

---

# Education and Skills: An Assessment of Recent Canadian Experience

W. Craig Riddell<sup>1</sup>

## Introduction

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.

---

<sup>1</sup>I thank Patrick Grady, Andrew Sharpe and Thomas Lemieux for comments on an earlier draft of this paper.

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.”<sup>1</sup>

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.

---

<sup>1</sup>Hon. Paul Martin, “Presentation to the House of Commons Standing Committee on Finance”, November 2, 1999 <<http://www.fin.gc.ca/update99/speeches/chr19990111.htm>> Riddell

The importance of this emergence of a common emphasis on human capital formation in both economic and social policy has been noted by several observers. For example, Courchene (2001, p. 285) states that we are presented “with a historically unprecedented window of opportunity ... [in which] ... a societal commitment to a human capital future is emerging as the principal avenue by which to promote both economic competitiveness and social cohesion”.

The Economic Council of Canada, which David Slater chaired from 1980 to 1985, provided a natural vehicle for periodic study of Canada’s education and training systems. Indeed, not only were education and training prominent in numerous Council reports, but the last major study published by the Council was *Education and Training in Canada* (Canada Communication Group, 1992). The purpose of this paper is to survey the current state of knowledge in this area, with particular emphasis on advances and developments during the past decade. In order to keep the paper manageable, my focus will be principally on education and skill formation.

The paper is organized as follows. The first section compares Canadian educational expenditures and educational outcomes with those of other countries. Several educational outcomes are discussed: educational attainment, student achievement, and the literacy and numeracy skills of the adult population. This comparative examination of educational “inputs” and “outcomes” provides a basis for assessing whether Canada obtains good value from its public and private investments in education. The paper then turns to the incidence of educational attainment across the population. What groups or types of individuals are most likely to be well educated, and how has this changed over time? What is the relationship between educational attainment and family background, and has this relationship changed in recent years?

The third section examines evidence on the economic returns to education. The question of how best to interpret the strong positive correlation between education and economic success has long been a subject of debate and controversy. Substantial recent progress has been made on this issue. This literature is briefly reviewed here, and the findings of Canadian studies are discussed. The final section summarizes the main conclusions and discusses their implications for public policy.

## Education Expenditures and Outcomes

Education systems vary substantially from country to country. For example, there are important differences across countries in the provision of publicly-funded early childhood and pre-elementary schooling, in the extent to which students are streamed into “academic” and “vocational” programs, in the ways in which school and work experience can be combined, and in the extent to which the system provides a “second chance” for those who drop out at some stage. These and other differences make international comparisons of educational inputs and outcomes difficult. Although considerable progress has been made in improving the comparability of educational data across Organisation for Economic Co-operation and Development (OECD) countries, these institutional differences among education systems should be kept in mind when interpreting comparative statistics.<sup>2</sup>

### *Investment in 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 G7 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 United States) among the G7 countries and

---

<sup>2</sup>The series of OECD publications *Education at a Glance: OECD Indicators* make a valuable contribution to international comparisons of educational expenditures and outcomes in OECD countries.

**Table 1: Educational Expenditures in G7 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<sup>1</sup>

	<i>Canada</i>	<i>France</i>	<i>Germany</i>	<i>Italy</i>	<i>Japan</i>	<i>UK</i>	<i>U.S.</i>	<i>OECD average</i> <sup>2</sup>
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 <sup>3</sup>	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 G7 countries, 1995

	<i>Canada</i>	<i>France</i>	<i>Germany</i>	<i>Italy</i>	<i>Japan</i>	<i>UK</i>	<i>U.S.</i>	<i>OECD average</i> <sup>2</sup>
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 <sup>3</sup>	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).

substantially above the OECD average. The gaps between the United States 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 gross domestic product (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

G7 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 per cent of GDP in 1995 is highest in the G7 countries and (although not shown) among the highest in the OECD.<sup>3</sup> In Canada and the United States, the share of GDP devoted to formal post-secondary education is more than double that of all other G7 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.

Canada invests heavily in educating its population. What are the consequences of these substantial expenditures on formal education? The next three sub-sections summarize the available evidence on this question using several measures of educational outcomes. First to be examined is educational attainment, the dimension we know the most about. The discussion then turns to student achievement and the literacy skills of the adult population — two measures of the skills and knowledge imparted by education as well as other activities.

### *Educational Attainment*

Several measures of the educational attainment of the adult population in Canada and other G7 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 per cent 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 per cent. Canada's proportion is similar to that of Germany, Japan and the United Kingdom, but

---

<sup>3</sup>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).  
*W. Craig Riddell*

**Table 2: Educational Attainment in Canada and G7 Countries**

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

	<i>Canada</i>	<i>France</i>	<i>Germany</i>	<i>Italy</i>	<i>Japan</i>	<i>UK</i>	<i>U.S.</i>	<i>OECD average</i>
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

	<i>Canada</i>	<i>France</i>	<i>Germany</i>	<i>Italy</i>	<i>Japan</i>	<i>UK</i>	<i>U.S.</i>	<i>OECD average</i>
	13.2	11.2	13.4	10.0	-	12.1	13.5	11.9

Source: OECD (1998).

(c) Ratio of Upper Secondary Graduates to Population at a Typical Age of Graduation, 1996

	<i>Canada</i>	<i>France</i>	<i>Germany</i>	<i>Italy</i>	<i>Japan</i>	<i>UK</i>	<i>U.S.</i>
Both sexes	75	85	86	79	99	-	72
Males	70	85	86	76	96	-	69
Females	81	86	86	82	102	-	76

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

substantially below the United States where 87 per cent of the adult population have at least a high school diploma.<sup>4</sup> Average completed years of schooling are also among the highest in the OECD, albeit somewhat below Germany and the United States.<sup>5</sup>

Canada stands out in terms of the fraction of the adult population with completed post-secondary education. Canada's proportion (52 per cent) is not only more than double the OECD average of 25 per cent, but is also the highest in the OECD countries and substantially higher than the United States, the country ranked second (where 35 per cent 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 per cent, triple the OECD average and more than double any other G7 country. At the university level, Canada is above the OECD average (19 per cent versus the OECD average of 14 per cent) and similar to Japan and the United Kingdom, but substantially below the United States where 27 per cent 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 United States, 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 United States 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 per cent and top 20 per cent — Canada ranks significantly below the United States. It is in the middle of the distribution where Canadian educational attainment dominates according to these standard measures. In both countries, approximately 60 per cent of the adult population have completed high school or a non-university post-secondary program. However, the composition of this middle group differs substantially

---

<sup>4</sup>The comparison of Canada and the United States with several European countries is quite sensitive to the definition of "upper secondary education". For example, France and the United Kingdom 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 UK's proportion with upper secondary or higher drops from 82 to 62 per cent and the French figure falls from 62 to 34 per cent. See OECD (2001).

<sup>5</sup>The measurement of years of completed schooling is problematic in countries like Germany where there are extensive apprenticeship programs that combine



between the two countries: in Canada more than half (33 per cent out of 61 per cent) have completed non-university post-secondary education, whereas less than one-sixth (8 per cent out of 65 per cent) of Americans are in this category.

Because of its evident importance in Canada, a closer look at the non-university post-secondary category is warranted. There are two main types of individuals in this group: those with a community college or College d'enseignement général et professionnel (CEGEP) diploma and those with a certificate from a trade school or apprenticeship program. Because high school completion is not necessarily a prerequisite to enter these programs, not all those classified as non-university post-secondary graduates are high school graduates. Furthermore, although many community college programs are two years in length, trade school and some community college programs may be of much shorter duration. For these reasons, one might conjecture that the human capital of some of those in the "non-university post-secondary" group may not be substantially higher than that of the average high school graduate.

The monthly Labour Force Survey, the source of the Canadian data in Table 2, classifies those who report that they completed a community college or CEGEP, apprenticeship or trade school program as having a non-university post-secondary certificate or diploma whether or not they have graduated from high school.<sup>6</sup> To obtain some insight into this potentially diverse non-university post-secondary category, Table 3 reports data from the 1996 Census. The advantage of the Census is that the questionnaire asks about all diplomas, certificates and degrees obtained as well as years of completed schooling. In order to obtain information on individuals' wages —

---

<sup>6</sup>This has been the structure of the educational attainment questions since a major revision to these questions in 1990. Prior to that time, high school completion was required in order to be classified in one of the post-secondary education categories, even in the case of respondents who had completed a trade certificate or community college program. 493

an additional measure of human capital — the data shown in Table 3 is for those employed in 1995 rather than the adult population.<sup>7</sup>

The data on educational attainment of employed Canadians provides a very similar picture to that of the adult population shown in Table 2. The non-university post-secondary category constitutes 34 per cent of all workers in 1996 versus 33 per cent of the adult population in 1999. This group is a slightly larger proportion of the female workforce (35 per cent) than the male workforce (33 per cent). On average, those with a non-university certificate or diploma have 1.3 additional years of schooling compared to high school graduates. This differential is also a bit larger for females (1.4 years) than males (1.1 years). However, within the non-university post-secondary category there is a substantial gap of 1.6 years of completed schooling between those with a high school diploma (14.4 years) and those without this credential (12.8 years). Indeed, high school graduates have very similar years of schooling to those with a college diploma or trade certificate who did not graduate from high school (12.8 versus 12.6 years). For males, the average high school graduate actually has slightly more years of schooling than his counterpart who completed a trade school or community college program without also completing high school.

This evidence based on years of schooling suggests that the human capital of college/trade school graduates who did not complete high school may be very similar to those whose highest educational attainment is a high school diploma, and substantially lower than those with both a high school degree and a community college diploma or trade school certificate. However, this conclusion does not continue to hold when we use wages rather than years of education as an indicator of human capital. Indeed, for both males and females the average wages of the “college/trade without high school” group are much closer to their college/trade school counterparts who also completed secondary school than they are to those whose highest educational attainment is a high school diploma. This suggests that it is not unreasonable to group together all those with a college diploma or trade certificate, whether or not they also are high school graduates, and despite the substantial differences in their years of schooling.

Relative to other countries, the extent of Canadian non-university post-secondary education may be somewhat overstated because of the Quebec CEGEP system. These institutions provide both “general” and “professional” programs. The former constitute a stage between high school and university, providing the equivalent of the final year of high school and the first year of university in most other Canadian provinces. The professional programs

---

<sup>7</sup>The Census, taken in June 1996, asks about income and weeks worked during the previous year. The wage measure used is the weekly wage for those employed in 1995.

provide the equivalent of the final year of secondary school and a two-year community college program in English Canada.

Graduates of the professional CEGEP programs are similar to graduates of professional/vocational community college programs in English Canada, and are appropriately classified as “non-university post-secondary”. Students who pursue the CEGEP general stream and who obtain a university degree will also be appropriately classified in the data as university graduates. However, those who pursue the general stream but who subsequently do not enter or complete university will be measured as “non-university post-secondary graduates” in Quebec but would appear as high school graduates (albeit with some, but incomplete post-secondary education) in English Canada. Some adjustment to the Canadian data to account for this difference may be appropriate.

In summary, according to commonly used measures, Canadian educational attainment is very high by international standards, a finding that is consistent with the country’s substantial investment in education. The distribution of the educational attainment of Canadians also has some unique features. At the bottom and top of the educational attainment distribution — specifically, those with less than completed high school and those with a university degree — Canadian educational attainment is similar to that of several other OECD countries and significantly lower than that of the United States. However, in the middle of the distribution — those who have completed secondary school but not university — the proportion of Canadians with a community college diploma or trade school certificate is unusually high and the proportion of high school graduates relatively low. However, this “non-university post-secondary” group is heterogeneous. Canada’s provincial education systems have “forgiving” features and provide various routes to a community college diploma or trade school certificate. More than one-quarter of the “non-university post-secondary” group have not graduated from secondary school, and their average years of completed schooling is not much different from those whose highest educational attainment is high school completion. This raises some questions about whether these individuals should be placed in a higher educational attainment category than secondary school graduates. However, these doubts are dispelled to a considerable extent by a comparison of the average earnings of this “college/trade without high school” group to high school graduates and the “college/trade with high school” group. In particular, this “market test” suggests that the human capital of the “college/trade without high school” is much closer to that of their “college/trade with high school” counterparts than to secondary school graduates. Accordingly, Canada’s high measured educational attainment in the middle of the distribution appears to be real, and

not simply due to inappropriate labelling of some of those in the non-university post-secondary category.<sup>8</sup>

Although the overall educational attainment of Canadians is impressive, high school completion has been a weak spot for many years. For example, based on administrative data on the number of graduates relative to the number of 18 year olds, the recent Canadian secondary school graduation rate is near the bottom of the G7 countries and only marginally above that of the United States, the bottom dweller on this dimension (see Table 2(c)). As of the mid-1990s, approximately 25 per cent of 18 years olds had not graduated from high school. This non-completion rate is much higher among males (30 per cent) than females (20 per cent). Some of these individuals graduate after the “normal age” of 18; according to LFS data the high school graduation rate is 81 per cent by age 19–20 and 87 per cent by age 25–29 (Council of Ministers of Education, Canada and Statistics Canada, 2000, p. 91). In addition, as discussed above, a significant number of high school dropouts obtain a college diploma or trade certificate. Nonetheless, Canada’s relatively high secondary school non-completion rate is a potential concern.

Measures of educational attainment such as years of completed schooling or highest credential received are frequently used to compare the amount of human capital of the population or workforce over time and across regions and countries. Nonetheless, these are indirect measures of human capital, reflecting principally the inputs of time and other resources into the production of skills, knowledge and competencies. We now turn to measures of the outcomes of human capital formation.

### *Student Achievement*

We know a good deal more about student achievement than we did even a decade ago when the Economic Council of Canada carried out its assessment of Canada’s education and training systems. Canada did not participate in the early rounds of international mathematics and science tests carried out in the 1960s and 1970s. However, some provinces took part in the Second International Mathematics and Science Studies carried out in the 1980s, and all Canadian jurisdictions participated in the third round — the Third International Mathematics and Science Study or TIMSS — carried out in the mid-1990s. In addition, there was Canadian involvement in some other

---

<sup>8</sup>For some additional Canadian evidence, see Ferrer and Riddell (2001). Nonetheless, further investigation of the comparability of these categories across countries appears warranted.

international studies of student achievement in the 1980s and 1990s, and the decade of the 1990s saw the introduction of the Canadian School Achievement Indicators Program which has now completed two rounds of testing.

Table 4 summarizes some of the key results from TIMSS, the most recent international tests of achievement in mathematics and science.<sup>9</sup> These data have the advantage of providing information on student performance on a common set of tests administered in numerous countries. For the present purposes, one disadvantage is that the set of countries is very diverse, and includes several countries that we do not normally compare ourselves to — both “high achievers” such as Korea, Singapore and Hong Kong and “low achievers” such as Iran, Kuwait and Portugal. The set of countries participating in each test also varies, so the international average needs to be interpreted cautiously.

In order to provide information on student achievement that is comparable to our previous analyses of educational expenditure and attainment, the top panel of Table 4 reports mean scores for the G7 countries that participated in TIMSS (Canada, France, Japan and United States) as well as the international average score.<sup>10</sup> For each test there are unfortunately only two other G7 countries as comparators. In Grade 4 mathematics, Canada is the lowest of the three G7 participants and the only member of this group

---

<sup>9</sup>Canada Communications Group (1992) and Riddell (1995) summarize and assess the results of earlier Canadian student achievement tests.

<sup>10</sup>Results for England and Germany are not reported because these countries did not meet the requirements for a nationally representative sample. The U.S. results for Grade 8 ~~mathematics and science~~ are also not shown for the same reason.

**Table 4: Student Achievement in G7 Countries and Canadian Jurisdictions**

(a) Student Achievement in Mathematics and Science in Canada and G7 Countries, 1994–95

	Mean value of per cent correct				
	<i>Canada</i>	<i>France</i>	<i>Japan</i>	<i>U.S.</i>	<i>International mean</i>
Grade 4 math	60	-	74 <sup>+</sup>	63 <sup>+</sup>	59
Grade 8 math	59 <sup>+</sup>	61 <sup>+</sup>	73 <sup>+</sup>	-	55
Grade 4 science	64 <sup>+</sup>	-	70 <sup>+</sup>	66 <sup>+</sup>	59
Grade 8 science	59 <sup>+</sup>	54 <sup>-</sup>	65 <sup>+</sup>	-	56

Notes: + statistically significant above the international mean  
 - statistically significant below the international mean

(b) Student Achievement in Mathematics and Science in Canadian Jurisdictions, 1994–95

	Mean value of per cent correct						
	<i>Nfld</i>	<i>NB (english)</i>	<i>Que</i>	<i>Ont</i>	<i>Alta</i>	<i>BC</i>	<i>Canadian mean</i>
Grade 4 math	58	58	69 <sup>+</sup>	57	65	59	60
Grade 8 math	56	54 <sup>-</sup>	68 <sup>+</sup>	54 <sup>-</sup>	61	63 <sup>+</sup>	59
Grade 4 science	62	61	65	62	68 <sup>+</sup>	64	64
Grade 8 science	59	57	59	56 <sup>-</sup>	65 <sup>+</sup>	62	59
Average score	59	58	65	57	65	62	61

Notes: + statistically significant above the international mean  
 - statistically significant below the international mean

Sources: Robitaille, Taylor and Orpwood (1996, 1997) and Council of Ministers of Education, Canada and Statistics Canada (2000).

that did not score significantly above the international mean. In Grade 8 mathematics, Canada's score is significantly higher than the international mean, but this is mainly due to the reduction in the international average resulting from the addition of several very low scoring countries (e.g., Columbia and South Africa) that did not participate in the Grade 4 tests. Again, Canada is the lowest scoring country among the participating G7 countries.

Canadian performance in science is somewhat better, although still not impressive. At the Grade 4 level, Canadian students' scores were statistically significantly above the international average (64 per cent correct versus 59 per cent) but still significantly lower than those of Japan and the United States, the other two G7 countries that took these tests. At the Grade 8 level, Canadian achievement was above the international average and in the middle of the three G7 participants — above France but below Japan.

Several Canadian jurisdictions over-sampled their student populations in order to provide meaningful results at the provincial level, and these are reported in the bottom panel of Table 4.<sup>11</sup> Substantial provincial variation in student achievement is evident. In mathematics, Quebec student achievement is substantially above the Canadian average and high by international standards, albeit still significantly below the top-ranked countries (Korea, Singapore, Hong Kong and Japan). BC students also perform significantly above the Canadian average in Grade 8 mathematics, and rank well internationally in both Grade 8 math and science. Ontario's student performance is consistently below the national average, and the differences are statistically significant in both Grade 8 mathematics and science. Test scores in New Brunswick (English schools) also consistently fall below the Canadian mean, although only significantly so in the case of Grade 8 mathematics. Finally, Alberta student performance exceeds the Canadian average in all four tests. The Alberta results are particularly impressive in science; at both Grade 4 and Grade 8 they are among the best in the world, exceeded only by Korea and Japan.

In summary, according to the most recent international tests, Canadian student achievement in mathematics is about average among a diverse set of countries. Within the G7, Canada ranks at the bottom of the four participating countries. In science, Canadian student performance is above average among the full set of countries that took the tests but below average among the G7 participants — above France but below Japan and the United States.

---

<sup>11</sup>The results for Canada as a whole are based on a representative sample of schools in all provinces and territories, with the exception of PEI, the only province that did not participate in TIMSS. 499

Considerable caution is appropriate in interpreting these summary statistics on student performance in mathematics and science. Many factors in addition to the resources devoted to the school system influence student achievement. For example, relative to other G7 countries, Canada has a high proportion of immigrant children (for whom English or French is often a second language) in its schools. Furthermore, countries may differ in the extent to which they aim to raise average performance or to principally improve achievement among those who would otherwise perform poorly. Nonetheless, these results suggest that Canada does not appear to obtain “good value for money” from the elementary and secondary school system, at least as measured by average student achievement in mathematics and science. Canada ranks at or near the top of the G7 countries in terms of expenditure per student on elementary and secondary schooling but at or near the bottom of the limited number of G7 participants in terms of student performance. More generally, Canada is at the high end internationally in the resources it devotes to elementary and secondary education, but in the middle of the pack in student achievement in math and science.<sup>12</sup>

Although overall national levels of Canadian student performance in mathematics and science are disappointing, some provinces — such as Quebec in mathematics and Alberta in science — are able to obtain high levels of achievement within the existing Canadian social, cultural and fiscal framework. In other provinces, notably Ontario, student achievement in math and science consistently falls below the Canadian average and is relatively low by international standards. The source of these provincial variations is an important subject for research.

---

<sup>12</sup>For example, at the Grade 4 level five countries (Korea, Japan, Netherlands, United States and Australia) had significantly higher science scores and eight countries (Korea, Japan, Singapore, Hong Kong, Netherlands, Czech Republic, Austria and Slovenia) had significantly higher mathematics scores.



## *Literacy Skills of the Adult Population*

Data on student achievement provide some information on the skills of those who will be entering the labour force in the future — i.e., the flow of new entrants. Until recently, however, no nationally representative measures of the skills and knowledge of the existing stock — the adult population — were available. The International Adult Literacy Survey (IALS), which was carried out in over 20 countries during the 1994–98 period, represents a breakthrough in international data collection, providing for the first time measures of the literacy and numeracy skills of the adult population that are comparable across countries and language groups.<sup>13</sup>

The survey provided three measures of literacy: prose, document and quantitative literacy (or numeracy). Details of the tests used to measure these skills are given in OECD and Statistics Canada (1995); the main point is that these measures correspond to information-processing skills needed to perform everyday tasks at home, at work, and in the community. For each respondent, the survey measures prose, document and quantitative literacy on a scale from 0 to 500. These numerical literacy scores are also grouped into five main levels of competency, with level 1 being the lowest and level 5 being the highest. According to Statistics Canada, individuals with only level 1 or level 2 literacy skills have marginal or quite limited capabilities (Crompton, 1996).

Table 5 summarizes some of the key findings from the IALS. In order to maintain comparability with previous sections of this paper, results are reported for Canada and other participating G7 countries (Germany, United Kingdom and United States).<sup>14</sup> The top panel shows the mean score on each of the three literacy scales and the score at the 25th and 75th percentiles of the literacy distribution. The average scores rank Germany at the top (with the exception of the prose scale, on which Canada ranks first and Germany second), followed by Canada, the United States, and the United Kingdom at the bottom. Although the differences in mean scores among these four countries may not appear large, they are non-trivial. For example, on the document scale the mean score in Germany, the top-ranked country, is 285,

---

<sup>13</sup>See OECD and Statistics Canada (1995, 2000) for further details on this survey.

<sup>14</sup>France also participated in IALS, but the French results have not been publicly  
*Education and Skills* 501

while that in the United Kingdom, the bottom-ranked country, is 268. An individual with a score of 268 is in the middle of the distribution in the United Kingdom but would be at approximately the 33rd percentile of the distribution in Germany — i.e., about two-thirds of the adult population would have superior document literacy skills.

Compared with many countries participating in the IALS survey, especially continental European countries, Canada, the United Kingdom and the United States display substantial variation in the literacy skills of the adult population (OECD and Statistics Canada, 1995, 2000). This phenomenon is evident in Table 5(a) from a comparison of the lower and upper tails of the literacy distributions for Canada and Germany. At the 25th percentile, the German score exceeds that of Canada on all three literacy scales, with the differential being especially large for document and quantitative literacy. However, at the 75th percentile the Canadian score exceeds that of Germany in both prose and document literacy and is approximately equal to that of Germany in quantitative literacy. In general, individuals in the top 25 per cent of the Canadian literacy distribution have higher literacy skills than their German counterparts, while individuals in the bottom one-quarter of the Canadian literacy distribution have lower skills than their German counterparts.

Panel 5(b) shows the per cent of adults with low literacy skills (level 1 or level 2) by broad age groups.<sup>15</sup> For the adult population as a whole, the ranking is the same as before: Germany has the lowest per cent of adults with low literacy (the exception being the prose scale, on which Canada ranks at the top), followed by Canada, the United States and the United Kingdom. However, important differences in the country rankings are evident among age groups. Among young adults (16–25 years of age), Canadians rank at the top, followed closely by Germans. In the United Kingdom, and especially the United States, the incidence of low literacy skills among young adults is much higher. In contrast, Canada has the highest incidence of low literacy skills among those 46–55 years of age, exceeding even the United Kingdom on this dimension and substantially above Germany.

The bottom panel, 4(c), provides some insight into the relationship between education and literacy in these countries. Among those with less than a completed secondary school education, literacy skills of Canadians are very poor, substantially below the United Kingdom and Germany but above the United States. However, average literacy scores improve substantially with educational attainment, and this gradient appears to be steepest in Canada. Canadian high school graduates rank second (after Germany) among this group of countries, and post-secondary graduates rank at the top, despite the

---

<sup>15</sup>On a scale of 0 to 500, literacy level 1 corresponds to a score from 0 to 225 and level 2 corresponds to a score from 226 to 275. *W. Craig Riddell*

very large fraction of the Canadian population with completed post-secondary education.

These results suggest that Canadian literacy skills are reasonably good by international standards, especially among younger cohorts and post-secondary graduates.<sup>16</sup> However, the literacy skills of older Canadians and those with less than a high school education are relatively poor. The fact that, on average, young Canadians display high levels of literacy compared to their counterparts in Germany, the United States and the United Kingdom may be due in part to the increased quantity of education received by recent cohorts compared to earlier generations. This possibility is reinforced by the result that Canadian post-secondary graduates achieve literacy scores that are relatively high compared to their counterparts in other countries that participated in the IALS survey.

In all of these countries, a disturbingly large fraction of the population has low levels of prose, document and quantitative literacy. Nonetheless, to the extent that these information-processing skills used in daily activities are an outcome of the education system, this simple examination of the IALS data is more favourable to Canada's education system than was the analysis of tests of student achievement.

## **Incidence of Education**

Educational attainment has risen substantially in the postwar period. Riddell and Sweetman (2000) document the main trends using data from the 1971, 1981 and 1991 Censuses together with recent data from the Labour Force Survey. By breaking down the data into age and birth cohorts, a picture of how schooling levels evolved through time in Canada can be drawn.

The most dramatic changes during the post-war period were increases in basic elementary and secondary schooling. Through time, successive younger age groups exhibit substantial decreases in the proportions of both men and women with only elementary or incomplete secondary education. Much of this increase in educational attainment occurred in the group born between 1940 and 1960 — those now in their 40s and 50s. The significant educational reforms that took place in Canada in the 1960s and 1970s probably facilitated this substantial growth in schooling. Additional factors, including growth in real incomes, declining family size, the shift of employment out of agriculture

---

<sup>16</sup>This conclusion continues to hold if a wider group of countries, including Australia and Sweden, is used (Riddell and Sweetman, 2000).

and into manufacturing and services, and the shift of population out of rural and into urban communities, also contributed to these changes.

Substantial increases have also occurred in post-secondary education, especially for females. The community college system was established in the 1960s and 1970s, and significantly increased post-secondary education opportunities for those who did not attend university. Over time, the proportion of both males and females obtaining a community college (or CEGEP) diploma or certificate has risen from about 30 to 35 per cent. Significant expansion of the university system also took place in the 1960s and 1970s. Following age cohorts through time indicates that male university completion has increased only modestly; for example, the fraction of men with a university degree increased from 19 per cent for those aged 50–59 in 2000 to 20 per cent for those aged 30–39. In contrast, the growth in university attendance and completion among females has been much greater. The proportion of females with a university degree rose from 12 per cent of those aged 50–59 in 2000 to 20 per cent for those aged 30–39.

Apart from the impressive overall growth in educational attainment, the most significant development has been the much more rapid increase in schooling of women compared to men. In the past educational levels of men generally exceeded those of women. However, both high school completion and university undergraduate completion rates are now higher for females (Riddell and Sweetman, 2000). The gender gap in university graduate completion rates has also significantly narrowed.

Educational attainment is similar across language groups (Council of Ministers of Education, Canada and Statistics Canada, 2000). However, schooling levels are significantly lower among the aboriginal population.

Higher education is often regarded as a tool for promoting equality of opportunity and social mobility. Indeed, the case for substantial public financing of post-secondary education is more often based on such equity considerations than on beliefs about the contribution to efficiency and economic growth. However, if post-secondary attendance is much higher among children from high income families, these equity objectives may not be realized and the financing of post-secondary education may be regressive. Early Canadian studies (for example, Mehmet, 1978; Meng and Sentance, 1982) concluded that in Canada, as in many other countries, children from high income families are much more likely to obtain a post-secondary education. However, as documented by Christophides, Cirello and Hoy (2001), differentials in post-secondary attendance by family income have narrowed. Between 1975 and 1993 the proportion of young adults aged 18–24 attending post-secondary education rose from 33 per cent to 54 per cent, reflecting the rise in post-secondary enrollment discussed previously. The

increase among families in the poorest quintile of the family income distribution was from 18 per cent to 44 per cent, a rise of more than 140 per cent. Among families in the highest income quintile, the increase was from 53 per cent to 71 per cent, a rise of about 34 per cent. Thus the gap in the likelihood of a child's attendance at a post-secondary educational institution narrowed substantially over this period. In the mid-1970s, a child's likelihood of post-secondary attendance was almost 200 per cent higher (almost triple) among high income families than among low income families. By the early 1990s, the likelihood was about 60 per cent higher.

Bouchard and Zhao (2000) compare university participation rates of 18–21 year olds by family socio-economic status (SES) using data from 1986 and 1994. In the earlier period, university attendance rates were approximately equal in the lowest SES families and the middle SES families — 13.7 per cent and 14.5 per cent respectively. University participation of 18–21 year olds from high SES families was much higher (33 per cent). Between 1986 and 1994 the largest increases in university attendance were by children in middle SES families — from 14.5 per cent to 25.3 per cent. University participation of children from the lowest and highest SES families increased to 18.3 per cent and 40.2 per cent respectively. Thus the gap in university participation of children from the lowest and middle SES families widened, but the differential between the middle and the highest SES families narrowed.

These findings suggest that the long-term trend in Canada has been towards increased participation in post-secondary education among children of lower income families. However, an important concern is whether this favourable development may have been reversed in the 1990s when tuition fees increased substantially and significant revisions to student loan programs took place. This question is an important subject for future research, especially using data from the latter part of the 1990s when the steepest increases in tuition occurred.

## **Education and Labour Market Success**

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, productivity and earnings are of substantial importance for both economic and social policy.

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).

The strong positive correlation between education and earnings is one of the most well established relationships in social science. Table 6 summarizes the results of two recent Canadian studies of this relationship. The top panel, which is based on Vaillancourt and Bourdeau-Primeau (2001), shows estimates of the private after-tax returns to university programs. These estimates take into account such costs as tuition fees and foregone earnings. Rates of return are highest at the Bachelor’s level.<sup>17</sup> Females benefit more from higher education than do males, a reflection of the general finding that the gap between male and female earnings is largest at low levels of education and least at high levels of schooling.

---

<sup>17</sup>Note that in this study Bachelor’s degrees include law degrees and degrees in medicine, dentistry, optometry and veterinary medicine. *W. Craig Riddell*

**Table 6: Estimates of the Private Returns to Schooling in Canada, 1995**

(a) Estimates of the after-tax returns to university degree programs<sup>1</sup>

<i>Educational attainment</i>	<i>Males</i>	<i>Females</i>
Bachelor's degree <sup>2</sup>	17	20
Master's degree	nc <sup>3</sup>	5
PhD degree	2	10

Notes: 1. Rates of return by level of education are calculated relative to the next lowest level. For example, the return to a Bachelor's degree is relative to completed secondary school, and the return to a Master's degree is relative to a Bachelor's degree.

2. Bachelor's degree includes health (medicine, dentistry, optometry, veterinary) and law degrees.

3. "nc" indicates "not calculated" because the estimated returns were not significantly different from zero.

Source: Vaillancourt and Bourdeau-Primeau (2001).

(b) Estimates of the before-tax returns to years of schooling and credentials received

	<i>Males</i>	<i>Females</i>
(i) Years of schooling (without credential effects)	5.9	8.6
(ii) Years of schooling (with credential effects)	3.3	5.5
High school graduate	5.2	6.1
College diploma/trade certificate school without HS	7.6	8.4
Marginal effect over high school: College diploma/trade certificate with high school	6.6	5.9
Bachelor's degree	22.8	25.2
Marginal effect over BA: Medicine	34.1	30.0
Master's degree	4.6	7.0
Marginal effect over MA: PhD	4.2	0.8

Source: Ferrer and Riddell (2001).

The bottom panel summarizes some of the findings of the study by Ferrer and Riddell (2001) which analyzes the influence on pre-tax earnings of both years of schooling and “sheepskin effects” — increases in earnings associated with the receipt of a diploma, certificate or degree. When “years of schooling” alone is used to control for the influence of education, each additional year of schooling is estimated to be associated with an increase in weekly earnings of females of approximately 9 per cent and of males of approximately 6 per cent, after controlling for other influences on earnings. These OLS estimates of the return to schooling correspond approximately to estimates of the real rate of return on the investment.<sup>18</sup>

Ferrer and Riddell (2001) find that a more general specification in which both years of schooling and credentials received provides a better fit to the data. In this more general specification, the estimated coefficients on the “years of schooling” variable decline but are nonetheless still substantial (3.3 per cent for males and 5.5 per cent for females). The total return to any specific level of education consists of the “years of schooling” effect and the cumulative impact of the estimated “sheepskin effects”. The main point to note for the purposes of this paper is that estimated rates of return to schooling are substantial. Particularly large “sheepskin effects” are associated with the completion of a university Bachelor’s degree and with degrees in medicine, dentistry, optometry and veterinary medicine.<sup>19</sup>

---

<sup>18</sup>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”.

<sup>19</sup>Although this evidence of substantial “sheepskin” or credential effects may reflect signalling or screening in the labour market, it is also consistent with a human capital perspective if the educational program consists of a package of complementary courses (Ferrer and Riddell, 2001). In addition, in fields such as medicine, the large estimated sheepskin effect may reflect professional licensing requirements and restrictions on entry into the profession.

*W. Craig Riddell*



These Canadian studies obtain OLS estimates of the “return to schooling” that are similar to those obtained in many studies carried out in the United States and other countries: approximately 8–10 per cent rate of return when the analysis is based on annual earnings and 6–9 per cent when the analysis is based on weekly earnings.<sup>20</sup> 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 signalling/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”.

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.<sup>21</sup>

Perhaps less well understood is the point that the social policy case for investing in education is also weakened if the signalling/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

---

<sup>20</sup>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.

<sup>21</sup>The economic case for investing in education should also incorporate any social ~~Edms~~ ~~educat~~ ~~Skills~~ may not be captured by the individual receiving the education. 509

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 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. 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 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 II 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 per cent, substantially higher than the OLS estimate with their data of 7 per cent.

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 per cent for females (versus an OLS estimate of 14.6 per cent) and 11.8 per cent for males (compared to an OLS estimate of 10.8 per cent).

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.

## Conclusions

This paper has provided a general review of the recent Canadian experience relating to education and skill formation. Several conclusions follow from the analysis.

Canada invests heavily in education. Relative to other G7 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.

One consequence of this substantial expenditure is a population that is well educated by international standards. Canada compares favourably with other G7 and OECD countries in terms of most measures of educational attainment. Compared to the United States, 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.

Student achievement in mathematics is about average among the diverse set of countries participating in these tests, and relatively low among the G7 countries that participated. Student achievement in science is somewhat better, although still relatively low compared to the other G7 participants. These results suggest that Canada may not obtain good “value for money” from its relatively high expenditure on the elementary and secondary school system, at least as judged by student achievement in mathematics and science. However, although the average Canadian performance is less than impressive, some jurisdictions — especially Quebec in mathematics and

Alberta in science — achieve results that are excellent by international standards.

The literacy skills of the adult population are above average among the G7 countries that participated in the IALS survey. Canada, like the United States and United Kingdom, has a high variance across the population in its literacy skills compared to European countries such as Germany. By international standards, older and less well-educated Canadians have relatively poor literacy skills, whereas younger and well-educated Canadians have relatively good literacy skills compared to their counterparts in other G7 countries.

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.

## References

- Bouchard, B. and J. Zhao (2000), “University Education: Recent Trends in Participation, Accessibility and Returns”, *Education Quarterly Review* 6(4), 24–32.
- Canada Communication Group (1992), *Education and Training in Canada* (Ottawa: Minister of Supply and Services).
- Card, D (1999), “The Causal Effect of Education on Earnings”, in O. Ashenfelter and D. Card (eds.), *Handbook of Labor Economics*, Vol. 3A (Amsterdam: North Holland).
- \_\_\_\_\_ (2000), “Estimating the Return to Schooling: Progress on Some Persistent Problems”, NBER Working Paper No. 7769 (Cambridge, MA: National Bureau of Economic Research).
- Christophides, L.N., J. Cirello and M. Hoy (2001), “Family Income and Post-secondary Education in Canada”, *Canadian Journal of Higher Education* 31(1), 177–208.
- Council of Ministers of Education, Canada and Statistics Canada (2000), *Education Indicators in Canada: Report of the Pan-Canadian Education Indicators Program 1999* (Toronto and Ottawa: Council of Ministers of Education, Canada and Statistics Canada).
- Courchene, T.J. (2001), *A State of Minds: Toward a Human Capital Future for Canadians* (Montreal: Institute for Research on Public Policy).

- Crompton, S. (1996), "The Marginally Literate Workforce", *Perspectives on Labour and Income* 8 (Summer), 14–21.
- Ferrer, A. and W.C. Riddell (2001), "The Role of Credentials in the Canadian Labour Market", Discussion Paper No. 01–16 (Vancouver: Department of Economics, University of British Columbia).
- Haveman, R. and B. Wolfe (1984), "Schooling and Economic Well-Being: The Role of Non-Market Effects", *Journal of Human Resources* 19 (Summer), 377–407.
- Lemieux, T. and D. Card (2001), "Education, Earnings, and the 'Canadian G.I. Bill' ", *Canadian Journal of Economics* 34 (February).
- Mehmet, O. (1978), *Who Benefits From the Ontario University System?* (Toronto: Ontario Economic Council).
- Meng, R. and J. Sentance (1982), "Canadian Universities: Who Benefits and Who Pays?" *Canadian Journal of Higher Education* 12(3), 45–58.
- Mincer, J. (1974), *Schooling, Experience and Earnings* (New York: Columbia University Press).
- Organisation for Economic Co-operation and Development (OECD) (1998), *Human Capital Investment: An International Comparison* (Paris: OECD).
- \_\_\_\_\_ (2001), *Education at a Glance: OECD Indicators 2001* (Paris: OECD).
- OECD and Statistics Canada (1995), *Literacy, Economy and Society* (Paris and Ottawa: OECD and Statistics Canada).
- \_\_\_\_\_ (2000), *Literacy in the Information Age* (Paris and Ottawa: OECD and Statistics Canada).
- Riddell, W.C. (1995), "Human Capital Formation in Canada: Recent Developments and Policy Responses", in K.G. Banting and C.M. Beach (eds.), *Labour Market Polarization and Social Policy Reform* (Kingston: School of Policy Studies, Queen's University), 125–172.
- Riddell, W.C. and A. Sweetman (2000), "Human Capital Formation in a Period of Rapid Change", in W.C. Riddell and F. St-Hilaire (eds.), *Adapting Public Policy to a Labour Market in Transition* (Montreal: Institute for Research on Public Policy), 85–141.
- Robitaille, D.F., A.R. Taylor and G. Orpwood (1996), *The TIMSS Canada Report Volume 1: Grade 8* (Vancouver: Department of Curriculum Studies, University of British Columbia).
- \_\_\_\_\_ (1997), *The TIMSS Canada Report Volume 2: Grade 4* (Vancouver: Department of Curriculum Studies, University of British Columbia).
- Sweetman, A. (1999), "What If High School Were a Year Longer? Evidence from Newfoundland", WRNET Working Paper No. 00–01 (Vancouver: Western Research Network on Education and Training).
- Vaillancourt, F. and S. Bourdeau-Primeau (2001), *The Returns to University Education in Canada, 1990 and 1995* (Toronto: C.D. Howe Institute).

**Table 3: Average Weekly Wages and Years of Schooling by Highest Level of Educational Attainment, Canada, 1996**

	<i>All workers</i>			<i>Females</i>			<i>Males</i>		
	<i>%</i>	<i>Average wage</i>	<i>Years of schooling</i>	<i>%</i>	<i>Average wage</i>	<i>Years of schooling</i>	<i>%</i>	<i>Average wage</i>	<i>Years of schooling</i>
No degree	23.4	\$582.4	10.1	19.9	\$429.3	10.3	26.5	\$681.7	9.9
High school graduate	26.2	584.4	12.6	28.0	473.3	12.6	24.7	693.5	12.7
College/trade without high school	9.9	712.5	12.8	8.8	537.6	13.1	10.9	834.6	12.6
College/trade school and high school	23.8	704.1	14.4	26.0	570.4	14.3	21.9	841.7	14.4
All college/ trade school	33.7	706.6	13.9	34.7	562.1	14.0	32.8	839.3	13.8
University degree	16.7	941.7	17.5	17.4	786.4	17.4	16.0	1088.3	17.6
All levels of education	100.0	684.9	13.3	100.0	550.3	13.5	100.0	801.6	13.1

Source: Author's calculations from the 1996 Census public use master file (Ottawa: Statistics Canada).

**Table 5: Literacy Skills in Canada and G7 Countries, 1994–98**(a) Mean scores and scores at the 25<sup>th</sup> and 75<sup>th</sup> percentiles of the prose, document and quantitative literacy scales

<i>Literacy scale</i>	<i>Canada</i>			<i>Germany</i>			<i>United Kingdom</i>			<i>United States</i>		
	<i>25<sup>th</sup></i>	<i>mean</i>	<i>75<sup>th</sup></i>	<i>25<sup>th</sup></i>	<i>mean</i>	<i>75<sup>th</sup></i>	<i>25<sup>th</sup></i>	<i>mean</i>	<i>75<sup>th</sup></i>	<i>25<sup>th</sup></i>	<i>mean</i>	<i>75<sup>th</sup></i>
Prose	243	279	322	245	276	308	233	267	311	237	274	320
Document	243	279	326	256	285	318	230	268	314	230	268	316
Quantitative	247	281	323	265	293	324	231	268	314	237	275	322
Average literacy score	244	280	324	255	285	317	231	268	313	235	272	319

(b) Per cent of adults with low literacy skills<sup>1</sup>

<i>Age group</i>	<i>Literacy scale</i>	<i>Canada</i>	<i>Germany</i>	<i>United Kingdom</i>	<i>United States</i>
16–65	Prose	42	49	52	47
16–65	Document	43	42	50	50
16–65	Quantitative	43	33	51	46
16–65	Document	33	34	44	56
46–55	Document	54	42	53	50
16–65	Document	43	42	50	50

(c) Mean document literacy score and educational attainment

<i>Education</i>	<i>Canada</i>	<i>Germany</i>	<i>United Kingdom</i>	<i>United States</i>
Less than high school	227	276	247	200
High school graduate	288	295	286	266
Post-secondary graduate	318	315	312	303
All adults	279	285	268	268

Notes: 1. Low literacy skills are defined as literacy levels 1 or 2 on document literacy. Literacy is measured on a scale from 1 to 5 with levels 1 and 2 being the lowest levels.

Sources: OECD (1998) and OECD and Statistics Canada (2000).