The Economic Role of Education -- with special reference to Atlantic Canada

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"The Economic Role of Education - with special reference to Atlantic Canada"[1]

In many respects, Canada's educational system is fighting for its credibility. While newspaper stories talk about the "crisis" in Canadian education, anecdotal evidence about illiterate high school graduates and unemployed B.A.s is undermining the public's perception of the intellectual and economic benefits of education. At the same time, however, the number of school dropouts has become a highly visible issue as "stay in school" advertisements exhort youth to continue their education - implicitly, the school system is condemned for their non-attendance. For many pundits, Canada's school system deserves a "failing grade" in a number of subjects -- and there is no shortage of recipes for improvement.

But is this pessimism warranted? Section 1 of this essay looks at recent trends in the supply of education in Canada and in Atlantic Canada. In Canada as a whole, the number of university graduates increased by 26.6% between 1986 and 1991,[2] and within that general increase, the relative position of Atlantic Canada improved significantly. Recent years have seen dramatic change in the educational attainment of youth in Atlantic Canada --although the stereotype is still dominated by the relatively low educational attainment of older cohorts, the youth of Atlantic Canada had, in the early 1990s, higher levels of educational attainment than that of older cohorts or of youth in the rest of the country.

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[1]Revised Version of Keynote Address to the Atlantic Canada Economics Association, October 29, 1993, Charlottetown, Prince Edward Island.

[2]Statistics Canada, The Daily, May 11, 1993, p. 5.

Section 2 of this essay examines whether education still pays in terms of increased earnings or lower probability of unemployment. The statistical evidence indicates that greater education continues to pay a handsome return in higher earnings and lower probability of unemployment.

Section 3 asks what the available evidence can tell us about the relative quality of Canadian education. Direct measurement of literacy skills indicates that literacy problems among younger Canadians are substantially less than among older cohorts. International comparative evidence on science and mathematics achievement test scores indicates that Canadian students do not do as well as those in some other countries, but the differential in achievement levels is not huge.

However, since Canadians want to continue to enjoy above-average levels of earnings, it is not good enough to have an educational system that is only "average" in quality. Educational reform is crucially important for the long run productivity of the Canadian labour force, but it is also important not to oversell the short run payoff that can be expected. Since it is reasonable to expect someone who is now entering grade 1 to be still in the labour force in the year 2050, educational reform has to try to anticipate the future demands of society rather than react to the perceived deficiencies of the past -- Section 4, therefore, discusses the needed dimensions of educational reform.

The educational sector is important because it represents a major use of Canada's resources -- approximately 7 percent of Gross Domestic Product, or about $50 billion per year. Since most Canadian families do not possess the financial wealth to make more than a small difference to the total life time consumption of their children, increasing the "human capital"

(earnings power) of one's children is the major way in which one generation can try to pass on an inheritance to the next, and education is the primary form of human capital.

Canadians have, however, somewhat contradictory expectations of their schools. Canadians simultaneously demand that the educational system should ensure the advantages of their own children, and that the educational system should help to ensure "equality of opportunity." Students are expected to learn academic subjects, but the school system is also expected to inculcate values of good citizenship, develop social skills, maintain physical fitness, and pass on miscellaneous life skills, from drug avoidance to anti-racism. Clearly, Canadians ask for a great deal from their schools.

It is also possible that discontent with the educational system may reflect more basic discontents with economic outcomes in Canada. Canadians who are now in their forties grew up with the vision of a growing economy and ever increasing material prosperity. The 1950s and 1960s saw average real wage increases of 35.9 percent and 36.4 percent, respectively, but average real hourly wages have been stagnant since 1975 [-- see Economic Council of Canada (1991) and Rashid (1993)]. It is not surprising that many people feel that something has gone wrong and somebody or some thing must be at fault.

The relentless upward march of unemployment rates has also spread insecurity throughout Canadian society. From 4.2 percent in the 1950s, 5.0 percent in the 1960s, 6.7 percent in the 1970s and 9.5 percent in the 1980s, unemployment has risen to over 11 percent and has penetrated into occupational and educational groups where it was previously unthinkable. For a very large fraction of the population, the Canadian economy no longer "delivers the goods". By the fall of 1993, over 50 percent of Canadians agreed with the statement, "I feel I have lost all

control over my economic future" (EKOS, 1993). In many ways, the school system is a convenient lightning rod for the more basic discontent which many Canadian feel about economic outcomes and the anxieties which they feel for the future of their children.

Analytically, discussion of the economic role of education also illustrates three general issues in economics: (a) the interplay of supply and demand; (b) the importance of distinguishing carefully between stocks and flows and (c) the problem of aggregation in constructing summary measures of outcomes. Given the lack of clarity on these three issues, it is not surprising that the debate on education has been somewhat fruitless.

1.0 The Supply of Education

Educational statistics in Canada are not collected on a standardized basis, and no province has in place a system which effectively tracks individual students. Since students who leave one school may move to another school or drop out, and school dropouts often later return to school, attendance statistics at the individual school level mingle the effects of geographic mobility and educational retention/re-entry.

Although aggregate data on school enrolment and high school graduation rates measure slightly different aspects of educational achievement, the trend in both is unmistakable. Table 1 presents data on the "grade 12 retention rate" -- the total number of Nova Scotia students enroled in grade 12 as a fraction of the total number of students enroled in grade 7 five years earlier. The big news of Table 1 is the dramatic change in enrolment in Nova Scotia over the last 27 years. In the mid-1960s, two-thirds of the grade 7 class left

TABLE 1

NOVA SCOTIA DEPARTMENT OF EDUCATION PROVINCIAL RETENTION RATES*

GRADE 12		GRADE 7		RETENTION RATE
Year	Enrolment	Year	Enrolment	
1992	12,881	1987	13,678	94%
1991	12,165	1986	13,981	87%
1990	11,578	1985	14,099	82%
1989	11,662	1984	14,450	81%
1988	11,834	1983	14,927	79%
1987	11,408	1982	14,576	78%
1986	10,972	1981	14,999	73%
1985	10,777	1980	15,372	70%
1984	11,376	1979	15,794	72%
1983	11,691	1978	16,826	69%
1982	11,637	1977	18,360	63%
1981	10,910	1976	18,832	58%
1980	10,742	1975	19,003	57%
1975	9,817	1970	18,417	53%
1970	8,860	1965	17,111	52%
1965	5,315	1960	16,146	33%

* Retention rates may be over-estimated as there is no record of the number of students returning to grade 12 after dropping out for a period of time. During downturns in the economy, more students are likely to return to school.

school before grade 12, but by the early 1990s grade 12 enrolment was over 90% of the enroled in Grade 7 five years earlier. Although the 1991/92 retention rate may be somewhat inflated by students who have returned to school to improve their grades because no jobs are available in a recession labour market, there is no mistaking the dramatic upward trend in school retention rates during the 1980s or the fact that by 1990 the vast majority of Nova Scotia students did stay in school through grade 12.[3]

In analyzing educational achievement, it is absolutely essential to distinguish carefully between the educational achievement of the flow of new school leavers entering the labour force and that of the stock of old school leavers already present in the labour market. Since there used to be a rather low grade 12 retention rate in Atlantic Canada, the labour force as a whole is dominated by the educational characteristics of older workers who entered the labour force many years ago. Someone who dropped out of school at age 16 in 1965 would still be only 44 in 1993, with another 20 years of labour force participation expected before retirement. The older cohorts of Atlantic Canadian workers have relatively low educational achievement levels which depresses the average level of educational achievement of the labour force as a whole. However, as Table 2

[3]To the 90% plus who are now staying in school until grade 12, one should add those who return to school as adults and get their GED certificate of grade 12 equivalency. Over the 1989-1991 period, GED graduates numbered about 15% of average grade 12 enrolment in Nova Scotia. Since the high rate of adult achievement of Grade 12 equivalency reflects in part the high rates of school drop out in previous years, one cannot simply add together the GED graduation rate and the Grade 12 retention rate -- but it is clear that the eventual rate of completion of high school is now actually quite high.

indicates, the percentage of the 20-24 age population who have attended university is, in all the provinces of Atlantic Canada, higher than the corresponding national percentage.[4]

TABLE 2

PERCENTAGE OF POPULATION YEARS 20 AND OLDER
WHO HAVE ATTENDED UNIVERSITY

AGE GROUP	NFLD.	N.S.	N.B.	P.E.I.	NATIONAL
ALL >20	17.2%	24.6%	18.8%	21.7%	24.4%
20-24	31.9%	34.7%	33.0%	35.7%	29.9%
25-34	20.5%	27.1%	22.1%	24.9%	26.3%
35-44	19.4%	26.8%	21.8%	27.4%	27.9%
45-54	14.4%	19.1%	16.7%	18.8%	21.7%
55-64	7.5%	13.1%	10.8%	13.4%	13.3%
65+	4.9%	10.1%	8.0%	9.7%	9.8%

SOURCE: CENSUS OF CANADA, 1991. CAT. NO. 93-328 PP. 24-29.

Table 3 provides more detail on population educational attainment levels by province, and by educational category - at the cost of providing less detail on differences between age cohorts. It illustrates the substantial drop in all provinces in the percentage of the population with very low levels of education -- i.e. less than grade 9. However, Table 3 can also be used as a object lesson

[4]Although a substantial proportion of the Nova Scotia student body comes from out of province, Table 2 is based on 1991 census, which was administered as of June 1, 1991 -- at which time out-of-province students have returned home -- and which asked respondents for their "normal" place of residence.

of the importance of looking at disaggregated age categories when the retention rate of the school system is changing rapidly (see Table 1).

TABLE 3

EDUCATIONAL ATTAINMENT
BY PROVINCE

	LESS THAN GRADE 9		LESS THAN HIGH SCHOOL (No H.S. Dip./Cert.)		UNIVERSITY DEGREE	
	20-34	35-64	20-34	35-64	20-34	35-64
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NFLD.	9.6%	23.1%	21.9%	25.5%	8.8%	8.2%
N.S.	4.9%	14.1%	20.8%	25.8%	13.7%	12.2%
P.E.I.	6.1%	16.3%	20.6%	23.3%	11.3%	10.4%
N.B.	6.3%	21.7%	20.7%	21.9%	10.8%	10.2%
QUE.	4.6%	23.0%	18.0%	15.9%	13.3%	11.8%
ONT.	2.4%	12.9%	17.6%	21.1%	16.2%	15.3%
MAN.	4.7%	14.1%	24.2%	26.3%	12.8%	12.9%
SASK.	4.2%	14.0%	23.9%	26.6%	11.0%	11.3%
ALTA.	2.6%	8.6%	21.3%	22.8%	12.9%	15.3%
B.C.	2.3%	8.3%	18.9%	20.8%	12.1%	14.2%
NATIONAL	3.5%	15.2%	19.0%	20.5%	14.0%	13.6%

SOURCE: CENSUS OF CANADA, 1991. CAT. NO. 93-328 PP. 24 - 36.

Looking at the educational system, Table 1 indicates that the grade 12 retention rate in Nova Scotia in 1991 was 87 percent. Looking at the population, Table 3 indicates that 26.3 percent of the 20 to 34 age population have less than high school. Although this is much better than the 39.9 percent of 35 to 64-year-olds in Nova Scotia who have less than high school, Table 3 represents a snapshot of the historic stock of educational attainment, while Table 1 describes the current flow produced by the educational system. When the retention rate of the educational system is changing rapidly, statistics on the stock are dominated by the past performance of the educational system -- someone who was 34 in 1991 was 18 in 1975 when the Nova Scotia grade 12 retention rate was 53 percent, as compared to its 87 percent level in 1991. When, as in education, a system is changing rapidly, the stock of past output is a poor guide to the characteristics of current output.

Doug May (1993) emphasized the importance of distinguishing between urban and rural educational attainment levels in Newfoundland and the poor performance of some rural areas in average educational attainment of the population. However, within Nova Scotia, the retention rate in almost all school districts, rose significantly during the 1980s. Although the Halifax/Dartmouth area had the highest average high school retention rates, some rural areas (e.g. Antigonish and Inverness Counties) were close behind (see Nova Scotia Department of Education, 1993). There clearly are a few rural school boards within Nova Scotia with relatively low high school retention, but it does not appear to be the case that the school system is systematically underperforming in rural areas.

Although some rural areas are characterized by low average educational attainment levels (e.g. in the 1986 Census, 69.9% of the adult population of Guysborough County reported that

they had less than high school graduation), the low schooling attainment of the population of these areas reflects the economic opportunities of past decades. At a time when forestry, mining and fishplant jobs were available, it was possible to drop out of school and get a job that paid about the same as the jobs one's parents had. Educational achievement was low because the financial benefits to continued education were not obvious and the cost of continuing in school was a forgone pay cheque. However, during the 1980s, resource sector jobs largely disappeared. As a consequence, some rural school boards have realized very large increases in high school retention rates -- in 1991/92 Guysborough County had a high school withdrawal rate much below the provincial average[5].

2.0 Does Education Still Pay?

As Tables 1 to 3 indicated, the 1980s saw a substantial increase in the educational qualifications of Canadian youth. However, the same period also saw a chorus of complaints about the "failure" of the Canadian educational system. Is this verdict of "failure" being rendered because education no longer pays in an economic sense?

Table 4 presents the percentage differential in annual earnings (compared to a high school graduate) of Canadian males and females in 1980 and 1990, controlling for their other personal

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[5] Interviews with high school teachers in Guysborough County have persuaded me that the fact that the High School withdrawal rate there is now about one third of the provincial average (see N.S. Department of Education,1993:12) is not due to any sudden surge in the love of learning, but rather to the fact that there are no jobs available locally and it is widely known that the chance of getting a job elsewhere depends on high school graduation. In an isolated rural area, there is also not actually much to do during the day other than school or a job. One can go to school free until the age of 21. Even if school attendance is up for the unedifying reason of a lack of alternatives, the result still is an increase in the human capital of rural youth.

characteristics.[6] It indicates that, among other things, female university graduates aged 25 to 54 earned 37% more than high school graduates. For males between 16 and 69, the differential between those with high school graduation and those with only primary education widened over the 1980s from 16% to 20%.

[6]The full earnings regression underlying Table 4 is presented in Appendix 1 Table A4.

TABLE 4

Earnings Determination 1980 And 1990

Variable Names	Canadian Males 16 To 69 Years (Standard Error)		Canadian Females 16 To 69 Years (Standard Error)		Full Model, 1990 25 To 54 Years (Standard Error)	
Education Variables	1980	1990	1980	1990	Males	Females
Dummy=1 if 0 to 8 Years of School *(Dummy=1 if Some Elementary School)*	-0.159 (0.024)	-0.201 (0.021)	-0.186 (0.035)	-0.363 (0.032)	-0.155 (0.018)	-0.185 (0.021)
Dummy=1 if 9 to 11 Years of Education *(Dummy=1 if Some Secondary Education)*	-0.120 (0.021)	-0.109 (0.015)	-0.170 (0.027)	-0.200 (0.019)	-0.086 (0.012)	-0.084 (0.013)
Dummy=1 if Some Post-Secondary Education		-0.023 (0.016)		0.002 (0.019)	0.045 (0.014)	0.051 (0.014)
Dummy=1 if No Cert/Dip or Cert/Dip Below Bachelor Deg.	0.113 (0.025)		0.256 (0.032)			
Dummy=1 if Post-Secondary Certificate/Diploma		0.076 (0.015)		0.216 (0.017)	0.106 (0.012)	0.174 (0.011)
Dummy=1 if University Degree *(Dummy=1 if Bachelor Degree)*	0.297 (0.026)	0.191 (0.015)	0.478 (0.036)	0.406 (0.018)	0.247 (0.013)	0.370 (0.012)
Dummy=1 if Degree Beyond Bachelors Level	0.402 (0.031)		0.602 (0.052)			
Dummy=1 if Trade Certificate/Diploma	0.059 (0.019)	0.053 (0.021)	0.101 (0.025)	0.077 (0.030)	0.054 (0.016)	0.059 (0.020)

The 1980 estimates are based on the 1981 census, which has the advantage of a large sample size but the disadvantage of limited information on the personal characteristics of respondents, while the 1990 estimates are based on the 1990 Labour Market Activity Survey of Statistics Canada, which has an unusually rich list of potential control variables. To make comparisons easy, columns 1-4 therefore present the results for identically specified regressions while columns 5 and 6 take full advantage of the potential in the LMAS to control for personal characteristics (such as disability or visible minority status) which are not often available in other microdata sets.[7]

The 1980/1990 comparisons indicate that the earnings disadvantage associated with very low levels of education increased over the 1980s, although there may have been some slippage in the earnings premium of university graduates (compared to high school graduates). However, the greater richness of the 1990 LMAS data enables one to question if the apparent return to education is partly due to other personal characteristics whose influences were not measured by earlier surveys. Columns 5 and 6 of Table 4 indicate that consideration of additional control variables reduces, somewhat, the estimated premium for high school and university completion, but the return to years of schooling remains highly significant, both statistically and economically.

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[7]Bar-Or et al (1993) provide a comprehensive analysis of the trends in financial returns to education over the 1971-1990 period, using microdata from successive waves of the Survey of Consumer Finance. Their conclusion is that the wage premium for university educated did decline from 1971 to 1977, but since then has been quite stable. Unlike the US, in the 1980's Canada did not see an increase in the earnings premium for college graduates, since Canada's larger increase in supply of highly educated labour kept pace with the increased demand for educational credentials, producing a rough constancy in the educational earnings premium in the 1980's, in Canada.

TABLE 4A

Earnings Determination 1990

Variable Names	Atlantic Region Males 16 To 69 Years (Standard Error)	Atlantic Region Females 16 To 69 Years (Standard Error)	Atlantic Region Full Model, 1990 25 To 54 Years (Standard Error)	
<u>Education Variables</u>				
Dummy=1 if 0 to 8 Years of School *(Dummy=1 if Some Elementary School)*	-0.195 (0.040)	-0.190 (0.054)	-0.187 (0.034)	-0.117 (0.036)
Dummy=1 if 9 to 11 Years of Education *(Dummy=1 if Some Secondary Education)*	-0.129 (0.030)	-0.170 (0.035)	-0.097 (0.027)	-0.083 (0.024)
Dummy=1 if Some Post-Secondary Education	-0.016 (0.036)	-0.014 (0.041)	0.085 (0.034)	0.027 (0.032)
Dummy=1 if Post-Secondary Certificate/Diploma	0.090 (0.037)	0.287 (0.035)	0.089 (0.031)	0.194 (0.023)
Dummy=1 if University Degree	0.228 (0.036)	0.598 (0.039)	0.299 (0.033)	0.442 (0.026)
Dummy=1 if Trade Certificate/Diploma	0.056 (0.038)	0.150 (0.044)	0.102 (0.030)	0.116 (0.028)

Furthermore, the return to education is somewhat greater in Atlantic Canada than elsewhere in the country. Table 4A presents the percentage earnings differentials associated with different levels of schooling (as compared to a high school graduate) in Atlantic Canada in 1990, using regression specifications identical to those used in Table 4 to control for the influence of other personal characteristics. The disadvantages associated with low levels of education, and the earnings premium associated with advanced educational credentials, are both somewhat greater in Atlantic Canada than in the national data reported in Table 4. Over and above the influence of other variables, years of schooling continues to be a reliable predictor of individual earnings. Investment in education continues to be a profitable route to higher earnings.[8]

University graduates may enjoy higher earnings if they are employed, but can they get a job? One of the most common complaints now heard about the value of education is that possession of advanced credentials no longer represents a guarantee against unemployment. The Labour Force Survey reports monthly the unemployment rate of workers with differing levels of schooling, and simple comparison of averages indicate, for example, that the unemployment rate of high school graduates in 1992 was about twice as high as the unemployment rate of university graduates (10.8% compared to 5.5%), but anecdotes about unemployed university graduates still abound. As well, it might be objected that the comparison of average unemployment rates can mask the influence of other variables (such as age or unionization status) that are also correlated with both unemployment and education. Table 5 therefore presents both a simple comparison

[8]In the 1970s, there was considerable concern that the individual return to education might be "credentialism" or "signalling," in which the more educated gain relative to the less educated, but do not add to total product. However, in recent years, the endogenous growth literature has emphasized the role played by the total stock of education in a country's growth rate -- for a survey, see Howitt (1993).

of average unemployment rates by education level and estimates of the standardized probability of experiencing unemployment (using data from the 1990 LMAS to control for the influence of other variables in influencing unemployment -- Table A3 in the Appendix presents the complete probit regression model). Evidently, once one controls fully for the influence on unemployment probability of age, marital status, unionization, industry, occupation, disability, language, visible minority status, establishment size, region and weekly hours while employed, the independent role played by education in predicting unemployment diminishes (e.g. for males, the ratio of the raw unemployment rate of those with elementary schooling to the unemployment rate of university graduates is about 4:1, but the ratio of the standardized probabilities of unemployment is about 2:1). However, even after controlling for the potential influence of all these other variables on the probability of unemployment, the influence of education on the unemployment probability of males remains very significant.[9]

[9] For females, the increase in the standardized probability of unemployment associated with lower education is not nearly as great as for males, but it remains true that the return to education is greater in Atlantic Canada than elsewhere.

TABLE 5

Unemployment And Education
Canada & Atlantic Canada

	The Probability of Experiencing Unemployment, 1990 LMAS Data *				Labour Force Survey Data**	
	Canada 25 to 54 Years		Atlantic Canada 25 to 54 Years		Unemployment Rate Canada 15 Years & Over	
Variable Names	Males	Females	Males	Females	Males	Females
Some Elementary School	0.1967	0.2768	0.3162	0.2689	12.2	13.0
Some Secondary School	0.1973	0.2546	0.3252	0.2489	12.2	12.2
High School Graduate (base case)	0.1516	0.2307	0.2609	0.2348	7.7	7.7
Some Post-Secondary Education	0.1831	0.2291	0.2449	0.2480	7.7	8.3
Post-Secondary Certificate/Diploma	0.1245	0.2201	0.2016	0.2456	6.3	6.3
Trade Certificate/Diploma	0.1679	0.2034	0.2895	0.1896		
University Degree	0.1092	0.2073	0.2078	0.1851	3.4	4.2

(Using The Log Of Hours Worked Variable)

* Conditional on Age, Marital Status, Unionization, Industry, Occupation, Disability, Language, Visible Minority, Establishment Size, Region, and Weekly Hours
Source: 1990 LMAS

** Source: Labour Force Survey, Annual Averages 1990

Tables 4, 4A and 5 indicate that in a relative sense, individuals with more years of schooling continue to do better in the labour market, in both annual earnings and probability of unemployment. Of course, in the recession of the early 1990s, jobs of any kind have become hard to find. As a result, the labour market has seen a "bumping" phenomenon in which the more qualified have displaced the less qualified, and have often moved into jobs which do not use fully their training. It is also no longer true, as it was in the 1960s and 1970s, that advanced degrees are an automatic guarantee of a secure job with good pay. However, the fact that all types of workers have poorer outcomes in a depressed labour market does not diminish the fact that more years of schooling still mean a higher chance of a more secure job with better pay.

Why has the return to education stayed high despite the substantial increase in the supply of educated labour? Increased supply generally drives prices lower, unless demand also increases. Increased demand for educated workers is being fed both by an increase in relative importance of service sector industries and by an increasing demand for occupations requiring highly educated workers within industries (see Osberg, Baumol and Wolff, 1989).

However, although the "information economy" now dominates economic activity in Canada, Canadians retain a cultural blindness to the importance of educated labour -- and the educational system is, in part, responsible. To take an example from close to home, the Nova Scotia Grade 6 Social Studies text has a chapter devoted to "Working in Nova Scotia" which purports to outline the industrial and occupational structure of economic activity in Nova Scotia. The 48 pages of text on the economy of Nova Scotia contain 46 pages which describe (with numerous diagrams and photographs) the farming, fishing, forestry, mining and manufacturing sectors. In the middle of the 47th page (buried where no Grade 6 student would be likely to

remember it) one encounters the statistic that, in fact, 70% of the labour force in Nova Scotia, as in other provinces, works in the service sector. A brief paragraph describes the tourism industry and the chapter ends. The vast majority of economic activity has simply disappeared -- and although the Grade 6 treatment may be extreme, it is important because it sets the context for future learning and because there is no systematic later attempt to provide a truer picture of the modern economy to all students.

3.0 Is Low Quality Education the Problem?

Although the quantity of schooling received by today's youth is clearly greater than that received by earlier generations, an influential group of critics argues that the quality of Canadian education has declined and that today's graduates are being poorly prepared for the technically demanding jobs of the future. This line of argument should lead us to think carefully about what we mean by educational "quality".

"Quality" is an ambiguous and relative term. The school system attempts to deliver competency in a number of subject areas, and in different types of skills within each subject area. Judgements about overall "quality" necessarily involve some weighting of the relative importance of mathematics, english, social studies or science achievement and some assessment of the importance of skill sets within subject areas - knowledge of spelling and grammar rules, compared to ability in creative writing, for example. In addition to academic skills, the school system is also asked to play a role in developing the social skills of students. But even if one were only interested in assessing academic "quality", the multi-dimensional nature of the output of schools creates the important problem of defining an index number of "quality" which is (inevitably) a somewhat arbitrary weighting of the underlying skills and subjects which are considered important. [Appendix 2 formalizes the argument of this section.]

Implicitly, assessment of "quality" is also a relative affair. It is not much of a criticism to say that the system is not doing a perfect job, since that is inevitably true. The real issue is how the system is doing compared to other school systems, or compared to how it has done in the past, or compared to how it should be expected to do with the resources at its disposal. One should also distinguish between the quality of graduates and the quality of the job done by the

school system. The "value added" of the school system is the increase in skills of the students who attend school -- if student quality is increasing (perhaps because some students now learn computer skills at home), the school system cannot claim credit for the better quality of input into the educational process. Conversely, if some students now come to school with more social and personal problems, one cannot blame the schools for the poorer "quality" of student input. Sensible assessments of "quality" should specify clearly the reference group for comparison and why that comparison is useful.

Furthermore, even presuming one could define clearly the academic quality of a particular student's education, measures of the quality of the system as a whole must aggregate over a population in which "quality" is unequally distributed. If quality could be ranked on a scale of 1 to 10, an average quality index of 5 could come from a school system where everyone got schooling quality of 5 or from a school system where half the population received school quality of 2 while the other half got school quality of 8. It is certainly not obvious, either economically or socially, that one should consider these two systems to be equivalent in their impacts.[10]

The popular discussion of school quality tends (1) to focus on output quality, not value added quality; (2) to jump back and forth between different reference groups for comparison; and (3) to pay little attention to the many judgements underlying measures of school quality. Statistics cited are usually limited to the simple average of test scores or the percentage who fall below

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[10] A criterion of economic efficiency would argue that the best quality schooling should go to those for whom it has the highest marginal productivity, but it is not clear, a priori, whether that means it should go to the more able (who might be able to learn what they need wherever they go to school) or to the less able. A criterion of economic equity, or equalization of opportunity, would argue that any inequalities in school quality should be allocated such that the poor receive the better quality schooling - but a great deal of sociological research argues that school quality differentials tend to reinforce inequality, as the rich demand and receive better opportunities for their children.

some arbitrary score. In Canada, the primary focus of the debate has been (1) concern over illiteracy and (2) Canada's relative standing in international comparisons of science and mathematics achievement.

3.1 Literacy

The first point to make about illiteracy is that there is a continuum of reading and writing skills and the appropriate definition of "literacy" depends on the social context in which literacy skills are to be used. In the 19th century, the standard of literacy was whether or not a person could sign his or her own name (which was all that was required for individuals to signify their assent to legal documents). Today, basic literacy skills involve the decoding of fairly complex text --and some analysts would broaden the concept to include "computer literacy" or "science literacy" as well as reading and writing skills. Several surveys in recent years have assessed the level of literacy skills of Canadians through the use of a test battery of tasks of varying complexity.[11] Table 6 is taken from the Statistics Canada Literacy Survey of 1989.

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[11]The Southam survey of 1986 was followed by Statistics Canada (1989). The basic idea of these surveys is to assess the ability of a person to use literacy skills in real-life situations. In these survey instruments, ability in reading forms is assessed (for example) by showing respondents a bus schedule and asking them to state when the last bus leaves point X that will get them to Y by a specified time. Literary comprehension may be tested by questioning respondents about the contents of a newspaper article. Numeric skills may be assessed in realistic situations such as the totalling of a bill, plus tax, from a restaurant menu. The objective is to measure the ability of individuals to use written information in real-life contexts.

TABLE 6

LITERACY SKILLS - CANADA AND NOVA SCOTIA

	ALL AGES		OVER 35		AGE 16-34			
	Canada	N.S.	Canada	N.S.	Canada	All N.S.	Rural N.S.	Urban N.S.
% Level 1	7	5	8	6	1	2	2	1
% Level 2	9	10	13	16	5	4	5	4
% Level 3	22	28	24	31	20	23	23	24
% Level 4	62	57	53	46	73	71	70	71

Level 1 - Canadians at this level have difficulty dealing with printed materials. They most likely identify themselves as people who cannot read.

Level 2 - Canadians at this level can use printed materials only for limited purposes such as finding a familiar word in a simple text. They would likely recognize themselves as having difficulties with common reading materials.

Level 3 - Canadians at this level can use reading materials in a variety of situations provided the material is kept simple, clearly laid out and the tasks involved are not too complex. While these people generally do not see themselves as having major reading difficulties, they tend to avoid situations requiring reading.

Level 4 - Canadians at this level meet most everyday reading demands. This is a large and diverse group which exhibits a wide range of reading skills.

Source: Statistics Canada, special tabulation from "Survey of Literacy Skills Used in Daily Activity" (1989).

Given the dramatic increase in school retention rates, it is not surprising that there is a very significant difference between the prevalence of low literacy among older Canadians and among younger cohorts. It may, however, be somewhat surprising that there is essentially no difference between Nova Scotia and Canada as a whole in the percentage of the population in the two lowest literacy skill categories, and only a small difference in the percentage in Category 3.

Clearly, Table 6 indicates that the problem of low literacy skills is much more acute among the over 35 age cohort than among younger Canadians - the current performance of the school system in delivering literacy skills is much superior to its past performance. Among Canadians aged over 35, 21% either cannot read or have difficulty with common reading materials -- but less than one third of this number (6%) of Canadians aged 16-34 are reading at similarly low levels. Whether or not it is acceptable to continue to have 6% of younger cohorts reading at very low levels must be assessed relative to the demands of society and the labour market for literacy skills - and one must remember that even in a very "high tech" world, a few jobs still demand little by way of reading skills.

This paper avoids categorical statements such as "X% of Canadians are illiterate". The issue, for functional literacy, is whether or not an individual has the level of literacy needed to solve the problems actually encountered in his or her own daily life. Without reference to the need for literacy skills, it makes no sense to talk of "illiteracy". Those people who have found niches in the labour force which do not depend much on written communication, or who have retired, may not possess the ability to decode complex written text -- but this fact may also not cause them much of a problem in daily life in the workplace.

It is essential to distinguish between the literacy problems of Canada's youth and the literacy problems of its older population. Problems of low literacy skills are concentrated among

people who had relatively few years of education and who have been out of school for many years. In some sectors of the labour market, limited literacy skills are not always a barrier to continued employment. People may need to get help occasionally with written instructions but, as long as they do so, they can cope. The social problem of literacy is, however, more pressing for workers at risk of job loss because their lack of literacy will create future problems in locating a replacement job. For those who have to adapt to significant technical change, lack of literacy is a problem of the present, since both productivity and safety depend on being able to understand the manuals, and the principles of operation, of new equipment.

3.2 International Comparisons

The Canadian educational system produces illiterates and it also produces research scientists who compete successfully with the world's best. The ambiguity and complexity of discussions of the overall "quality" of the educational system is illustrated by the fact that the debate on "quality" sometimes focuses on "illiteracy" -- the skills (or lack of) of the bottom part of the educational distribution -- while at other times it emphasizes the problems of the top end of the distribution. Although the direct employment of research scientists will always be a relatively small percentage of the labour force, this does not mean that the post-graduate university sector is unimportant, just that its influence on total employment levels is indirect. In the long run, Canada needs an internationally competitive research effort if Canadian firms are going to tap into rapidly changing developments at the frontiers of science. Since Canada is a relatively small country, (of which Nova Scotia is a small part) and since the expansion of scientific knowledge is occurring world-wide, the big issue for economic development is not how much new knowledge is discovered here, but rather how much of the world's new knowledge Canadians can put to work. If Canada has only a small percentage of the world's scientists, it is unreasonable to expect

Canada to produce a large percentage of the world's research results. But although Canadian scientists may only produce 4% of the world's new knowledge, Canadian industry also needs access to the other 96%.

Access to the world's knowledge depends crucially on the presence, in Canada, of first-rate scientists who know what is going on at the frontiers of science and who can evaluate its significance. It is rarely possible to jump directly from a scientific discovery to the complex, practical realities of producing and marketing a new commodity -- a long process of adaptation and engineering is invariably essential. In order to choose the technologies which have a chance of eventual success, and in order to make them a success, a sophisticated familiarity with the problems and potentials of the underlying science is needed. Such familiarity cannot, in practice, be expected to come from spectators in the world of research -- hence basic research in Canada is crucial both for its results and for the access it brings to research results developed elsewhere.

Although there are a variety of paths for the development of new technology, the big issue, in economic terms, is the rate of adaptation and diffusion of new technology. This process of diffusion of advanced technology throughout the economy depends on both a local research community which operates at the highest international levels of expertise and a broad base of technological competency which is able to absorb continual innovations in production technology. Firms need a few research scientists but they need many skilled technicians to take a new idea from the laboratory to low-cost, high quality production.

For this reason, this paper emphasizes the simultaneous importance of a broad base and a high peak in science achievement. And Canadians should recognize that a major strength of the Canadian educational/training system is the broad base of exposure it provides to Canadian youth

in upper level secondary science education. Table 8 presents comparative data on science achievement among senior high school students in the early 1980's. Columns 1 to 4 are included in order to make the point that, in Canada, a substantially higher fraction of youth remain in school, compared to most other countries. The United States is the only country with a higher rate of school retention than Canada, but because many other softer options in high school education are available, the percentage of 17/18 year-olds who take advanced secondary school chemistry or physics is dramatically lower in the U.S. than the percentage of Canadian youth taking these courses. Indeed, columns 1 to 4 not only indicate a major strength of Canada's education system, they also go a long way to explaining the differences in average test results revealed in columns 5 to 7 -- highly selective school systems (such as England or Singapore) can achieve higher average test scores because of greater selectivity, but the cost of a high average test score among the elite 5% who take upper level chemistry (as in England) is greater ignorance of chemistry among the 95% who have been weeded out.

The International Assessment of Educational Progress project has also tested thirteen and nine year olds in science and mathematics. At these earlier age levels, there is less variation in school attendance rates, hence "creaming" does not inflate the test scores of highly selective systems. At this level, Canadian test scores are quite similar to those of most countries, but "average percentage correct" lags behind the achievement levels of Korea and Taiwan. Since almost everyone is still in school at age 13, comparisons of average education quality at that age are particularly relevant. In tests of science knowledge among thirteen-year-olds, Korean students scored highest in international comparisons -- their average score was 13% higher than Nova Scotia students.

There is a considerable debate as to whether these differentials represent differences in the quality of education and thinking skills, or differences in the acquisition of the type of knowledge which can be easily tested for in multiple choice examinations.[12] In the test of science knowledge, 69% correct was the average score for 13 year olds in both Nova Scotia and in Canada as a whole, which compares closely with 68% in Scotland, 69% in France, 67% in the U.S. and 71% in the Soviet Union -- but lags behind the 76% score in Taiwan and 78% score in Korea.

An "average" score is not good enough. Canadians have become accustomed to earning wages which are well above the international average wage, and if we expect this fortunate situation to continue, Canadians will have to offer skills which are similarly above the international average. However, achievement scores at ages nine and thirteen are primarily useful as internal diagnostics for the educational system -- from the point of view of the labour market, the important issue is the skills and attitudes which students have when they leave school. The educational system is succeeding in reaching a relatively high fraction of youth with upper level secondary school courses in mathematics and science. Continual improvement in the delivery of these courses is essential, but reforms which increased the selectivity of mathematics and science education would defeat the objective of a broad base of technological competency.

As well, another implication of Table 6 is that it indicates that the Canadian system of education has delivered roughly similar literacy outcomes in both rural and urban areas and in both rich and poor provinces.[13] Sitting behind the delivery of schooling is the system of inter-governmental fiscal transfers that finances expenditures on schooling. Nova Scotia has the

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[12]Another issue is whether test scores accurately indicate whether such knowledge can be scored as a cardinal or ordinal number.

[13]There is a wide variation in individual schools test scores on grade 12 achievement, but one finds small rural high schools at both the top and the bottom of the distribution of test scores.

resources to spend money on schooling its citizens because, in part, of the system of equalization grants from the federal government which brings the revenues of the Nova Scotia government in line with the revenues of richer provinces. Rural counties within Nova Scotia have greater resources to spend on schools because equalization grants within Nova Scotia mean they do not have to depend entirely on tax revenue from the local property tax base. Both in literacy attainment and in the levels of high school retention and university attendance previously discussed, poorer areas of Canada have been able to deliver an important amount of equality of opportunity - and it is hard to see how that would have been possible without money.

Tables 7 and 8 compare the average test scores achieved by Canadian and other students in international comparison tests of achievement in specific disciplines, conducted as part of the International Assessment of Educational Progress project. It is comparisons such as these which are often cited as evidence that Canadian schools are doing poorly, but one must reiterate that simply reading down the columns of average scores begs the questions of which aspects of curriculum mastery are important, and ignores the issue of how to summarize the distribution of educational quality among the population. Furthermore, Tables 7 and 8 represent measurements taken at different ages, and school systems differ greatly in their degree of selectivity.

TABLE 7
Ages, Participation Rates and Test Scores

			Percentage of age group taking course			Mean test score		
	Percentage in school	Mean age	Biology	Chemistry	Physics	Biology	Chemistry	Physics
Australia	39	17	18	12	11	48.2	46.6	48.5
Canada (English)	71	18	28	25	19	45.9	36.9	39.6
England	20	18	4	5	6	63.4	69.5	58.3
Finland	45(63)*	18	45	14	14	51.9	33.3	37.9
Hong Kong	20	18	7	14	14	50.8	64.4	59.3
Hungary	18(40)*	18	3	1	4	59.7	47.7	56.5
Italy	52	19	14	2	19	42.3	38.0	28.0
Japan	63	18	12	16	11	46.2	51.9	56.1
Norway	40	18	10	15	24	54.8	41.9	52.8
Poland	28	18	9	9	9	56.9	44.6	51.5
Singapore	17	18	3	5	7	66.8	66.1	54.9
Sweden	15(30)*	19	15	15	15	48.5	40.0	44.8
U.S.A.	90	17	6	1	1	37.9	37.7	45.5

* The figures in parentheses include students in vocational or similar streams which were not sampled

Sources: R.K. Crocker, Science Achievement in Canadian Schools: National and International Comparisons, Economic Council of Canada, 1990, Ottawa (p. 27).
I.E.A., Science Achievement in Seventeen Countries, Pergamon Press, Oxford, 1990, pages 51-53.

TABLE 8
Mathematics and Science Achievement Average Test Scores
Among 13 Year Olds

Country	Mathematics	Science	Canadian Provinces	Mathematics	Science
Korea	73 (0.6)	78 (0.5)	Quebec French-speaking schools	69 (0.7)	71 (0.5)
Taiwan	73 (0.7)	76 (0.4)	Saskatchewan French-speaking schools	68 (1.0)	65 (0.8)
Switzerland 15 cantons	71 (1.3)	74 (0.9)	British Columbia	66 (0.7)	72 (0.5)
Soviet Union Russian-speaking schools in 14 Republics	70 (1.0)	71 (1.0)	Quebec English-speaking schools	66 (0.9)	69 (0.5)
Hungary	68 (0.8)	73 (0.5)	Alberta	64 (0.7)	74 (0.4)
France	64 (0.8)	69 (0.6)	Manitoba French-speaking schools	63 (0.6)	67 (0.7)
Emilia-Romagna, Italy	64 (0.9)	70 (0.7)	Saskatchewan English-speaking schools	62 (0.7)	70 (0.6)
Israel Hebrew-speaking schools	63 (0.8)	70 (0.7)	New Brunswick (French-speaking schools)	61 (0.4)	64 (0.3)
Canada	62 (0.6)	69 (0.4)	Nova Scotia	60 (0.6)	69 (0.4)
Scotland	61 (0.9)	68 (0.6)	Newfoundland	59 (0.6)	66 (0.5)
Ireland	61 (0.9)	63 (0.6)	Ontario (English-speaking schools)	58 (0.8)	67 (0.6)
Slovenia	57 (0.8)	70 (0.5)	Manitoba (English-speaking schools)	58 (0.8)	69 (0.6)
Spain Spanish-speaking schools except in Cataluña	55 (0.8)	68 (0.6)	New Brunswick English-speaking schools	58 (0.5)	66 (0.4)
United States	55 (1.0)	67 (1.0)	Ontario French-speaking schools)	53 (0.6)	60 (0.5)
Jordan	40 (1.0)	57 (0.7)			

Sources: (1) Learning Mathematics pp. 18/19. International Assessment of Educational Progress, Educational Testing Service, New Jersey, 1992.
(2) Learning Science pp. 18/19. International Assessment of Educational Progress, Educational Testing Service, New Jersey, 1992.

These issues interact because the educational system has to fill the needs of the entire spectrum of occupations of the modern labour market - and the adequacy of its performance at one level interacts with the adequacy with which it will be able to succeed at other levels. The educational system has to produce both PhD level research scientists and technicians - Canada's ability to compete internationally depends on both, but there is a subtle balance to be struck in how the educational system is oriented to each type of student.

In many ways, the structure of the Canadian system is a very "forgiving" one - students can mess up at a number of grade levels and still get another chance to come back. There are few irretrievable decisions made about children at early ages which good performance at a later age cannot reverse - and this structure contrasts with many systems which stream children at fairly early ages. Although this makes teachers at the upper levels work harder in order to produce a final "product" of comparable quality, harder work for teachers is not such a bad thing. From a societal point of view, there is every reason to insist that the final products of the educational system meet or exceed international norms, but there is no reason that the system should be organized such that senior level teachers have a more pleasant and easier life because they only have to deal with the best students.

4.0 Educational Reform

In the 1950's and 1960's, school children sat in rows, and were expected to remain silent in class. In those days, the emphasis was on working individually on such tasks as the memorization of multiplication tables, the acquisition of good penmanship and the learning of large amounts of factual material. Educational reforms since then have emphasized the development of skills, especially social and research skills, rather than the memorization of facts. At the Primary level, school classrooms in the 1990's are usually arranged in clusters of desks, where students are expected to work in teams on group projects -- there is an entirely new emphasis on social interaction skills and on group problem solving. In secondary schools, there is an increasing questioning of the disciplinary boundaries in science and experimentation with new, inter-disciplinary, "problem oriented" curricula. At the university level, there is continual change in the content of courses and increasing use of cooperative education models.

The educational system has, in other words, been busy reforming itself. The broader social concern over "reform" arises not because of the lack of change in education but because of concern with the type of change, or the fact of change itself. But, before Canadians with these concerns demand of their governments that different changes be instituted, one should think about what educational reform can, and cannot, be expected to achieve.

Firstly, of course, reform imposed by political fiat is unlikely to be successful. Reforms which are "dropped from the top" are generally not likely to succeed, in practice. Even in a relatively small province, the educational system is far larger, and far more complex, than the largest private sector firms. Yet even in these smaller, much more focused private sector firms, it

is, in practice, essential to enlist the active cooperation and the creative energies of all levels of the organizational hierarchy if organizational change is to be significant and lasting.

Once the classroom door closes, it is not very easy to monitor what is really happening in education. Teachers who buy into the need for change can be very innovative, and motivated teachers can effectively customize educational reforms to suit the needs/abilities of their individual students -- but if teachers are not convinced of educational reforms, attempts to bludgeon them into compliance [e.g., with external tests and sanctions] are likely to produce "teaching to test" and minimal effort/involvement. In education, the active cooperation of teachers and principals in reforms is essential, both because of the multiplicity of objectives which the education system is expected to attain and because the individual classroom teacher in fact controls the process and knows a lot about the needs, attitudes and abilities of individual students.

It is also important to recognize that although educational reforms, if well thought out, can have major benefits in the long run, such reforms cannot hope to provide a "quick fix" for Canada's economic problems. Given the complexity of the educational system, it will inevitably take time to think through the innovations required in education, to design new curricula to implement these ideas and to train teachers in their delivery. However, even if the best possible educational system in the world could be implemented in time for next year's opening of school, such reforms would take decades before they could possibly have a major impact on the average quality of the Canadian labour force.

In Nova Scotia, for example, the number of people enroled in Grade 12 in recent years has been about 2 1/2% of the labour force. If the world's best educational system was put in place next year for the entire primary and secondary educational system, next year's graduates would

have one-twelfth of their education under the new system, the benefit of a new system would be the difference between its quality, and the quality of the current system. For the purposes of illustration, one might assume that the best possible educational system could eventually increase achievement levels by 15 percent -- the average differential between Canada and Korea in science and math.

In phasing in a new educational system, one always has the problem that one has to prepare students for the tasks they will encounter at each stage -- there is no point in asking a Grade 10 student to do calculus if they have not had algebra earlier. However, even if one ignores the problem of sequencing and assumes that the impact of educational reforms is proportional to the time spent in the reformed system, in the first year after reform, graduates would only have had one-twelfth of their education under the new system. Hence the impact on their average skill level would be about 1.25% (i.e. 15% divided by 12). The impact of educational reforms on the skills of graduates clearly increases over time, since graduates two years from now will have had two years exposure to the new system, etc., but it would take a full twelve years before grade 12 graduates have experienced the full impact of educational reforms (i.e. 15%).

The "bottom line" is that reforms to primary and secondary education can only have slow impacts on the quality of the labour force. Even if, next year, an educational system could be put in place which immediately increased the average quality of Canadian primary and secondary education by 15%, 12 years from now this reform would only have affected the 30% of the labour force who graduate in these dozen years. The average impact on graduates (given that most of these people are already in school) would be an improvement of 7.5% -- i.e. the impact on the

average quality of the labour force as a whole would be an improvement of 2.25%. [In addition, since most high school graduates do not directly enter the labour force, the impact of reforms would be delayed by the amount of time spent in post-secondary education and the degree to which the post secondary system makes up for the failings of earlier years.]

This is not an argument against educational reform -- but it is an argument against the expectation that educational reform can provide quick fix, miracle cures for the current problems of the Canadian economy. It is essential for the long-run health of the Canadian economy, and the long-run quality of life in Canadian society, that Canadian students receive an education which is just as good, and preferably better, than that provided anywhere else in the world. Section 2 of this essay has argued that education does pay off, in economic terms. Investments in education will yield a return, both socially and economically, for many decades to come. A failure to invest in educational reform will mean that Canada will inevitably lose its ability to compete in the knowledge intensive industries of the future. However, it should be recognized that investment in education is investment for the long term. Since it is simply not arithmetically possible for reforms to primary and secondary education to have a huge impact on the average productivity of the Canadian labour force within the next decade, Canadians should not turn in disillusionment away from educational reform when it fails to provide immediate solutions to the current problems of the Canadian economy.

It is also essential to recognize the substantial strengths of Canada's existing educational system. A clear recognition of the strengths of the existing system is necessary if one is to focus attention, and resources, on areas of weakness. Canada cannot afford (even if it were possible) to

reform every aspect of its educational system and it would not be desirable to do so, since it is essential to retain the strengths of the system which we now have.

Throughout the 1980's, the real cost of post-secondary education in Canada remained heavily subsidized by government. With relatively low tuition fees, (at least by US standards) the cash cost of continued education remained manageable. Canadian students also realized that, with high unemployment, they were not giving up much in the job market if they continued in school -- hence the participation rate in post-secondary education has increased steadily, unlike the U.S. situation.

In the "Information Economy" age, one of Canada's real strengths is, therefore, the relatively high level of accessibility of the Canadian post-secondary education system. In the 1980's, this accessibility enabled the supply of university graduates to keep up with increasing demand for high level skills, thereby preventing the widening of earnings differentials. In the recession of the early 1990's, the accessibility of the post-secondary education system has, in effect, enabled many people who would otherwise have been unemployed to invest in their human capital. As they graduate into a high unemployment labour market, they find real difficulties in locating jobs and they displace high school graduates from jobs. Although high unemployment means that many of the graduates of post-secondary educational institutions do not now use all the skills they have learned, those skills are available, if and when economic growth resumes.

Up to this point we have not really examined what it is about education that is socially valuable. Statistical evidence, such as Table 4 or 5, indicates that educational attainment yields economic advantages, but in these regressions, education is a "black box" -- the statistical correlation of years of education and higher earnings cannot reveal why years of education is

economically productive. Furthermore, in thinking about what aspects of education are economically and socially productive, one must remember that it is the future labour market which is important.

Using currently available data, one could in principle assess which aspects of education are now associated with higher wages or better probabilities of employment. However, [since a student who is now entering Grade 1 can realistically expect to be still in the labour market in the year 2050,] educational planners must attempt to anticipate the future social and economic returns to education, rather than simply examine present data.

Although educational planners may realize that the world of work is changing rapidly and that their job is to anticipate future needs, one often encounters among educational critics a certain nostalgia for "the good old days" and a demand to go "back to basics".

Personally, I am not particularly nostalgic about my primary and secondary education (in Ontario). I remember learning great amounts of material by rote, much of which is now either forgotten or useless. Hours spent colouring in the counties of England or learning lists of English kings' names have yielded no benefit that I can think of. I never could understand the emphasis on penmanship, and although I learned my multiplication tables and was a whiz at spelling bees, I now use computers and the spellchecking program. From kindergarten to Ph.D, I only once engaged in a group project -- perhaps one could say that by training me to work individualistically at the mastery of reams of useless information, my primary and secondary education prepared me well for my current position as a university professor, but most other jobs require substantially more social and practical skills.

Although the school system of the 1950's and 1960's paid little attention to the development of social attitudes and personal skills, personal attitudes like self confidence are really a necessary precondition for further learning and for employment. Furthermore, at the same time as the traditional institutions of socialization -- the family and the Church -- are less able to fulfil their traditional roles, teamwork on the job and effective interpersonal skills are becoming increasingly important to employers.

A persistent refrain at many high technology companies is the importance of social and communications skills. These skills do not matter much to more traditional employers, but firms that depend on assembly line production and many-layered hierarchies are finding it increasingly difficult to compete. The traditional objectives of ensuring basic literacy and numeracy are not enough for high quality services and high tech manufacturing industry. Organizations emphasizing high quality production demand high-level social skills, as well as cognitive knowledge. To meet the needs of these employers, schools increasingly emphasize non-traditional skills in oral expression, teamwork and research. Since technology is rapidly changing and the workplace is increasingly organized into self-directed teams, these non-traditional skills are becoming more and more crucial. The school system has in fact shifted very substantially, from grade primary through grade 12, in the direction of emphasizing communications, teamwork and learning skills, and it would be a retrograde step to shift its emphasis back to the comfortingly familiar curriculum of the 1950's.

5.0 Conclusions

This essay has argued that there has been dramatic increase in the quantity of education of Canadian youth, and that the increased flow of better educated school leavers is poorly reflected in historic stock figures [which are dominated by poorer achievement in past years]. It has argued that education still pays in higher earnings and less unemployment. And it has emphasized some of the ambiguities involved in assessment of educational quality.

Overall, its is useful to draw a distinction between the general role of education and the specific aims of training. Education can be thought of as a broadening process, whose objectives are the instilling of high-level values (like tolerance or cooperation), the formation of general skills (such as literacy or numeracy), the acquisition of useful habits, (such as dependability or punctuality) and the learning of broadly applicable principles (e.g. how to take a partial derivative in calculus). These are useful to people in a wide variety of contexts, over the whole of their lives, and the increasing complexity of our society has produced a steady escalation of the general skills demanded by the world of work.

For most people, the general education they get early in life has to serve as the basis on which their training, and future retraining, is built. Training aims at providing specific, directly useful skills. It builds on the basic attitudes, such as adaptability to change, and the general skills, such as literacy, which a general education provides. However, because job duties are continually changing, training and retraining is a never-ending process.

The dividing line between education and training is not exact but we draw the distinction in order to make the point that the major problem area for Nova Scotia, and for Canada, is not primarily the educational system, but rather the training system. At the primary and secondary

level of education, Canada's system delivers a broad base of general skills, comparable in quality with that in most other developed countries, and with the significant advantage of a relatively high penetration of science education in the youth population. At the post-secondary level, Canadian colleges and universities compare well internationally in quality. Accessibility has also been a major strength of the Canadian university system, as enrolment rates have continued to increase throughout the 1980's (in contrast to a decline in college participation rates in the United States).

Many of the problems faced by older workers in today's labour market stem from the fact that the Canadian educational system did not always perform so well. Because it was so common for people to drop out of school in the 1950's and 1960's many older workers lack a high school education today. However, the current performance of the educational system is much improved.

A frequent criticism of the education system concerns inadequate writing skills among high school graduates (not in the sense of the writing skills needed to author a book, but rather in the sense of the writing skills needed in business correspondence). There has also been wide-spread concern, primarily among educators, that advanced mathematical skills (such as calculus) are not introduced sufficiently early in the curriculum. Furthermore, it is not good enough for schools in Nova Scotia and in Canada to be "average" in comparison to schools in other countries if Canadians wish to retain above average wage rates in the long term.

These are important issues which need to be faced in improving the quality of the educational system. However, given the large number of people with good general skills who cannot get work in today's labour market, the more pressing issues are (1) job availability and (2) training and retraining. These issues are linked because one cannot expect firms to invest in training their workforce if high unemployment creates a queue of qualified applicants. However,

discussion of the institutions of training and retraining (e.g. apprenticeship programmes, on-the-job training, continuing education, retraining courses, etc.) deserves another paper.

Appendix 1

Table: A1
Least Squares Estimation on the Log of 1990 Income - Females 25 to 54 Years

Variable Names	CANADA Est. Coef. (Std. Err.)	ATLANTIC Est. Coef. (Std. Err.)	QUEBEC Est. Coef. (Std. Err.)	ONTARIO Est. Coef. (Std. Err.)	PRAIRIE Est. Coef. (Std. Err.)	BRITISH COLUMBIA Est. Coef. (Std. Err.)
Intercept	1.699 (0.04)	1.594 (0.05)	1.572 (0.05)	1.647 (0.05)	1.628 (0.05)	1.622 0.05
Dummy=1 if Some Elementary School	-0.168 (0.02)	-0.156 (0.02)	-0.156 (0.02)	-0.155 (0.02)	-0.163 (0.02)	-0.162 0.02
Dummy=1 if Some Secondary School	-0.101 (0.01)	-0.110 (0.01)	-0.110 (0.01)	-0.096 (0.01)	-0.106 (0.01)	-0.011 0.01
Dummy=1 if Some Post-Secondary School	0.093 (0.01)	0.093 (0.01)	0.095 (0.01)	0.099 (0.01)	0.094 (0.01)	0.089 0.01
Dummy=1 if Post-Secondary Certificate or Diploma	0.173 (0.01)	0.152 (0.01)	0.155 (0.01)	0.167 (0.01)	0.153 (0.01)	0.148 0.01
Dummy=1 if University Degree	0.384 (0.01)	0.386 (0.01)	0.379 (0.01)	0.396 (0.01)	0.383 (0.01)	0.377 0.01
Dummy=1 if Trade Certificate or Diploma	0.083 (0.02)	0.072 (0.02)	0.075 (0.02)	0.087 (0.02)	0.074 (0.02)	0.068 0.02
Dummy=1 if 25 to 34 Years of Age	-0.153 (0.01)	-0.295 (0.02)	-0.158 (0.01)	-0.107 (0.01)	-0.184 (0.02)	-0.070 0.02
Dummy=1 if 45 to 54 Years of Age	0.017 (0.01)	0.015 (0.01)	0.015 (0.01)	0.015 (0.01)	0.016 (0.01)	0.015 0.01

Dummy=1 if Covered by Collective Agreement	0.123 (0.01)	0.118 (0.01)	0.117 (0.01)	0.120 (0.01)	0.119 (0.01)	0.118 0.01
Log of Total Hours Worked for All Paid Jobs 90	1.058 (0.00)	1.072 (0.01)	1.072 (0.01)	1.066 (0.01)	1.068 (0.01)	1.068 0.01
Dummy=1 if Married	0.049 (0.01)	0.054 (0.01)	0.059 (0.01)	0.055 (0.01)	0.054 (0.01)	0.054 0.01
Dummy=1 if Primary Ind.	0.256 (0.02)	0.259 (0.02)	0.272 (0.02)	0.247 (0.02)	0.259 (0.02)	0.266 0.02
Dummy=1 if Manufacturing Ind.	0.235 (0.02)	0.247 (0.02)	0.248 (0.02)	0.225 (0.02)	0.239 (0.02)	0.251 0.02
Dummy=1 if Financial Ind.	0.223 (0.02)	0.226 (0.02)	0.233 (0.02)	0.214 (0.02)	0.217 (0.02)	0.227 0.02
Dummy=1 if Social Services Ind.	0.133 (0.02)	0.123 (0.02)	0.139 (0.02)	0.112 (0.02)	0.114 (0.02)	0.124 0.02
Dummy=1 if Trade Ind.	0.064 (0.02)	0.086 (0.02)	0.091 (0.02)	0.065 (0.02)	0.073 (0.02)	0.087 0.02
Dummy=1 if Utilities Ind.	0.287 (0.02)	0.284 (0.02)	0.295 (0.02)	0.265 (0.02)	0.277 (0.02)	0.291 0.02
Dummy=1 if Knowledge Worker	0.174 (0.02)	0.192 (0.02)	0.191 (0.02)	0.184 (0.02)	0.193 (0.02)	0.185 0.02
Dummy=1 if Data Worker	0.115 (0.01)	0.116 (0.01)	0.118 (0.01)	0.113 (0.01)	0.113 (0.01)	0.111 0.01
Dummy=1 if Goods Worker	0.130 (0.01)	0.161 (0.02)	0.157 (0.02)	0.150 (0.02)	0.152 (0.02)	0.153 0.02
Dummy=1 if Disability	-0.060 (0.02)	-0.049 (0.02)	-0.043 (0.02)	-0.050 (0.02)	-0.060 (0.02)	-0.053 0.02

Dummy=1 if French	0.001 (0.01)	0.005 (0.01)	0.007 (0.01)	0.004 (0.01)	0.005 (0.01)	0.004 0.01
Dummy=1 if Other Language	0.000 (0.01)	0.001 (0.01)	0.003 (0.01)	-0.006 (0.01)	0.001 (0.01)	0.001 0.01
Dummy=1 if Visible Minority	-0.139 (0.02)	-0.125 (0.02)	-0.119 (0.02)	-0.145 (0.02)	-0.129 (0.02)	-0.124 0.02
Dummy=1 if Foreign Borne	0.025 (0.01)	0.016 (0.01)	0.019 (0.01)	0.026 (0.01)	0.014 (0.01)	0.015 0.01
Dummy=1 if Participated in Training Prg.	-0.131 (0.04)	-0.193 (0.05)	-0.189 (0.05)	-0.181 (0.05)	-0.195 (0.05)	-0.176 0.05
Dummy=1 if Received Money While Training	0.075 (0.02)	0.103 (0.02)	0.097 (0.02)	0.081 (0.02)	0.100 (0.02)	0.095 0.02
Dummy=1 if Participated in Job Re-entry Prg.	-0.024 (0.07)	-0.099 (0.08)	-0.101 (0.08)	-0.090 (0.08)	-0.075 (0.08)	-0.027 0.07
Dummy=1 if Employed 19 or Less	-0.126 (0.01)	-0.149 (0.01)	-0.139 (0.01)	-0.138 (0.01)	-0.144 (0.01)	-0.145 0.01
Dummy=1 if Employed 100 to 499	0.068 (0.01)	0.072 (0.01)	0.072 (0.01)	0.070 (0.01)	0.073 (0.01)	0.076 0.01
Dummy=1 if Employed 500 of More	0.088 (0.01)	0.086 (0.01)	0.093 (0.01)	0.084 (0.01)	0.085 (0.01)	0.091 0.01
R Sqd	0.8128	0.7868	0.7946	0.7907	0.7897	0.7877
R Sqd Adjusted	0.8124	0.7863	0.7941	0.7902	0.7892	0.7872
F Value	2,301.128	1,558.294	1,592.401	1,573.307	1,617.648	1,490.109
Prob > F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
DF	31	31	31	31	31	31
Date/Page	09/26/93/12	09/26/93/16	09/26/93/20	09/26/93/24	09/26/93/28	09/26/93/32

Run Number	1446	1446	1446	1446	1446	1446

The Base Case:
A non-disabled single, English Speaking Canadian, 35 to 44 years, with positive 1990 income and positive wages from job 1.
with high school, working in a service role for a medium sized employer 20 to 99 persons in the service industry,
not covered by a collective agreement.

Table: A2

Least Squares Estimation on the Log of 1990 Income - Males 25 to 54 Years

Variable Names	CANADA Est. Coef. (Std. Err.)	ATLANTIC Est. Coef. (Std. Err.)	QUEBEC Est. Coef. (Std. Err.)	ONTARIO Est. Coef. (Std. Err.)	PRAIRIE Est. Coef. (Std. Err.)	BRITISH COLUMBIA Est. Coef. (Std. Err.)
Intercept	1.615 (0.04)	1.585 (0.05)	1.543 (0.05)	1.625 (0.05)	1.578 (0.05)	1.606 (0.05)
Dummy=1 if Some Elementary School	-0.168 (0.02)	-0.158 (0.02)	-0.158 (0.02)	-0.164 (0.02)	-0.159 (0.02)	-0.157 (0.02)
Dummy=1 if Some Secondary School	-0.100 (0.01)	-0.107 (0.01)	-0.103 (0.01)	-0.109 (0.01)	-0.109 (0.01)	-0.105 (0.01)
Dummy=1 if Some Post-Secondary School	0.067 (0.01)	0.093 (0.01)	0.097 (0.01)	0.073 (0.01)	0.082 (0.01)	0.092 (0.01)
Dummy=1 if Post-Secondary Certificate or Diploma	0.140 (0.01)	0.147 (0.01)	0.143 (0.01)	0.146 (0.01)	0.143 (0.01)	0.149 (0.01)
Dummy=1 if University Degree	0.340 (0.01)	0.382 (0.01)	0.372 (0.01)	0.365 (0.01)	0.376 (0.01)	0.374 (0.01)
Dummy=1 if Trade Certificate or Diploma	0.053 (0.01)	0.073 (0.02)	0.063 (0.02)	0.064 (0.02)	0.067 (0.02)	0.067 (0.02)
Dummy=1 if 25 to 34 Years of Age	-0.008 (0.01)	-0.160 (0.02)	-0.048 (0.01)	0.020 (0.01)	-0.016 (0.02)	0.063 (0.02)
Dummy=1 if 45 to 54 Years of Age	0.013 (0.01)	0.015 (0.01)	0.014 (0.01)	0.015 (0.01)	0.014 (0.01)	0.014 (0.01)
Dummy=1 if Covered by Collective Agreement	0.117 (0.01)	0.118 (0.01)	0.109 (0.01)	0.118 (0.01)	0.116 (0.01)	0.120 (0.01)

Log of Total Hours Worked for All Paid Jobs 90	1.069 (0.00)	1.073 (0.01)	1.077 (0.01)	1.069 (0.01)	1.075 (0.01)	1.069 (0.01)
Dummy=1 if Married	0.073 (0.01)	0.057 (0.01)	0.069 (0.01)	0.060 (0.01)	0.061 (0.01)	0.060 (0.01)
Dummy=1 if Primary Ind.	0.256 (0.02)	0.257 (0.02)	0.267 (0.02)	0.256 (0.02)	0.260 (0.02)	0.264 (0.02)
Dummy=1 if Manufacturing Ind.	0.236 (0.02)	0.244 (0.02)	0.234 (0.02)	0.241 (0.02)	0.242 (0.02)	0.247 (0.02)
Dummy=1 if Financial Ind.	0.227 (0.02)	0.222 (0.02)	0.232 (0.02)	0.219 (0.02)	0.222 (0.02)	0.229 (0.02)
Dummy=1 if Social Services Ind.	0.117 (0.02)	0.117 (0.02)	0.125 (0.02)	0.113 (0.02)	0.116 (0.02)	0.124 (0.02)
Dummy=1 if Trade Ind.	0.109 (0.02)	0.088 (0.02)	0.085 (0.02)	0.104 (0.02)	0.087 (0.02)	0.094 (0.02)
Dummy=1 if Utilities Ind.	0.254 (0.02)	0.274 (0.02)	0.278 (0.02)	0.022 (0.02)	0.276 (0.02)	0.274 (0.02)
Dummy=1 if Knowledge Worker	0.199 (0.02)	0.191 (0.02)	0.192 (0.02)	0.019 (0.02)	0.183 (0.02)	0.196 (0.02)
Dummy=1 if Data Worker	0.116 (0.01)	0.113 (0.01)	0.114 (0.01)	0.119 (0.01)	0.115 (0.01)	0.113 (0.01)
Dummy=1 if Goods Worker	0.148 (0.01)	0.158 (0.02)	0.159 (0.02)	0.156 (0.02)	0.155 (0.02)	0.165 (0.02)
Dummy=1 if Disability	-0.054 (0.02)	-0.051 (0.02)	-0.049 (0.02)	-0.049 (0.02)	-0.049 (0.02)	-0.050 (0.02)
Dummy=1 if French	-0.010 (0.01)	0.004 (0.01)	0.011 (0.01)	-0.001 (0.01)	0.004 (0.01)	0.003 (0.01)

Dummy=1 if Other Language	-0.015 (0.01)	0.000 (0.01)	-0.009 (0.01)	-0.002 (0.01)	-0.006 (0.01)	0.000 (0.01)
Dummy=1 if Visible Minority	-0.140 (0.02)	-0.124 (0.02)	-0.138 (0.02)	-0.123 (0.02)	-0.133 (0.02)	-0.129 (0.02)
Dummy=1 if Foreign Borne	0.012 (0.01)	0.015 (0.010	0.017 (0.01)	0.004 (0.01)	0.021 (0.01)	0.020 (0.01)
Dummy=1 if Participated in Training Prg.	-0.180 (0.04)	-0.205 (0.05)	-0.199 (0.05)	-0.211 (0.05)	-0.200 (0.05)	-0.191 (0.05)
Dummy=1 if Received Money While Training	0.102 (0.02)	0.097 (0.02)	0.114 (0.02)	0.095 (0.02)	0.093 (0.02)	0.103 (0.02)
Dummy=1 if Participated in Job Re-entry Prg.	-0.020 (0.07)	-0.092 (0.08)	-0.090 (0.08)	-0.024 (0.08)	-0.096 (0.08)	-0.095 (0.08)
Dummy=1 if Employed 19 or Less	-0.129 (0.01)	-0.144 (0.01)	-0.136 (0.01)	-0.146 (0.01)	-0.148 (0.01)	-0.144 (0.01)
Dummy=1 if Employed 100 to 499	0.066 (0.01)	0.075 (0.01)	0.076 (0.01)	0.064 (0.01)	0.072 (0.01)	0.073 (0.01)
Dummy=1 if Employed 500 of More	0.102 (0.01)	0.089 (0.01)	0.101 (0.01)	0.086 (0.01)	0.091 (0.01)	0.087 (0.01)
R Sqd	0.7813	0.7796	0.7829	0.7771	0.7807	0.7835
R Sqd Adjusted	0.7809	0.7791	0.7823	0.7766	0.7802	0.7829
F Value	1,916.582	1,498.983	1,500.766	1,453.778	1,525.672	1,460.068
Prob > F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
DF	31	31	31	31	31	31

The Base Case:

A non-disabled single, English Speaking Canadian, 35 to 44 years, with positive 1990 income and positive wages from job 1.
with high school, working in a service role for a medium sized employer 20 to 99 persons in the service industry,
not covered by a collective agreement.

Table: A3
Probability of Unemployment, 1990

Variable Names	Canada Males 25 to 54 Years	Females 25 to 54 Years	Atlantic Males 25 to 54 Years	Females 25 to 54 Years
Education Variables				
Intercept	-0.388 (0.019)	-1.035 (0.013)	-1.811 (0.069)	-1.647 (0.045)
-Dummy=1 if Some Elementary School	0.315 (0.006)	0.181 (0.008)	0.270 (0.019)	0.237 (0.023)
Dummy=1 if Some Secondary School	0.319 (0.005)	0.077 (0.005)	0.311 (0.016)	0.004 (0.017)
Dummy=1 if Some Post-Secondary Education	0.226 (0.006)	0.072 (0.006)	-0.085 (0.022)	-0.345 (0.025)
Dummy=1 if Post-Secondary Certificate/Diploma	-0.229 (0.006)	0.059 (0.005)	-0.335 (0.021)	-0.168 (0.017)
Dummy=1 if University Degree	-0.377 (0.006)	-0.301 (0.006)	-0.297 (0.024)	-0.293 (0.021)
Dummy=1 if Trade Certificate/Diploma	0.122 (0.006)	-0.271 (0.009)	0.144 (0.019)	0.183 (0.020)
Experience Variables				
Dummy=1 if 25 to 34 Years	0.179 (0.004)	0.224 (0.004)	0.151 (0.012)	0.210 (0.012)
Dummy=1 if 45 to 54 Years	-0.037 (0.005)	-0.072 (0.005)	-0.273 (0.015)	-0.249 (0.016)
Other Control Variables				

Dummy=1 if Covered by a Collective Agreement	-0.009 (0.004)	-0.259 (0.004)	-0.268 (0.013)	-0.428 (0.014)
Dummy=1 if Married	-0.429 (0.004)	-0.123 (0.004)	-0.411 (0.013)	0.253 (0.014)
Dummy=1 if Primary Ind.	0.136 (0.008)	-0.284 (0.009)	0.295 (0.028)	-0.195 (0.025)
Dummy=1 if Manufacturing Ind.	-0.388 (0.009)	-0.106 (0.008)	-0.358 (0.031)	-0.762 (0.034)
Dummy=1 if Financial Ind.	-0.690 (0.009)	-0.328 (0.007)	-0.252 (0.030)	-0.814 (0.023)
Dummy=1 if Social Services Ind.	-0.878 (0.010)	-0.438 (0.007)	-0.587 (0.033)	-0.353 (0.019)
Dummy=1 if Trade Ind.	-0.573 (0.009)	-0.425 (0.007)	-0.612 (0.030)	-0.622 (0.022)
Dummy=1 if Utility Ind.	-0.766 (0.009)	-0.463 (0.010)	-0.871 (0.032)	-0.782 (0.036)
Dummy=1 if Knowledge Worker	0.012 (0.010)	0.089 (0.009)	0.341 (0.030)	-0.052 (0.032)
Dummy=1 if Data Worker	0.131 (0.008)	-0.049 (0.006)	-0.171 (0.026)	-0.151 (0.018)
Dummy=1 if Goods Worker	0.563 (0.008)	0.765 (0.008)	0.534 (0.025)	0.756 (0.024)
Dummy=1 if Have disability	0.234 (0.007)	0.341 (0.008)	0.345 (0.026)	-0.103 (0.028)
Dummy=1 if French	-0.127 (0.006)	0.069 (0.006)	0.234 (0.014)	0.147 (0.015)

Dummy=1 if Other Language	-0.281 (0.006)	-0.044 (0.006)	-2.305 (0.141)	-0.685 (0.064)
Dummy=1 if Visible Minority	0.348 (0.007)	0.155 (0.007)	-0.201 (0.073)	0.618 (0.049)
Dummy=1 if Employed 19 or Less	0.495 (0.005)	0.176 (0.005)	0.387 (0.014)	0.127 (0.015)
Dummy=1 if Employed 100 to 499	-0.035 (0.006)	-0.087 (0.006)	-0.198 (0.019)	-0.540 (0.020)
Dummy=1 if Employed Over 500	-0.340 (0.005)	-0.321 (0.005)	-0.788 (0.016)	-0.247 (0.016)
Dummy=1 if Atlantic	0.552 (0.006)	0.761 (0.006)		
Dummy=1 if Quebec	0.543 (0.006)	0.384 (0.006)		
Dummy=1 if Prairie	0.141 (0.005)	0.099 (0.005)		
Dummy=1 if British Columbia	0.299 (0.005)	0.244 (0.006)		
Log of Weeks Worked	-0.381 (0.004)	-0.234 (0.003)	0.220 (0.016)	0.180 (0.011)
Observations	10873	10191	2655	2437
Date	10/27/1993/7	10/27/1993/11	10/27/1993/15	10/27/1993/18
Run Number	1099	1099	1099	1099

Table: A4
Earnings Determination 1980 And 1990

Variable Names	Canadian Males 16 To 69 Years		Canadian Females 16 To 69 Years		Full Model, 1990 25 To 54 Years	
Education Variables	1980	1990	1980	1990	Males	Females
Intercept	5.660 (0.070)	5.845 (0.039)	4.800 (0.070)	4.997 (0.043)	2.122 (0.054)	1.818 0.040
Dummy=1 if 0 to 8 Years of School *(Dummy=1 if Some Elementary School)*	-0.159 (0.024)	-0.201 (0.021)	-0.186 (0.035)	-0.363 (0.032)	-0.155 (0.018)	-0.185 0.021
Dummy=1 if 9 to 11 Years of Education *(Dummy=1 if Some Secondary Education)*	-0.120 (0.021)	-0.109 (0.015)	-0.170 (0.027)	-0.200 (0.019)	-0.086 (0.012)	-0.084 0.013
Dummy=1 if Some Post-Secondary Education		-0.023 (0.016)		0.002 (0.019)	0.045 (0.014)	0.051 0.014
Dummy=1 if No Cert/Dip or Cert/Dip Below Bachelor Deg.	0.113 (0.025)		0.256 (0.032)			
Dummy=1 if Post-Secondary Certificate/Diploma		0.076 (0.015)		0.216 (0.017)	0.106 (0.012)	0.174 0.011
Dummy=1 if University Degree *(Dummy=1 if Bachelor Degree)*	0.297 (0.026)	0.191 (0.015)	0.478 (0.036)	0.406 (0.018)	0.247 (0.013)	0.370 0.012
Dummy=1 if Degree Beyond Bachelors Level	0.402 (0.031)		0.602 (0.052)			

Dummy=1 if Trade Certificate/Diploma	0.059 (0.019)	0.053 (0.021)	0.101 (0.025)	0.077 (0.030)	0.054 (0.016)	0.059 0.020
<u>Experience Variables</u> Dummy=1 if 16 to 19 Years		-0.965 (0.018)		-0.508 (0.022)		
Dummy=1 if 20 to 24 Years		-0.482 (0.016)		-0.177 (0.019)		
Dummy=1 if 25 to 34 Years		-0.159 (0.013)		-0.043 (0.015)	-0.113 (0.009)	-0.035 0.008
Dummy=1 if 45 to 54 Years		0.012 (0.015)		-0.025 (0.019)	0.024 (0.010)	-0.023 0.010
Dummy=1 if 55 to 64 Years		-0.080 (0.020)		-0.187 (0.027)		
Dummy=1 if 65 to 69 Years		-0.896 (0.063)		-0.736 (0.081)		
T (=agewflp-school-5)	0.049 (0.002)		0.017 (0.003)			
T Squared	-0.001 (0.000)		0.000 (0.070)			
<u>Region Variables</u> Dummy=1 if Atlantic	-0.156 (0.026)	-0.167 (0.018)	-0.091 (0.037)	-0.173 (0.023)	-0.202 (0.015)	-0.200 0.015
Dummy=1 if Quebec	-0.020 (0.016)	-0.081 (0.012)	0.126 (0.023)	-0.059 (0.015)	-0.051 (0.014)	-0.041 0.014
Dummy=1 if Prairie	0.010 (0.018)	-0.072 (0.014)	-0.010 (0.025)	-0.150 (0.017)	-0.051 (0.012)	-0.081 0.011

Dummy=1 if British Columbia	0.065 (0.021)	0.031 (0.015)	0.112 (0.029)	-0.037 (0.019)	0.053 (0.013)	0.003 0.013
<u>Other Control Variables</u> Dummy=1 if Covered by a Collective Agreement					0.082 (0.009)	0.136 0.009
Log of Hours					1.022 (0.006)	1.039 0.005
Log of Weeks	0.921 (0.018)	1.173 (0.009)	1.070 (0.074)	1.222 (0.010)		
Dummy=1 if Married					0.120 (0.010)	0.001 0.009
Dummy=1 if Primary Ind.					0.264 (0.023)	0.156 0.021
Dummy=1 if Manufacturing Ind.					0.244 (0.023)	0.152 0.020
Dummy=1 if Financial Ind.					0.256 (0.022)	0.157 0.016
Dummy=1 if Social Services Ind.					0.101 (0.024)	0.150 0.016
Dummy=1 if Trade Ind.					0.148 (0.023)	-0.025 0.017
Dummy=1 if Utility Ind.					0.242 (0.024)	0.209 0.022
Dummy=1 if Knowledge Worker					0.148 (0.019)	0.215 0.020
Dummy=1 if Data Worker					0.118 (0.017)	0.182 0.014

Dummy=1 if Goods Worker					0.069 (0.017)	-0.009 0.019
Dummy=1 if Have disability					-0.100 (0.019)	-0.043 0.018
Dummy=1 if Visible Minority					-0.166 (0.016)	-0.113 0.015
Dummy=1 if French					0.009 (0.014)	0.002 0.014
Dummy=1 if Employed 19 or Less					-0.090 (0.013)	-0.111 0.012
Dummy=1 if Employed 100 to 499					0.075 (0.013)	0.042 0.013
Dummy=1 if Employed Over 500					0.122 (0.011)	0.051 0.011
R-Square		0.6346		0.5679	0.7451	0.8552
R-Square Adj	0.33	0.6342	0.42	0.5674	0.7444	0.8548
Observations	9501	15747	6407	10191	10873	10191
Prob>F		0.0001		0.0001	0.0001	0.0001
F-Value	360.7	1606.635	358.1	1110.069	1056.481	2000.429
Date		10/23/1993/4		10/23/1993/6	10/24/1993/6	10/24/1993/9
Run Number		815		815	976	976

Base Case: A non-minority English Speaking high school graduate without any disabilities, aged 35 to 44 years, employed in the service industry, in a service job for a medium sized employer (20 to 99 persons employed).

Source for 1980 regressions:
See page 60 of Lars Osberg, Edward N. Wolf and William J. Baumol's
The Information Economy: The Implications Of Unbalanced Growth,
The Institute for Research on Public Policy, Canada, 1989

Table: A4A
Earnings Determination 1990

Variable Names	Atlantic Region Males 16 To 69 Years	Atlantic Region Females 16 To 69 Years	Atlantic Region Full Model, 1990 25 To 54 Years	
Education Variables	1990	1990	Males	Females
Intercept	5.865 (0.075)	5.029 (0.073)	2.041 (0.122)	1.646 (0.079)
Dummy=1 if 0 to 8 Years of School *(Dummy=1 if Some Elementary School)*	-0.195 (0.040)	-0.190 (0.054)	-0.187 (0.034)	-0.117 (0.036)
Dummy=1 if 9 to 11 Years of Education *(Dummy=1 if Some Secondary Education)*	-0.129 (0.030)	-0.170 (0.035)	-0.097 (0.027)	-0.083 (0.024)
Dummy=1 if Some Post-Secondary Education	-0.016 (0.036)	-0.014 (0.041)	0.085 (0.034)	0.027 (0.032)
Dummy=1 if Post-Secondary Certificate/Diploma	0.090 (0.037)	0.287 (0.035)	0.089 (0.031)	0.194 (0.023)
Dummy=1 if University Degree	0.228 (0.036)	0.598 (0.039)	0.299 (0.033)	0.442 (0.026)
Dummy=1 if Trade Certificate/Diploma	0.056 (0.038)	0.150 (0.044)	0.102 (0.030)	0.116 (0.028)
Experience Variables				
Dummy=1 if 16 to 19 Years	-0.897 (0.037)	-0.422 (0.042)		
Dummy=1 if 20 to 24 Years	-0.521 (0.033)	-0.120 (0.035)		

Dummy=1 if 25 to 34 Years	-0.164 (0.027)	-0.003 (0.030)	-0.115 (0.019)	0.000 (0.016)
Dummy=1 if 45 to 54 Years	-0.060 (0.033)	0.024 (0.038)	-0.028 (0.023)	0.028 (0.021)
Dummy=1 if 55 to 64 Years	-0.025 (0.044)	-0.230 (0.059)		
Dummy=1 if 65 to 69 Years	-0.220 (0.199)	-0.455 (0.243)		
Other Control Variables Log Of Weeks	1.116 (0.018)	1.139 (0.018)		
R-Square	0.6414	0.6405	0.7298	0.8762
R-Square Adj	0.6402	0.6391	0.7272	0.8749
Observations	3904	3420	2655	2437
Prob>F	0.0001	0.0001	0.0001	0.0001
F-Value	535.316	466.758	273.059	656.088
Date	10/23/1993/8	10/23/1993/10	10/24/1993/11	10/24/1993/13
Run Number	815	815	976	976
Base Case: A high school graduate, aged 35 to 44 years, employed in the service industry, in a service job.				

Appendix 2

One can think of the skill sets of n students (i = 1 ... n) as being definable over m categories of skills S_j (j = 1 ... m) and measured by some test score T_{ij}.[14] Any statement about "average quality" therefore requires a vector of weights ($\propto_j$). Average test quality, conditional on some vector of weights α is:[15]

[1] $$\bar{T}_{"} = \frac{1}{n} \sum_{i=1}^{n} \sum_{j=1}^{m} {}"_j T_{ij}$$

In general, the measure of average graduate test quality will be sensitive to the weighting of attributes -- i.e. $\bar{r}_{"} \neq \bar{T}_{\$}$

where $$\bar{T}_{\$} = \frac{1}{n} \sum_{i=1}^{n} \sum_{j=1}^{m} \$_j T_{ij}$$

The skills of students at any point in time (S_{ij}) depend on their skills at entry to the school system (S^o_{ij}), school inputs and their personal learning ability. One can summarize learning ability

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[14]Typically, it is known that $T_{ij} = t(S_{ij}) + \epsilon_{ij}$ -- i.e. test measure skills with some error. If E (ϵ_{ij}) = 0, then aggregate test "quality" is measured accurately, but the efficiency of schooling allocation may still depend on the properties of ϵ_{ij}. Although test scores are cardinal numbers, it is not clear that the underlying metric of knowledge can be seen as cardinal, rather than ordinal.

[15]Clearly, if all S_j are perfectly correlated, the problem of weighting is irrelevant. Perhaps this simple case is what some have in mind, but it is far from accurate.

as a production function (making, for now, the gross simplification that all school inputs are aggregated into one imput measure E_i).

[2] $$S_{ij} = l_{ij}(S^o_{ij}, E_i)$$

The average "value added" by schools is:

[3] $$\bar{V}_{"} = \frac{1}{n} \sum_{i=1}^{n} \sum_{j=1}^{m} "_j (S_{ij} - S^o_{ij})$$

Clearly, $\bar{V}_{"}$ is not in general equal to $\bar{V}_{\$}$ and depends on the vectors l_{ij}, E_i and S^o_{ij}.

Average "test score value added" is :

[4] $$\bar{T}_{"}(V) = \frac{1}{n} \sum_{i=1}^{n} \sum_{j=1}^{m} "_j (t(S_{ij}) - t(S^o_{ij}))$$

It will, in general, depend on the properties of the testing metric e.g. - whether it aims to differentiate clearly mid level or high level skills [Note that the International Comparison Project was not designed to test accurately skill variations in the top and of the ability distribution.]

One concept of "quality" would be to maximize the average value added by schools, but this would not in general be economically efficient since maximization of $\bar{V}_{"}$ (or $\bar{V}_{\$}$) does not reflect the relative costs of achieving increases in skills, or the relative economic benefits. Skill sets are bundled in individuals, and different skills are, for different individuals, binding constraints on workplace productivity. The criterion of economic efficiency would

require that the marginal dollar of educational expenditure should produce the same increase in the economic output of all students -- hence if MP_i is the marginal product of the ith person and is some function g_{ij} of that person's vector of skills (S_{ij}), then

[5] $$MP_i = g_{ij}(\vec{S}_{ij}) = g_{ij}(\vec{l}_{ij}(S^o_{ij}, E_i))$$

Efficiency in allocation requires:

[6] $$\frac{\partial MP_i}{\partial E_i} = \frac{\partial MP_i'}{\partial E_i'}$$

Since both learning ability (l_{ij}) and the marginal productivity of particular attributes as embodied in individuals (g_{ij}) are not easily observable, the efficiency criterion for educational quality is not easy to operationalize -- but it is worth emphasizing that it is not in general going to mean maximizing $T_{..}$ or $V_{..}$, or even $T_{..}(V)$.

If the idea is to measure educational "quality" directly, either as a function of test scores or value added, the issue also arises of how to summarize the <u>distribution</u> of quality. The literature on comparisons of income distributions is immediately relevant, since in general the social evaluation of a <u>distribution</u> depends on both the mean and higher moments of the distribution. If we summarize the social welfare function as $SWF(T_{..}, F_T)$ where σ_T is some measure of the dispersion of $T_{\propto i}$, we still face the problem of how to summarize the dispersion of the distribution (e.g. coefficient of variation, generalized entropy (Theil) index, Gini ratio?). An egalitarian would argue that for similar mean values of $T_{\alpha i}$, one should prefer education system A to education system B if $F^A(T_{\alpha i}) \geq F^B(T_{\propto i})$ for all T, where F denotes the cumulative distribution function. However, it is not totally obvious that this criterion of "Lorenz domination" has the same ethical or economic validity in discussion of educational inequality as in income inequality.

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