figure 1



Males and Females - FYFT - Aged 40 to 55 Years