

Literacy and employability

Ross Finnie and Ronald Meng

Since the early 1990s, the technology-driven ‘knowledge-based’ economy has captured the attention and affected the lives of virtually all Canadians. This phenomenon has been of particular interest to researchers and policy makers, not to mention business owners, long-time workers, and students permanently entering the job market following graduation or, more troubling, after dropping out of high school. One concern is how those lacking the technical skills, experience and necessary education—beginning with the three Rs—may be left behind in dead-end jobs as their peers pursue more dependable and lucrative career paths.

While the economic effects of educational attainment have been examined in many studies,¹ the role of literacy and numeracy skills in determining the economic well-being of individuals also provides valuable insights. Previously, most investigations of the relationship between education and labour market outcomes ignored these basic skills, or simply assumed that they were captured in conventional education measures.

But more recent studies² have demonstrated that literacy and numeracy skills influence labour market performance and income in specific ways other than educational attainment, which is at best an imperfect proxy for these abilities.³ In this paper, Statistics Canada’s Survey of Literacy Skills Used in Daily

Activities (LSUDA) was used, including actual test scores measuring literacy and numeracy as opposed to commonly used self-reported competency levels.⁴ The goal is to shed light on the relationship between these skills and various employment outcomes of high school dropouts (see *Data source and methodology*).

Identifying the effects of literacy and numeracy test scores on the employment outcomes of dropouts allows important questions relating to their economic future to be addressed. If early school leavers are confined to ‘bad’ jobs (low earnings, few or no benefits, reduced working hours) where language and numeracy skills have little or no effect on economic well-being (Doeringer and Piore 1971), then these skills should play only a minor role in explaining employment patterns or incomes. If, alternatively, literacy and numeracy skills have significant effects on these outcomes, the finding would have implications for public policy relating to high school curricula as well as adult education and re-training programs, not to mention researchers in this field.

This article investigates the effects of literacy and numeracy skills—or the lack thereof—on the employability and incomes of high school dropouts, in conjunction with traditional educational attainment measures. Descriptive information is presented on both dropouts and high school graduates,¹¹ followed by an examination of socio-economic background characteristics deemed to be associated with premature school departure (such as parental education). The dropout population is then analyzed in terms of broad employment characteristics based on a number of binary outcomes, such as whether a person who dropped out had a disability or whether they lived in a particular province. Finally, income functions are estimated for both dropouts and graduates. In all cases, the focus is on cognitive skills measured in terms of literacy and numeracy test scores.

*Ross Finnie is with the School of Policy Studies at Queen’s University and the Business and Labour Market Analysis Division at Statistics Canada. He can be reached at 613-533-6000, ext. 74219. Ronald Meng is with the Department of Economics at the University of Windsor. He can be reached at 519-253-4232, ext. 2371. Both authors can be reached at perspectives@statcan.ca. The research paper *The Importance of Functional Literacy: Reading and Math Skills and Labour Market Outcomes of High School Drop-outs* from which this article is adapted is available on the Statistics Canada Web site at <http://www.statcan.ca/english/research/11F0019MIE/11F0019MIE2006275.pdf>.*

Data source and methodology

This article is based on the October 1989 **Survey of Literacy Skills Used in Daily Activities** (LSUDA). The survey had two components. The first asked about socio-demographic and employment characteristics, family background, and experience related to literacy and numeracy skills (reading, writing and arithmetic). The second asked respondents to perform a series of tasks to directly measure their literacy and numeracy skills (Statistics Canada 1991).

The LSUDA sample was selected from dwellings that had recently participated in the Labour Force Survey, which excludes persons living on Indian reserves, residents of the territories, full-time members of the Armed Forces, and people living in institutions (for example, nursing homes or prisons).

The full LSUDA file consists of a weighted sample of 9,455 respondents aged 16 to 69 in 1989. The analysis was restricted to Canadian-born men and women aged 21 to 54 who were not attending school at the time of the interview—2,318 men and 2,806 women of whom 851 and 872 respectively had left high school before graduating.⁵

The LSUDA measures of literacy and numeracy are based on item response theory.⁶ The resulting measures are continuous variables ranging from 0 to 500. Individuals with a literacy score below 160 have difficulty dealing with any printed material, that is, they are fundamentally illiterate. Those with a numeracy score below 200 “have very limited numeracy abilities which enable them to, at most, locate and recognize numbers in isolation or in a short text” (Statistics Canada 1991, 19); in other words, they are effectively innumerate. Unfortunately, reading and numeracy are so closely related⁷ that it is often difficult to separate the independent effects of each on employment, income, and other labour market indicators.⁸

To deal with this problem, some researchers have used only literacy in their analyses (Rivera-Batiz, 1990a, 1990b), others have used only numeracy (Rivera-Batiz, 1992), while still others have used both. However, taking the simple average of the two variables yields the best results and is easier to interpret in a context where it is difficult to identify their separate effects (Charette and Meng 1998; Pryor and Schaffer 1999; Green and Riddell 2001). In this article, the literacy and numeracy scores have been averaged to form one composite variable called **functional literacy**, a term initiated by Pryor and Schaffer.

The variables used in the analysis can be grouped into three categories. The first deals with employment and income—whether the respondent was employed at the time of the survey or at any time within the past 12 months, whether the employment was mostly full-time (30 hours or more per week), number of weeks worked in the last year, and the logarithm of income.

The second group of variables provides measures of socioeconomic background—mother’s and father’s years of education, whether the parents were immigrants, province of birth, Aboriginal status, first spoken language,⁹ presence of a disability,¹⁰ and any learning difficulty as a child.

The third group captures demographic characteristics and circumstances at the time of the survey—age, years of education, province of residence, city size, the first (or preferred) language used in adulthood, marital status, and presence of at least one child.

A probit model was used to calculate the probabilities of dropping out of school, depending on the binary outcomes of some of the explanatory variables above. Estimates based on a two-stage probit-OLS (ordinary least squares) procedure were also calculated to establish the positive or negative impacts of selected variables on employment outcomes.

Graduates have higher functional literacy

As expected, the functional literacy scores of both men and women who dropped out of high school were significantly below those of graduates (Table 1).¹² In addition, dropouts reported a weaker attachment to the labour market and lower average incomes than their more educated counterparts.

The parents of high school graduates tended to be more educated than those whose offspring had dropped out, the differences varying from 2.4 to 2.9 additional years of schooling. The children of immigrants stayed in school longer than those of native-born Canadians. Higher-than-expected proportions of dropouts were born in the Atlantic provinces and Quebec (particularly women in this province), were

Aboriginal persons, spoke French in childhood, reported a disability, and had experienced learning difficulties in childhood.

In terms of demographic characteristics and circumstances, male dropouts were 4.5 years older, on average, than those who had graduated; female dropouts were almost five years older. Male and female dropouts tended to have five years less education, and a disproportionately high number lived in the Atlantic provinces. Disproportionately high numbers of female dropouts were also found in Quebec and Ontario. Dropouts were much more likely to be living in small cities and towns with a population under 30,000 and in rural areas. They were also more likely to speak French as adults, be married, and have children.

Table 1 Characteristics of high school dropouts and graduates

	Men		Women	
	Dropouts	Graduates ¹	Dropouts	Graduates ¹
Functional literacy scores ²	238.8	271.3	236.4	275.3
Age ²	38.1	33.6	38.3	33.5
Years of education ²	9.3	14.4	9.3	14.4
Number of weeks worked in the past 12 months	41.5	47.1	26.4	38.8
Log of income ²	10.08	10.27	9.20	9.73
Mother's years of education	7.9	10.5	8.1	10.5
Father's years of education	7.6	10.5	7.6	10.3
			%	
Employed, October 1989	82	92	50	77
Employed at any time in the past 12 months	91	97	63	87
Mostly full time ³	88	91	44	66
Immigrant mother	9	14	11	15
Immigrant father	10	15	11	16
Born in				
Atlantic	16	10	15	12
Quebec	32	31	40	30
Ontario	30	35	25	30
Prairies	17	18	18	19
British Columbia	5	6	3	9
Aboriginal persons ²	5	2	6	3
Language spoken as a child				
English	58	64	54	66
French	37	30	43	29
Other	4	6	3	6
With a disability ²	12	6	12	7
Learning difficulties as a child	17	10	16	9
Province of residence ²				
Atlantic	12	8	11	10
Quebec	29	29	31	27
Ontario	35	36	36	32
Prairies	15	18	16	19
British Columbia	9	9	6	12
City size ²				
100,000 or more	40	63	49	62
30,000 to 99,999	11	11	9	11
Under 30,000 ⁴	49	26	42	27
First language as an adult ²				
English	68	73	67	73
French or other	32	27	33	27
Married ²	73	66	76	69
With at least one child ²	58	50	65	55

1 Includes those with postsecondary education.

2 Averages used in the income equations.

3 During periods of employment.

4 Includes rural areas.

Source: Survey of Literacy Skills Used in Daily Activities, 1989

force. For example, among men who worked mostly full time (when employed) in the 12 months preceding the survey, the test score difference between graduates and non-graduates was 29.4; the corresponding difference among women was 30.5. Yet as poor as the scores were for dropouts with jobs, they were significantly higher than the scores for those not in the labour force.¹³ Among both graduates and non-graduates, literacy scores were consistently higher for women than for men in all employment categories.

The odds of dropping out

A probit model was used to calculate the probabilities of dropping out of school depending on various explanatory variables (Table 3).¹⁴ As a result of cohort effects, age is positively associated with the probability of dropping out of school, since all those leaving school did so when relatively young. For every additional year of age, the probability of leaving school early is almost 1 percentage point higher for men, while for women it is 0.77 of a point higher (the marginal effect¹⁵).

Interestingly, the province of birth effects for men are not as significant as the raw data suggest—except for those born in Quebec, who are significantly less likely to have dropped out than those born in the Atlantic provinces (the omitted category).¹⁶ Among women, place of birth is much more important, with those born in Quebec, the Prairie provinces, and British Columbia having significantly lower probabilities of dropping out than those born in Atlantic Canada.

Having experienced learning difficulties as a child increased the probability of leaving school early

The average functional literacy scores of men and women were calculated according to various employment characteristics (Table 2). The differences between the scores are striking, not only between male and female graduates and non-graduates, but also between those in and out of the labour

Table 2 Functional literacy scores and employment characteristics

	Men			Women		
	Total	Dropouts	Graduates ¹	Total	Dropouts	Graduates ¹
Employed, October 1989	261.9	244.7	271.8	267.5	247.2	276.6
Employed at any time in the past 12 months	261.0	242.3	271.8	266.6	244.6	276.5
Mostly full time ²	261.8	243.2	272.6	266.3	245.3	275.8
Not in the labour force	219.4	203.5	253.9	242.3	222.4	267.3

¹ Includes those with postsecondary education.

² During periods of employment.

Source: Survey of Literacy Skills Used in Daily Activities, 1989

by 19 percentage points for both men and women. Aboriginal persons also had a notably higher dropout rate (14 points for men and 13 points for women).

Parental education exerted a strong influence on a child's educational attainment. A 2.5-year increase in a mother's and father's education¹⁷ reduced the odds of dropping out by about 15 points for both men and women.¹⁸ While the evidence is not overwhelming, mothers appear to have a greater impact on a daughter's educational attainment than a son's, while fathers have a greater impact on a son's. A similar parent-child influence is seen in the significant impact an immigrant mother has on a daughter's chances of dropping out of school (a 12% probability reduction).¹⁹

Factors affecting employment among dropouts

Among high school dropouts of both sexes, functional literacy had a significant, positive impact on being employed at the time of the survey, having been employed at any time in the previous 12 months, and having worked mostly full time when employed (Table 4).²⁰ In

contrast, the formal education variable (years of education) was not at all significant for male dropouts and significant only for female dropouts who worked mostly full time. For men, a one-standard-deviation increase in the functional literacy score increased the probability of the outcomes

Table 3 Probit model determinants of dropping out of school

	Men		Women	
	Coefficients	Marginal effects ¹	Coefficients	Marginal effects ¹
		%-point change		%-point change
Age	0.027	0.95***	0.024	0.77***
Born in				
Quebec	-0.224	-7.86**	-0.224	-7.27**
Ontario	-0.072	-2.54	-0.074	-2.38
Prairies	-0.031	-1.10	-0.151	-4.89*
British Columbia	-0.035	-1.22	-0.359	-11.63***
With a disability	0.075	2.62	0.096	3.11
Learning difficulties as a child	0.531	18.63***	0.591	19.12***
Mother's years of education	-0.080	-2.81***	-0.105	-3.41***
Father's years of education	-0.091	-3.20***	-0.088	-2.84***
Immigrant mother	-0.125	-4.39	-0.369	-11.96***
Immigrant father	-0.122	-4.30	-0.015	-0.48
Aboriginal persons	0.409	14.36**	0.406	13.14***
Language spoken as a child				
English	-0.135	-4.75	-0.165	-5.36*
French or other	0.125	-4.39	-0.023	-0.74
Constant	0.328	...	0.604	...

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

¹ See Note 15.

Source: Survey of Literacy Skills Used in Daily Activities, 1989

Table 4 Determinants of selected employment characteristics of dropouts

	Men			Women		
	Employed, October 1989	Employed at any time in the past 12 months	Mostly full time ¹	Employed, October 1989	Employed at any time in the past 12 months	Mostly full time ¹
Functional literacy scores	0.004***	0.006***	0.005***	0.006***	0.005***	0.004***
Age	0.247***	0.159**	0.125**	0.011	-0.007	0.000
Years of education	0.032	-0.027	0.007	0.016	0.038	0.083**
With a disability	0.153	-0.005	0.050	-0.472***	-0.713	-0.546***
Aboriginal persons	-0.262	-0.031	-0.104	-0.024	-0.017	-0.439**
Province of residence						
Atlantic	-0.354*	-0.103	-0.130	-0.686***	-0.312*	0.077
Quebec	-0.463*	-0.261	-0.316	-0.712***	-0.495**	-0.285
Prairies	0.138	-0.027	-0.241	-0.342**	-0.088	-0.024
British Columbia	0.299	-0.031	-0.215	-1.136***	-0.889***	-0.476**
City size						
100,000 or more	-0.235*	-0.494**	-0.202	0.248**	-0.062	0.022
30,000 to 99,999	-0.013	-0.189	-0.042	0.271	-0.055	-0.216
First language as an adult: English	-0.424*	-0.275	-0.246	0.068	0.117	0.048
Married	0.352**	0.651***	0.264*	0.350***	0.357***	0.160
With at least one child	-0.072	-0.316*	-0.005	-0.214*	-0.231*	-0.467***
Constant	-5.330***	-2.708*	-2.488*	-1.638	-0.740	-0.908
ρ	0.651***	0.681***	0.641***	0.026	-0.081	-0.333**

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

¹ During periods of employment.

Source: Survey of Literacy Skills Used in Daily Activities, 1989

between 1.4 and 4.3 percentage points. For women, the effects were all substantially greater, from 8.6 to 10.4 points (data not shown).

The parameter estimates for the other explanatory variables indicate further differences between men and women. The relationship between age and employment was non-linear for men, peaking at 37.8 years for those working at the time of the survey, 38.3 years for those working mostly full time in the 12 months preceding the survey, and 44.8 years for those who had been employed at any time in that period (data not shown). In the case of women, however, no clear age–employment relationship was seen.

Having a disability did not directly influence the employability of men who had dropped out of high school, but it had a significant, adverse effect on women in terms of current or full-time employment.

In general, the employment patterns of Aboriginal persons were not significantly different from their non-Aboriginal counterparts once the other variables in the models were taken into account.²¹ However, a strong negative association between Aboriginal women and full-time work was evident. The province of residence was in many cases significant for women, but rarely so for men. While marriage had a positive impact on both sexes, the presence of children had a significant, negative impact on full-time employment for women.

As expected, literacy significantly increased the number of weeks worked for both sexes. Years of education also had a positive effect, but this finding was significant for men only (Table 5).²²

The other independent variables generally behaved as noted earlier. Age positively affected the number of weeks worked by men but not women, while having

Table 5 Determinants of weeks worked by dropouts

	Men	Women
Functional literacy scores	0.055***	0.091***
Age	2.290***	0.277
Years of education	0.877**	0.920
With a disability	0.053	-10.393***
Aboriginal persons	-7.762***	-7.463**
Province of residence		
Atlantic	-8.709***	-15.686***
Quebec	-4.332	-8.365**
Prairies	1.870	-1.877
British Columbia	0.207	-18.498***
City size		
100,000 or more	-2.295*	2.607
30,000 to 99,999	0.460	1.462
First language as an adult:		
English	-4.448	1.746
Married	6.416***	5.706***
With at least one child	-0.768	-4.188**
λ (inverse Mill's ratio adjustment)	7.444***	-4.186*
Constant	-27.826**	-0.546
F	11.4	11.5

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

Source: Survey of Literacy Skills Used in Daily Activities, 1989

a disability strongly reduced them for women but not men. Aboriginal persons of both sexes reported significantly reduced weeks of employment, as did people living in the Atlantic provinces; however, living in British Columbia had a negative impact only for women. Finally, marriage had a strong positive association with weeks worked for both men and women, while the presence of children reduced the number of weeks worked for women only.

Income of dropouts

Among men, increased literacy exerted a strong positive effect on incomes for both graduates and dropouts (Table 6).²³ Interestingly, the number of years of education was highly significant for male dropouts only, which may reflect a somewhat diminishing marginal economic return to education and a strong correlation between functional literacy and education for school leavers (reducing the statistical significance of

both measures).²⁴ For women, the effect of literacy was significant for graduates but not dropouts, while the return to years of education was highly significant for both. The remaining variables included in the models generally behave as expected, although the flatter age–income profiles seen for dropouts is of particular interest.

For graduates, in three of the four income regressions, the Aboriginal variable is positive and significant, albeit only at the 10% level. This finding suggests that while Aboriginal persons have significantly higher dropout rates than the rest of the population, their employment and income patterns are not much different once the observables controlled for in the models are taken into account.²⁵

Conclusion

Literacy and numeracy skills undoubtedly contribute to economic and social well-being. It is, however, unclear whether this holds for everybody, including those at the bottom end of the labour market, or only those with higher levels of education, who are more likely to be plugged into today's knowledge economy. The findings in this study suggest that among high school dropouts, who tend to have much lower functional literacy scores than their graduate counterparts, enhanced literacy and numeracy skills can significantly improve labour market outcomes—independently of the impact of formal education. Indeed, in some cases, the effects of functional literacy appear to be substantially greater than the number of years of education.

A study of literacy rates in 21 countries, including the United States, the United Kingdom and many European countries, found that Canadians in the top 25% of the literacy scale had overall scores well above many industrialized countries; however, the scores for the bottom 25% compared poorly with the lowest scores of other countries. Moreover, Canadians ranked 15th in literacy inequality (Tuijnman 2001).²⁶ Nevertheless, this article illustrates that although the literacy scores of Canadian high school dropouts are low compared with more educated Canadians or persons living in a selection of other countries, the acquisition of higher skill levels can have significant effects on their labour market success.

A trend to overqualification has been noted in the case of many North American jobs in recent years (Pryor and Schaffer 1999, among others). University graduates are often found doing work that high school graduates could do, while the latter are starting to per-

Table 6 Determinants of income

	Men				Women			
	Dropouts		Graduates ¹		Dropouts		Graduates ¹	
Functional literacy scores	0.002***	0.002***	0.001***	0.001**	-0.001	0.000	0.002***	0.002***
Age	0.037*	0.058***	0.143***	0.144***	0.057*	0.039	0.121***	0.123***
Years of education	0.075***	0.058***	0.024*	0.012	0.129***	0.098***	0.106***	0.103***
With a disability	-0.094	-0.053	-0.097*	-0.060	0.130	-0.126	-0.033	-0.021
Aboriginal persons	-0.103	0.037	0.098	0.198*	-0.073	-0.129	0.199*	0.217*
Province of residence								
Atlantic	-0.050	-0.032	-0.200***	-0.175***	-0.139	-0.178	-0.174**	-0.168**
Quebec	0.079	0.021	0.002	-0.011	0.141	0.042	-0.131	-0.135
Prairies	-0.076	-0.101	-0.152***	-0.155***	0.064	0.064	-0.158***	0.158***
British Columbia	0.069	0.054	-0.127***	-0.142***	0.062	0.074	-0.142**	-0.148**
City size								
100,000 or more	0.083*	0.071	0.130***	0.123***	0.248***	0.284***	0.192***	0.189***
30,000 to 99,999	0.112	0.082	0.044	0.047	0.023	0.065	-0.016	-0.017
First language as an adult:								
English	0.077	0.050	0.117*	0.094	0.067	0.055	0.040	0.027
Married	0.048	0.074	0.333***	0.331***	-0.338***	-0.285***	0.007	0.008
With at least one child	0.156***	0.134***	-0.073**	-0.070**	-0.158*	-0.184**	-0.256***	-0.256***
λ_1 (see note)	-0.111	...	0.011	...	-0.226	...	0.002	...
λ_2 (see note)	...	0.300***	...	-0.215***	...	-0.368***	...	-0.067
Constant	7.571***	6.928***	6.447***	6.681***	7.456***	8.161***	5.276***	5.347***
F	13.7	14.9	44.1	45.1	4.7	5.3	20.3	20.4

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

¹ Includes those with postsecondary education.

Note: Two different sets of variables were used for selecting persons who were employed at any time in the past 12 months. The first set consists of the explanatory variables listed in Table 4, as well as the years of education of both parents and whether they are immigrants (λ_1). The second set of explanatory variables is listed in Table 3 (λ_2).

Source: Survey of Literacy Skills Used in Daily Activities, 1989

form jobs previously held by dropouts. The results of this paper, however, suggest that those at the bottom end of the economic ladder are not completely trapped in a secondary labour market with few available options. Indeed, skills matter, and helping individuals increase their literacy and numeracy capabilities could be important for improving their labour market opportunities.

Perspectives

Notes

1 See Card (1999) for a review of the literature.

2 See Rivera-Batiz (1990a, 1990b, 1992); Charette and Meng (1994, 1998); Murnane, Willett and Levy (1995); Pryor and Schaffer (1999); Green and Riddell (2001); and Finnie and Meng (2001, 2002b, 2005).

3 In virtually all the studies cited here, the inclusion of literacy or numeracy measures reduces the magnitude of the effects and statistical significance of the education variables in conventional human capital earnings models. That said, education is clearly related to literacy and numeracy skills in a causal fashion, but the full set of relationships has not been investigated to any degree (Finnie and Meng 2002a).

4 See Finnie and Meng (2005) on the comparison of test scores versus self-reported skill levels and their effects in employment and income models.

5 Immigrants were excluded from the analysis because the relationships between literacy, numeracy, education, and labour market outcomes are different for them than for native-born Canadians (Finnie and Meng 2002b). Older individuals (55 to 69) were excluded to avoid issues related to pre-retirement. Persons born in one of the territories but living in a province at the time of the survey were also omitted.

6 Item response theory (IRT) is an iterative statistical procedure used to summarize the pattern of answers on a test in a manner that accounts for task difficulty, tasks not attempted, guesses and random errors. IRT calculates an estimate of each task's difficulty and an estimate of an individual's ability to solve it using the same numerical scale, commonly ranging from 0 to 500 (Statistics Canada 1991).

7 The sample correlation between literacy and numeracy for both men and women in this study is 0.77.

8 Apart from people who are illiterate also tending to be innumerate, the numeracy questions in the LSUDA were embedded in a subset of reading tasks to simulate ways arithmetic is used on a daily basis. This means that a respondent had to first understand the written instructions in a question before attempting to perform the required arithmetic.

9 Very few adults (about 0.6% of the population) claim a first (or preferred) language other than English or French. For simplicity, those reporting speaking other languages as children were included with the French language group.

10 Although the presence or absence of a disability is treated as a background variable, no information is available on when a disability occurred—at birth, in childhood, or later in life.

11 High school graduates also include those who continued their schooling at a university, college or other postsecondary institution.

12 Difference-in-means tests for the functional literacy scores yield t-statistics of 17.8 for men and 23.2 for women, both of which are significant at the 1% level.

13 As Pryor and Schaffer (1999) conclude when looking at somewhat similar U.S. results: “[the functional literacy averages] hardly seem consistent with active participation in the heralded ‘information age’ ” (p. 23).

14 White's technique was used to control for heteroskedasticity.

15 Marginal effects indicate how much a given unit rise in a particular variable will increase or decrease the probability of an event occurring.

16 This indicates that province is correlated with other explanatory variables included in the models.

17 This is roughly equal to the differences in mean parental education levels seen in Table 1 for both graduates and non-graduates.

18 This was calculated by adding the marginal effects associated with both parents' years of education and multiplying the total by 2.5. For example, the calculation for men was as follows: $[(-2.81) + (-3.20)] \times 2.5 = -15.0\%$.

19 Several interaction variables were added to capture additional cohort and other cross effects: age x parent's education, mother's years of education x father's years of education, and age squared. None of the estimated coefficients were statistically significant.

20 To control for the joint circumstances of dropping out of school and having been employed, a two-stage procedure was carried out, which first involved estimating a bivariate probit that jointly determined the probability of dropping out of school (i.e., $DROP = 1$) with each of the binary variables examined. The determinants of dropping out are the variables listed in Table 3, while the determinants of each of the other outcomes are shown in Table 4. The resulting sample selection term was then included in the non-linear OLS dropout models. This approach is similar to that developed by Abowd and Farber (1982). Table 4 indicates that for men the estimates for the adjustment term (ρ) are highly significant, while for women the variable is significant in just one of the three equations (Greene 1990, 692).

21 Aboriginal persons tend to have lower levels of education and functional literacy. And those living on Indian reserves or in the territories were not included in this study.

22 Evaluated at the sample means, the elasticity of weeks worked with respect to literacy scores and years of education is 0.31 and 0.19 respectively for men, and 0.81 and 0.31 for women. These elasticities are quite high for women, and functional literacy has a greater impact on their labour supply than men's. Rivera-Batiz (1992) reports similar results in his study on the effects of quantitative literacy (numeracy) on the labour supply of men and women.

23 Total income includes earnings (income from employment), pension income, transfer payments, investment income, and other income. Although it may have been preferable to use earnings or wage rates in these calculations, the LSUDA database does not contain this information. Moreover, since earnings constitute the greatest part of income, particularly among working-age individuals, and similar analytical results are obtained using earnings or income, the latter was deemed to produce good results for the purposes of this study.

24 Adding a 'squared years of education' term generally drove both the linear and quadratic terms to non-significance, so the simpler linear measure was retained. Larger sample sizes might allow these effects to be better delineated.

25 It should be remembered that data were not collected for persons living on Indian reserves or in the territories.

26 Inequality was measured in terms of the variance in the distribution of literacy scores.

■ References

- Abowd, John M. and Henry S. Farber. 1982. "Job queues and the union status of workers." *Industrial and Labor Relations Review*. Vol. 35, no. 3. April. p. 354–367.
- Card, David. 1999. "The causal effect of education on earnings." In *Handbook of Labor Economics*. Vol. 3A. Orley Ashenfelter and David Card (eds.). Elsevier Science, North-Holland. p. 1801–1863.
- Charette, Michael F. and Ronald Meng. 1994. "Explaining language proficiency: Objective versus self-assessed measures of literacy." *Economics Letters*. Vol. 44, no. 3. p. 313–321.
- . 1998. "The determinants of literacy and numeracy, and the effect of literacy and numeracy on labour market outcomes." *Canadian Journal of Economics*. Vol. 31, no. 3. August. p. 495–517.
- Doeringer, Peter B. and Michael J. Piore. 1971. *Internal Labor Markets and Manpower Analysis*. Lexington, Mass. D.C. Heath & Co. 214 p.
- Finnie, Ross and Ronald Meng. 2001. "Cognitive skills and the youth labour market." *Applied Economics Letters*. Vol. 8, no. 10. October. p. 675–679.
- . 2002a. *A Recursive Income Model for Canadians: The Direct and Indirect Effects of Family Background*. Working paper no. 28. Kingston, Ont. Queen's University, School of Policy Studies. 28 p.
- . 2002b. "Minorities, cognitive skills and incomes of Canadians." *Canadian Public Policy*. Vol. 28, no. 2. June. p. 257–273.
- . 2005. "Literacy and labour market outcomes: Self-assessment versus test score measures." *Applied Economics*. Vol. 37, no. 17. September. p. 1935–1951.
- Green, David A. and W. Craig Riddell. 2001. *Literacy, Numeracy and Labour Market Outcomes in Canada*. Ottawa. Statistics Canada Catalogue no. 89-552-MIE, no. 8. 44 p. <http://www.statcan.ca/english/research/89-552-MIE/89-552-MIE2001008.pdf> (accessed February 22, 2007).
- Greene, William H. 1990. *Econometric Analysis*. New York. Macmillan. 783 p.
- Murnane, Richard, John B. Willett and Frank Levy. 1995. "The growing importance of cognitive skills in wage determination." *Review of Economics and Statistics*. Vol. 77, no. 2. May. p. 251–266.
- Pryor, Frederic L. and David L. Schaffer. 1999. *Who's Not Working and Why: Employment, Cognitive Skills, Wages, and the Changing U.S. Labor Market*. New York. Cambridge University Press. 314 p.
- Rivera-Batiz, Francisco L. 1990a. "English language proficiency and the economic progress of immigrants." *Economic Letters*. Vol. 34, no. 3. November. p. 295–300.
- . 1990b. "Literacy skills and the wages of young black and white males in the U.S." *Economics Letters*. Vol. 32, no. 4. April. p. 377–382.
- . 1992. "Quantitative literacy and the likelihood of employment among young adults in the United States." *Journal of Human Resources*. Vol. 27, no. 2. Spring. p. 313–328.
- Statistics Canada. 1991. *Adult Literacy in Canada: Results of a National Study*. Ottawa. Statistics Canada Catalogue no. 89-525-XPE. 101 p.
- Tuijnman, Albert. 2001. *Benchmarking Adult Literacy in North America: An International Comparative Study*. Ottawa. Statistics Canada Catalogue no. 89-572-XIE. 57 p. <http://www.statcan.ca/english/freepub/89-572-XIE/89-572-XIE1998001.pdf> (accessed February 22, 2007).