6

Acquiring Human Capital: The Relationship of PISA Reading Proficiencies and the Pathway to Higher Education

Abstract

To date, the majority of research examining youth in post-secondary education has focused on access. The results presented in this chapter extend the understanding of the post-secondary education process in several ways. First, access to university and college are examined with respect to a number of key background characteristics, including performance in PISA 2000. Persistence in post-secondary education is also analysed, as well as factors associated with course choice. The use of the same background characteristics across the three outcomes of access, persistence and choice in field of study paints a complex and nuanced picture of the trajectories of the youth who participated in PISA and YITS. The evidence described here highlights that access, persistence and field of study in post-secondary education (university, in particular) are closely related to higher PISA achievement and particular background characteristics.

INTRODUCTION

As discussed in Chapter 3, it is becoming increasingly important to obtain a post-secondary education qualification, particularly in industrialised countries. However, the issue is not just one of access, it is also a case of actually completing a course, as well as selecting a field that supplies a good match between its content and demands, and an individual's skills and interests. Participating in post-secondary education, persisting to the end of a particular degree to obtain a qualification and selecting a course of study that matches one's expectations and strengths are extremely important outcomes for young people.

There are also implications for society at large. First, participation in post-secondary education can be regarded as an important policy issue in terms of equity for different groups (by region, socio-economic group, gender, country of origin, etc.). Second, if significant numbers of young people enrol in some post-secondary education but leave without completing it, this has potential costs in terms of educational investment without return, as well as for a group of youth that has not attained its educational potential. Third, a poor match between a young person's expectations for a course and what is involved in that course may also result in non-completion of that course and/or a mismatch between the education youth receive and the education they expect or need. Choice of field of study also has implications for policy designed to maximise the supply and demand of the various sectors of the labour market.

To date, research into the area of post-secondary education has tended to focus more on access than persistence and less still is known about patterns of course choice. Furthermore, the focus has tended to be on barriers to access/persistence which are often poorly defined (Finnie, Sweetman and Usher, 2008).

The results presented in this chapter will contribute to fostering a better understanding of young Canadians' participation in post-secondary education, who persists and who chooses which course. By combining YITS with PISA, it became possible to ascertain whether similar characteristics predict these three outcomes. Furthermore, the availability of achievement measures from both PISA and school marks will provide an indication of the relative importance of each measure in considering subsequent outcomes as young people progress further with their studies beyond the end of compulsory schooling. This comparison is of relevance as it provides information on the relative importance of general, real-life literacy measured by PISA compared with school-based assessment for future educational pathways.

The results provide a detailed and sound empirical basis on which to develop policy with respect to participation, persistence and course choice in post-secondary education. They are based on analyses conducted by Kamanzi *et al.* (2009).

The following questions are the focus of this chapter:

- What is the relationship between cognitive competencies and participation in college and university, persistence in study, and course choice?
- Is there a difference between PISA competencies and school-based competencies in their relationship to participation, persistence and course choice?
- What other background characteristics predict participation, persistence and course choice?
- Are there gender differences with respect to patterns in participation, persistence and course choice?

WHAT OUTCOMES AND BACKGROUND CHARACTERISTICS ARE USED IN THE ANALYSIS?

As mentioned, this chapter examines three outcomes in post-secondary education: participation, persistence and choice of field of study.

With respect to participation, YITS participants were split into three groups according to having attended university (43%), college (32%) or no post-secondary education (25%). This measure looks at participation only – it does not take into account whether students actually completed a post-secondary degree.

The persistence measure applies only to the sub-cohort of YITS participants that proceeded to some form of post-secondary education, *i.e.* 75% of the total. Three groups were identified at age 21: left without a qualification (13%), obtained a qualification (19%) and still in post-secondary education (68%).

The field of study measure applies only to the 43% of YITS participants who attended university. Three categories were identified: pure (theoretical or experimental) sciences (16%), life sciences (23%) and social and human sciences, arts and communication (61%).

In analysing each of the three outcomes, the same set of background characteristics was considered. These were classified into three groups: *i)* demographic and socio-economic characteristics (gender, highest level of parental education, parents' occupational category, household income, country of birth, language group and visible minority status), *ii)* geographic characteristics (population density of local community and province of residence) and *iii)* educational antecedents (PISA reading achievement in proficiency levels, school marks in reading, mathematics and science for each subject, 90-100%, 80-89%, 70-79%, 60-69%, less than 60%, time spent on studying at age 15, disruptions in schooling in progressing from primary to secondary, grade retention/repetition, trouble experienced during school such as an expulsion or changing schools, attended a remedial course in secondary school, school type private/public, completion of secondary school at a younger than average age.

Box 6.1 provides a description of the relationship between the PISA reading scores and marks obtained in reading, mathematics and science while at school.

Box 6.2 provides some information on how the analyses were carried out. Further information on this method can be found in Raudenbush, Bryk and Congdon (2004, Chapter 6).

Box 6.1 What was the relationship between PISA reading and school marks in reading, mathematics and science?

Correlations between PISA reading scores and school marks in mathematics, science and reading were on the low side, at .33, .38 and .34, respectively (see below). The relationship amongst the school-based achievement results is higher in the case of mathematics and science.

School-based marks are not measured on a continuous scale, so this may have the effect of reducing the size of the relationship between measures. Also, while PISA is an objective, benchmarked assessment, school marks may vary in terms of their content and standards and they are also self-reported.

	PISA Reading	School Marks – Mathematics	School Marks – Science	School Marks – Reading
PISA Reading	1.00	-	-	-
School Marks – Mathematics	0.33	1.00	-	-
School Marks – Science	0.38	0.55	1.00	-
School Marks – Reading	0.34	0.38	0.47	1.00

Box 6.2 Odds ratios and their interpretation

Since the outcomes are categorical rather than continuous, multinomial multilevel modelling was used. This involves choosing a reference group in the outcome.

In the case of participation in post-secondary education, the reference category was secondary schooling only (*i.e.* no post-secondary education access). The results are then presented as comparisons between access to university and no post-secondary education access and access to college and no post-secondary education access.

For persistence, the reference category was incomplete post-secondary education, compared with completed post-secondary education and still in post-secondary education.

For course choice, the reference category was human sciences/arts/communications, compared with pure sciences and life sciences.

The results from the multinomial regression are presented in terms of odds ratios in comparison to a reference category. Ratios above 1.0 indicate a positive relationship while ratios below 1.0 indicate a negative relationship.

As an example, if the results of a model of access to college or university as opposed to no post-secondary education, with gender as a predictor, yield odds ratios as follows:

- Odds ratio for females, college: 2.0.
- Odds ratios for females, university: 1.5.

This means that females have twice the odds as males (the reference category) to attend college than to end their education at secondary schooling and that female students have one-and-a-half times the odds as males to attend university than to end their education at secondary schooling.

CHARACTERISTICS OF YOUNG CANADIANS WITHOUT POST-SECONDARY EDUCATION WHO ENTER COLLEGE AND ENTER UNIVERSITY

Demographic and socio-economic characteristics

This section provides a descriptive overview of the variables analysed in this chapter as context to the more complex analyses that follow. Table 6.1 shows the percentages of young Canadians across various demographic and socio-economic background characteristics for those without post-secondary education, for those who attended college and for those who attended university. These results should be interpreted with caution as the estimated relationships among these variables are not independent from one another.

In terms of attendance, generally speaking, the variables were not as strongly related to college participation compared to university participation. Results show that more males than females did not attend post-secondary education. And, while similar percentages of males and females attended college, more females than males attended university.

Table 6.1

Distribution of Canadian youth across demographic and socio-economic characteristics, by post-secondary education group

	All youth (%)	No post-secondary education (%)	College (%)	University (%)
Gender				
Male	50	34	30	36
Female	50	21	28	51
Parental education				
Secondary or less	27	42	33	25
College	43	28	32	40
University	29	10	21	69
Household income				
25 000 or less	9	38	29	33
25 000 to 65 000	43	32	32	36
65 000 to 100 000	34	22	28	50
More than 100 000	14	13	23	64
Occupational category				
Senior executive or manager	23	25	31	44
Business owner	11	20	30	50
Professional	1	18	25	57
Associate professional	25	23	19	58
White collar	18	36	29	35
Self-employed blue collar	4	29	33	38
Blue collar	6	36	33	31
Craftsworker	9	38	33	29
Unemployed	2	28	34	38
Language group				
Anglophones outside Québec	64	27	27	46
Francophones outside Québec	4	29	32	39
Francophones in Québec	19	33	39	28
Anglophones in Québec	2	17	41	42
Other	11	14	23	63
Visible minority				
Yes	12	13	24	63
No	88	28	30	42
Country of birth				
Canada	92	27	30	43
Outside Canada	8	15	24	61
Number of observations	17 709	4 427	5 667	7 615

Source: OECD PISA and HRSDC.

Table 6.1 also shows that post-secondary education attendance differed along a number of socio-economic variables. For example, there is a strong pattern of intergenerational effects due to parental education: close to three times as many youth with one or more parents with a university education themselves went on to university compared to students whose parents did not have post-secondary education. Conversely, four times as many youth whose parents had no post-secondary education only went as far as secondary school compared with the 10% of students whose parents had a university qualification. There was also an advantage for students from families with higher incomes with respect to university attendance. The patterns of access vary with occupational category of the parents, but the differences are not as large as one might expect. There was, however, a relative advantage for youth with parents in professional and associate professional (more skilled) occupations in terms of the rates of university participation.

An examination of some of the minority groups indicates that, at least when considered in bivariate analyses, youth speaking a language other than English or French had the highest rate of university attendance and the lowest rate of non-post-secondary education attendance. Similarly, youth born outside Canada had a higher rate of participation in university compared to youth born in Canada. The rate of access to university was higher among visible minority youth than those without such status. In Québec, participation rates in higher education were different, depending on whether the individual speaks English or French – Francophones were disadvantaged relative to their English-speaking counterparts in this province.

In summary, the descriptive results presented in Table 6.1 indicate a disadvantage for males, for youth from less privileged socio-economic backgrounds and for Francophones in Québec. They also suggest a relative advantage for some minority groups.

Educational antecedents and geographic location

Table 6.2 shows the distribution of the three access groups according to characteristics relating to both educational antecedents and geographic features. Again, these results serve descriptive purposes only.

Participation is associated with achievement scores, particularly attendance at a university. There is a strong inverse distribution of student achievement across the PISA proficiency levels, when one compares the non-post-secondary education group with the university group. About eleven times (76%) as many students attending university scored at Level 5 on reading, compared to 7% of the non-post-secondary education group. Conversely, about six times as many students scoring at Level 1 or below (62%) were in the non-post-secondary education group compared with the group who went to university (10%). Nonetheless, it is notable that 7% of students who did not attend post-secondary education scored at Level 5 by age 21. The distribution of college students across proficiency levels does not indicate a strong association with PISA reading competencies, which stands in contrast to those attending university. Distributions across the various categories of school marks in reading, mathematics and science reveal a similar pattern as PISA reading proficiency levels, although the relationship is not at marked.

Not only were measures of achievement relevant to participation in post-secondary education, other indicators of engagement in school were also relevant. For example, time spent on study was associated with patterns of post-secondary education participation: 73% of the group studying for eight hours or more went to university, compared with the 9% not accessing post-secondary education and the 18% attending college.

Students' educational careers were also associated with participation in post-secondary education. Disruptions in schooling were markedly different across the three access groups: 83% experiencing disruptions did not access post-secondary education. Grade retention showed a similar pattern to disruptions in schooling.

Table 6.2

Distribution of Canadian youth across educational and geographic characteristics, by post-secondary education group

	All Youth (%)	No PSE (%)	College (%)	University (%)
PISA reading proficiency				
Level 5	16	7	17	76
Level 4	29	15	28	57
Level 3	29	28	34	38
Level 2	17	45	35	20
Level 1 or below	9	62	28	10
Mark in reading				
90 – 100%	9	7	16	77
80 – 89%	30	11	23	66
70 – 79%	30	23	34	43
60 – 69%	18	41	36	23
Less than 60%	13	56	31	13
Mark in mathematics				
90 – 100%	13	7	15	78
80 – 89%	24	15	25	60
70 – 79%	25	24	33	43
60 – 69%	19	33	35	32
Less than 60%	20	45	33	22
Mark in science				
90 – 100%	13	7	14	79
80 – 89%	28	13	26	61
70 – 79%	27	25	33	42
60 – 69%	18	37	37	26
Less than 60%	14	52	32	16
Time spent on studying per week (age 15)				
Less than one hour	24	45	32	23
1 to 3 hours	41	27	31	42
4 to 7 hours	25	15	29	56
8 hours or more	10	9	18	73
Trouble experienced during school				
No	79	21	30	49
Yes	21	44	26	30
Attended a remedial course				
No	69	23	32	45
Yes	31	29	39	32
Disruptions in schooling				
No	95	24	30	46
Yes	5	83	13	4
Grade retention/repetition				
No	94	24	30	46
Yes	6	67	24	9
Finished secondary school earlier than average				
No	86	28	30	42
Yes	14	10	42	48
School type				
Private	6	9	29	62
Public	94	28	30	42
Geographic location				
Rural	23	34	34	32
Urban	77	23	29	48
Province				
Ontario	38	20	30	50
Newfoundland and Labrador	2	27	26	47
Prince Edward Island	1	23	21	56
Nova Scotia	3	23	21	56
New Brunswick	3	27	24	49
Québec	23	31	39	30
Manitoba	4	35	17	48
Saskatchewan	4	33	23	44
Alberta	11	37	27	36
British Columbia	12	29	21	50
Number of observations	17 709	4 427	5 667	7 615

Source: OECD PISA and HRSDC.

Structural and geographic variations were also evident. Although only a small percentage of students attended private schools (around 6%), this group did experience a relative advantage in terms of university, but not college, attendance. Furthermore, students in rural areas were about equally likely to fall into each of the three post-secondary education groups, while living in an urban location was associated with a higher rate of attendance at university. Considerable provincial variation was also evident, with more advantageous patterns of access associated with Prince Edward Island and Nova Scotia and less advantageous patterns in Québec and Alberta.

In summary, an initial descriptive overview of patterns of post-secondary education attendance along various educational antecedents, school and geographic features indicates a large advantage, particularly for university attendance, for students who achieved higher scores both on PISA reading and on their marks in school. Aside from this, the evidence suggests that students experiencing smooth educational careers, more engaged in study, in private schools and in urban areas were at a relative advantage in terms of university attendance. Also, generally, there was more variation in university attendance relative to attending college along these characteristics.

DETERMINANTS OF PARTICIPATION IN POST-SECONDARY EDUCATION: WHAT ARE THE MOST IMPORTANT CHARACTERISTICS?

This section presents the results of a multivariate model that examines access patterns with respect to background characteristics considered simultaneously. That is, the model examines whether there are significant differences between no post-secondary education and attendance at college and between no post-secondary education access and attendance at university. Table 6.3 shows the effects of each variable when considered one at a time (unadjusted) and with all variables considered together (adjusted). A comparison of the adjusted ratios with the unadjusted ones gives an indication of the relative independence of the effects of each characteristic. These results are of considerable importance since they show the relative importance of competencies measured in PISA and of school marks, once a range of background characteristics have been taken into account. As will be seen, the results paint a rich and complex picture of the processes of attending college and university. A summary of the key findings are provided at the end of this section.

When all characteristics are considered together, they account for a moderate 30% of the variation in patterns of access.[1] Six findings emerge from this evidence.

The first key finding in Table 6.3 is that the contribution of achievement to attending post-secondary education, particularly university is confirmed, even after accounting for the other background characteristics. For example, in the adjusted model, students scoring at Level 5 on PISA reading were close to 20 times more likely to attend university. The marks that students achieved in school also had a significant contribution to the likelihood of attending post-secondary education, particularly university, although their effects were weaker when compared with achievement on PISA reading. This finding provides strong evidence for the importance of reading proficiency as measured in PISA for attendance at post-secondary education, over and above school-based measures.

Second, the advantage of females over males in terms of both college and university attendance is independent of the other characteristics since the unadjusted and adjusted odds ratios are about the same. Thus, females were about 1.5 times more likely to attend college and about 2.2 times more likely to attend university compared to males. This finding suggests that policies to promote attendance at post-secondary education, particularly university, in males, will need to search beyond the characteristics included in the model. There may be other aspects of the Canadian context, such as wider socio-cultural norms or labour market expectations, that act as barriers for males.

Table 6.3 [Part 1/2]

Unadjusted and adjusted odds ratios for participation in post-secondary education

	Comparison			
	College – no post-secondary education		University – no post-secondary education	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Gender				
Female	1.52	1.51	2.27	2.15
Male	*Reference group*			
Parental education				
College	1.47	1.58	2.44	1.87
University	2.60	2.02	11.60	4.56
Secondary or less	*Reference group*			
Household income				
More than 100 000	2.29	1.52	5.55	2.12
65 000 to 100 000	1.63	1.09	2.52	1.18
25 000 to 65 000	1.25	1.01	1.25	0.85
25 000 or less	*Reference group*			
Occupational category				
Senior executive or manager	1.40	1.16	1.85	1.45
Business owner	1.89	1.39	2.60	1.33
Professional	1.03	0.76	2.38	1.20
Associate professional	1.67	1.23	3.34	1.54
Self-employed blue collar	1.21	0.89	1.24	0.89
Blue collar	1.04	1.12	0.81	0.88
Craftsworker	1.00	1.01	0.78	0.79
Unemployed	1.18	0.94	1.28	1.04
White collar	*Reference group*			
Country of birth				
Outside Canada	1.46	0.78	2.57	0.76
Canada	*Reference group*			
Language group				
Francophones outside Québec	- 1.18	1.30	0.82	1.70
Francophones in Québec	1.23	1.25	0.52	1.11
Anglophones in Québec	2.63	2.15	1.55	2.55
Other	1.68	2.02	2.64	2.86
Anglophones outside Québec	*Reference group*			
Visible minority				
No	1.69	1.72	3.28	3.30
Yes	*Reference group*			
PISA reading proficiency				
Level 5	5.48	1.62	69.94	19.97
Level 4	4.09	1.57	23.67	13.25
Level 3	2.92	1.58	9.11	8.46
Level 2	1.84	1.31	2.83	3.84
Level 1 or below	*Reference group*			
Mark in reading				
90 – 100%	2.94	2.03	22.61	4.82
80 – 89%	2.18	1.53	7.81	3.08
70 – 79%	1.83	1.30	3.61	2.30
60 – 69%	1.45	1.22	1.93	1.64
Less than 60%	*Reference group*			
Mark in mathematics				
90 – 100%	3.89	2.03	45.81	4.29
80 – 89%	3.54	1.68	24.76	3.17
70 – 79%	2.66	1.72	7.81	2.13
60 – 69%	1.56	1.24	2.46	1.18
Less than 60%	*Reference group*			
Mark in science				
90 – 100%	3.55	1.21	38.44	4.51
80 – 89%	3.27	1.54	15.17	3.29
70 – 79%	2.07	1.21	5.13	1.82
60 – 69%	1.60	1.13	2.15	1.47
Less than 60%	*Reference group*			

$p < 0.05$
$p < 0.01$
$p < 0.001$

Source: OECD PISA and HRSDC.

Table 6.3 [Part 2/2]

Unadjusted and adjusted odds ratios for participation in post-secondary education

	Comparison			
	College – no post-secondary education		University – no post-secondary education	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Time spent on studying per week (age 15)				
1 to 3 hours	1.66	1.29	3.08	1.71
4 to 7 hours	2.56	1.58	6.98	2.83
8 hours or more	3.93	1.95	16.18	5.06
Less than 1 hour	*Reference group*			
Grade retention/repetition				
Yes	0.27	0.54	0.06	0.24
No	*Reference group*			
Disruptions in schooling				
Yes	0.12	0.31	0.20	0.10
No	*Reference group*			
Attended a remedial course				
Yes	0.81	0.87	0.71	0.97
No	*Reference group*			
Trouble experienced during school				
Yes	0.41	0.74	0.29	0.50
No	*Reference group*			
School type				
Private	2.92	1.84	4.39	2.69
Public	*Reference group*			
Finished secondary school earlier than average				
Yes	11.05	3.98	37.01	5.50
No	*Reference group*			
Geographic location				
Rural	0.79	1.00	0.46	0.67
Urban	*Reference group*			
Province				
Newfoundland and Labrador	0.62	0.74	0.69	1.56
Prince Edward Island	0.58	0.56	0.97	2.11
Nova Scotia	0.59	0.57	0.97	1.79
New Brunswick	0.56	0.53	0.70	1.54
Québec	0.81	0.35	0.38	0.15
Manitoba	0.31	0.31	0.54	0.67
Saskatchewan	0.43	0.33	0.51	0.64
Alberta	0.47	0.39	0.39	0.48
British Columbia	0.48	0.35	0.70	0.36
Ontario	*Reference group*			

$p < 0.05$
$p < 0.01$
$p < 0.001$

Source: OECD PISA and HRSDC.

A third key finding is that the effects associated with the socio-economic variables were smaller in the adjusted model compared with the adjusted one, although these characteristics remained significant. Considered on its own, students whose parents had university education were 11.6 times more likely to enter university, but 4.6 times more likely when all variables were considered together. The adjusted effects of parental income and occupation were small. However, students in households with the highest level of income still had a relative advantage in terms of post-secondary education attendance, after adjusting for the other characteristics in the model. These results indicate that while socio-economic variables are perhaps less important than some of the other characteristics considered, the findings nonetheless underline the need to promote attendance at post-secondary education for less privileged students, particularly those whose families do not have a tradition or expectation of post-secondary education.

Fourth, some of the initial findings with respect to minority groups changed once all characteristics were considered together. For example, the relative advantage of country of birth in terms of access to college and university disappeared when considered along with the other variables in the adjusted model. This indicates that students born outside Canada may be advantaged on some of the other characteristics in the model. In contrast, non-membership in a visible minority group was associated with the higher likelihood of access to both college and university when all characteristics were considered together, which suggests in turn that visible minority students were disadvantaged on some of the other characteristics in the model.

A fifth key finding is that, even after adjusting for achievement, indicators relating to engagement in school and educational career remained significant. Thus, time spent on study, although having a weaker association when considered with the other variables in the model, contributed significantly to access to university and to a lesser extent, access to college. This suggests that the promotion of out-of-school educational activities may in turn promote post-secondary education attendance, over and above achievement levels attained.

Students who had experienced a delay in schooling and transition difficulties between primary and post-primary were significantly less likely to access college and university and these effects appear to be strong. Conversely, completion of secondary schooling at an earlier than average age was associated with relative advantages in post-secondary education access rates to both college and university. The effects also appear to be strong and possibly indicative of a smooth educational career up to the age of 15 when PISA was conducted. The effects of disruptions in schooling and early school completion merit further investigation since they are indicative of other complex processes.

Sixth, school and geographic characteristics remained significant for post-secondary education attendance, but the effects of some of these changed in the adjusted model. Hence, the relative advantage of attending a private school compared with a public one remained and students that attended private schools were close to three times as likely to attend university and almost twice as likely to attend college compared to students from public schools when all characteristics were considered together. Also, attendance at university was significantly more likely in urban areas compared to rural ones, but this advantage disappeared for access to college once adjustments for the other variables were made. In fact students in rural and urban regions were equally likely to attend college. With respect to attendance at college, provincial differences were, generally speaking, independent of the other characteristics in the adjusted model in the case of access to college. Québec was an exception where the adjusted likelihood of attending college decreased. In the case of attendance at university, the adjusted odds ratios were different from the unadjusted ones for the majority of provinces and changes occurred in both directions. These changes may reflect provincial differences in the other characteristics considered in the model. Taken together, findings regarding geographical variations appear to be complex and policies to promote post-secondary education attendance in different geographical regions will need to be informed by the contexts experienced by students in rural areas and in the educational, demographic and socio-economic contexts within individual provinces.

Box 6.3 provides a summary picture of the findings described in this section. The main differences between characteristics that were related to access to university and access to college were that the effects were considerably stronger for university access, implying that student achievement and a range of background characteristics are more important when considering access to university. Generally, however, the variables that were predictive of post-secondary education access were consistent, whether one considers college or university.

Box 6.3 Summary of results relating to post-secondary education participation

The characteristics considered generally differentiate non-post-secondary education and university access to a stronger degree than non-post-secondary education and college access.

When all factors were considered together, compared to students with no post-secondary education, students attending college were more likely to:

- Score above Level 1 on PISA reading.
- Have high school marks in reading and mathematics.
- Be female.
- Have parents with college or university education and with income in the top earning group.
- Speak a language other than English or French.
- Not belong to a visible minority group.
- Have spent more time on studying at age 15.
- Have had a smooth educational career, with no disruptions, grade repetition, or trouble in school.
- Have not attended a remedial course.
- Have attended a private school.
- Have completed secondary school at a younger than average age.
- Be living in Ontario.

When all factors were considered together, compared to students with no post-secondary education, students attending university were more likely to:

- Score above Level 1 on PISA reading, particularly at Levels 4 and 5.
- Have high school marks in reading, mathematics and science.
- Be female.
- Have parents with college or particularly university education and with income in the top earning group and with more "prestigious" occupations.
- Speak a language other than English or French, or be a Francophone outside Québec.
- Not belong to a visible minority group.
- Have spent more time on studying at age 15.
- Have had a smooth educational career, with no disruptions, grade repetition, or trouble in school.
- Have attended a private school.
- Have completed secondary school at a younger than average age.
- Be living in an urban location.
- Be living in Newfoundland and Labrador, Prince Edward Island, Nova Scotia or New Brunswick.

DIFFERENCE IN CHARACTERISTICS OF YOUNG CANADIANS WHO LEAVE EDUCATION WITHOUT A POST-SECONDARY EDUCATION QUALIFICATION, OBTAIN A POST-SECONDARY EDUCATION QUALIFICATION AND ARE STILL STUDYING IN POST-SECONDARY EDUCATION

Demographic and socio-economic characteristics

As noted in the introduction to this chapter, the impacts, both on the individual and on society at large, for students who begin post-secondary education but who do not obtain a post-secondary education qualification are significant. Therefore analyses that aim to achieve a better understanding of the factors that act as barriers to post-secondary education completion are important in informing policy.

This section describes how background characteristics vary along three levels of educational persistence – left without a qualification, left with a qualification or still in post-secondary education in 2005. These are only descriptive and more emphasis should be placed on the results in the subsequent section, which consider all the variables together in more in-depth analyses that follow in the next section.

Table 6.4

Distribution of Canadian youth across demographic and socio-economic characteristics, by persistence group

	All Youth (%)	No post-secondary education qualification	Qualification obtained	Still studying in post-secondary education
Gender				
Male	46	11	19	65
Female	54	16	19	70
Parental education				
Secondary or less	22	16	27	57
College	43	15	21	64
University	35	10	10	80
Household income				
25 000 or less	7	17	19	64
25 000 to 65 000	40	16	22	62
65 000 to 100 000	36	12	17	71
More than 100 000	17	10	12	78
Occupational category				
Senior executive or manager	24	13	19	68
Business owner	13	15	14	71
Professional	1	11	6	83
Associate professional	28	10	15	75
White collar	16	16	23	61
Self-employed blue collar	4	15	20	65
Blue collar	5	14	23	63
Craftsworker	8	17	25	58
Unemployed	2	15	15	70
Country of birth				
Canada	9	13	7	80
Outside Canada	91	13	20	67
Language group				
Anglophones outside Québec	64	13	19	68
Francophones outside Québec	4	14	24	62
Francophones in Québec	17	18	22	60
Anglophones in Québec	2	22	15	63
Other	13	10	8	82
Visible minority				
Yes	15	11	9	80
No	85	14	20	66
Country of birth				
Canada	21	13	30	57
Outside Canada	79	13	16	71
Number of observations	13 389	1 740	2 544	9 105

Source: OECD PISA and HRSDC.

There are differences in persistence depending on whether a student attended college or university. Of the 13% of students that left post-secondary education without a qualification, two-thirds were attending colleges and one-third were attending a university. Furthermore, 75% of YITS participants in universities were still pursuing a course of study, compared to just 14% of students in colleges. The latter observation is likely to be due to the shorter duration of college courses.

Table 6.4 shows the distribution of the three "persistence" groups across a range of demographic and socio-economic variables. Three main findings can be highlighted from these results.

First, females left without a qualification slightly more frequently than did males and females were also slightly more likely to still be in study. There is no gender difference in post-secondary education graduation rates (college and university combined). These gender patterns differ considerably from the gender patterns observed for participation, considered in the previous section.

A second finding is that students' socio-economic backgrounds conferred an advantage in persistence, as well as in attendance at post-secondary education (*i.e.* attendance as described in the previous section). Higher parental levels of education were associated with higher post-secondary education completion rates and higher rates of still being in education. Furthermore, students still in post-secondary education were more likely to have parents from professional backgrounds. The length of persistence was lowest among students whose parents were unemployed.

Third, regardless of country of birth, students were about as likely to drop out. However, students born outside Canada more frequently obtained a post-secondary education qualification and less frequently reported still being in study in 2005.

In summary, an initial examination of the demographic and social characteristics as they relate to persistence indicates that the most important factors relating to persistence considered in Table 6.4 comprised indicators of socio-economic status.

Educational antecedents and geographic location

Table 6.5 shows the distribution of the three persistence groups across educational characteristics and geographic features. Five findings emerge from this evidence.

The first result to note is that all four measures of achievement – PISA reading proficiency and school marks in reading, mathematics and science, were strongly associated with persistence in post-secondary education. For example, in the case of PISA reading proficiency, 8% of students at Level 5 left without a post-secondary education qualification, compared to 20% scoring at or below Level 1.

Secondly, students' engagement with homework was associated with higher persistence rates. That is, more time spent per week on study was associated with higher rates of persistence and lower rates of post-secondary education non-completion.

Third, aspects of students' educational careers were associated with persistence. In particular, having experienced trouble in school (changing schools or expulsion) was associated with higher rates of non-post-secondary education completion and lower rates of still being in study. A similar pattern is evident for having studied a remedial course, where students who had been on a remedial course tended to have lower rates of persistence.

Table 6.5

Distribution of Canadian youth across educational and geographic characteristics, by persistence group

	All youth (%)	No post-secondary education qualification	Qualification obtained	Still studying in post-secondary education
PISA reading proficiency				
Level 5	20	8	10	82
Level 4	33	11	16	73
Level 3	30	16	21	63
Level 2	13	17	27	56
Level 1 or below	5	20	30	50
Mark in reading				
90 – 100%	12	8	9	83
80 – 89%	36	9	15	76
70 – 79%	31	14	21	65
60 – 69%	15	19	24	57
Less than 60%	7	18	26	56
Mark in mathematics				
90 – 100%	16	8	11	81
80 – 89%	28	10	15	75
70 – 79%	25	13	20	67
60 – 69%	17	15	23	62
Less than 60%	15	18	25	57
Mark in science				
90 – 100%	16	7	8	85
80 – 89%	33	10	16	74
70 – 79%	27	15	20	65
60 – 69%	15	17	24	59
Less than 60%	9	18	28	54
Time spent on studying per week (age 15)				
Less than one hour	18	18	24	58
1 to 3 hours	40	14	20	66
4 to 7 hours	29	12	16	72
8 hours or more	13	7	10	83
Disruptions in schooling				
Yes	1	23	17	60
No	99	13	19	68
Grade retention/repetition				
Yes	3	20	22	58
No	97	13	18	69
Attended a remedial course				
Yes	71	12	19	69
No	29	15	18	67
Trouble experienced during school				
Yes	16	16	18	66
No	84	12	19	69
Finished secondary school earlier than average				
Yes	17	15	22	63
No	83	13	18	69
School type				
Private	7	12	13	75
Public	93	13	19	68
Geographic location				
Rural	21	13	30	57
Urban	79	13	16	71
Province				
Ontario	41	11	16	73
Newfoundland and Labrador	2	15	21	64
Prince Edward Island	1	13	20	67
Nova Scotia	3	16	18	66
New Brunswick	3	13	25	62
Québec	21	18	20	62
Manitoba	3	17	20	63
Saskatchewan	4	15	23	62
Alberta	9	13	20	67
British Columbia	12	14	17	69
Number of observations	13 389	1 740	2 544	9 105

Source: OECD PISA and HRSDC.

Fourth, students in private schools were about as likely as students in public schools not to have completed post-secondary education. However, students in public schools had higher rates of post-secondary education completion than students in private schools. This higher completion rate may be due to the fact that students in private schools were more commonly enrolled in university courses than students in public schools and university courses are longer than college courses.

Fifth, some geographical differences are evident. Rates of non-post-secondary education completion were the same in urban and rural areas. However, more rural students had completed post-secondary education while more urban students were still in study. Again this difference may be due to the fact that students in urban areas had higher rates of attending university than students in urban areas. Rates of post-secondary education completion also varied across provinces. The rate was lowest in Ontario (11%) and highest in Québec (18%). Students in Ontario also had the lowest rates of post-secondary education completion and the highest rates of still being in post-secondary education. Post-secondary education completion rates were highest in New Brunswick.

To sum up then, rates of post-secondary education completion varied along several characteristics considered in Table 6.5. Achievement on both PISA and school marks was positively related to persistence, as was engaging in study while at school. In contrast, a school career marked by trouble and/or disruptions was associated with lower rates of persistence. The provincial variations observed are substantial and it is of interest to examine whether these become smaller in the model considered in the following section.

DETERMINANTS OF EDUCATIONAL PERSISTENCE: WHAT ARE THE MOST IMPORTANT CHARACTERISTICS?

This section considers persistence patterns when all characteristics were considered together. Again, as with the model for participation in post-secondary education, it is useful to compare the unadjusted and adjusted odds ratios to gain some information about the relative independence of the effects of each variable. Of key interest is the extent to which PISA reading scores and school marks predicted persistence after adjusting for the other variables in the model.

Although many characteristics were associated with persistence, the strength of the estimated relationships tends to be small and the variance in persistence patterns explained by the adjusted model is on the low side, at .11 (Table 6.6).[2]

The results in Table 6.6 present some interesting contrasts between characteristics that predict persistence when compared with characteristics that predict attendance at post-secondary education (Table 6.3). For example, achievement as measured in PISA reading was unrelated to still being in post-secondary education, yet negatively related to having completed post-secondary education, particularly if the student scored at or above Level 3. Possibly, students who have completed post-secondary education were in college and hence the duration of the courses are shorter on average. It is nonetheless surprising that while lower achievement predicted post-secondary education completion, higher achievement did not predict still being in post-secondary education.

When comparing the results for the PISA reading measure with those of school-based marks, some interesting differences are evident. With respect to marks in mathematics, those students scoring above 60% were more likely to still be in post-secondary education. Completing post-secondary education was more likely for students scoring in the mid-range in their mathematics marks (70-79%). As for science, only students scoring at or above 90% were more likely to still be in post-secondary education. This evidence suggests that the method of awarding school marks in science is stricter than for mathematics, at least in terms of how these marks translate into persistence in post-secondary education.

Table 6.6 [Part 1/2]

Unadjusted and adjusted odds ratios for persistence in post-secondary education

	Comparison			
	Qualification obtained – no post-secondary qualification		Still studying in post-secondary education – no post-secondary education qualification	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Gender				
Female	1.49	1.53	1.61	1.47
Male	*Reference group*			
Parental education				
College	0.86	0.97	1.24	1.17
University	0.64	0.79	2.41	1.56
Secondary or less	*Reference group*			
Household income				
More than 100 000	1.14	1.46	2.09	1.79
65 000 to 100 000	1.30	1.40	1.56	1.39
25 000 to 65 000	1.33	1.47	1.08	1.19
25 000 or less	*Reference group*			
Occupational category				
Senior executive or manager	0.98	0.9	1.31	1.13
Business owner	0.66	0.67	1.25	0.95
Professional	0.39	0.30	2.17	1.80
Associate professional	0.90	1.01	1.78	1.28
Self-employed blue collar	0.91	0.89	1.11	1.16
Blue collar	1.04	0.88	1.08	0.98
Craftsworker	0.99	0.90	0.85	0.85
Unemployed	0.69	0.92	1.20	1.47
White collar	*Reference group*			
Country of birth				
Outside Canada	0.38	0.65	1.20	0.76
Canada	*Reference group*			
Language group				
Francophones outside Québec	1.18	1.26	0.85	1.34
Francophones in Québec	0.78	1.37	0.60	1.17
Anglophones in Québec	0.45	0.90	0.53	1.07
Other	0.54	0.98	1.51	2.01
Anglophones outside Québec	*Reference group*			
Visible minority				
Yes	0.57	0.77	1.48	1.20
No	*Reference group*			
PISA reading proficiency				
Level 5	0.83	0.40	4.01	1.44
Level 4	1.01	0.50	2.68	1.32
Level 3	0.91	0.54	1.62	1.00
Level 2	1.10	0.77	1.36	1.05
Level 1 or below	*Reference group*			
Mark in reading				
90 – 100%	0.79	0.78	3.26	1.35
80 – 89%	1.15	1.05	2.70	1.30
70 – 79%	0.95	0.89	1.41	0.89
60 – 69%	0.80	0.70	0.89	0.73
Less than 60%	*Reference group*			
Mark in mathematics				
90 – 100%	1.08	1.44	3.47	1.69
80 – 89%	1.10	1.26	2.42	1.79
70 – 79%	1.10	1.55	1.61	1.64
60 – 69%	1.13	1.27	1.32	1.45
Less than 60%	*Reference group*			
Mark in science				
90 – 100%	0.83	1.02	4.44	2.29
80 – 89%	1.08	0.93	2.51	1.29
70 – 79%	0.86	0.80	1.49	1.08
60 – 69%	0.91	0.83	1.20	1.10
Less than 60%	*Reference group*			

$p < 0.05$
$p < 0.01$
$p < 0.001$

Source: OECD PISA and HRSDC.

Table 6.6 [Part 2/2]
Unadjusted and adjusted odds ratios for persistence in post-secondary education

	Comparison			
	Qualification obtained – no post-secondary qualification		Still studying in post-secondary education – no post-secondary education qualification	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Time spent on studying per week (age 15)				
1 to 3 hours	1.07	0.96	1.41	1.06
4 to 7 hours	1.07	0.91	1.93	1.2
8 hours or more	1.12	1.11	3.91	1.85
Less than 1 hour	*Reference group*			
Grade retention/repetition				
Yes	0.55	0.71	0.52	0.59
No	*Reference group*			
Disruptions in schooling				
Yes	0.78	1.08	0.54	1.42
No	*Reference group*			
Attended a remedial course				
Yes	0.88	0.82	0.88	0.91
No	*Reference group*			
Trouble experienced during school				
Yes	0.74	0.81	0.74	0.77
No	*Reference group*			
School type				
Private	0.77	1.09	1.24	1.38
Public	*Reference group*			
Finished secondary school earlier than average				
Yes	0.99	1.58	0.74	1.02
No	*Reference group*			
Geographic location				
Rural	1.88	1.61	0.78	0.93
Urban	*Reference group*			
Province				
Newfoundland and Labrador	0.95	0.63	0.63	0.65
Prince Edward Island	1.08	0.68	0.78	0.66
Nova Scotia	0.79	0.54	0.63	0.56
New Brunswick	1.20	0.71	0.67	0.62
Québec	0.78	0.34	0.50	0.33
Manitoba	0.79	0.62	0.54	0.40
Saskatchewan	0.99	0.59	0.60	0.43
Alberta	1.05	0.89	0.77	0.64
British Columbia	0.85	0.81	0.72	0.44
Ontario	*Reference group*			

$p < 0.05$
$p < 0.01$
$p < 0.001$

Source: OECD PISA and HRSDC.

A second finding of interest is that females were about 1.5 times more likely to have obtained a qualification and also about 1.5 times more likely to still be studying, when compared with males. Also, the gender differences were independent of the other variables, since the adjusted and unadjusted odds ratios are similar. Overall, this finding indicates that females persisted to a greater degree than their male counterparts, whether having completed post-secondary education or not. Results therefore suggest the need to investigate the wider context in which these gender differences are occurring in order to develop policies to successfully promote completion of post-secondary education by males.

Some additional characteristics, when considered jointly, also contributed to persistence in post-secondary education. There was evidence for a socio-economic advantage even after adjusting for achievement, for

example: persistence in post-secondary education studies was higher for students whose parents had a university degree and a high income. This evidence may be indicative of the higher participation of more advantaged students in (longer) university courses as opposed to college courses. Thus, as with participation in post-secondary education, students with less advantaged socio-economic backgrounds would merit further policy attention, particularly in securing higher participation rates in universities amongst less advantaged youth.

The effects of school type on persistence were independent of the other characteristics. Students attending private schools were about 1.4 times as likely to still be in post-secondary education. This lower estimate was obtained after adjusting for socio-economic characteristics such as income and suggests that other aspects of private schooling conferred this advantage.

Box 6.4 Summary of results relating to post-secondary education persistence

Overall, the effects of background characteristics on persistence were found to be weak, accounting for just 11% of the variance.

Compared to students leaving without a post-secondary education qualification, students who obtained a post-secondary education qualification were more likely to:

- Have a lower PISA reading scores and have marks in the middle range of school-based mathematics.
- Be female.
- Have parents in the top earnings group.
- Have not attended a remedial course.
- Have completed secondary school at a younger than average age.
- Be living in Alberta, British Colombia, or Ontario.
- Be living in a rural area.

Compared to students leaving without a post-secondary education qualification, students who were still attending post-secondary education were more likely to;

- Have high school marks in mathematics and science (and not differentiated by PISA scores in reading).
- Be female.
- Have parents with college education and with income in the top earning group and with more "prestigious" occupations.
- Speak a language other than English or French.
- Belong to a visible minority group.
- Have spent more time on studying at age 15.
- Have had no experience of trouble while at school.
- Have attended a private school.
- Be living in Ontario.

Country of birth and visible minority status were unrelated to persistence, when all characteristics were considered together and a small persistence advantage was evident for students that spoke a language other than English or French. This important finding suggests that characteristics (such as socio-economic factors) other than being in a minority group were key determinants of persistence. The results concerning language spoken merit further investigation since it would be important to identify characteristics of students that speak a language other than English or French that predict persistence. These characteristics, if identifiable, may also be relevant to a general consideration of persistence.

Geographical characteristics are also a factor in post-secondary education. Students in rural areas were more likely to have obtained a post-secondary education qualification and this relationship was independent of the other characteristics. This result may be due to the preponderance of universities in urban areas; hence, students in rural areas attending college would have been more likely to have completed post-secondary education. Finally, differences in persistence patterns across provinces indicate that, relative to Ontario, students in all other provinces were less likely still be in post-secondary education at age 21, particularly Québec. This evidence indicates that both provision of post-secondary education and policies regarding persistence merit closer attention in Québec, if a policy objective is to increase the future opportunities of youth in all provinces.

Box 6.4 summarises the findings relating to persistence in higher education.

CHARACTERISTICS OF YOUNG CANADIANS ASSOCIATED WITH DIFFERENT FIELDS OF STUDY AT UNIVERSITY

Demographic and socio-economic characteristics

This section describes differences in the background characteristics of university students according to which field of study they have chosen: pure (theoretical, experimental) sciences, life sciences, or human sciences/arts/communication. The analysis applies only to university students. Results have policy relevance not only to gender equity in terms of course choice, but also have implications for the match between labour market demands *vis á vis* field of study and equity of sub-groups other than males and females.

The next section examines these variables simultaneously, so the information presented in this section is intended for descriptive purposes only. Table 6.7 shows the distribution of these three groups of students across demographic and social background characteristics. Three main findings emerge from this evidence.

First of all, strong gender differentiation is evident, particularly for pure sciences, where close to four times as many males (28%) than females (8%) opted for this field of study. Conversely, more females opted for courses in life sciences or human sciences/arts/communication. Note also that more females (59%) compared with males (41%) entered university in the first place.

Second, the distribution of household income showed no advantage for high earners, regardless of the field of study. Nor is there substantial variation across the various occupational categories. This evidence suggests that it is attending university that differentiates socio-economic groups, rather than university course choice.

Third, there were some differences with respect to language group and country of birth. Students speaking a language other than English or French were more frequently enrolled in life sciences and pure sciences courses. Similarly, visible minority groups were more frequently enrolled in pure sciences and life sciences. Students born outside Canada more commonly opted for a pure science course, while more Canadian-born students chose human sciences/arts/communication.

Table 6.7

Distribution of Canadian youth across demographic and socio-economic characteristics, by university field of study

	All youth (%)	Life sciences	Pure sciences	Human sciences/arts/ communication
Gender				
Male	41	18	28	54
Female	59	25	8	67
Parental education				
Secondary or less	15	21	13	66
College	37	22	15	63
University	47	23	18	59
Household income				
25 000 or less	6	21	14	65
25 000 to 65 000	35	23	16	61
65 000 to 100 000	38	23	16	61
More than 100 000	21	22	16	62
Occupational category				
Senior executive or manager	24	20	15	64
Business owner	13	20	16	63
Professional	2	18	19	63
Associate professional	33	25	18	57
White collar	13	20	14	65
Self-employed blue collar	3	18	16	66
Blue collar	4	28	13	59
Craftsworker	6	26	14	60
Unemployed	2	21	24	55
Country of birth				
Outside Canada	11	23	26	51
Canada	89	23	15	62
Language group				
Anglophones outside Québec	65	22	16	62
Francophones outside Québec	3	24	16	60
Francophones in Québec	13	20	16	64
Anglophones in Québec	2	19	14	67
Other	16	25	19	56
Visible minority				
Yes	18	28	19	53
No	82	21	16	63
Number of observations	6 501	1 495	1 040	3 966

Source: OECD PISA and HRSDC.

In summary, it appears course choice is associated with the following student characteristics: gender, language group, country of birth and minority group status. Socio-economic indicators are less relevant to a consideration of university course choice.

Educational antecedents and geographic location

Table 6.8 shows the distribution of course choice across educational antecedents and geographical location. A key observation with respect to these results is that, compared with the other two outcomes considered, *i.e.* post-secondary education participation and persistence, the characteristics have a weaker association with course choice. Four findings emerge from this evidence.

First, students with higher PISA competencies were more likely to opt for pure sciences and life sciences, while students with lower competencies were more likely to choose human sciences, arts or communications. Also, as one might expect, higher school marks in both mathematics and science were associated with higher rates of majoring in pure and life sciences and lower rates of opting for human sciences, arts or communications.

Second, time spent on study was only weakly associated with course choice.

Table 6.8

Distribution of Canadian youth across educational and geographic characteristics, by university field of study

	All youth (%)	Life sciences	Pure sciences	Human sciences/arts/ communication
PISA reading proficiency				
Level 5	30	28	17	55
Level 4	39	22	16	62
Level 3	24	19	16	65
Level 2 or below	7	16	12	72
Mark in reading				
90 – 100%	17	28	16	56
80 – 89%	45	23	16	60
70 – 79%	27	19	16	65
60 – 69%	8	17	19	64
Less than 60%	3	16	14	70
Mark in mathematics				
90 – 100%	23	31	28	41
80 – 89%	33	25	17	58
70 – 79%	24	18	12	70
60 – 69%	13	13	9	78
Less than 60%	7	13	8	79
Mark in science				
90 – 100%	24	30	25	45
80 – 89%	40	25	17	58
70 – 79%	24	15	12	73
60 – 69%	9	13	8	79
Less than 60%	4	7	10	83
Time spent on studying per week (age 15)				
Less than one hour	12	22	17	61
1 to 3 hours	36	21	17	62
4 to 7 hours	34	21	16	63
8 hours or more	18	29	16	55
Grade retention/repetition				
Yes	1	9	10	81
No	99	22	17	61
Trouble experienced during school				
Yes	13	24	18	58
No	87	22	16	62
Finished school earlier than average				
Yes	17	18	18	64
No	83	23	16	61
School Type				
Public	91	23	16	61
Private	9	19	16	65
Province				
Ontario	45	21	15	64
Newfoundland and Labrador	2	26	18	56
Prince Edward Island	1	25	14	61
Nova Scotia	4	21	15	64
New Brunswick	3	22	16	62
Québec	17	20	18	62
Manitoba	4	30	15	55
Saskatchewan	4	21	19	60
Alberta	9	27	21	52
British Columbia	11	24	18	58
Number of observations	6 501	1 495	1 040	3 966

Source: OECD PISA and HRSDC.

Third, experiences while at school, including grade retention, experiencing trouble while at school and finishing school at an earlier than average age did not show any strongly different patterns across the three fields of study, nor did the type of school attended (public or private).

Fourth, some variations by course of study were evident across the provinces and urban and rural areas.

To sum up, the descriptive overview indicates that background characteristics of Canadian youth that were included in these analyses are less relevant than those for the other two outcomes considered in this analysis. It seems reasonable to assume that the group participating in university education is more homogenous than other groups. Also students' decisions as to which courses they take may occur in complex and subtle ways.

DETERMINANTS OF CHOICE OF FIELD OF STUDY AT UNIVERSITY: WHAT ARE THE MOST IMPORTANT CHARACTERISTICS?

The identification of the main determinants of course choice was addressed in the same way as post-secondary education attendance and persistence; that is, by considering all characteristics in the previous section together. Again, comparisons of the unadjusted and adjusted odds ratios provide some information about the relative independence of the effects of each variable. Table 6.9 shows the results of this modelling exercise. Similar to the model of persistence in post-secondary education, the variance explained by the model is not large, at 0.12.[3]

Six main findings emerge from this evidence. First, regarding PISA reading proficiency, it can be seen that higher achievers were more likely to study pure sciences. The unadjusted and adjusted odds ratios are similar, implying that these effects occurred independently of the other characteristics included in the model. In contrast to PISA reading proficiency, school marks in reading were associated with a lower likelihood of studying both life sciences and pure science. On the other hand, school marks in both mathematics and science were associated with a higher likelihood of studying both pure science and life sciences.

A second key finding is that there were marked gender differences with respect to field of study. Females were only about a fifth as likely to study pure sciences compared to males. In contrast, males and females were about equally likely to study life sciences. These gender differences are independent of the other variables in the model, since the adjusted and unadjusted odds ratios are similar. Clearly, there is a clear gender preference for the field of pure sciences.

Third, there is no apparent association of course choice with the socio-economic variables of parental education, parental occupation and income. This result indicates that factors that other than the students' socio-economic position influence course choice upon beginning university. However it should be borne in mind that the sub-group of students entering university are more advantaged than those not attending university, as was found in the model shown in Table 6.3.

A fourth finding of note is that some variations by language group, country of birth and minority group status remained in the adjusted model. For example students in Québec, whether Anglophone or Francophone, were less likely to study pure sciences compared to Anglophones and Francophones outside of Québec. Students speaking a language other than French or English were also less likely to study pure sciences. In contrast, students born outside Canada were about 2.8 times more likely to study pure sciences compared to those born in Canada. And students who were not a visible minority were about as likely as visible minority students to study pure sciences, although they were 1.7 times more likely to study life sciences compared to visible minority students. These interesting results may be indicative of complex underlying socio-cultural processes associated with language, ethnicity and culture of origin which may be playing a part in which field students choose to study.

Table 6.9 [Part 1/2]
Unadjusted and adjusted odds ratios for university field of study

	Comparison			
	Pure sciences-human sciences/arts/communication		Life sciences-human sciences/arts/communication	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Gender				
Female	0.19	0.21	1.10	1.02
Male	*Reference group*			
Parental education				
College	1.27	1.05	1.03	0.91
University	1.62	0.94	1.21	0.95
Secondary or less	*Reference group*			
Household income				
More than 100 000	1.24	1.20	1.08	1.09
65 000 to 100 000	1.27	1.36	1.18	1.23
25 000 to 65 000	1.26	1.37	1.21	1.17
25 000 or less	*Reference group*			
Occupational category				
Senior executive or manager	1.03	1.07	1.04	1.04
Business owner	1.18	1.02	1.01	1.06
Professional	1.35	1.06	0.92	0.78
Associate professional	1.49	1.39	1.40	1.22
Self-employed blue collar	1.15	1.03	0.91	0.98
Blue collar	1.01	1.03	1.55	1.31
Craftsworker	1.09	0.89	1.35	1.16
Unemployed	1.95	2.10	1.20	1.30
White collar	*Reference group*			
Language group				
Francophones outside Québec	1.03	1.09	1.13	1.28
Francophones in Québec	0.96	0.42	0.89	0.63
Anglophones in Québec	0.83	0.38	0.77	0.65
Other	1.34	0.67	1.25	1.02
Anglophones outside Québec	*Reference group*			
Visible minority				
Yes	1.45	1.11	1.59	1.71
No	*Reference group*			
Country of birth				
Outside Canada	2.13	2.79	1.24	0.94
Canada	*Reference group*			
PISA reading proficiency				
Level 5	1.90	1.65	2.31	1.27
Level 4	1.58	1.65	1.71	1.13
Level 3	1.45	1.70	1.29	0.93
Level 2 or below	*Reference group*			
Mark in mathematics				
90 – 100%	6.81	4.80	4.90	2.85
80 – 89%	3.01	2.37	2.66	1.80
70 – 79%	1.75	1.61	1.56	1.22
60 – 69%	1.21	0.78	1.03	1.05
Less than 60%	*Reference group*			
Mark in reading				
90 – 100%	1.36	0.38	2.39	0.59
80 – 89%	1.41	0.47	1.85	0.69
70 – 79%	1.34	0.53	1.32	0.69
60 – 69%	1.44	0.91	1.29	0.85
Less than 60%	*Reference group*			
Mark in science				
90 – 100%	4.86	2.95	8.13	4.05
80 – 89%	2.27	2.04	5.30	3.09
70 – 79%	1.26	1.32	2.63	1.85
60 – 69%	0.80	0.93	1.89	1.80
Less than 60%	*Reference group*			

$p < 0.05$
$p < 0.01$
$p < 0.001$

Source: OECD PISA and HRSDC.

Table 6.9 [Part 2/2]
Unadjusted and adjusted odds ratios for university field of study

	Comparison			
	Pure sciences-human sciences/arts/communication		Life sciences-human sciences/arts/communication	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Time spent on studying per week (age 15)				
1 to 3 hours	1.04	1.29	0.92	1.23
4 to 7 hours	0.95	1.09	0.94	1.17
8 hours or more	1.10	1.26	1.44	1.91
Less than 1 hour	*Reference group*			
Grade retention/repetition				
Yes	0.32	0.62	0.42	0.95
No	*Reference group*			
Disruptions in schooling				
Yes	0.39	0.06	1.03	2.36
No	*Reference group*			
Attended a remedial course				
Yes	0.87	0.89	0.91	0.84
No	*Reference group*			
Trouble experienced during school				
Yes	1.14	0.91	1.18	0.87
No	*Reference group*			
School type				
Private	0.97	0.71	0.77	0.64
Public	*Reference group*			
Finished secondary school earlier than average				
Yes	1.06	0.58	1.74	0.94
No	*Reference group*			
Geographic location				
Rural	0.96	1.06	1.37	1.26
Urban	*Reference group*			
Province				
Newfoundland and Labrador	1.34	1.81	1.43	1.82
Prince Edward Island	0.96	0.93	1.21	1.07
Nova Scotia	0.98	1.02	1.03	1.08
New Brunswick	1.08	1.17	1.09	1.07
Québec	1.21	3.35	0.95	1.72
Manitoba	1.13	1.56	1.63	1.96
Saskatchewan	1.33	1.28	1.06	1.11
Alberta	1.75	2.31	1.56	1.58
British Columbia	1.34	0.99	1.23	1.04
Ontario	*Reference group*			

$p < 0.05$
$p < 0.01$
$p < 0.001$

Source: OECD PISA and HRSDC.

Fifth, students' educational experiences while at school were unrelated to course choice, namely grade retention/repetition, disruptions in schooling, trouble experienced while at school, completing school at a younger than average age and school type (public/private). Again, this result may be due to the fact that students participating in university (regardless of field of study) were less likely to have experienced disruptions in their educational careers.

Finally, variations according to geographic location were evident. Students in rural areas were more likely than those in urban areas to study life sciences than their urban counterparts, but the odds ratio of about 1.3 is not large. Variations by province in contrast were larger and the results suggest that in four provinces – Québec, Newfoundland and Labrador, Manitoba and Alberta – students were more likely to study pure science and life science than students in the other six provinces.

The main determinants of choice of field of study are summarised in Box 6.5.[4]

Box 6.5 **Summary of results relating to choice of field of study at university**

Overall, the effects of background characteristics on choice of field of study at university were found to be weak, accounting for 12% of the variance.

Compared to students studying human sciences, arts or communications courses, students studying pure sciences were more likely to:

- Have higher PISA reading proficiency and even more so, high school marks in science and mathematics.
- Be male.
- Be born outside Canada.
- Be living in Québec, Newfoundland and Labrador, Manitoba or Alberta.

Compared to students studying human sciences, arts or communications courses, students studying life sciences were more likely to:

- Belong to a visible minority group.
- Have high school marks in mathematics and science.
- Be living in a rural area.
- Be living in Québec, Newfoundland and Labrador, Manitoba or Alberta.

CONCLUSION

This chapter considered three important aspects of post-secondary education: participation, persistence and choice of field of study in university. As mentioned in the introduction, the research focus in post-secondary education has tended to emphasise barriers to accessing post-secondary education and less is known about persistence and course choice. Through the availability of a wide array of background data, covering demographic, socio-economic, achievement and other characteristics, it has been possible to examine these three important outcomes in considerable detail when Canadian students were aged 21.

The analyses in this chapter sought first to examine the relationship between cognitive competencies and participation in college and university, persistence in study, and course choice.

Perhaps the most important finding with respect to cognitive competencies was that for all three outcomes considered, PISA achievement remained a significant predictor, even after adjusting for demographic, socio-economic, educational and geographic characteristics. At times the estimated associations were particularly strong. For example, in the adjusted model of post-secondary education participation, students scoring at PISA proficiency Level 5 were 20 times more likely than students scoring at or below Level 1 to attend university rather than not attend any post-secondary education. The association of PISA scores were also significant in predicting college attendance, but not as strong. School marks in reading, mathematics and science were significant in the model of post-secondary education participation, but their effects were not as strong as the PISA score. In other words, a real-life measure of competencies as provided in PISA is a substantial determinant of participation in post-secondary education, particularly university, and in fact, it is a stronger determinant than school-based assessment results.

The relevance of competency measures such as PISA and school marks are demonstrated for all three outcomes. The findings also provide strong support for the predictive validity of PISA scores, particularly for participation in university, since the effects remain strong after adjusting for a variety of background characteristics. Nonetheless, there is room for further research in this area, particularly with respect to the choice of field of study and persistence in post-secondary education, since the relationship between these outcomes and prior competencies was not as clear-cut as for attendance at post-secondary education.

The analyses sought also to examine the relevance of other background characteristics for these three post-secondary education outcomes. A key message emerges from this analysis with respect to participation in post-secondary education: there is strong evidence of an intergenerational transmission effect due to parental education on attendance at university. Even after adjusting for other socio-economic characteristics such as parental occupation and income, students whose parents had a university qualification were about 4.5 times more likely to attend university themselves, compared to students whose parents did not have post-secondary education. This evidence suggests that earlier, targeted supports for students whose parents have lower levels of education may boost their chances of attending university, should they wish to do so.

The intergenerational effects were also found with respect to access to college, but they were not as strong. Parental education levels emerged as less relevant to understanding why students persist in post-secondary education and were not significant in the case of choice of field of study.

Another key finding to emerge from this evidence was that in several instances, the patterns of participation and persistence in post-secondary education for various important subgroups of the population, *i.e.* language spoken at home, ethnic minority status and country, changed once other background variables (such as province on indicators of socio-economic status) were added to the models. These results indicate that, for policy purposes, it is insufficient to examine these sub-groups without understanding the wider social, economic and cultural contexts of these groups.

These student characteristics, language spoken at home and ethnic minority status and country, were also significant predictors of choice of field of study at university. Course choice is the result of a complex set of processes, which are likely mediated by one's ethnic, cultural, linguistic and national identity. Since it would be of potential policy relevance, this area can be studied in more depth.

Furthermore, participation, persistence and course choice varied significantly across provinces and also by urban-rural regions. This result indicates that across Canada, students do not experience equity in these outcomes. However, it is not living in a particular province or urban/rural region *per se* that is important, but rather the educational, economic, social and cultural characteristics of the location. Policy interventions to promote equity will therefore need to be well informed of the specific contexts of various locations. Understanding how they impact outcomes relating to post-secondary education may be complex and challenging.

The last research question considered in this chapter sought to identify gender differences within patterns of participation, persistence and course choice. Gender differences were found in all three cases which were unrelated to the other background characteristics in the models. This indicates that the reasons for the observed gender differences lie outside the models. Females were significantly more likely than males to participate in post-secondary education, both college and university. Females were also more likely to persist in post-secondary education than males and females were noticeably under-represented in university courses that were in the field of pure sciences.

If gender equity is of concern, a better understanding as to why these differences occur is necessary in order to promote higher post-secondary education attendance and persistence in males, as well as higher take-up of pure science courses by females.

In conclusion, the educational outcomes of youth are underpinned by complex processes. To inform policy, the findings discussed above confirm the need for complex data that is capable of capturing these processes over time and in context. The evidence also confirms the significant value associated with longitudinal analysis of pathways.

Notes

1. Since the outcome is categorical rather than continuous, this is an approximation of the explained variance (pseudo R^2). The term "weak" is used if around 10% of variance is explained, "moderate" if around 25% of variance is explained, and "strong" if around 50% of variance is explained (*e.g.* Hayes, 2005).

2. Again, this is an approximation of the explained variance (pseudo R^2).

3. Again, this is an approximation of the explained variance (pseudo R^2).

4. At first glance, the results for language group appear to be inconsistent to the results for province. On the one hand, Francophones and Anglophones in Québec were less likely to be studying pure sciences. On the other, students in Québec as a whole were more likely to be studying pure sciences. This can be explained by the over-representation of students speaking another language residing in Québec, and the fact that these students tended to opt for pure sciences more frequently than the other language groups.