Pathways to Success

HOW KNOWLEDGE AND SKILLS AT AGE 15 SHAPE FUTURE LIVES IN CANADA

Programme for International Student Assessment

OECD

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Programme for **I**nternational **S**tudent **A**ssessment

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Foreword

In 2000, Canada launched the Youth in Transition Survey, a longitudinal component attached to PISA. Since then, the 30 000 Canadian students who participated in the 2000 PISA assessment have been interviewed every two years. The measurement of individual competencies followed by a longitudinal survey can lead to significant new policy insights in understanding choices made at different ages, and the impact of these decisions on consequent education and labour market outcomes. The improved quality of antecedent data and the ability to better adjust for background factors improve analytical power. The Canadian example has demonstrated the value of PISA linked to a longitudinal follow-up and can be a model for other OECD countries that are contemplating a strategy to seek a better understanding of the social and economic impact of competencies acquired at school and to produce insights on the causal nature of these relationships.

Canadian 15-year-olds performed well in PISA 2000 compared to other countries, which shows that high quality education was being provided despite the complexity and diversity of its education systems. Though there were variations in the performance across the provinces of Canada, performance variation between schools as well as between socio-economic groups was comparatively low.

Canadian youth had 48 pathway options to further education and work. About three-quarters of the students took a linear pathway to university (*i.e.* proceeding directly from secondary school) and they also had had the highest PISA scores at age 15. Regardless of the pathway, those in university had scored, on average, at PISA Level 4 or 5 and those in college scored at Level 3 or 4. Indeed, all students in university or college in 2006 at age 21 had had PISA scores well above the OECD average of 500. The pathways to college were more diverse, often including spells of work; however, these were not reflected in lower PISA scores. A significant number of youth followed indirect pathways, shifting between education and work. Half of the youth that were working in 2006 sought employment directly after secondary education and had below average PISA scores. The dispersion of reading scores among youth who were working in 2006 was much wider than both the university- and college-going youth.

There was a strong association between reading skills and educational attainment in longitudinal multivariate analyses. Higher achievement made a substantial contribution to completion of secondary school and participation in at least some post-secondary education. Students in the bottom quartile of PISA reading scores were much more likely to drop out of secondary school and less likely to have completed a grade beyond grade 12 than those in the top quartile. High achievers were more likely to still be in education at age 21 and also less likely to be in work. If they did work, they were more likely to return to education later. Among men, higher reading and mathematical proficiency had a positive association with transitions to educational and lower proficiency to work. However, among women, lower mathematics proficiency had a negative relationship with transitions to work and low maternal education had a negative relationship as well.

Though students may access post-secondary education, success is dependent on persistence (*i.e.* course completion) and course choice. How much of these outcomes are affected by competencies compared to background characteristics, since education is intended to provide equal life chances? Higher PISA proficiencies were strongly related to access, persistence and course choice at university. Students at the top PISA level of reading proficiency (Level 5) were 20 times more likely to access university than those at or below Level 1.

There remains, in addition, a strong intergenerational transmission effect on access since students with university-educated parents were 4.5 times more likely to attend university, even after adjusting for a range of other background characteristics. Furthermore, participation in university was more sensitive to background characteristics than participation in college. Also, almost two-thirds of students from high income households attended university compared with one-third from the lowest income group. Surprisingly, 61% of youth born outside of Canada attended university compared to 43% of Canadian-born youth. Therefore, it followed that almost two thirds of youth speaking a language other than English or French attended university. Female respondents were more likely to access university; however, gender differences with respect to course choice were marked in some cases. For example, males were five times more likely to choose a pure science course than females.

PISA competencies at age 15 predicted labour market outcomes as well, though it is probably too early to draw firm conclusions since at age 21, youth are barely launching their work careers. Nonetheless, by age 21, women who had obtained high reading scores at age 15 earned 12% more than those with low scores. The relationship was weaker for men. Overall, gender-based earning disparities were evident at age 21, since men earned 23% more than women.

The report is the product of a collaborative effort between the countries participating in PISA, the experts and institutions working within the framework of the PISA Consortium, the OECD, and Human Resources and Skills Development Canada (HRSDC). The production of the report was funded by a contribution from the government of Canada. The report was drafted by Satya Brink, Jude Cosgrove, Tomasz Gluszynski, Andreas Schleicher and Pablo Zoido. Jude Cosgrove from the Educational Research Centre in Dublin, Ireland edited the report based on draft chapters prepared by Satya Brink and Andreas Schleicher (for Chapters 1 and 8), Darren King from Human Resources and Skills Development Canada (for Chapter 3), Justin Bayard and Tomasz Gluszynski from Human Resources and Skills Development Canada (for Chapter 4), Jorgen Hansen from Concordia University (for Chapter 5), Pierre Canisius Kamanzi, Pierre Doray, Jake Murdoch, Stéphane Moulin, Élise Comoé, Amélie Groleau, Catherine Leroy, Frédéric Dufresne from the Centre Interuniversitaire de Recherche sur la Science et la Technologie at the Université du Québec à Montréal (for Chapter 6) and Torben Drewes from Trent University (for Chapter 7). Patrick Bussière and Tomasz Gluszynski provided guidance and input for the report from Human Resources and Skills Development Canada and Pablo Zoido from the OECD Secretariat. Juliet Evans, Niccolina Clements, Elisabeth Villoutreix and Simone Bloem provided editorial and administrative input for the report. Fung Kwan Tam did the layout design. The development of the report was steered by the PISA Governing Board, which is chaired by Lorna Bertrand (United Kingdom). The report is published on the responsibility of the Secretary-General of the OECD.

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Executive Summary

The measurement of individual competencies followed by a longitudinal survey can lead to significant policy insights in understanding the choices made at different ages and the impact these decisions have on consequent education and labour market outcomes.

In 2000, Canada launched the Youth in Transition Survey (YITS) in conjunction with the OECD Programme for International Student Assessment (PISA). Since then, the 30 000 Canadian students that participated in PISA 2000 have been interviewed every two years to collect information about their experiences in education and the labour market. The enhanced assessment of individual competencies, the quality of antecedent data and the ability to better adjust for background factors, improve analytical power. The availability of outcome variables later on in time maximises the capacity to explain the increase or decrease in results relative to explanatory factors. YITS will be completed in 2010 and in 2009 participants were re-assessed using the same tools as in PISA 2000. *Pathways to Success* showcases some of the advantages of a PISA longitudinal component by highlighting some key findings emerging from the PISA 2000/YITS data up to the 2006 round.

The Canadian example has demonstrated the value of linking PISA to a longitudinal follow-up and can be a model for other OECD countries that are contemplating a strategy to seek a better understanding of the social and economic impact of competencies acquired by the school going population.

The analysis and insights emerging from YITS up to 2006 are of interest for Canada and PISA countries. The availability of such a large sample coupled with the student, school and parent questionnaires as well as the student assessment resulted in a rich source of information. Its geographical diversity, the heterogeneity of its student population and the institutional variance across educational systems through provinces allows for a varied and complex set of circumstances that may mirror those found in many other PISA participating countries and economies.

Canada measured up favourably in terms of the equity of educational outcomes and the excellence of student achievement across an array of student socio-economic and background characteristics.

Canadian performance in PISA 2000 showed that it is possible to succeed in providing both excellence and equity in complex and heterogeneous circumstances. PISA 2000 also proved useful in Canada to identify remaining challenges. Given the diversity of the Canadian education systems, Canada's experience provides insights that may be of interest to other countries. For all of these reasons, the results discussed in this report are relevant for a global audience.

High levels of competencies at age 15 are associated with linear pathways and higher educational attainment – notably a university education – but the Canadian evidence on nonlinear pathways (those shifting between education and work) show that many paths are available for youth to pursue a successful academic and professional career.

The analysis of youth pathways through education and work is one of the critical advantages of longitudinal studies. For Canada, YITS shows that most youth follow linear pathways (proceed straight to post-secondary education from secondary school). Combining PISA and YITS, the evidence shows that in Canada educational attainment was associated with higher performance in PISA 2000. All students in university or college in 2006 (at age 21) had PISA scores well above the OECD average of 500 score points. The vast majority of university students in 2006 were top performers in PISA 2000 (scoring at Levels 4 and 5). Sizable proportions of university (14%) and college students (35%) worked before pursuing their post-secondary education degrees. Those at work in 2006 formed the most heterogeneous group of respondents in terms of their PISA 2000 scores. The degree of variation in the scores is evidence that high proficiency as measured by PISA is not a prerequisite for entry into post-secondary education and that students can continue to gain competencies through further education.

Generally speaking, students who completed secondary school at an older than average age, regardless of whether they attended post-secondary education or not, had fared worse in terms of their achievement on PISA in 2000. Also, students proceeding directly to work from school had low PISA scores. This may be indicative of the negative association between disruptions to schooling or grade repetition on both achievement and later outcomes. Linear pathways to post-secondary education were associated with higher reading scores which suggest that policies to promote post-secondary education attendance could include initiatives to promote smooth transitions to post-secondary education.

Higher achievement in PISA plays a role in predicting transition from and to education, work and inactivity. Notably, high PISA scores made a substantial contribution to completion of secondary school and participation in at least some post-secondary education even after taking other student background characteristics into account.

The results also show that there is a strong association between reading proficiency and educational attainment in longitudinal multivariate analyses, after adjusting for background factors, indicating that strong competencies could overcome effects of disadvantages. Students in the bottom quartile of PISA reading scores were much more likely to drop out of secondary school and less likely to have completed a year beyond grade 12 than those in the top quartile. High achievers were more likely to still be in education at age 21 and also less likely to be in work. If they did work, they were more likely to return to education later. Among men, higher reading and mathematical proficiency had a positive association with transitions to education and lower proficiency, to work. Among women, lower mathematics proficiency had a negative relationship with transitions to work and low maternal education had a negative relationship as well. Years of schooling, that is higher educational attainment, was the other background characteristic that was consistently associated with higher likelihood of continuing in education and a lower likelihood of transitioning to work or inactivity. Other background characteristic, such as parental income, did not help predict transitions.

Access to and persistence in post-secondary education and choice of field of study at university are strongly related with higher PISA achievement and some student background characteristics.

Access and persistence in post-secondary education, and the appropriate field of study in university are all important outcomes for educational policy design and implementation. But these outcomes are underpinned by complex processes. An advantage of longitudinal data is that they can inform such policies. The nuanced findings and robust evidence discussed in this report confirms the significant value of the longitudinal analyses of pathways available through PISA and YITS.

Longitudinal multivariate analyses from PISA and YITS show the importance of the competencies measured by PISA and other student background characteristics for access to and persistence in post-secondary education and university course choice. For example, students at the top PISA level of reading proficiency (Level 5) were twenty times more likely to access university than those at or below Level 1. Student background characteristics also play an important role in these three areas. A strong intergenerational transmission effect remains present: students with university-educated parents were 4.5 times more likely to attend university, even after adjusting for a range of other background characteristics. Furthermore, participation in university was more sensitive to background characteristics than participation in college. Also, almost two-thirds of students from high income households attended university compared with one-third from the lowest income group. 61% of youth born outside of Canada attended university compared to 43% of Canadian-born youth. Female respondents were more likely to access university. However, gender differences with respect to choice of field of study were marked in some cases. For example, males were five times more likely to choose a pure science than females.

At age 21, there is some evidence for the relationship between competencies as measured by PISA and labour market outcomes but most likely it is still premature and any potential impact is likely to strengthen later on in the careers of YITS participants.

PISA competencies at age 15 predicted to some extent labour market outcomes at age 21. It is, however, too early to draw firm conclusions since at age 21, youth are barely launching their work careers. Nonetheless, by age 21, women with high reading scores earned 12% more than those with low scores. The relationship was weaker for men. Overall, gender-based earning disparities were evident at age 21, since men earned 23% more than women.

In short, combining of a reliable measure of student performance with a longitudinal follow-up lives up to expectations by providing invaluable information for policy makers.

This Executive Summary provides an overview of the two objectives of the report: to provide evidence from longitudinal analyses related to the PISA 2000 cohort that can be of value to participating countries and to emphasise the importance of integrating PISA measures of competence with longitudinal surveys for policy making. The report provides results from Canada which integrated PISA and a longitudinal follow up, which can be sensitively generalised to other countries. Furthermore, the value of linking the PISA test of competence with longitudinal data is evident from the generated policy relevant evidence to:

- Track the diversity of traditional and emerging pathways and their impact on higher education as well as labour market pathways based on early measures of competence.
- Monitor participation in higher education by different groups of young people and factors affecting the choice of discipline and type of higher education.
- Identify the factors that influence access to different education and labour market options and whether these pathways were completed, interrupted or unachieved.

List of Acronyms

CÉGEP	Collège d'Enseignement Général et Professionnel (associated with the education system of Québec)
ESCS	Economic, social and cultural capital (the socio-economic measure employed in many analyses of PISA)
GDP	Gross Domestic Product
HRSDC	Human Resources and Skills Development Canada
OECD	Organisation for Economic Co-operation and Development
PGB	PISA Governing Board
PISA	Programme for International Student Assessment
S.D.	Standard deviation
S.E.	Standard error
YITS	Youth in Transition Survey (longitudinal study of PISA 2000 students in Canada)

1

Introduction: The Case for Linking PISA with Longitudinal Studies

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Abstract

The Programme for International Student Assessment (PISA) offers a comprehensive, high-quality and reliable indicator of how education systems fare in close to 70 countries. It allows countries to benchmark their performance against international standards and also contextualise their performance in order to inform policy in a number of areas. Using Canada as an example, this chapter shows that the results of cross-sectional studies such as PISA can be significantly enhanced through the strategic implementation of a longitudinal component. These enhancements can lead to significant policy insights in understanding the choices made at different ages and the impact these choices have on consequent education and labour market outcomes. With these insights at hand, decision makers can make more informed investments in public policy.

INTRODUCTION

In most OECD countries, education is one of the highest social expenditures as a proportion of GDP. A better understanding of the process by which citizens build their human capital is important for successful government policies for growth and development. Therefore, it is vital to have reliable measures of the returns to investments in education as well as the impact of competencies learned during education on later outcomes in life.

MEASURING THE EDUCATIONAL, LABOUR MARKET AND SOCIAL OUTCOMES IN RELATION TO COMPETENCIES ACQUIRED EARLY IN LIFE

In addition to governments, parents, students and those who teach and run education systems seek reliable information on how well their education systems prepare students for life. As a start, many countries assess national student performance in schools. For example, among 36 countries with comparable data, including the 30 members of the OECD, 22 countries undertake national student examinations and/or assessments and 17 require schools to be evaluated (either self-evaluations and/or inspections by an external body) at regular intervals.

The need for international comparability has gained prominence over recent years, since in an increasingly interconnected world, the quality of education can no longer solely be judged by improvements in national standards, but also by benchmarking national performance against the most successful education systems in the world. Comparative international assessments can, therefore, extend and enrich the national picture by providing a larger context within which to interpret national performance. Such international comparisons enable countries to identify areas of relative strengths and weaknesses and to monitor the pace of progress in their own education system. They can also stimulate countries to raise aspirations by showing what is possible in terms of the quality, equity and efficiency of education achieved in other countries. From such comparisons they can better understand how other governments and different education systems address similar policy challenges.

In response to the need for cross-nationally comparable evidence on student performance, the OECD launched the Programme for International Student Assessment (PISA) in 1997. PISA represents a commitment by governments to monitor the outcomes of education systems in terms of student achievement on a regular basis and within an internationally agreed common framework. PISA breaks new ground as the framework focuses on what 15-year-olds (regardless of grade or curriculum) know and examines the real-world application of knowledge gained in school in an international perspective. It aims to provide a new basis for international

and national policy dialogue about the skills that are relevant to adult life and how best to develop them through compulsory education for all children.

Because PISA only assesses 15-year-olds in school, these data alone cannot answer fundamental policy questions such as: how successfully do education systems ensure high levels of performance among students to prepare them for adult life? Do all children completing school have equal odds of achieving such high levels of performance regardless of geographic location, socio-economic condition or cultural background? Are children equally well-prepared to carry out adult roles? What factors lead to positive longer-term educational and labour-market outcomes over the lifespan?

In 2001, OECD countries, assisted by Statistics Canada, discussed a potential strategy to integrate PISA more systematically with a series of longitudinal surveys in order to link the competencies students acquire as young adults with their subsequent educational, labour-market and social outcomes. The essence of longitudinal methodology is that the same individuals are surveyed on a regular basis over time. By surveying the same students (whose competencies were measured by PISA) repeatedly over time, it is possible to monitor how early performance affects later outcomes in life within the context of the choices they make and their major life events. Longitudinal data linked to measured performance provide a key means of relating the extent to which the variation in knowledge and competence acquired through school do in fact affect the distribution of education, labour market and social outcomes in adult life.

Canada was the first country to pioneer such an approach by a coherent set of data enhancements in order to understand the links between student performance and adult outcomes. In 2000, Canada augmented the sample size of children who participated in PISA, so that more detailed national analyses could be conducted. These 30 000 students, whose competencies were measured by PISA in 2000 were interviewed every two years from age 15 into their mid-20s through the longitudinal Youth in Transition Survey (YITS). It is this combination of enhancements that has given Canada the unique advantage of long-run longitudinal analyses of the pathways of a cohort of children who made choices between the ages of 17 and 24 on their time spent on education, work or combinations of both. In addition, parents of these students were also interviewed to gather information on incomes, occupations, countries of origin and aspirations for their children. Furthermore, these data allowed the testing of the predictive value of PISA assessments in relation to concrete outcomes of higher education and the labour market. Specifically, this strategy provided policy relevant evidence to:

- compare Canadian student performance to other countries participating in PISA and to examine the life chances of high and low performers;
- monitor participation in higher education by different groups of young people and factors affecting the choice of discipline and type of higher education;
- track the diversity of traditional and emerging pathways and their impact on higher education as well labour market pathways;
- map the patterns of pathways from initial education to subsequent education and training and the labour market in relation to early competencies;
- identify the factors that influence access to different education and labour market options and whether these pathways were completed, interrupted or unachieved;
- quantify the economic and social benefits from participation in different forms of education and training, such as the labour market destinations of different education and training pathways; and
- investigate additional aspects of the transition from education to adult life, such as family formation and civic participation.

While the longitudinal Youth in Transition Survey will continue until those 15-year-olds in 2000 are 25 years old, results from the analyses of the first waves of data already reveal important insights on the impact of PISA performance on the subsequent educational and labour market options and outcomes.

Other PISA participating countries judge these Canadian results so relevant for their national policies that the decision was made to jointly publish a thematic report of these analyses with the Government of Canada. Moreover, since Canada first began its longitudinal extension of PISA in 2000, a number of other countries, most notably Australia, Denmark, Switzerland and Uruguay, have developed similar approaches, further underlining the relevance of longitudinal data (see Annex A).

Before turning to the analysis of the results in the subsequent chapters, this chapter lays out the rationale for a longitudinal extension of PISA in greater detail.

A RATIONALE FOR THE LONGITUDINAL EXTENSION OF PISA

The rationale for linking PISA with a longitudinal survey is based on the value of measured competence as a predictor of future outcomes, the importance of the young adulthood phase, the evolving nature of transition between school and work and the importance of reliable antecedents as well as competence as determinants of future educational labour market outcomes. Longitudinal tracking of a cross-sectional cohort also presents advantages of data quality, analytical strengths and reduction of bias.

Longitudinal surveys have traditionally been used to measure progression, but variations in progression could not be explained without some measure of competencies. The combination of performance measures with subsequent pathways is invaluable for evidence-based policy. Cognitive ability, as measured by marks or standardised achievement tests, have been linked to future educational attainment and to labour market earnings. Longitudinal surveys of youth are therefore greatly enhanced by the addition of achievement measures, such as the ones provided by PISA. Without the inclusion of achievement measures, analyses of young people's educational and labour market outcomes do not provide adequate evidence for targeted policies.

The PISA cohort age of 15 makes for a natural beginning for the study of transitions from school to adulthood. Though a great majority of youth at this age are still in secondary school, they are beginning to form expectations about the directions in which they can develop their talents in the future. This is an age at which they start making key decisions that will affect their longer term educational and labour market success. They begin to explore options and gain experience for the labour market through part time or voluntary work. The attitudes towards learning and their learning habits will serve them for the rest of their lives. Therefore, a longitudinal extension of PISA enables the exploration of the relationship between achievements at age 15 and later education and labour market outcomes in order to strengthen the knowledge base for better collaboration between education and labour-market policy in support of smoother school-work transitions. More specifically, it can facilitate the understanding of the longer-term effects of educational achievements at age 15; the formation of educational and occupational aspirations; the effect of schools on educational and occupation outcomes; the impact of various activities on transitions, such as volunteer work, part-time work, participation in work experience programs; the various work-based (apprenticeship), general, vocational, technical and academic pathways taken by youth and the progression to further education and/or the labour market and subsequent transitions.

Most labour market surveys and national transition surveys cover only transitions from the point when people leave education and enter the labour market. However, the transition from education to work can no longer be thought of as a single event. It is now more appropriately seen as a sequence of transitions between single and/or multiple options combining learning and working. By examining the whole transition process,

with a representative cohort of young people born in a particular year, it is possible to understand the different choices made during the transition process in response to complex social and economic contexts. Indeed, the ability to measure change or growth over time is a key benefit of longitudinal analysis.

Furthermore, unlike cross-sectional data, longitudinal studies are better able to isolate confounding factors such as social and cultural background. Each longitudinal record contains information about the past social and educational background of the young person as well as their occupational or educational status over time. The capacity to adjust for background factors while measuring growth or change over time is a key feature of longitudinal data. This is because background data are gathered at an earlier time rather than at the same time as when the educational or employment outcomes are measured. Through the linkage of individual records of policy sensitive variables over time from the same group of individuals, a longitudinal survey permits the study of relationships between factors measured in one period, such as achievement, aspirations, behaviours and outcomes measured in future time periods. The quality of antecedent data also tends to be better in longitudinal rather than cross-sectional data. Respondents in a cross-sectional survey would be required to answer questions based on the past, resulting in potential inaccuracies. Because respondents in longitudinal surveys are interviewed frequently, data quality is better and without recall bias. Statistical methods for removing bias are more powerful when accurate background, educational and work history data are available.

Ideally, a longitudinal design provides an opportunity for respondents to be re-assessed many years later to determine the extent to which the performance at age 15 is related to the learning gained formally and informally since that time. Again, Canada will be the first country to test this innovative methodology, though the results are not available for this publication.

CONCLUSION

The integration of PISA with longitudinal surveys in order to link the competencies students acquire as young adults with their subsequent educational, labour market and social outcomes offers significant new policy insights. By surveying the students that participated in PISA repeatedly over time, it is possible to monitor how early performance affects their later outcomes in life within the context of the choices they make and their major life events.

At the present time only a minority of OECD countries have some form of national longitudinal study. Those studies have developed at different times with different frameworks, and have only very limited international comparability. Better co-ordination of such studies among countries participating in PISA would, for the first time, allow cross-national analyses of young people's pathways through education and into work in national and international contexts. The diversity of pathways and associated results would provide invaluable information for the targeting of policies and the evaluation of their effectiveness.

The sharing of developmental costs and opportunities for mutual learning that will result from such co-ordination would benefit, in particular:

- countries without a national longitudinal study;
- countries where the current longitudinal study does not include data on student achievement;
- countries whose current longitudinal study does include student achievement data, but where the achievement and other measures are not internationally comparable; and
- countries with a longitudinal study that does not cover a full cross-section of young people, or that covers a limited range of transitions.

Because the group of participating countries in PISA has now grown close to 70, the value of sharing both the experience of building PISA into a national data system as well as the results from longitudinal analysis is magnified. This report, which builds on selected research projects using Canadian data, adds value precisely in this sense. It serves the two-fold objective of demonstrating how the value of PISA can be enhanced for national policy analyses in participating countries and of sharing the results of analyses that might be sensitively generalised to other countries.

ORGANISATION OF THIS REPORT

This chapter illustrates the relation of competencies acquired early in life by a representative sample of Canadian youth born in 1984, to later educational, social and labour market outcomes.

Chapter 2 provides an overview of PISA 2000 and describes how YITS was implemented and gives an overview of the Canadian education system in order to provide a context to interpret the results in subsequent chapters.

Chapter 3 revisits Canadian performance in PISA 2000 and considers how the Canadian education system measures up in terms of quality and equity.

Chapter 4 considers five major pathways through education and work taken by young Canadians up to age 21, identifies the more and less common pathways and considers the extent to which achievement on PISA varies depending on the pathway selected. The predictive power of achievement on the PISA assessment will be over-estimated if adjustments are not made for background characteristics that are themselves associated with achievement. Therefore, the results in Chapters 5, 6 and 7 examine outcomes and pathways in a more nuanced manner that takes this into account.

Chapter 5 focuses on educational attainment – that is, how far students had progressed in their educational pathways by age 21. It examines the extent to which attainment varies according to achievement in PISA 2000 as well as a variety of school and student characteristics.

Chapter 6 addresses three important outcomes relating to post-secondary education; that is, access, persistence and course choice. It seeks to examine the extent to which achievement on PISA, as well as school-based achievement measures, predict these three outcomes. Results are adjusted, once again, for a variety of background characteristics.

Chapter 7 considers the extent to which achievement on PISA predicts the labour market outcomes of young Canadians at age 21. The influence of other background characteristics is taken into account, including, importantly, the highest level of education attained.

Chapter 8 – the conclusion – summarises the evidence from the longitudinal analysis for policy and presents transferable ideas for future linkages between PISA and longitudinal studies.

2

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Abstract

This chapter provides the context in which to interpret the analyses presented in the chapters that follow. It describes the objectives and designs of the Programme for International Student Assessment (PISA) and the Youth in Transition Survey (YITS) and discusses a rationale for linking cross-sectional and longitudinal surveys. It uses Canada as an example to identify the benefits of synergies between cross-sectional and longitudinal studies in education. The chapter concludes with an overview of the systems of education in Canada in order to facilitate and enhance the interpretation of the evidence discussed in subsequent chapters.

IMPORTANCE OF LINKING ASSESSMENTS AND LONGITUDINAL PROJECTS FOR POLICY

PISA allows countries to benchmark the performance of students near the end of compulsory schooling to a global standard. The survey also provides information on the quality and equity in educational outcomes (Brink, 2009; OECD, 2001). However, while the results potentially predict the future quality of human capital within countries and also signal future competitive advantages and challenges, these are projections to the future and so cannot be made with certainty on the basis of the PISA results alone.

The addition of a longitudinal component, such as YITS, to a cross-sectional survey, such as PISA, is of potentially great value to educational, economic and social policy design, implementation and evaluation. YITS provides an opportunity to assess the extent to which predictions of future quality of human capital on the basis of PISA actually come to fruition in the form of subsequent educational and labour market outcomes such as access to post-secondary education, employment and hourly earnings. Furthermore, it is possible to examine how and why different subsequent educational trajectories play out for further education and work after completion of compulsory education.

This chapter begins with a brief overview of PISA 2000 and describes how and why Canada implemented a longitudinal component beginning in 2000. Then it offers a short presentation of YITS, the longitudinal component of PISA. An overview of the Canadian education system is also given to provide a context in which to interpret the results of analyses featuring in subsequent chapters.

PISA OVERVIEW

The OECD Programme for International Student Assessment (PISA) is a collaborative endeavour among OECD member countries and economies to assess the extent to which students at age 15, approaching the end of compulsory schooling, are prepared to meet the challenges presented to them by the knowledge societies of the twenty-first century. The assessment is therefore focused on young people's capacity to use their knowledge and skills to solve real-life challenges rather than on mastery of a school-based curriculum. This approach represents a shift in the objectives of curricula, which are increasingly focusing on what students can do with the knowledge and skills learned at school, over and above whether they have learned it.

PISA represents the most comprehensive and rigorous international assessment programme to date. It collects not only information on student achievement in the three key domains of reading, mathematics and science, but also important contextual information on individual, family and institutional factors in order to understand how and why achievement varies. The scope and design of these instruments was guided by leading experts in the participating countries and steered by governments on the basis of shared, policy-driven interests. The assessments incorporate both cultural and linguistic breadth and the study is

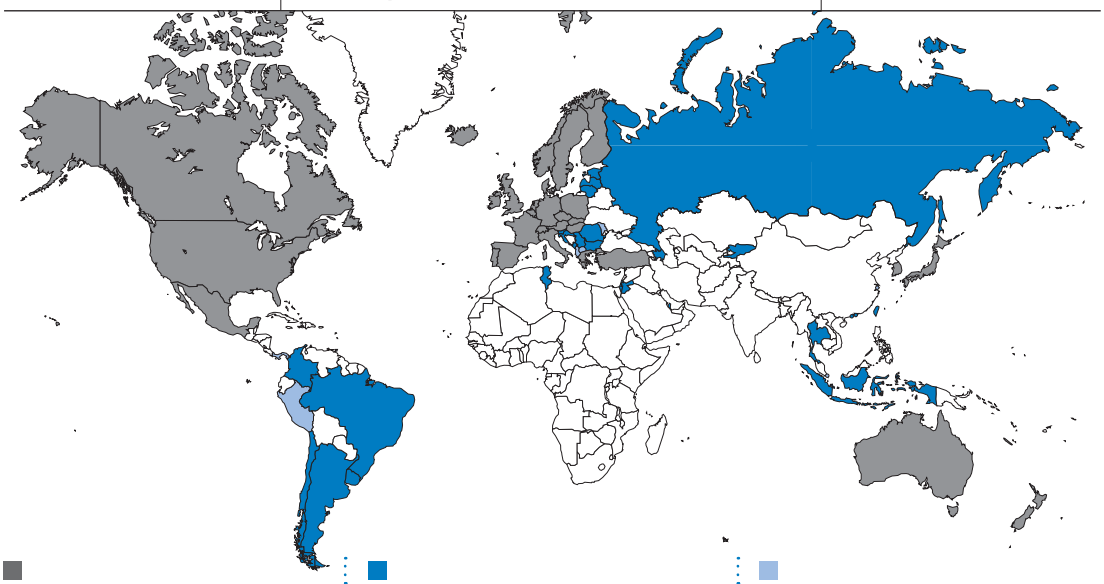
underpinned by a stringent quality assurance programme that covers all aspects of implementation, including sampling, translation and response rates. As a result, the PISA data have high validity and reliability and provide high-quality, internationally comparable measures of cognitive ability.

PISA is based on a dynamic model of lifelong learning, in which knowledge and skills are continuously acquired throughout a person's lifetime in order to adapt successfully to a changing environment. PISA therefore focuses on knowledge and skills that 15-year-olds will need in the future and aims to assess how they apply what they have learned. The assessment is informed, but not constrained, by national curricula.

The assessment takes place every three years, with the first one in 2000 in 28 OECD member countries and four partner countries (Figure 2.1). In total, over one-quarter of a million students, representative of close to 17 million 15-year-olds enrolled in schools across these 32 countries, participated. In 2002 an additional 11 partner countries and economies administered the PISA 2000 assessment, for a total of 43 educational systems.

Figure 2.1

A map of PISA countries and economies



OECD countries

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Korea
Luxembourg
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

Partner countries and economies in PISA 2006

Argentina
Azerbaijan
Brazil
Bulgaria
Chile
Colombia
Croatia
Estonia
Hong Kong-China
Indonesia
Israel
Jordan
Kyrgyzstan
Latvia
Liechtenstein
Lithuania
Macao-China
Montenegro
Qatar
Romania
Russian Federation
Serbia
Slovenia
Chinese Taipei
Thailand
Tunisia
Uruguay

Partner countries and economies in previous PISA surveys or in PISA 2009

Albania
Shanghai-China
Macedonia
Moldova
Panama
Peru
Singapore
Trinidad and Tobago

Source: OECD (2007).

In PISA 2000, students in participating countries completed a two-hour written assessment and a 30-minutes questionnaire, while school principals completed a school questionnaire. In 25 of the countries, students also completed an optional section of the questionnaire that examined their attitudes to learning. The assessments comprised a mixture of multiple-choice questions (about two-thirds of tasks) and open-ended questions requiring a written response (about one-third of tasks). The types of written responses ranged from a word or short phrase to more extended responses of several sentences in length. About seven hours of assessment material was used, with each student attempting a subset of this material. In 2000, reading was the main focus of the assessment, with smaller amounts of the total assessment time allocated to mathematics and science. In 2003 the focus domain was mathematics and in 2006, it was science. In 2009, the focus was again on reading.

Since 2000, the number of countries participating has increased, so that by 2009, 67 countries and economies participated in PISA.

The results of PISA yield a number of important outcomes including a detailed profile of knowledge and skills of 15-year-olds and contextual factors that relate these results to student and school characteristics. The PISA assessments form a rich knowledge base for policy analysis and research; with each successive three-year cycle, trend data monitor changes over time. In particular, comparing reading results from 2000 and 2009 can provide information about improvements (or worsening conditions) in educational programmes.

What PISA measures

Proficiency in the three domains (reading, mathematics and science) is conceived as a continuum rather than a binary measure. PISA suggests a minimum threshold level of proficiency, below which competency levels would be considered to be inadequate for effective functioning in the modern world. The concept of proficiency levels is explained a little later in this section.

The assessment framework for PISA 2000 (OECD, 1999, 2000) describes each domain in detail, distinguishes between the content or structure of the assessment, the processes required and the contexts in which knowledge and skills are applied. A comprehensive compendium of assessment tasks drawn from PISA 2000, 2003 and 2006 was also published (OECD, 2009).

In PISA 2000, reading literacy is defined as the ability to understand, use and reflect on written texts in order to achieve one's goals, to develop one's knowledge and skills and to participate effectively in society. This definition goes well beyond the notion of reading as simply decoding or literal comprehension and extends it to its value in the real world.

In total, 141 questions were used in the 2000 assessment of reading. Performance on three subscales (retrieving information, interpreting texts and reflecting and evaluating texts) was also reported (OECD, 2001). Scales were developed based on a hierarchy of tasks, from simple retrieval of information to higher-order analytical thinking.

In PISA 2000, competency in mathematics is defined as the ability to identify, to understand and engage in mathematics and to make well-founded judgements about the role that mathematics plays for an individual's current and future private life, occupational life, social life with peers and relatives and life as a constructive, concerned and reflective citizen. In total, 32 mathematics questions were included in the PISA 2000 assessment.

Finally, in PISA 2000, competency in science is defined as the ability to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity. A total of 35 questions were included in the assessment of science in PISA 2000.

Figure 2.2
PISA 2000 reading literacy proficiency levels

	Retrieving information	Interpreting texts	Reflection and evaluation
What is being assessed on each of the reading literacy scales:	Retrieving information is defined as locating one or more pieces of information in a text.	Interpreting texts is defined as constructing meaning and drawing inferences from one or more parts of a text.	Reflecting and evaluation is defined as relating a text to one's experience, knowledge and ideas.
Characteristics of the tasks associated with increasing difficulty on each of the reading literacy scales:	Task difficulty depends on the number of pieces of information that need to be located. Difficulty also depends on the number of conditions that must be met to locate the requested information, and on whether what is retrieved needs to be sequenced in a particular way. Difficulty also depends on the prominence of information and the familiarity of the context. Other relevant characteristics are the complexity of the text and the presence and strength of competing information.	Task difficulty depends on the type of interpretation required, with the easiest tasks requiring identification of the main idea in a text, more difficult tasks requiring an understanding of relationships that are part of the text and the most difficult requiring an understanding either of the meaning of language in context or analogical reasoning. Difficulty also depends on how explicitly the text provides the ideas or information the reader needs in order to complete the task, how prominent the required information is and how much competing information is present. Finally, the length and complexity of the text and the familiarity of its content affect difficulty.	Task difficulty depends on the type of reflection required, with the easiest tasks requiring simple connections or explanations relating the text to external experience and the more difficult requiring a hypothesis or evaluation. Difficulty also depends on the familiarity of the knowledge that must be drawn on from outside the text, the complexity of the text, the level of textual understanding demanded on how explicitly the reader is directed to relevant factors in both the task and the text.
LEVEL 5	Locate and possibly sequence or combine multiple pieces of deeply embedded information, some of which may be outside the main body of the text. Infer which information in the text is relevant to the task. Deal with highly plausible and/or extensive competing information.	Either construe the meaning of nuanced language or demonstrate a full and detailed understanding of a text.	Critically evaluate or hypothesise, drawing on specialised knowledge. Deal with concepts that are contrary to expectations and draw on a deep understanding of long or complex texts.
4	Locate and possibly sequence or combine multiple pieces of embedded information, each of which may need to meet multiple criteria, in a text with unfamiliar context or form. Infer which information in the text is relevant to the task.	Use a high level of text-based inference to understand and apply categories in an unfamiliar context, and to construe the meaning of a section of text by taking into account the text as a whole. Deal with ambiguities, ideas that are contrary to expectation and ideas that are negatively worded.	Use formal or public knowledge to hypothesise about or critically evaluate a text. Show accurate understanding of long or complex texts.
3	Locate, and in some cases recognise, the relationship between pieces of information, each of which may need to meet multiple criteria. Deal with prominent competing information.	Integrate several parts of a text in order to identify a main idea, understand a relationship or construe the meaning of a word or phrase. Compare, contrast or categorise taking many criteria into account. Deal with competing information.	Make connections or comparisons, give explanations, or evaluate a feature of text. Demonstrate a detailed understanding of the text in relation to familiar, everyday knowledge, or draw on less common knowledge.
2	Locate one or more pieces of information, each of which may be required to meet multiple criteria. Deal with competing information.	Identify the main idea in a text, understand relationships, form or apply simple categories, or construe meaning within a limited part of the text when the information is not prominent and low-level inferences are required.	Make a comparison or connections between the text and outside knowledge, or explain a feature of the text by drawing on personal experience and attitudes.
1	Take account of a single criterion to locate one or more independent pieces of explicitly stated information.	Recognise the main theme or author's purpose in a text about a familiar topic, when the required information in the text is prominent.	Make a simple connection between information in the text and common, everyday knowledge.

Source: *Knowledge and skills for life: First results from PISA 2000* (OECD, 2001).

For all three domains, achievement scores for PISA 2000 were scaled to have an OECD average of 500 and a standard deviation of 100. That is, across the OECD, approximately two-thirds of students score between 400 and 600. The averages and standard deviations for the three reading subscales differ slightly to those of the combined reading scale.

Since the mathematics and science assessments contained fewer questions in PISA 2000, it was not possible to develop proficiency levels. However, in the case of reading, proficiency levels were developed. The *PISA 2000 Technical Report* (OECD, 2002) provides detailed information on the methods used to produce the achievement scales and also the proficiency levels.

To develop and describe the reading proficiency levels, cut-points on the continuous scales were first identified based on the hierarchy of tasks and the knowledge and skills associated with each task within a level was described. In this manner, the knowledge and skills of students scoring at a particular level can be described in concrete terms and with reference to specific assessment tasks. This is important since the levels can then be used to benchmark performance within and across countries and describe in concrete terms what these benchmarks mean in relation to real-world demands.

Proficiency Level 5 corresponds to a score of more than 625, Level 4 ranges from 553 to 625, Level 3 ranges from 481 to 552, Level 2 corresponds to a score between 408 and 480 and Level 1 ranges between 335 and 407. Students scoring below 335, *i.e.* below Level 1, were routinely unable to demonstrate the most basic levels of knowledge and skill assessed in PISA. While PISA does not establish a threshold for illiteracy, performance below Level 1 does signal serious deficiencies in reading and at most, an ability to respond successfully only to the most basic and straightforward of reading tasks. Furthermore, it is likely that students scoring at Level 1 and below are some distance from possessing adequate knowledge and skills to function effectively in the future. As such, students scoring at or below Level 1 may be the focus of targeted interventions. In contrast, students scoring at Level 5 may be regarded as demonstrating advanced reading skills and able to reason in complex, analytic ways.

Figure 2.2 provides a description of the knowledge and skills associated with each reading proficiency level for the three reading subscales of retrieving information, interpreting texts and reflecting on and evaluating texts.

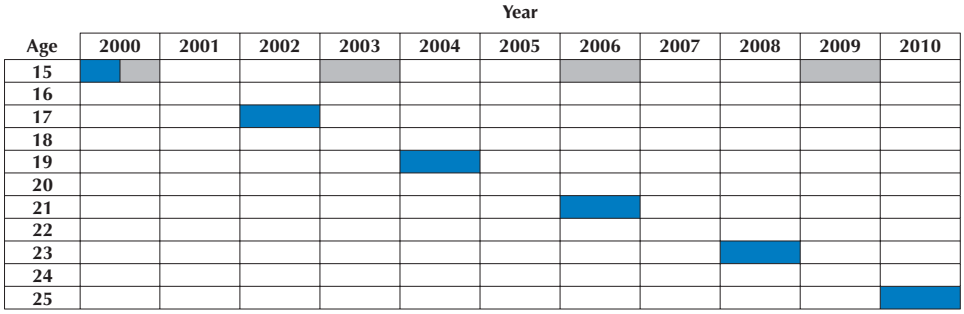
Canada's sample for PISA 2000 was over 30 000 respondents (where a "typical" sample size was around 4 500). This large sample tremendously boosts analytical power, allowing, for example, detailed comparisons across Canada's provinces along different dimensions of quality and equity in educational outcomes. Canada also included a parents' questionnaire to collect more accurate information on parents' education, occupation and income, as well as their aspirations for their children.

YITS OVERVIEW

The idea to implement the Youth in Transition Survey (YITS) began in the mid-1990s, in order to develop evidence for policies to improve the educational outcomes of Canadian youth to ensure Canada's continuing prosperity. A better understanding was required of the costs and benefits of educational investments, reasons why some youth pursue education while others do not and the pathways youth take as they transition into the labour market (Motte *et al.*, 2008).

In total, 29 687 students in 1 242 schools in Canada participated in PISA 2000. These students were then followed up every two years.[1] To date, data are available for 2000, 2002, 2004 and 2006. Two more cycles, ending in 2010, will provide extremely detailed data by which to analyse and contextualise the education and labour market pathways for Canadian youth, who will be age 25 in 2010.

Figure 2.3
Overview of data collection waves for YITS and PISA



YITS younger cohort
PISA cross-sectional sample

Source: HRSDC.

Figure 2.3 shows the data collection cycles for YITS for students that participated in PISA 2000.[2]

The information gathered in each cycle of YITS is slightly different. In 2000, the information gathered was composed of four components:

- Data derived from participation in PISA 2000.
- A specially designed student survey that collected information on learning behaviours.
- A questionnaire for parents that collected information on learning environments at home.
- A specially designed school survey in addition to what was already included in the PISA school questionnaire that collected detailed information on the learning environments of the school.

In 2002, 2004 and 2006, only the student survey was re-administered, with some further questions adjusted to account for the youths' current situation and their previous responses. No data was collected from parents or from schools, but the survey focused on pathways and contextual information to measure progress and change in context.

The YITS, administered by telephone, gathered information on four major themes – demographic and family characteristics, high school experience, post-secondary education and labour market activities financial factors as related to post-secondary education (Motte *et al.*, 2008; Statistics Canada, 2007).

This information was merged with the rich content of the PISA 2000 dataset for Canada. In this way, PISA and YITS represent a complementary and synergistic programme of research. As a result, the Canadian national report released in 2001 (Bussière *et al.*, 2001) contained more detailed national analyses compared to the international report. It provided additional information on the performance of individual provinces and more detailed analysis of background variables not included in PISA. It also contained documentation of the beginning of pathways near the end of compulsory education, where diversity was limited and equity was likely to be higher.

As an illustration, Box 2.1 describes the content of the information collected in the YITS student survey in 2006 in a little more detail.

Box 2.1 **What type of information is gathered in YITS?**

The YITS student survey was designed to complement the information gathered in PISA 2000 and to allow researchers to address important questions that relate to student pathways and transitions through education and work.

In some cases, the information was used to check information in previous cycles; in others, it provided an update of the respondent's current situation and related decisions. The information collected over the cycles tracked the shifts to adult roles in higher education, work and society.

In 2006, students were asked questions on the following topics:

- Upper and lower secondary school and primary school education status
- Post-secondary education and engagement
- Financing of post-secondary education
- Educational and work aspirations
- Move to the USA/Return to Canada
- Health issues
- Support from others
- Employment status and details
- Courses attended relevant to employment
- Gaps (periods not in education and not in work)
- Volunteering
- Self-rated skills profile
- Personal characteristics and family background
- Income

The YITS database allows for a very rich analysis. For example, although participants are only surveyed every two years, they are asked on a month-by-month basis their education or employment status. Then, when databases from successive cycles are merged, extremely detailed analyses of transition patterns and other outcomes are possible. Furthermore, being able to merge this information with prior assessment data held in the PISA 2000 database further strengthens the analytic and policy-relevant potential of this research programme.

Source: Motte *et al.*, 2008; Statistics Canada, 2007.

Advantages of YITS

The Canadian government invested in PISA and YITS in order to develop more solid evidence on the pathways of youth beyond high school into higher education and work. This extra effort makes it possible to develop policies and programmes on the basis of characteristics of those students who did not complete secondary education; who left, then returned to complete secondary school; or who went directly to work or higher education.

The combination of the initial measure of competencies (*i.e.* achievement in PISA 2000), detailed background characteristics at each cycle and subsequent education and labour market outcomes makes it possible to identify and target those on less desirable pathways in order to provide them with training and support to ensure a secure future and also to design intervention programmes for future generations of Canadian youth.

Canada is not alone in its endeavour to apply a longitudinal component to the PISA study. Six other countries have implemented longitudinal studies that are linked to PISA (Australia, the Czech Republic, Denmark, Germany, Switzerland and Uruguay). More detailed information on these studies features in Annex A.

Box 2.2 **How can a longitudinal survey add to PISA?**

Limitations of cross-sectional surveys

As with all cross-sectional surveys, PISA 2000 provides a "snapshot" – picture at a specific point in time – of the group being surveyed. Therefore, even though PISA provides detailed information on students, this is at a single point in time, so although one can examine the relationships between student achievement and background characteristics, causal inferences cannot be made and one cannot predict with any accuracy what the future lives of these students will be like.

Added value of longitudinal surveys

A longitudinal survey, on the other hand, involves following the same group of people over a period of time. Collecting information on the same respondents over time makes it possible to study relationships between characteristics measured in one period with outcomes measured in subsequent time periods. A key advantage of integrating PISA and a longitudinal component is that the relationship between proficiency, that has been measured using a high quality, reliable and valid instrument, and education and labour market outcomes of youth measured longitudinally, can be examined. The added value of a longitudinal study thus provides a natural analytic and policy-relevant synergy with a cross-sectional survey.

Analytical advantages

A wide array of antecedent characteristics (achievement, demographics, socio-economic factors, attitudinal and behavioural variables and educational experiences) can be examined with respect to subsequent educational and occupational outcomes. In this way, it is possible to exploit the PISA data further to determine the combinations of antecedent conditions that lead to more and less positive educational and occupational outcomes. Adjustments for changes in context over time can also be taken into consideration.

Policy advantages

Examining educational and labour market outcomes with respect to competence and a detailed set of antecedents and identifying characteristics of sub-groups of Canada's population of 15-year-old youth with more and less favourable educational and occupational outcomes enables the development of targeted policies designed to improve the outcomes of youth with less positive outcomes. Furthermore, the efficacy and appropriateness of existing policies can be evaluated in a rigorous, evidence-based manner. The success of youth who have overcome disadvantages provide insights for policy.

Source: Bussière *et al.*, 2001; Statistics Canada, 2007.

OVERVIEW OF CANADA AND ITS EDUCATION SYSTEM

Canada is a federation composed of ten provinces and three territories.[3] Western Canada consists of British Columbia and the three Prairie provinces (Alberta, Saskatchewan and Manitoba); Central Canada includes Québec and Ontario; while Atlantic Canada is composed of the three Maritime provinces (New Brunswick, Prince Edward Island and Nova Scotia), along with Newfoundland and Labrador. Sometimes Central and Atlantic Canada are referred to jointly as Eastern Canada. Northern Canada is comprised of three territories[4] (Northwest Territories, Nunavut and Yukon). Provinces have more autonomy than territories.

The provinces are autonomous in the administration of social programmes, such as health care and education. Indeed, provinces together collect more revenue than the federal government, which is unusual for a federated structure. While the federal government may initiate national policies, provinces can opt in or out of these (though opting out is rare in practice). The federal government operates a system of equalisation payments in order to achieve uniform standards of services and taxation revenue between the provinces.

The total population of Canada in 2009 was 33.6 million. This population is unevenly distributed across provinces. The largest ones, in terms of population, are Ontario (with 13 million inhabitants), Québec (7.8 million), British Colombia (4.4 million) and Alberta (3.7 million). The smallest two provinces are Newfoundland and Labrador (510 000 inhabitants) and Prince Edward Island (141 000 inhabitants) (Statistics Canada, 2009).

Across Canada, 58% of the population speaks English as a first language, 22% speak French and 20% speak another language (*www.statcan.gc.ca*, 2006 Census). Of this third group, there is considerable diversity in languages spoken. The most common language groups are Chinese, Italian, German, Punjabi, Spanish and Arabic. Individuals speaking languages other then French or English are clustered mainly in Ontario (26.4%) and British Colombia (27.1%). French speakers are concentrated in Québec (where 80% are Francophone) and to a lesser extent, New Brunswick (where 33% are Francophone) (Table 2.1). Francophone minorities are found in Ontario, Nova Scotia, Manitoba and an Anglophone minority in Québec. In Québec, there are separate school boards serving the minority language populations.

Table 2.1

Population counts, GDP, unemployment rates, and languages spoken, by province and Canada overall

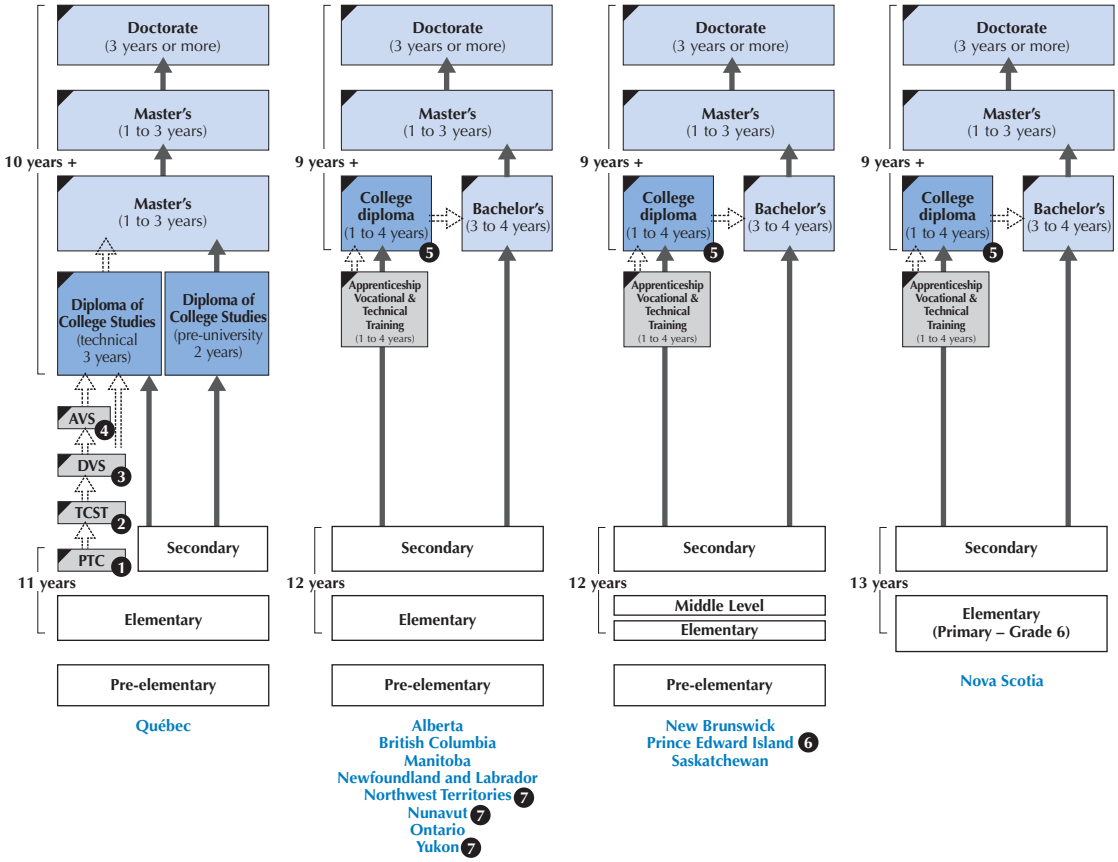
	Share of total population (%)	GDP per capita (2007)	Unemployment rate (2008)	Language spoken		
				English	French	Other
Alberta	10.9	54 939	3.6	80.0	1.9	18.1
British Columbia	13.2	37 221	4.6	71.5	1.4	27.1
Manitoba	3.6	34 715	4.2	74.9	3.9	21.1
New Brunswick	2.2	30 389	7.7	64.8	32.6	2.6
Newfoundland and Labrador	1.5	36 867	13.2	97.7	0.4	1.9
Nova Scotia	2.8	30 875	7.7	92.5	3.6	3.8
Ontario	38.7	41 406	6.5	69.4	4.1	26.4
Prince Edward Island	0.4	29 951	10.8	93.8	4.0	2.2
Québec	23.2	34 297	7.2	7.8	80.1	12.1
Saskatchewan	3.1	39 535	4.1	85.8	1.7	12.5
Canada	**100.0**	**39 736**	**6.1**	**57.9**	**22.2**	**19.9**

Sources:
http://www40.statcan.ca/l01/cst01/econ50-eng.htm
http://www40.statcan.gc.ca/l01/cst01/labor07a-eng.htm?sdi=unemployment
http://www4.hrsdc.gc.ca/.3ndic.1t.4r@-eng.jsp?preview=1&iid=26
http://www40.statcan.gc.ca/l01/cst01/demo11c-eng.htm

There is some variation in GDP per capita and unemployment rates across provinces (Table 2.1). For Canada as a whole, GDP per capita in 2007 was 39 736 Canadian Dollars (CDN). This ranged from a low of CDN 30 000 in Prince Edward Island, New Brunswick and Nova Scotia, to a high of almost CDN 55 000 in Alberta. Similarly, unemployment rates vary, from a low of about 3 to 4% in Alberta, Manitoba and Saskatchewan to a high of 11 to 13% in Prince Edward Island and Newfoundland and Labrador.

Canada spends approximately 6.2% of its GDP on all levels of education. This is higher than the OECD average of 5.8% and is eighth highest across the OECD. Of this, 3.6% is spent on primary, secondary and post-secondary (non-university education) and 2.6% is spent on tertiary education. The OECD averages, respectively, are 3.8% and 1.5%. Canada ranks eleventh of 29 OECD countries in its spending per GDP at primary level and is second only to the United States in its spending on tertiary education (2005 figures in OECD, 2008).

Figure 2.4
Canada's education systems



1. **PTC – Pre-work Training Certificate** *(3 years after Secondary II)*
2. **TCST – Training Certificate for a Semi-skilled Trade** *(1 year after Secondary II)*
3. **DVS – Diploma of Vocational Studies** *(600 to 1800 hrs), depending on the programme*
4. **AVS – Attestation of Vocational Specialization** *(300 to 1185 hrs), depending on the programme*
5. Selected institutions in Alberta, British Columbia, Ontario and Prince Edward Island offer applied degrees.
6. In Prince Edward Island, secondary education is divided into junior high (3 years) and senior high (3 years).
7. The territories have no degree-granting institutions. Some degrees are available through partnerships. Students may also access degrees directly from institutions outside the territories.

Notes: All colleges and universities offer certificate programmes of variable length. Continuing and adult education programmes, while not shown on this Chart, may be offered at all levels of instruction.
Source: 2008 Canadian Information Centre for International Credentials, Council of Ministers of Education, Canada.

As already mentioned, education is the responsibility of individual provinces and each of them has its own educational system. Therefore, provinces differ with respect to curriculum, assessment, accountability practices, teacher salaries, etc. Compulsory schooling ages also differ. Schooling is compulsory up to age 16 in every province except for Ontario and New Brunswick, where it is 18. Public education is free to all Canadians at primary and secondary level, provided they meet various age and residence requirements. Private schools exist, but are rare, as about 93% of Canadian students attend publicly-funded institutions at primary and secondary levels (OECD, 2008).

Figure 2.4 provides a schematic overview of the structure of the education system of Canada, by province. The system of Québec is distinct from other provinces particularly with respect to pathways to post-secondary education.

All provinces with the exception of Nova Scotia provide pre-school education (*i.e.* ages 5 to 6). Ontario is the only province to provide Junior Kindergarten (*i.e.* ages 4 to 5). Three provinces (New Brunswick, Prince Edward Island and Saskatchewan) offer schooling that is intermediate between elementary and secondary, while the other seven provinces do not. Combining primary and secondary schooling totals 12 years in all provinces except Nova Scotia (where it is 13 years in length) and Québec (where it is 11 years).

The primary school curriculum focuses on language, mathematics, social studies, science, health and physical education and arts; some provinces also offer second-language learning. In lower secondary school, students take mostly compulsory courses. The proportion of options increases in upper secondary so that students may take specific courses to prepare for the labour market or to meet the entrance requirements of post-secondary courses.

Secondary school diplomas are awarded to students who complete the requisite number of compulsory and optional courses. The secondary school diploma or its equivalent is a requirement for entry into post-secondary and tertiary education courses.

At post-secondary level, a distinction is made between colleges, universities and graduate schools. In colleges, the most common academic qualification granted is a diploma, following two to three years' study. In universities, a Bachelor's Degree is awarded after three to four years. In graduate schools, students may study a one- to two-year course to be awarded a postgraduate certificate or diploma, such as a Master's degree. Doctoral degrees can take three years or more.

Québec is distinct from the other provinces in many respects, notably, in the manner in which students proceed from secondary school to colleges/universities. The CÉGEP system (*Collège d'enseignement général et professionnel*) aims to make post-secondary education more accessible. Completion of a CÉGEP programme is compulsory before entering university courses. To compensate for this, there are 11 rather than 12 years of schooling at primary and secondary levels. Students can choose whether they want to follow a college stream (three years of CÉGEP) or a university stream (where they enter university after two years of CÉGEP).

Table 2.2 shows that graduation rates vary across Canada's provinces. In 2005, for Canada as a whole, 90% of students completed secondary schooling, while 33% earned a Bachelor's Degree or equivalent and 8% earned a postgraduate degree. Across provinces, secondary completion rates are lowest in Manitoba (87%) and highest in British Colombia (92.5%) and Newfoundland and Labrador (92%).

The frequency of Bachelor's degrees awarded in 2005 (per population at the typical age of graduation) exceeded 50% in Nova Scotia, between 35% and 40% in Ontario and New Brunswick, to around 24% in British Colombia. The rate of postgraduate graduations (again per population at the typical age of graduation) does not follow the same trend as that for undergraduate qualifications. For example, Québec ranks third lowest in its undergraduate completion rates but second on postgraduate completion rates.

Table 2.2

Secondary and third-level graduation rates, by province and Canada overall (2005)

	Secondary completion rate	Bachelor's and first professional degrees	Master's degrees	Earned doctorates
Alberta	88.0	28.0	4.6	1.0
British Columbia	92.5	24.0	4.5	1.0
Manitoba	87.0	31.0	3.0	0.0
New Brunswick	90.8	35.0	5.0	0.0
Newfoundland and Labrador	92.0	32.0	6.0	1.0
Nova Scotia	90.7	51.0	12.0	1.0
Ontario	90.9	39.0	7.0	1.0
Prince Edward Island	90.3	30.0	0.9	0.0
Québec	88.1	28.0	9.0	1.0
Saskatchewan	89.3	31.0	5.0	1.0
Canada	**89.9**	**33.0**	**7.0**	**1.0**

Sources:
http://www.statcan.gc.ca/cgi-bin/af-fdr.cgi?l=eng&loc=/pub/81-582-x/2006001/excel/updates200606/chapD5.xls
http://www.statcan.gc.ca/pub/81-004-x/2005004/8984-eng.htm#table2

The OECD (2008) has noted that 47% of Canadians between the ages of 25 and 64 have a tertiary qualification, which is high relative to the OECD average. The figure is even higher for the 25-34 age group, at 55%, indicating a steady increase in graduation rates over time (but also due to a large but selective immigration system). These high rates are achieved despite the fact that the average tuition fees in Canada, for tertiary-type A (university) institutions are high relative to the OECD and particularly countries in the EU. Student financial assistance is provided mainly in the form of subsidised loans and tax credits to compensate.

The earnings advantage associated with a tertiary qualification compared to those with an upper secondary qualification is 38%. This ranks Canada eighth out of 25 OECD countries with available data (OECD, 2008). In contrast, having an upper secondary education relative to not having one is expected to accrue an earnings advantage of 14% or so, which ranks Canada 18th out of 25 OECD countries with these data available (OECD, 2008). These figures point to the importance of attaining a tertiary qualification in the Canadian context and the diminishing number of low-skill jobs.

Employment rates for Canadians associated with five levels of educational attainment are compared to the OECD averages for males and females in Table 2.3 (OECD, 2008). The table shows firstly that employment rates are higher for females in Canada (71%) compared with the OECD average (64%). Secondly, employment rates by level of education are similar in Canada compared with the OECD average for both males and females, with the exception of primary level only, in which both males (56%) and females (33%) are at a relative disadvantage compared to the OECD averages for males (64%) and females (39%). Again, this points to the importance of high educational attainment in the Canadian context.

Table 2.3

Employment rates by level of education and gender: Canada and OECD averages (2006, 25- to 64-year-olds)

	Canada		OECD	
	Males	Females	Males	Females
Primary only	56	33	64	39
Lower secondary	71	53	73	50
Upper secondary	81	69	83	67
Post-secondary non-tertiary	83	73	87	72
Tertiary	87	79	89	80
Average	**82**	**71**	**82**	**64**

Source: OECD, 2008, Table A8.1a.

To provide a snapshot of the Canadian education system in an international perspective, Box 2.3 summarises some key points drawn from this section.

Box 2.3 **Highlights of the Canadian education systems in international perspective**

Provinces have high levels of autonomy for education with respect to curriculum, assessment, accountability and teacher salaries.

Québec's education system is distinct from the other nine provinces in its entry paths to colleges and universities.

There is significant diversity across provinces in terms of languages spoken, percentage of immigrant population, graduation rates, GDP per capita and unemployment rates.

In comparison with other OECD countries, Canada has:

- Medium spending per GDP on primary, secondary and non-tertiary education
- High spending per GDP on tertiary education
- High tertiary tuition fees, offset by well-developed student financial assistance programmes
- Comparatively high tertiary graduation rates, at 55% of 25-34 year-olds
- A moderate 38% advantage in earnings of having a tertiary qualification over upper secondary
- A modest 14% advantage in earnings of having an upper secondary qualification over lower secondary
- A high proportion of tertiary-educated working-age population

CONCLUSION

The richness and complexity of both the PISA and YITS datasets make it possible to link compulsory education to labour market and educational outcomes in order to develop more effective policies not only within each achievement domain, but also across them. It is also possible to examine the pathways to these outcomes over time.

Canada's commitment to education is evident in its high spending on education. However, the Canadian education system is itself complex, owing to Canada's federated system and the high levels of autonomy granted to the provinces in providing education to their children, youth and adults. Nevertheless, some of the indicators reviewed in this chapter confirm that the education system in Canada is remarkably equitable in outcomes across the country. Canada performs well in terms of, for example, tertiary graduation rates.

However, the evolving demographic and social conditions challenge educational policies in Canada. Policies should take this into account in order to maintain Canada's strong international position, as other countries are improving their performance faster and may surpass it. Canada's high immigration and increasing language diversity pose challenges to schools and risk slowing any efforts to improve performance. Furthermore, Canada's knowledge-based economy demands a well-educated labour force, which requires schools to graduate students capable of lifelong learning based on a solid foundation of knowledge and skills acquired during compulsory education that can be built on effectively in further education in college or university.

The results presented in the following chapters may be useful to other countries participating in PISA for their own policy debates. In addition, if the value of linking PISA with longitudinal surveys is demonstrated, countries may consider implementing a longitudinal component in their future decisions regarding PISA. The benefits for federated countries are also highlighted, where national objectives of equity must work in parallel with local objectives of excellence.

Notes

1. Needless to say, despite best practice and considerable efforts to follow up on all students in each cycle of YITS, some students were inevitably not possible to follow up. To account for the loss of students, or attrition in the sample size, special weights were computed and applied to all analyses. For technical information on these weights and patterns of attrition, see Statistics Canada (2007) and Tabuchi (2008).

2. It should be noted that YITS also included a survey of older Canadian youth, who were aged between 18 and 20 years in 2000. These individuals were also surveyed every two years, up to 2008, in order to have earlier information on post-secondary education participation and also to compare the younger and older cohorts. However, the lack of a measure of competencies was a shortcoming in potential analyses.

3. Due to its federated structure, some education statistical indicators published in the OECD's annual *Education at a Glance* (*e.g.* OECD, 2008) are not available for Canada. Therefore, this section is unable to draw extensively on that data source.

4. Due to their tiny population (0.32% of the total population) and geographical remoteness, the territories did not participate in PISA or in YITS.

3

Starting Right: Canadian Results from PISA 2000

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Abstract

A key concern from an international perspective is the extent to which education systems provide quality, equitable opportunities to students. Canada is no exception. In revisiting the PISA 2000 results for Canada, and this chapter presents an evaluation of the quality and equality of educational outcomes across the Canadian systems of education. In doing so, some key challenges are identified. The chapter is intended to provide readers with the baseline performance and antecedents for interpreting the results of the longitudinal analyses that are presented in subsequent chapters.

INTRODUCTION

Evidence suggests that educational outcomes and labour market success are directly connected to the early educational experiences of youth. Students at age 15 shared similar educational experiences, characterised by a progression through compulsory schooling. However, as they got older, their educational experiences diversified. Some youth successfully completed their secondary education and moved on to pursue post-secondary studies, while others did not and began employment at an early age. For others their pathways through education to employment were not linear at all, but were characterised by episodes of employment and education of various types. Some experienced various periods of time in unemployment.

While the majority of this report is dedicated to examining later educational and labour market outcomes as they relate to the competencies measured by PISA 2000 for a cohort of 15-year-olds, it is fitting to include an examination of the PISA 2000 results for Canada. These results provide a context for the subsequent chapters and will also illuminate those characteristics that are linked with higher achievement. The inference here is that both achievement and certain background characteristics can be expected to lead to higher participation rates in post-secondary education and more positive labour market outcomes. Subsequent chapters will also shed light on the pathways of low performers, whether they remained disadvantaged or started to recover lost ground.

Though post-secondary education is generally accessible to students with higher competencies, there are still troubling realities for certain sub-groups of the population. For instance, students from lower socio-economic backgrounds are still less likely to achieve higher PISA scores and to undertake post-secondary studies. Identification of those groups that perform poorly is a necessary first step in creating a more equitable and efficient education system. Therefore, research must also work to enable the development of policies that are successful in improving outcomes for these students. Evidence is not necessary only to continuously raise performance, but also to diminish the magnitude of the impact of disadvantage.

The large number of Canadian students – close to 30 000 – surveyed in PISA 2000 allows for provincial comparisons to be made with respect to the results, so that each provincial system can make independent decisions regarding their system.

The results for Canada are more complex than for other countries, since comparisons across linguistically and demographically diverse provinces are involved. A particular policy challenge in the case of Canada, in contrast to more culturally and ethnically homogenous countries, is to ensure the provision of high-quality education to all its children and youth, regardless of linguistic, ethnic, socio-economic background and geographic location and within a complex federated system. Nationally, it is vital to offer equal life chances to children regardless of the location in Canada.

This chapter addresses the following questions.

- How did Canada measure up compared to other countries in delivering a high-quality and equitable education to its Canadian youth?
- To what extent can the Canadian education system be considered excellent and equitable?
- Are there groups of students whose PISA results might give rise for concern and therefore be potential targets for intervention and support?

These are addressed by revisiting the results for Canada in PISA 2000.

CANADIAN PERFORMANCE IN PISA 2000

This section begins with a consideration of the performance of Canada as a whole with respect to a number of key indicators of quality and equity. Then, an overview of these key outcomes by province is provided.

Table 3.1 shows, for each of the three assessment domains, the mean scores, country ranking and variation in scores for Canada as a whole. It is evident that Canada's performance across all domains is high. Canada's mean on the combined reading scale (534) ranked second of all participating countries and Finland was the only country to score significantly higher. The average score for Canada for mathematics (533) was around a third of a standard deviation above the OECD average and only two countries – Japan and Korea – scored significantly higher. The Canadian mean for science, at 529, was similarly high and Canada was outperformed by just three countries – Finland, Japan and Korea (Bussière *et al.*, 2001; OECD, 2001).

Table 3.1

Summary of Canada's performance in PISA 2000

Outcome	Reading	Mathematics	Science
Rank	2	6	5
Range of ranks	2 to 4	5 to 8	4 to 8
Number of countries significantly higher	1	2	3
Mean	534	533	529
S.E.	1.6	1.4	1.6
S.D.	95	85	89
Score at 10th Percentile	410	423	412
Score at 90th Percentile	652	640	641
90th percentile – 10th percentile	242	217	229
Rank of 90th percentile – 10th percentile	13	6	5
Proportion of variance between schools	17.6	17.3	16.2
Rank of between-school variance	6	6	7

Source: Chapters 2 and 3, OECD, 2001.

More important than country averages, however, is the nature and extent of the variation in scores. This can yield information about the relative equity of an education system. A country may have a high average score, but if the difference between lower and higher achievers is large, it implies that some students are lagging behind.

Relative to other countries, Canada is characterised by low variation in achievement. Scores at the 10th percentile in Canada are some 40-50 score points above the OECD average 10th percentile (for example, in reading, Canada scored 410 compared to the OECD average of 366) (OECD, 2001). Furthermore, the scores of Canadian students at the 90th percentile are in the region of a sixth to a third of a standard deviation higher than the respective OECD averages. This pattern of results suggests that Canada is successful not only in attaining high average results, but also in attaining higher results among the lower-achieving students.

However, although equitable, the difference between the 10th and 90th percentile scores is still significant – equivalent to two PISA reading proficiency levels.

A useful method for understanding the reasons for variation in student performance is to examine the between-school and within-school differences in student performance. Greater between-school variance indicates a greater gap between the achievement level of the highest performing schools and the lowest-performing schools, while greater within-school variation indicates a larger gap between the higher-performing students and the lower-performing students within the same school. Among other things, these measures provide an idea of the degree to which students are "sorted" (intentionally or otherwise) into different schools based on ability levels.

Unlike the majority of OECD countries, Canada had very little variation which was attributable to differences between schools where only 16% to 18% of the total variation in achievement was attributable to differences between schools across the three domains. Taking reading literacy as an example, the between-school variation was 17.6%, ranking Canada sixth lowest among participating OECD countries (OECD, 2001).

The relative equality across schools in Canada was true also in the case of students' socio-economic status. This can be investigated by examining the extent to which students are "segregated" by socio-economic status into different schools. In other words, higher between-school variation in socio-economic status is indicative of higher social segregation in education systems.

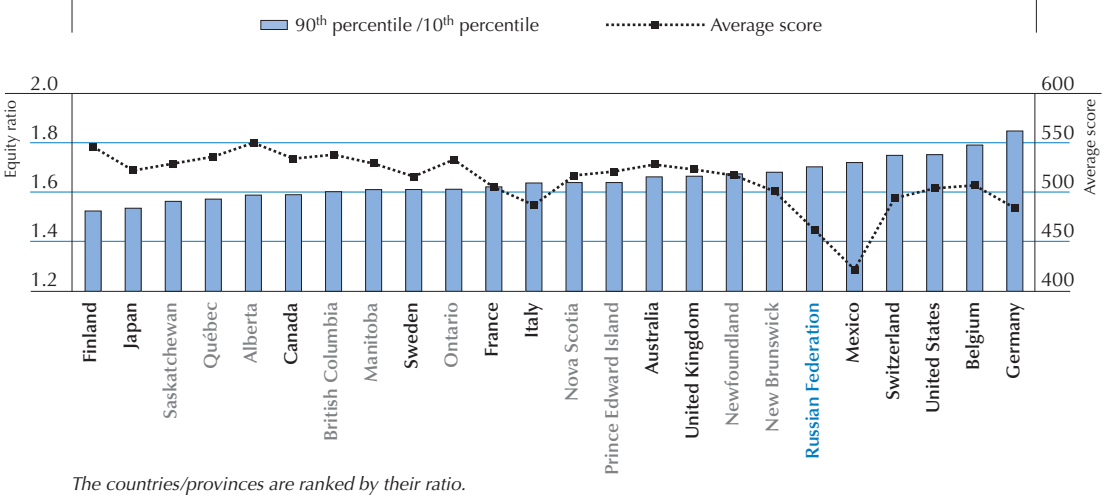
In an analysis of factors related to student achievement in Canada and the United States, Willms (2004) found that the proportion of variation in socio-economic status that occurred between schools in Canada (rather than within schools) was 19.5%, making it one of the least segregated education systems, in line with the performance of Norway at 11.5%, the country with the lowest between school variation.

Taken together, the low between-school variances in achievement and in socio-economic status provide good evidence that Canada is successful in providing an equitable education system to its youth.

As noted in Chapter 2, in addition to an overall reading scale, the PISA results for reading were reported in terms of three reading subscales (retrieving information, interpreting information and reflecting on/evaluating information). In the case of retrieving information, Canada's mean (530) was exceeded by only one country, Finland. Again, Finland was the only country to outperform Canada on the interpreting information scale (Canadian mean = 532). And Canada ranked highest of all countries on the reflecting on/evaluating texts scale (mean = 542). Thus, regardless of the reading process assessed, Canadian students' performance was uniformly high. This consistency in outcomes was achieved despite 10 different systems of education in the country.

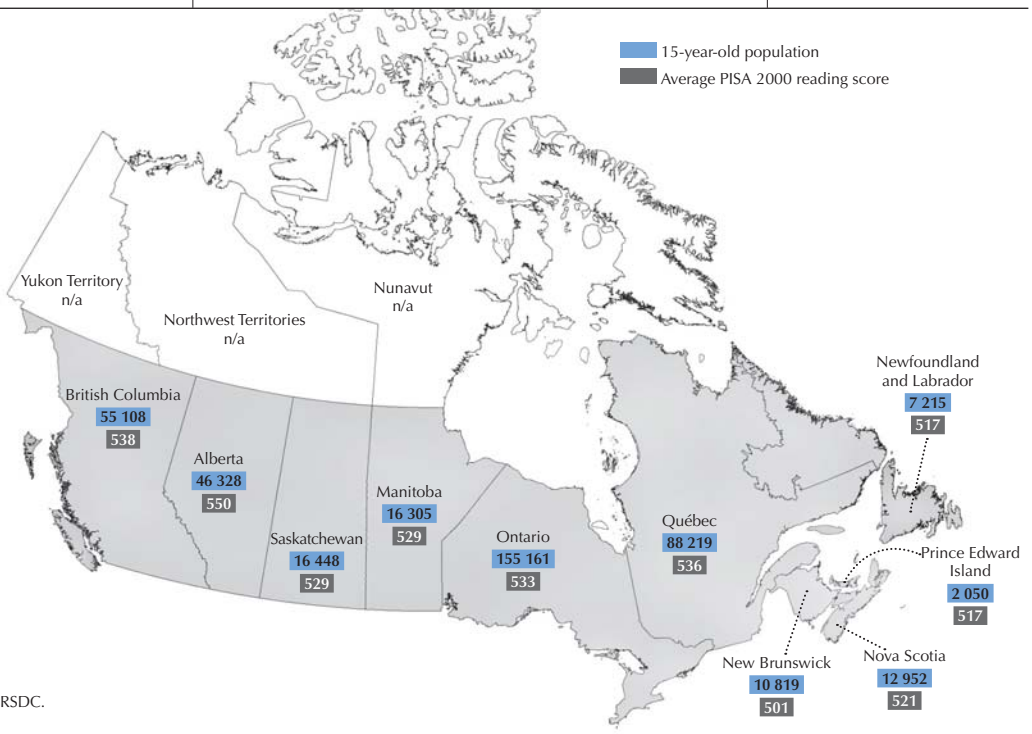
It is of concern internationally that male students tend to lag behind females in reading achievement, so it is useful to examine the pattern of gender differences in performance in Canada in PISA 2000. Gender differences in the three assessment domains in Canada were similar to the OECD averages. Female students in Canada outperformed male students by 32 points (OECD average gap = 32) in reading, while males outperformed females by 10 points (OECD average gap = 11) in mathematics and the minute difference in favour of female students of 2 points in science was not significant, again consistent with the OECD average gap of 0 points. The pattern of gender differences across the three reading subscales for Canada also revealed a pattern similar to the OECD averages, where smaller gender differences were associated with retrieving information (25 points in Canada) and interpreting information (29 points) compared to reflecting on/evaluating texts (42 points). The gender differences in reading are of significance when one considers that males are under-represented in post-secondary education, as will be shown in subsequent chapters of this report.

Figure 3.1
Proficiency level and equality ratio for selected countries and Canadian provinces



The countries/provinces are ranked by their ratio.
Source: Bussière *et al.* (2001).

Figure 3.2
Performance in PISA 2000 and population



Source: HRSDC.

In order to provide equal opportunities to students across Canada, proficiency scores should not vary widely between provinces. However, results from PISA indicated that not all provinces performed equally well on measures of excellence (average scores) and equity (score differences between high and low achievement groups). This is shown in Figure 3.1, where mean scores and equality ratios[1] are plotted for Canada and selected PISA countries. Figure 3.2 illustrates the mean performance and population counts by province.

In addition, Tables 3.2 a, b and c show, for each province and for each domain (compared with data for Canada as a whole), average scores, scores at the 10th and 90th percentiles and gender differences on the achievement scales.

Table 3.2a

PISA 2000 key results for reading, by province and Canada overall

	Mean	S.E.	10th Percentile	90th Percentile	90th Percentile – 10th Percentile	Gender difference (F-M)
Alberta	550	3.3	423	672	249	38
British Columbia	538	2.9	410	657	247	32
Manitoba	529	3.5	406	654	248	35
New Brunswick	501	1.8	370	622	252	47
Newfoundland and Labrador	517	2.8	381	638	257	42
Nova Scotia	521	2.3	391	641	250	33
Ontario	533	3.3	405	653	248	30
Prince Edward Island	517	2.8	391	641	250	35
Québec	536	3.0	414	651	237	32
Saskatchewan	529	2.7	410	641	231	36
Canada	**534**	**1.6**	**410**	**652**	**242**	**32**

Source: Bussiere *et al.*, 2001.

Table 3.2b

PISA 2000 key results for mathematics, by province and Canada overall

	Mean	S.E.	10th Percentile	90th Percentile	90th Percentile – 10th Percentile	Gender difference (F-M)
Alberta	547	3.3	437	656	219	-10
British Columbia	534	2.8	422	642	220	-13
Manitoba	533	3.7	422	640	218	-3
New Brunswick	506	2.2	401	607	206	2
Newfoundland and Labrador	509	3.0	405	610	205	-6
Nova Scotia	513	2.8	403	621	218	-13
Ontario	524	2.9	416	629	213	-9
Prince Edward Island	512	3.7	405	614	209	-10
Québec	550	2.7	443	654	211	-9
Saskatchewan	525	2.9	425	625	200	-12
Canada	**533**	**1.4**	**423**	**640**	**217**	**-10**

Source: Bussiere *et al.*, 2001.

Table 3.2c

PISA 2000 key results for science, by province and Canada overall

	Mean	S.E.	10th Percentile	90th Percentile	10th Percentile – 90th Percentile	Gender difference (F-M)
Alberta	546	3.5	429	656	227	4
British Columbia	533	3.2	418	642	224	-2
Manitoba	527	3.6	412	638	226	-4
New Brunswick	497	2.3	386	611	225	15
Newfoundland and Labrador	516	3.4	401	630	229	11
Nova Scotia	516	3.0	401	624	223	3
Ontario	522	3.4	406	632	226	5
Prince Edward Island	508	2.7	400	619	219	5
Québec	541	3.4	418	653	235	1
Saskatchewan	522	3.0	412	626	214	-2
Canada	**529**	**1.6**	**412**	**641**	**229**	**2**

Source: Bussiere *et al.*, 2001.

Generally, higher ratios, as shown in Figure 3.1, were found in provinces that had lower average scores. This pattern was also evident in international comparisons (Bussière *et al.*, 2001). This also demonstrates that high performance and high equity are possible and indeed tend to co-occur.

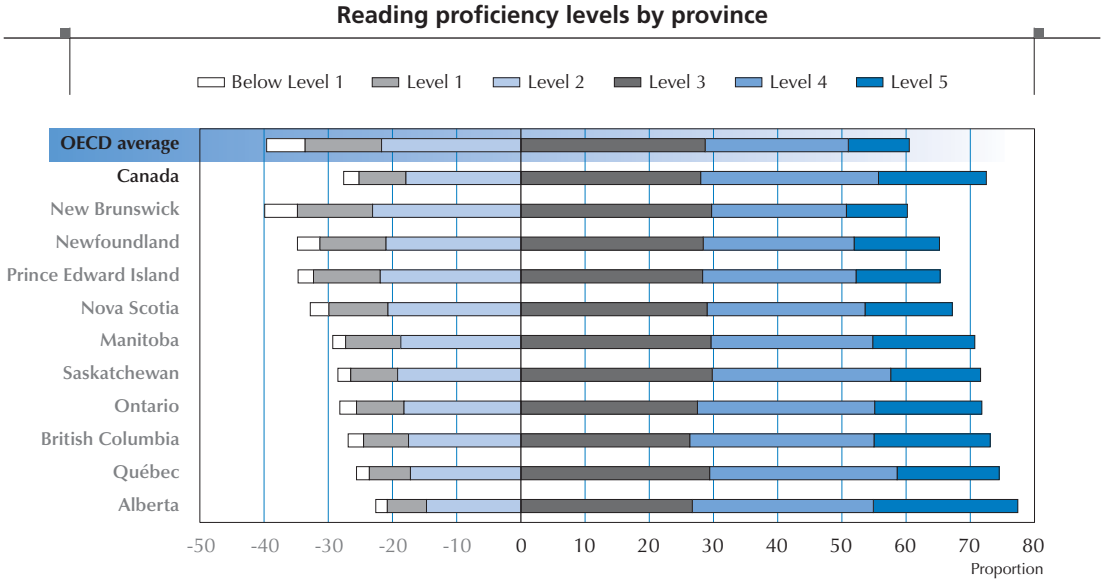
Provinces scoring a quarter of a standard deviation or more above the OECD average were Alberta, British Colombia, Québec, Ontario, Saskatchewan and Manitoba. Provinces performing in the mid-range were Nova Scotia, Prince Edward Island and Newfoundland and Labrador. New Brunswick was the only Canadian province with a mean score in reading (501) that was around the OECD average of 500. Similar provincial variations were evident for mathematics and science.

Reading scores at the 10th percentile ranged from a low of 370 in New Brunswick to a high of 423 in Alberta, while scores at the 90th percentile ranged from 622 (again, in New Brunswick) to 672 (Alberta). The range of scores at the 10th percentile across provinces for mathematics were narrower than for reading, ranging from 401 (New Brunswick) to an impressive 443 (Québec). Variation between provinces for scores at the 90th percentile on the mathematics scale ranged from 607 (New Brunswick) to 656 (Alberta). For science, scores at the 10th percentile ranged from 386 (New Brunswick) to 429 (Alberta). In terms of equality of scores, therefore, there was greater equity in science and mathematics.

Gender differences by province on the reading scale were consistent in that they all revealed a female advantage. However, the magnitude of the difference ranged from a low of 30 in Ontario to highs of 42 (Newfoundland and Labrador) and 47 (New Brunswick). The large gender difference coupled with the low average score for New Brunswick indicates that male students in this province constituted a low-achieving group relative to Canada as a whole.

Gender differences by province on the mathematics scale indicated that in seven of the ten provinces, male students had higher scores than did females, ranging from 9 to 13 scale points. In three provinces (Manitoba, New Brunswick and Newfoundland and Labrador) gender differences were smaller and not statistically significant.

Figure 3.3
Reading proficiency levels by province



Source: Bussière *et al.* (2001).

In the case of science, gender differences were generally small and not statistically significant, with two exceptions, where female students outperformed males by 11 and 15 points in Newfoundland and Labrador and New Brunswick, respectively. In these two provinces, gender differences in favour of female students on reading literacy were also the largest of the ten provinces.

Another way to examine achievement is in terms of proficiency levels in the case of reading. This allows one to benchmark performance in terms of the level of complexity of underlying tasks, as described in Chapter 2. Performance at Level 3 and higher is generally perceived as an important level of achievement for post-secondary educational success. Nearly 73% of Canadian students scored at Level 3 or higher. In international comparisons, this proportion ranked only behind Finland (Bussière *et al.*, 2001). Considerable provincial variation was evident here also. Proportions scoring at Level 3 or higher in the provinces ranged from a high of 77% in Alberta to a low of 60% in New Brunswick, though the greatest differences can be seen at the proportions scoring in Levels 4 and 5 (Figure 3.3).

These results show that many countries can look to Canada for a reference to a complex system that manages to achieve high excellence and equity. Moreover, the regional diversity of Canada provides examples of challenges that are likely to be similar to those faced by a very wide range of countries. For all these reasons, Canada is a particularly good choice for the study of the advantages of adding a longitudinal component to PISA.

SCHOOL SOCIO-ECONOMIC INTAKE AND PISA SCORES

In analysis equity across educational systems, it is important to consider not only the extent to which schools provide an equitable learning environment for students, but also the extent to which school achievement varies along a number of important background characteristics. Results of these types of analyses can point to inequities between schools that indicate a need for policy interventions to promote greater equity in achievement and background characteristics of schools. Generally, however, the relevance of school-level variables is lower in systems that do not segregate students to a high degree. Hence, in the case of Canada, there were few school characteristics that had a measurable relationship with PISA reading scores in Canada once student background characteristics were accounted for (Bussière *et al.*, 2001). The most important variable in this regard was the school's average level of economic, social and cultural status (ESCS)[2]. A school's socio-economic intake had a positive association in Canada as a whole, as well as in many provinces (Bussière *et al.*, 2001).

Although school socio-economic composition was the most important of school characteristics in explaining achievement differences, its effects in Canada were smaller compared with those in many other countries. For example, Willms (2004) found that for a hypothetical Canadian student with an average socio-economic background (an ESCS index score of zero), attendance at a school with an above-average socio-economic composition (a school ESCS index score of 0.5) predicted a reading score that was 45 points higher than if the same student had attended a school with a low average socio-economic composition (a school ESCS index of -0.5). Comparatively, the same difference in school socio-economic status in the United States was associated with a larger increase of 63 points. The relationship of the school's average socio-economic status may be attributed to student peer effects, or it may be that greater school average socio-economic status is correlated with other supports such as parental involvement.

STUDENT CHARACTERISTICS AND PISA SCORES

Education is widely viewed as a means of reducing disadvantage and as a means of supporting upward mobility. There are many personal characteristics, attitudes and behaviours that were associated with PISA reading achievement. Certain variables are important to consider because they identify groups of low-achieving

students who are significant from an equity perspective, such as low income, single parent, or immigrant students. Other variables are of interest because they can be used to develop policy strategies that may increase reading proficiency and mitigate inequality in outcomes (King, 2009).

When considering whether or not a variable is related to reading proficiency, two concepts are important. The first is statistical significance, which indicates how much confidence one can have that a relationship exists. The second is the magnitude of the differences or the strength of the relationship used to gauge whether the relationship is strong enough to matter for policy relevance. Both concepts are applied in the following discussion. For this, consider that, for Canada a difference of 34 reading points was found to be equivalent to one year of education (Willms, 2004). Thus, a difference in scores of even 15 points constitutes a large variation in student ability.

Socio-economic status

Of all the factors that were found to be associated with achievement, an individual's socio-economic status had the most pronounced association, which is indicative of an intergenerational transmission of advantage (and, conversely, intergenerational transmission of disadvantage). Of interest in subsequent chapters, then, is the potential relationship between an initial advantage and subsequent educational and labour market outcomes, as measured in YITS.

Comparing the gap between the 5th and the 95th percentile on the economic, social and cultural status index provides an indication of equality in socio-economic status in each country. Canada had a value on this measure which was lower than the OECD average – 2.8 compared to the OECD average of 3 (OECD, 2001), meaning that Canada had greater equality in the distribution of socio-economic status of its students than other OECD countries.

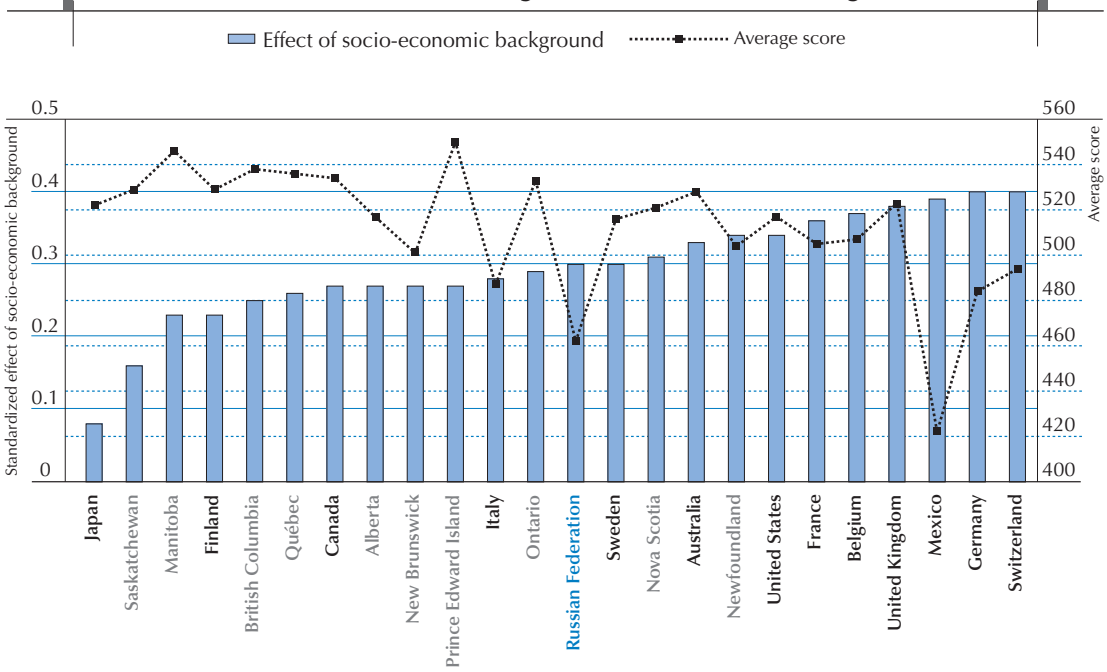
It is not just the distribution of scores that is of interest, but also the extent to which an individual's socio-economic status is related to achievement outcomes. The weaker the relationship, the more equitable a system is in this respect. When the strength of the relationship between a student's socio-economic status (using the socio-economic background index) and their score on the PISA reading test was analysed, Canada performed better than the OECD average. Willms (2004) reported that a simple regression of PISA scores on students' socio-economic background explained approximately 11% of the total variation in PISA scores in Canada, while (by comparison) it explained 21% of the variation in scores in the United States. Furthermore, estimates showed that, in Canada, an increase of one unit on the ESCS index translated into an increase of 37 points on the combined reading score, which was some 10% below the OECD average of 41 points (OECD, 2001).

Figure 3.4 illustrates the relationship between the strength of the association between socio-economic background and performance and average reading scores for Canada, its provinces and selected PISA countries.

These findings suggest that Canada was able to mitigate some of the influences of socio-economic status through more equal learning opportunities and with a smaller degree of student sorting than in other countries. It also suggests that programmes targeted to low socio-economic background students have the potential to increase average PISA scores in Canada, though perhaps not to the same degree as in countries with stronger links between student socio-economic background and performance.

It is encouraging to note that results from both Canada and other OECD countries suggest that achieving greater equality in PISA scores (and weaker effects of individual socio-economic background on student performance) does not have to come at the expense of high student achievement. Of 12 countries that had above average reading scores, Canada was among six countries, including Finland, Iceland, Japan, Korea and Sweden, that combined above average achievement with above average equality in student socio-economic status (OECD, 2001).

Figure 3.4
Effect of socio-economic background and combined reading score



The countries/provinces are ranked by their effect.
Source: Bussière *et al.* (2001).

Not every province performed equally well in terms of equity. There were some differences between Canadian provinces in the size of the relationship between socio-economic background and PISA reading scores. Saskatchewan and Manitoba had smaller effects while Newfoundland and Labrador and Nova Scotia had effects that were above the Canadian average (Bussière *et al.*, 2001).

Family structure

In recent years, substantial changes in family structure have occurred in industrialised countries, where dual-parent, nuclear families can no longer be taken as the norm. Furthermore, in some families headed by one parent only, there may be resource limitations for the children, both in terms of financial resources and also in the time that parents have to spend with and support their children. Therefore it is to be expected that Canadian youth from single-parent families were one group of students that were less likely to have high achievement on the PISA assessment. While 13% of students in the highest quartile of PISA scores belonged to a single parent family, 17% of students in the lowest quartile did so. Therefore, although a disadvantage was evident, it was of a small magnitude (Bussière *et al.*, 2001).

Country of birth

With high rates of immigration, successful integration is associated with equitable educational outcomes. However, the difference in reading scores between new Canadians and Canadian-born students was large. Students who were immigrants were twice as likely to be in the lowest quartile of PISA scores as they were to be in the highest quartile. Furthermore, after accounting for socio-economic status and parental and school factors, immigrants still scored 26 points below non-immigrant students (Frempong *et al.*, 2006).

An in-depth review of this issue found that both length of time spent in Canada and the language spoken at home were key determinants of how well immigrants performed on the PISA assessment (Gluszynski and Dhawan-Biswal, 2008). Students who were recent immigrants to Canada (*i.e.* who arrived within the previous 5 years) and who spoke a language other than French or English at home scored 20 points below the OECD average (a score of 478) on the reading assessment. In contrast, immigrants who had been in Canada longer than 5 years had an average score of 521, even if English and French were not spoken at home. These findings may help to explain how many immigrants are able to overcome lower achievement in reading skills at an early age and achieve a high level of educational attainment through integration.

Rural-urban differences

The location of the school is an important determinant of performance in Canada and can help identify schools facing more challenging situations. It may be the case that students in rural regions have access to fewer resources in the local infrastructure; on the other hand, students in densely populated areas may be exposed to a higher number of negative influences in the local community, particularly if poverty and unemployment are widespread. In the case of Canada, lower reading scores were observed for students in rural communities. Students from a rural area had an average reading score of 523 compared to 538 for urban students, a difference of 15 points (Cartwright & Allen, 2002). This difference can be explained by the fact that rural students were more likely to come from a lower socio-economic background, to have fewer educational and cultural resources at home and were less likely to discuss political or social issues with their parents. Hence, urban-rural differences observed in Canada were mediated by socio-economic and cultural differences.

Language minority groups

In Canada, not all students share the same language both at school and at home. It is important, nonetheless, that the educational experiences of all students, regardless of mother tongue, allow for equitable outcomes. Francophone students in Manitoba, Ontario, Nova Scotia and New Brunswick and Anglophone students in Québec were attending schools in a language that was not the dominant language of that province. In all provinces except Québec, minority language students had significantly lower scores in reading than their majority language counterparts (Bussière *et al.*, 2001). Furthermore, minority language students in these four provinces had average scores that were below the OECD average. These findings suggest that educational policy in Canada should direct further efforts at bridging the achievement gap in these groups of language minority students.

Parental involvement

For the majority of children, parents are likely to have the largest impact on their children's development and acquisition of competencies – greater than the role of schools and of educators.[3] The effects of parental income, educational attainment and cultural assets have already been identified as being important, but these characteristics alone say nothing about how skills are transmitted from parent to child.

Parental involvement with school activities, even in areas that are unrelated to cognitive development, is thought to reinforce the value of education and create healthier learning environments. Parents are instrumental in promoting healthy concepts of self-identity and educational aspirations which are important for school and non-school learning.

Parents' intellectual involvement in their children's learning has a direct effect on cognitive development through activities such as reading books together, having stimulating discussions or helping students with homework. The importance of these behaviours was well known before the PISA assessment in 2000. However, PISA made it possible to link parental behaviours to a direct assessment of student achievement.

Using data from PISA 2000, Frempong *et al.* (2006) considered four measures of family support that may be important for improving student achievement: academic interest, social interest, educational support and educational expectations. They found that students in the highest quartile of achievement were the most likely to have experienced the highest levels of parental academic interest and parental social interest and more often had parental expectations for higher education.

In contrast, students in the lowest quartile of achievement were more likely to receive a greater degree of educational support from their family. This finding may be explained by the greater likelihood of students who were having problems with school work to receive help from parents at home.

Not only was positive parental involvement associated with student achievement, it was also shown to mitigate some of the inequalities associated with certain personal characteristics, such as family socio-economic status (Frempong *et al.*, 2006). High parental academic interest was associated with an increase in reading scores of 11 points, parental social interest was at 4 points and parental educational expectations were at 27 points. These effects were found after accounting for socio-economic, family possessions and school characteristics. Therefore, some of the strongest policy interventions may entail the promotion of and support for parents' involvement in their children's learning.

STUDENT CHARACTERISTICS CONSIDERED TOGETHER

Bussière *et al.* (2001) considered the relative impact of various family and socio-economic characteristics with respect to achievement. This type of analysis can shed insight into those characteristics that are most relevant to policy intervention. The characteristics examined were family structure and size, socio-economic status, material and cultural possessions, books in the home, home educational resources, family educational support, parental academic interest and language spoken at home.

Of these characteristics, only five remained significant when considered jointly for Canada as a whole, *i.e.* socio-economic status, number of books in the home, student's cultural activities, family educational support and parental academic interest. This confirms the significance of parental involvement and a supportive home educational climate, over and above socio-economic status.

CONCLUSION

This chapter examined how Canada measured up in international comparison in delivering high-quality education and whether its system may be considered excellent and equitable. The results from PISA 2000 indicate that Canada fares very well in this regard. Few countries performed significantly better than Canadian students in PISA 2000 (for example, only one country, Finland, outperformed Canadian youth in reading). Additionally, Canada combined a high average score with a high level of equity in scores, displaying a comparatively low level of variation between high- and low-proficiency students. Having said this, the difference in scores of high and low achievers, although small by international standards, was nonetheless substantial, suggesting that there is still room to improve the achievement outcomes of lower achievers. The results also indicated that the Canadian education system, despite provincial differences in educational structures, segregated its students into different schools on the basis of achievement and socio-economic background considerably less than across the OECD as a whole. Furthermore, the association between students' socio-economic backgrounds and achievement, although significant, was substantially lower than that in many other countries. Taken together, these results generally confirm that Canada has succeeded in delivering an equitable, high-quality education to its youth, at least as measured by PISA.

However there are, of course, still groups of students with poor performance in PISA who are therefore vulnerable. Students from certain segments of the population lag behind their classmates in reading, including recent immigrant students, students of lower socio-economic status, with less educational and parental support at home, in certain provinces and students in language minority schools outside Québec. Also, the reading scores of male students relative to females are a cause for concern. Furthermore, it was demonstrated that urban-rural differences were mediated by socio-economic disparities. Increasing performance of the lower-achieving students is necessary if Canada is to increase its overall ability levels and for the education system to overcome any intergenerational effects of lower skills, which in turn are likely to translate into inequalities in subsequent outcomes such as access to post-secondary education.

In conclusion, the three key challenges for Canada are, first, to maintain its track record of high performance and high equity under changing demographic conditions, especially with high immigration rates and increasing linguistic diversity; second, to mitigate intergenerational advantage, while raising educational aspirations among groups with low performance; and third, to ensure that linkages between home and school improve the learning experiences and outcomes of students.

The results presented in this chapter show the power of the types of analysis and policy insights that can be produced based on the cross-sectional content of PISA in Canada. These findings also highlight the consistency of PISA results despite the diversity of the Canadian educational system across provinces. The following chapters exemplify how these findings and conclusions on policy can be extended with the longitudinal component of PISA in Canada, the Youth in Transition Survey (YITS).

Notes

1. The equality ratio is the score at the 90th percentile divided by the score at the 10th percentile. Smaller ratios indicate greater equality.

2. Economic, social and cultural status was a variable created by the PISA Consortium to combine a number of related socio-economic measures, including parental education, income, and cultural resources, into one index. This measure was also used to create an average level of ESCS for each school (Adams & Wu, 2002).

3. Frempong *et al.* (2006) provide a good discussion of theory of family and social influences on child learning, as well as a thorough literature review.

4

Decisions After School: Pathways Followed by the Cohort Born in 1984

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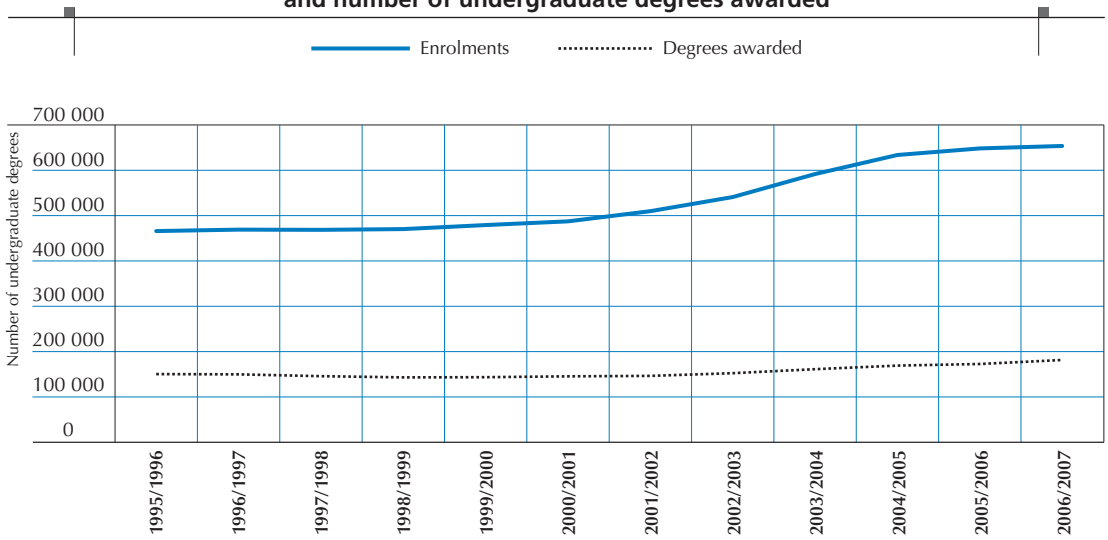
Abstract

This chapter provides a first glimpse at the results of Canada's longitudinal study – the Youth in Transition Survey (YITS). Using 2006 as a reference point, when students were 21 years olds, it examines the various pathways taken by students to college, university and work since 2000. These pathways are critical in shaping the future educational, occupational and social outcomes of these individuals and hence are of considerable policy relevance. While linear pathways were most common to achieve a post-secondary education, they were not the only ones. The importance of achievement in PISA 2000 evidenced by the results presented in this chapter. High levels of competencies at age 15 are in general associated with linear pathways and higher educational attainment – notably, a university education – but many students also followed non-linear pathways (those shifting between education and work) to achieve a post-secondary education.

INTRODUCTION: THE IMPORTANCE OF POST-SECONDARY EDUCATION

Over the last decade, Canada has experienced a substantial increase in the number of individuals participating in post-secondary education. As shown in Figure 4.1, the enrolment in full-time bachelor programmes has increased by 40% from 1995-96 to 2006-07. Similarly, the number of undergraduate degrees awarded has increased by 21% over the same time period.

Figure 4.1
Full-time enrolment levels in a bachelor degree programme and number of undergraduate degrees awarded



Source: Tables 477-0013 and 477-0014, Statistics Canada (2009).

This increasing trend of post-secondary education enrolment coupled with increases in degrees awarded has placed greater importance on the pathways leading to such outcomes and the competencies that are associated with them. This chapter describes a range of possible education and work outcomes at age 21 and the pathways that led to them.

This chapter is a descriptive introduction into the wealth of information that is available in the combination of the PISA and YITS databases. Of course, since the results discussed here are descriptive, it should be borne in mind that to gain a more complete understanding of patterns of transition to subsequent outcomes it would be necessary to adjust for a range of background characteristics. This approach for adjusting for the influences of multiple variables is made in subsequent chapters. However, a key aim of this chapter is to illustrate that, even with more simple descriptive analyses, the results are extremely insightful and shed light on a number of important policy issues.

The complexity and importance of transitioning to postsecondary education and work should not be understated. Indeed, a descriptive overview of the outcomes gathered in YITS provides a useful context in which to consider the more complex results in the chapters that follow.

The following questions form the focus of this chapter:

- What were the more and less common pathways taken by young Canadians to education and work?
- How much did reading scores vary by these pathways?
- Which pathways promote quality and equity?

The results in this chapter are based on analyses conducted by Bayard and Gluszynski (2009).

RATES OF ACCESS TO POST-SECONDARY EDUCATION

Before considering the pathways taken by Canadian students retrospectively from 2006, it is worth considering the overall rate of access to post-secondary education. Furthermore, a comparison of the PISA scores of students in university, college and work in 2006 provides an initial indication of the importance of prior achievement on real-life literacy tasks to subsequent educational and work choices and outcomes.

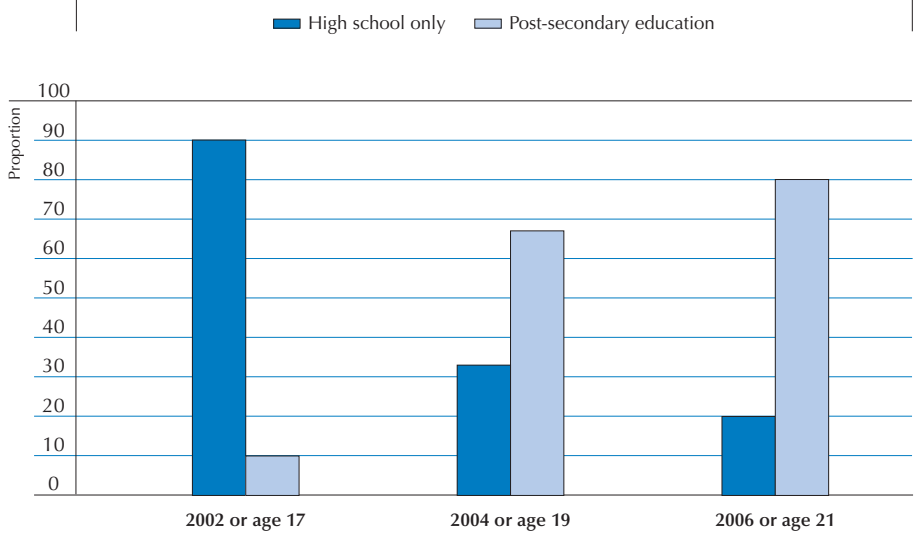
Secondary school completion rates in Canada are high. In all, 94% of PISA 2000 students graduated secondary school by 2006. The majority of Canadian high school students graduate at age 18 and nearly all by age 21. Conditional on being a high school graduate, Figure 4.2 shows that participation in post-secondary education increased with age. The largest increase occurred between the ages of 17 and 19, with post-secondary education attendance rising from 10% to 67%. Further, by age 21 (in 2006), nearly 80% of the original cohort that had graduated from high school had enrolled in post-secondary education institutions.

In 2006, 36% of Canadians who participated in PISA 2000 were attending a university, 19% were in college and 45% were working. The mean score of students in universities was highest (594), followed by college attenders (532) and lowest for students who were in work in 2006 (507). The score difference between university students and those in work in 2006 was close to one standard deviation.

It is also possible to compare the reading scores of students according to whether they accessed post-secondary education or not (*i.e.* regardless of the time-point at which they transitioned), since some students working in 2006 did attend post-secondary education, while others did not. Thus, regardless of the particular point in time at which students accessed post-secondary education (or not), the YITS dataset revealed that 20% of students did not access any type of post-secondary education and the mean reading score of this group (477) was some 60 points below the Canadian average. About 35% of students attended college and their mean score was 519. Students who attended university had the highest mean score (588) and this accounted for 44% of the cohort.

This initial descriptive overview of the outcomes of youth in 2006 with reference to their PISA reading scores in 2000 provides support for the importance of earlier proficiency in the achievement of more favourable educational attainment.

Figure 4.2
Proportion of youth who completed secondary school that attempted post-secondary education by reference cycle (conditional on secondary school graduation)



Source: Youth in Transition Survey, Special Analysis, Learning Policy Directorate, HRSDC.

PATHWAYS TO EDUCATION AND WORK

In 2006, the most recent point in time when data from YITS were available for this study, young adults that participated in PISA 2000 were aged 21. In these six years, though seems a short time, the 15-year-olds of PISA 2000 underwent a critical phase in their own personal development. They had to make important decisions about their future academic and professional careers. Those who completed their compulsory education had to decide whether to continue further in their education and opt for post-secondary education or join the workforce. Post-secondary education in Canada, as described in Chapter 2, offers several options to students, which can be broadly classified as college or university. If they joined the labour market, they may have been employed or unemployed at the time of the survey.

Although it may be observed that in 2006, youth that participated in PISA 2000 were in university, college or work, the paths taken that led to these outcomes are complex. Box 4.1 provides a description of the types of educational and labour market outcomes that have been used to describe pathways of this cohort of young people. By specifying the outcomes of individuals at each data collection point (2002, 2004, 2006), the extent of various transition pathways through the education system can then be identified. Identifying pathways in this fashion allows an examination of the more and less common pathways taken by Canadian youth, the extent to which these pathways may be considered linear and the pathways that may be considered more and less beneficial both to individuals and to the Canadian economy.

This analysis is extremely important since the choices students make and possible barriers preventing the optimal choice can have a profound impact on students' subsequent educational and occupational experiences.

Box 4.1 **What are the outcomes that define pathways to education and work?**

Pathways were defined using education and labour market outcomes across 2002, 2004 and 2006. These were:

1. University post-secondary education (ISCED 5A level or higher).
2. Non-university post-secondary education: education higher than a secondary school diploma, including college or vocational education (lower ISCED 5A).
3. Working: not attending upper secondary school or post-secondary education and working in a job the last two months of the reference year.
4. In upper secondary school.
5. Not in education, employment, or training: not enrolled in post-secondary education or in education as of December of the reference year and was not considered working (two consecutive months).

It should be noted that 6% of students did not complete upper secondary school. These individuals are not included in the analyses reported in this chapter. Similarly, students experiencing varying degrees of inactivity are not included since these patterns are complex to analyse.

For policy purposes, the group of students that may be classified as not being in education, employment or training is of concern since it is likely that many of the young people in this group may have fallen out of the system. But it is important to see this in a longitudinal context in order not to over-state the issue. It is estimated that about 11% of students experienced more than one consecutive period of inactivity. However, just 1% experienced three consecutive periods of inactivity. The lower percentages are an indication of the dynamic nature of an even less desirable pathway where youth can re-enter education or the workplace to improve their life chances. These movements out of inactivity can be affected by individual decisions as well as the educational and labour market environments.

The longer term prospects of early labour market entrants, with only a secondary education diploma or less, as well as those who graduated late from upper-secondary school, are also of concern. They may fall victim to increasing competition for jobs from those better qualified in terms of job opportunities, stability of employment and future earnings.

When PISA was conducted in 2000, all youth were in secondary education. Following that, at a given point in time, an individual could be in one of four states: university, college, work, or secondary school. The pathways are denoted backwards through time. For example, an individual with a pathway across 2002, 2004 and 2006 of "Work-College-School" means that he or she was in secondary school in 2002, in college in 2004 and in work in 2006. Similarly, a student with a pathway of "University-University-School" was in secondary school in 2002 and in university in 2004 and 2006.

The analysis starts with the primary activity of youth in 2006 (at age 21) – where they enrolled in college or a university or were working. Then, it asks how students got there – where these same students were in 2004 and 2002 (at ages 19 and 17). The cognitive skills these students demonstrated in terms of reading scores in PISA 2000 are also considered. The next three sections consider the pathways that led students to university, college and work respectively, in PISA 2006.

PATHWAYS TO UNIVERSITY AND ACHIEVEMENT IN PISA 2000

In educational terms, access to university is the most positive outcome. However, not all students may be suited to university. Another relevant issue with respect to post-secondary education access generally is the extent to which course choice matches students' educational strengths and educational and occupational expectations. These issues are examined further in subsequent chapters.

Given the various outcomes that were used to define youth pathways, there were no fewer than 16 possible pathways to attendance at a university in 2006. However, some pathways were much more common than others. Table 4.1 shows nine pathways to university in 2006 for which there were sufficient numbers of students to report the results (*i.e.* where there were 1% or more in the group). However, for the smaller groups, the standard errors of the achievement scores are high so results should be interpreted with caution.

The evidence suggests that being a PISA top performer in reading is not a necessary condition for attending university but rather that a high PISA score in reading provides a substantial advantage for achieving a university education. Furthermore, while linear pathways were the most common (*i.e.* proceeding directly from school to university), non-linear pathways were also possible. The highest PISA scores were associated with students finishing secondary school earlier and/or following a linear pathway.

Table 4.1

Frequencies of nine pathways to university (2006), and PISA combined reading literacy scores (2000)

2006 (age 21)	2004 (age 19)	2002 (age 17)	PISA combined reading score (2000)	S.E.	Distribution of 2006 university students (%)
University	University	Secondary school	597	8	73
University	Work	Secondary school	561	17	10
University	University	College	623	15	6
University	University	Work	*624*	*32*	2
University	Work	College	*617*	*31*	2
University	University	University	*649*	*48*	1
University	College	College	*600*	*44*	1
University	College	Secondary school	*607*	*28*	1
University	Secondary school	Secondary school	*546*	*112*	1

Note: Seven categories of pathways have fewer than one per cent of students and are not included in the table. This is why the distribution sums to 97, not 100. The percentages in the last column are subtotals of the 36% of PISA 2000 participants who were working in 2006.
Achievement scores in italics are to be interpreted cautiously as they are based on a small number of observations.
Source: Youth in Transition Survey, Special Analysis, Learning Policy Directorate, HRSDC.

By far the most common pathway identified for those in university at age 21 was completing upper secondary, then attending university in both 2004 and 2006. This category accounted for 73% of all students attending university in 2006. The second most common pathway (10% of 2006 university students) was completing upper secondary, then working and enrolling in university in 2006. The third most common was attending a college in 2002 and enrolling in university by 2004 (6% of 2006 university students). The latter figure could be affected by Québec's education system (described in Chapter 2).

There were three possible pathways to university that could be considered linear in nature (for youth living outside of Québec): University-University-University, University-University-School and University-School-School; *i.e.*, the student entered university directly after secondary school. Concentrating on linear pathways typical of an average Canadian youth, the transition from secondary education to university occurred at different points in time. The average PISA reading score at age 15 was especially high for those who made the earliest transition to university (University-University-University), with the students in this category scoring an average of 649 points, which put them at Level 5 on the PISA reading scale. Those entering university two years later in 2004 (University-University-School), obtained an average score of 597 points and finally those entering in 2006 (University-School-School) averaged 546 PISA reading points.

For some (most notably those in Québec), attending college prior to attending university was another possibility. Students who followed a pathway to university with more than one type of post-secondary education (*i.e.* secondary school followed by college followed by university) tended to have high reading scores at age 15. For the groups that contained sufficient sample sizes (University-University-University, University-College-College and University-College-School) the average scores were either at or above 600.

An episode of working was also possible in terms of pathways leading to university. An interruption for work could be positive, if the students did so to gain experience, to their career choice or to earn money specifically to finance their university education. Students who took an early working break (University-University-Work) obtained an average reading score of 624, just short of Level 5 in reading. Experiencing a work episode after attending college (University-Work-College) was also associated with particularly high reading scores at age 15 (617 points). And, although the other groups that experienced a work episode prior to attending university had lower reading scores, these were still high, ranging from 535 points for University-College-Work to 595 points for University-Work-Work.

PATHWAYS TO COLLEGE AND ACHIEVEMENT IN PISA 2000

Linear pathways to college were most common for youth in college in 2006. However transitions to work were more common than for the university group and, overall, the PISA 2000 reading scores of students in college were lower than youth in universities. This suggests first, that students may have needed to work to finance their studies to a greater degree than their university counterparts, and/or had a more vocationally-oriented disposition, second, that the ability requirements for college were generally not as high as for university. Of course, there was variation in these mean scores, depending on the particular pathway taken.

Just over half (54%) of college students followed a linear pathway, since these students were also in college two years earlier. The average reading score of this group of students was 550. Thirty-three per cent (33%) of the 2006 college students reported to have been working two years earlier at age 19, with their average reading scores being 513. Only a small proportion of these students were still in secondary school in 2004, with reading scores of this group averaging 500. Thus, similar to the university students, college students completing secondary school at an age older than average tended to have lower reading scores.

It was possible to identify seven of 16 pathways to college in 2006 that had sufficient sample sizes to report results (that is, 1% or more of college students). Table 4.2 shows these seven pathways. Again, caution is advised in interpreting the results for the smaller groups since the standard error of the achievement measure is large.

Table 4.2

Frequencies of seven pathways to college (2006), and PISA combined reading literacy scores (2000)

2006 (age 21)	2004 (age 19)	2002 (age 17)	PISA combined reading score (2000)	S.E.	Distribution of 2006 college students (%)
College	College	Secondary school	538	14	39
College	Work	Secondary school	507	16	30
College	College	College	587	20	11
College	College	Work	*557*	*44*	3
College	Secondary school	Secondary school	*503*	*57*	3
College	Work	College	*573*	*59*	2
College	Work	Work	*531*	*76*	2

Note: Nine categories of pathways have equal to or less than one per cent of students and are not included in the table. This is why the distribution sums to 90, not 100.
The percentages in the last column are subtotals of the 19% of PISA 2000 participants who were working in 2006.
Achievement scores in italics are to be interpreted cautiously as they are based on a small number of observations.
Source: Youth in Transition Survey, Special Analysis, Learning Policy Directorate, HRSDC.

Similar to the students in university, students entering college at a younger than average age and who remained in college (College-College-College) had a high average PISA reading score of 587 (Level 4). Interestingly, students experiencing a spell of work in 2002 also had high average scores – whether attendance at college was linear (College-College-Work, 557; College-Work-Work, 531) or not (College-Work-College, 573). Students still in secondary school in 2002 tended to have low average scores (College-Work-School, 507; College-School-School, 503).

SUMMARY OF PATHWAYS TO POST-SECONDARY EDUCATION

A key observation with respect to access to both college and university is that experiencing a spell of work was not necessarily associated with a lower PISA reading score. However, some pathways that were associated with work transitions were associated with lower PISA reading scores, particularly where the student finished secondary school at an older than average age. The analyses presented here cannot explain why these patterns of score differences are so, but they provide a first look at the important and complex issues of transition to post-secondary education and the relevance of prior proficiency and secondary school completion age in these transition patterns.

Typically, good marks were necessary for admission into post-secondary education. These results confirm that cognitive ability as measured by PISA reading not only distinguishes students proceeding to higher education from others who did not, but it also distinguishes those pursuing a university degree from those seeking a college diploma.

The importance of scores above the OECD average of 500 is underlined for future prospects. Therefore, schools should be encouraged to have average scores well above 500, with distributions skewed to the right (*i.e.* a majority of students scoring at or above 500). In other words, supports need to be put in place that not only raise achievement overall, but also serve to ensure that the largest majority possible attain their full potential in cognitive proficiency.

PATHWAYS TO WORK AND ACHIEVEMENT IN PISA 2000

While it is true to say that the demands for high levels of educational attainment have increased in industrialised countries (Canada being no exception), it is not the case that being employed by age 21 is invariably a negative outcome. However, as the various pathways to work described in this section show, there is a minority of students who had low reading scores and proceeded directly from secondary schools into the workforce. These students, who scored below the OECD average, may be unlikely to have sufficient proficiency and qualifications to secure stable, rewarding employment. They may also not be likely to reap the full benefits of on-the-job training or future professional development, if these were available to them.

In 2006, just under half of students that took part in PISA 2000 (46%) were working. In 2004, 59% of this group was working, 28% was in college, 7% was in secondary school and 6% was in university, which indicates an educational pathway intercepted (in some cases interrupted) by work. Nine distinct pathways to work in 2006 with sufficient numbers of cases to report (at or exceeding 1% of those working in 2006) are shown in Table 4.3. Again, caution is advised in considering the results of the smaller groups since the low numbers in these groups result in large margins of measurement error.

The most common pathway associated with students working in 2006 was attending secondary school in 2002 and then working in 2004 and 2006. This pathway accounted for 50% of those working in 2006. The second most common pathway to work, secondary school in 2002, college in 2004 and working in 2006, was taken by 21% of students and indicates labour market entrants with a college diploma. Seven per cent (7%) of students were in work in all three periods, while a further 7% were in secondary school in both

2002 and 2004, then in work by 2006. Six per cent (6%) of students attended secondary school in 2002, were in university in 2004 and working in 2006. A smaller percentage (4%) attended college in 2002 and 2004 and were working in 2006, likely graduating from longer programmes.

Table 4.3

Frequencies of nine pathways to work (2006), and PISA combined reading literacy scores (2000)

2006 (age 21)	2004 (age 19)	2002 (age 17)	PISA combined reading score (2000)	S.E.	Distribution of 2006 individuals working (%)
Work	Work	Secondary school	491	9	50
Work	College	Secondary school	520	10	21
Work	Work	Work	499	23	7
Work	Secondary school	Secondary school	456	20	7
Work	University	Secondary school	575	17	6
Work	College	College	578	17	4
Work	Work	College	*556*	*32*	2
Work	College	Work	*539*	*31*	2
Work	University	College	*621*	*73*	1

Note: Seven categories of pathways have fewer than one per cent of students and are not included in the table. This is why the distribution sums to 99, not 100%.
The percentages in the last column are subtotals of the 46% of PISA 2000 participants who were working in 2006.
Achievement scores in italics are to be interpreted cautiously as they are based on a small number of observations.
Source: Youth in Transition Survey, Special Analysis, Learning Policy Directorate, HRSDC.

The three groups of students who had linear pathways to work, *i.e.* going directly from secondary school to work, had the lowest PISA reading scores and again it can be seen that students finishing secondary school at an older than average age had low reading scores (Work-Work-School, 491; Work-Work-Work, 499; Work-School-School, 456).

In contrast, students who attended some post-secondary education prior to entering work achieved higher average reading scores, particularly those with two consecutive periods in post-secondary education (Work-College-School, 520; Work-University-School, 575; Work-College-College, 578; Work-Work-College, 556; Work-College-School, 539; Work-University-College, 621). However, some of these groups might include students who did not complete their post-secondary education course. For example, it is highly unlikely that a student would complete a university course in two years.

All in all, the dispersion in reading scores of the group of youth who were working in 2006 was much wider than both the university and college groups. This is because working before proceeding to higher education was less common than many of the other pathways described and these pathways may become more common if students want to avoid study debt.

CONCLUSION

With the administration of the PISA 2000 assessment prior to students setting out along various educational and labour market pathways, it is possible to make associations between early measures of performance and particular trajectories. The results make it clear that early skill levels are related to educational and labour market pathways, which in themselves are crucial because they can be expected to have a deep and lasting impact on these individuals' educational and occupational experiences. However, it is also true to say that high proficiency as measured by PISA is not a prerequisite for entry into post-secondary education, since a degree of variation in the scores of students was found, depending on the particular pathway taken.

The chapter sought first to identify the more and less common pathways to education and work taken by young Canadians from 2002 to 2006, by which time they were aged 21. In 2006, about 36% of students were in university, 19% were attending college and 45% were working. However, there were a number of

possible different pathways that led to the 2006 outcomes. It was observed that linear pathways to post-secondary education were more common than non-linear ones (*i.e.* proceeding directly to post-secondary education from secondary school). However, non-linear pathways were also the case for a large population of students who were in university or college. For example, 35% of college students and 14% of university students had a period of work prior to commencing post-secondary education. And, while 64% of youth working in 2006 proceeded to do so directly from secondary school, some of this group may not have successfully completed post-secondary education. For example, 6% of those working in 2006 had been in university the period prior and it is highly likely that they dropped out of university.

Second, the chapter considered variations in the reading scores according to the different types of pathways. Overall, the 2006 university students were well prepared for their learning careers in terms of reading competencies, since regardless of the pathway chosen, the vast majority scored at Levels 4 or 5. Also, a large majority of college students scored at Levels 3 or 4 despite the various pathways taken. A small minority of students in university in 2006, who were either still in school in 2004 or working during the same period, had lower PISA scores than other groups, although these were still well in excess of the OECD average. Overall, then, the university group may be considered advantaged both in prior achievement and also post-secondary education status.

Similarly, college students completing secondary schooling later than average and experiencing a period of work prior to beginning college also had the lowest PISA scores of college students, but, nonetheless, these were at or slightly above the OECD average. Of the three groups considered in this chapter, the group that was working in 2006 had the most variability in their reading skills in 2000. The reading scores within this group ranged from 446 points to 624 points. These results confirm that this group is the most heterogeneous among those analysed and could therefore be the focus of further research (*e.g.* in examining variations by gender, job, sector of employment and socio-economic status).

Finally, the chapter examined how the various pathways gave some indication of those associated with excellence and equity. Generally speaking, students who completed secondary school at an older than average age, regardless of whether they attended post-secondary education or not, fared worse in terms of their achievement on PISA in 2000. This may be indicative of the negative association between disruptions to schooling or grade repetition and both achievement and later outcomes. Also, students proceeding directly to work from school had low PISA scores. This group is therefore a target for policy intervention, for example, by examining and developing practices that promote on-the-job training, or a re-engagement with education appropriate to their needs. Linear pathways to post-secondary education were associated with higher reading scores and this indicates that policies to promote post-secondary education attendance should include drivers to promote smooth transitions to post-secondary education.

5

Predicting Success: Key Characteristics of Youth Affecting Transitions to Education and the Labour Market

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Abstract

The importance of securing post-secondary education has been demonstrated earlier in this report and elsewhere. This chapter considers the association of earlier educational achievement, as measured in PISA 2000, with subsequent pathways to educational attainment, as well as the likely effects of higher PISA achievement on further educational attainment. The chapter also presents pathways by the age of 21, when transitions between education, work and inactivity are likely to be common. The relative influence of PISA achievement, simultaneously analysed with a number of background characteristics, confirms the importance of prior competencies. This also provides some important policy implications that are particularly relevant to equity.

INTRODUCTION

As noted in Chapters 2 and 4, higher levels of educational attainment are crucial in securing quality and stable employment, even when transitions to and from education, work and inactivity are complex. Identifying barriers to higher educational attainment and positive transition patterns therefore have high policy relevance in presenting options to improve the life chances of individuals who may be experiencing difficulties with respect to educational attainment and a smooth transition from education to work. This chapter examines educational attainment and pathways between education, work and unemployment in the context of both achievement in PISA 2000 and several key background characteristics. A key focus of this chapter is on the extent to which males and females differ in these outcomes.

It has already been shown in Chapter 4 that young people's achievement affects subsequent educational opportunities and outcomes. Competencies may also determine labour market outcomes over the medium to long term. This chapter builds on the previous one by considering both educational attainment and patterns of movement to and from education, work and unemployment with respect to a number of key background characteristics.

The research in this area reveals three reasonably consistent findings. First, parental education is an important determinant. Second, the economic resources available within the family at the time students are in their early teenage years have also been shown to have important effects on grade attainment. To what extent this reflects the existence of financial barriers is, however, unclear. Third, whenever measures of academic performance have been included in analyses, they are generally significant determinants of educational attainment. Research on pathways suggests that higher educational attainment is associated with more positive trajectories from education to work but that for many youth, pathways from education to work do not stabilise for two years. Furthermore, spells of unemployment in the early stages of labour market experiences are associated with a higher likelihood of unemployment in the longer term. This suggests that the benefits from early interventions may be large. See Hansen (2009) for a detailed review of research on educational attainment and school-to-work transitions.

The following questions form the focus of this chapter:

- How does educational attainment differ across students with different PISA achievement scores?
- What are the effects of increased achievement on educational attainment?
- Do patterns of transition from education, work and inactivity vary depending on PISA achievement scores?
- Do other characteristics of the respondents modify the association between PISA scores and pathways?

This chapter is based on analyses carried out by Hansen (2009).

PATTERNS IN PATHWAYS TO EDUCATIONAL ATTAINMENT

Examining the educational attainments of students and their experiences in shifting to and from work, education and employment at age 21 can offer some extremely useful insights, particularly with respect to factors that may be acting as barriers to achieve more positive outcomes. While it is true to say that in 2006, when students were aged 21, it is likely that many may still be in a state of flux with respect to their educational attainment and occupational outcomes. It was observed in Chapter 4 that a sizeable proportion of students – 55% – were still in post-secondary education in 2006 and many of these students may have needed some time to secure stable employment. Furthermore, even those in work in 2006 may move to other employment, unemployment or further education.

The outcomes considered in this chapter are highest grade level completed (*i.e.* educational attainment ranging from grades 10 to 16) and three patterns of transition in a pathway. This chapter looks at the probability of students moving from one state to another across time points, with the three possible states being education, inactivity (unemployment) and work.

Two sets of results are presentd in this chapter. The first set of results examines the extent to which PISA scores affect the likelihood of grade completion for grades 10 to 16 separately for males and females. The second set of results examines patterns of transition to and from education, work and inactivity, again separately for males and females. The analysis also examines how PISA scores predict the likelihood of nine possible transitions between spring 2005 to autumn 2005, a particularly critical time as many YITS respondents approach the completion of their post-secondary education degree, after adjusting for a number of background characteristics.[1]

In many OECD countries, female students outperform males in reading and also have higher aspirations for higher education. In Canada, there are more women graduates from post-secondary institutions than there are men, with the exception of vocational education. Still, women tend to cluster in certain disciplines and, therefore, also in certain sectors of the labour market. Thus, it is appropriate to carry out the analyses separately for men and women.

The approaches taken in the analyses presented reflect a recent tendency in research on pathways to education / work that acknowledges that such transitions are highly complex and that a variety of analytic methods is preferable over reliance on a limited set of methodologies (*e.g.* Raffe, 2003).

Box 5.1 provides an overview of the rationale and methods of analysis used. Annex B provides some additional technical information. Hansen (2009) gives further technical details on the methods used to analyse the data.

Box 5.1 How were educational and labour market pathways analysed?

Previous research on educational attainment has tended to be overly simplistic, *i.e.* focusing either on a single transition (*e.g.* entry to university), or the basis of multiple regressions (*e.g.* to assess the extent to which background characteristics are associated with educational attainment).

More recent approaches use a model in which a sequence of probabilities of continuing in education is established. This approach recognises that the probability of progressing from one grade level to the next is contingent upon the previous progression. This technique was employed in analyses of educational attainment.

The second technique that was employed in the analyses presented in this chapter is multivariate modelling or, more specifically, multinomial modelling. This technique is suited to outcomes that are not continuous as in the case of the present analyses; the outcomes examined were transition patterns to and from education, work and inactivity.

PISA SCORES AND PROGRESSION AND ATTAINMENT IN POST-SECONDARY EDUCATION

It is useful first to consider how PISA reading scores were associated with varying levels of educational attainment for males and females. Table 5.1 shows that, for both males and females, reading scores were associated with the likelihood of students progressing from one grade level to another across grades 10 to 16. For example, 37% of males with a high reading score, *i.e.* in the top reading quintile, attained grade 16 compared to just 3.4% of males with a low reading score (bottom quintile). Similarly, 52.4% of females with a high reading score attained grade 16 compared to 14.9% of females with a low reading score.

The results show that reading scores had a stronger association with grade progression in post-secondary school years than for schooling up to grade 12 and particularly so for males. The table also shows that educational attainment in general was higher for females. For example, 34.7% of female students attained grade 16 compared with 20.9% of males.

Table 5.1

Distribution of highest grade completed for males and females, and for low and high PISA 2000 reading scores

Highest grade completed	Males	Females	Males, low PISA reading scores	Males, high PISA reading scores	Females, low PISA reading scores	Females, high PISA reading scores
Grade 10 or less	5.2	2.9	10.0	1.4	8.6	0.0
Grade 11	15.5	11.0	20.0	9.4	17.7	0.0
Grade 12	30.6	24.4	37.2	23.3	32.4	19.4
Grade 13	14.8	13.7	18.4	12.6	11.1	12.6
Grade 14	6.7	6.9	6.2	9.5	7.5	7.0
Grade 15	6.4	6.4	4.8	6.8	7.9	4.4
Grade 16 or more	20.9	34.7	3.4	37.0	14.9	52.4

Note: Low scores are in the bottom quintile and high scores are in the top quintile.
Source: OECD PISA and HRSDC.

Analysis of the probability of grade completion from one grade to the next confirms that PISA scores have a marked association with grade progression (Table B5.3).

Overall, the findings presented in this section for both males and females shows that competencies are important for success at every grade level and particularly so at grade levels beyond secondary school, when education is no longer compulsory and the educational experiences of these youth diversifies.

CAN IMPROVED PISA SCORES INCREASE LEVELS OF EDUCATIONAL ATTAINMENT?

This section considers how increases in achievement scores might play out in the distribution of educational attainment. This is done by deriving the transition probabilities for males and females on the basis of the information in Table 5.1.

For example, all students had the possibility of moving up to grade 11. Of these 5.2% of males and 2.9% females did not. These give transition probabilities of 0.948 for males and 0.971 for females. The average value of these transition probabilities across grades is 0.778 for males and 0.843 for females. These are the numbers that are used to estimate the relationship between mathematics and reading skills and grade progression. As an example, a 100-point increase in reading achievement would increase the probability of moving from grade 13 to grade 14 by 0.123 percentage points for males, which corresponds to a 16% increase in attainment to grade 14 (0.123/0.778). Therefore, even a more modest increase in reading scores may lead to increased educational attainment as the continuation probability is increased at all grade levels.

Table 5.2 displays in more detail the relationship between increased achievement in mathematics and reading and overall educational attainment for males and females.

Introducing a uniform increase in the reading score of one standard deviation results in a 17.4% reduction in secondary school non-completion and a 12.6% increase in the proportion of males attending post-secondary education. For females, the effects of increased reading scores are also substantial. A one standard deviation increase in reading is associated with a 31.5% reduction in non-completion of secondary school and 11.4% increase in completion of at least some post-secondary education.

The results of increased mathematics scores in completion of some post-secondary education were more marked for males than females. When both mathematics and reading score increases are considered together, there is an interesting gender difference. That is, the results were more marked for females for completion of secondary school, while they were stronger for males for completing some post-secondary education.

Table 5.2

Actual and expected grade level and educational attainment, for males and females

	Actual (data)	Expected	Increase in reading scores	Increase in mathematics scores	Increase in both reading and mathematics scores
Males					
Average grade level	13.1	12.9	13.3	13.3	13.8
Relative change (%)			3.2	3.2	6.7
Grade distribution					
Less than high school	0.1206	0.149	0.123	0.13	0.106
Relative change (%)			-17.4	-12.8	-28.8
High school	0.306	0.358	0.322	0.277	0.243
Relative change (%)			-10.1	-22.4	-32
Post-secondary school	0.488	0.493	0.555	0.593	0.651
Relative change (%)			12.6	20.1	31.9
Females					
Average grade level	13.7	13.8	14.1	14.1	14.4
Relative change (%)			2.7	2.7	4.9
Grade distribution					
Less than high school	0.139	0.085	0.075	0.081	0.054
Relative change (%)			-31.5	-4.4	-37.2
High school	0.244	0.247	0.212	0.2	0.157
Relative change (%)			-15.4	-19.1	-36.5
Post-secondary school	0.617	0.668	0.713	0.719	0.79
Relative change (%)			11.4	7.6	18.2

Note: The increases refer to a uniform increase in test scores with one standard deviation. The relative changes compare grade distributions after the score increase with those before an increase.
Source: OECD PISA and HRSDC.

To summarise, improvements in mathematics and reading skills are associated with progression in years of education and increases educational attainment. The effects are in most cases statistically significant and also quantitatively important. Given the high average skill levels of Canadian youth, policy will need to focus on improving the competencies of sub-populations that have lower levels of achievement.

TRANSITIONS BETWEEN EDUCATION, WORK AND INACTIVITY IN THE CONTEXT OF PISA READING AND MATHEMATICS SCORES

This section first considers the pathways to and from education, work and inactivity for Canadian youth generally and then examines the extent to which transitions vary depending on levels of achievement as

measured in PISA 2000. The transition period considered is the six-month interval between the spring and autumn of 2005, when most of the participants would have been age 20. This period is of importance since at age 20, many youth will be choosing to move from education to work, or to continued education. These results will also provide some indication of sub-groups of the YITS cohort that are experiencing less desirable pathways, notably with respect to continued inactivity.

The section then goes on to consider whether a range of background characteristics predict nine possible transition patterns in the same period, again separately for males and females. These more detailed multivariate analyses will provide a more nuanced picture of those sub-groups experiencing more and less transitions. The nine transition patterns are to and from education, work and inactivity.

Table 5.3 shows the distribution of transitions for males and females between the spring and autumn of 2005, overall and also for males and females scoring in the top and bottom quintiles on PISA 2000 reading.

Two key findings emerge from this evidence. First, transitions from education to education and from work to work were stable for both males and females, while there was more variation in the transition patterns for youth moving from inactivity to education, inactivity and work.

Second, of all males in education in the spring semester of 2005, 90.5% were still in education in the autumn semester of 2005. Thus, there is high stability with respect to education. However, 8% were working in the second semester and around 1.5% were inactive. Of males in work in spring of 2005, a majority of 82.7% were again in work in the autumn. However, about one in eight (12.5%) went back to education and 4.8% were inactive. Of the inactive group, 12.5% returned to education, 44.9% secured work and 42.7% were again inactive. The pattern of transitions from school, work and inactivity were similar for females in this period.

Therefore, for both males and females, there was a relative degree of stability in the six-month period with respect to continuing in both education and work. However, small proportions of youth progressed from education or work to inactivity.

The results overall suggest that students experiencing a period of inactivity in the spring of 2005 were considerably more likely to continue to experience a period of inactivity six months later compared with youth in education or in work. Nonetheless, 44.9% of males and 39.2% of females who were inactive during the first period had managed to secure work by the autumn and 12.5% of males and 15.6% of females who had been in active in the spring were in education six months later. Hence, a period of inactivity was followed by a period in work or education in over half of these youth, indicating that prolonged periods of inactivity are certainly not inevitable. It should be borne in mind that there may be many possible reasons for experiencing a spell of inactivity, and that these results cannot provide information as to why this may be the case.

When the transition patterns of low and high achievers are compared, the most important difference to note is that high achievers were more likely than low achievers to still be in education and also less likely to have entered work. Also, high achievers who were in work during the spring semester of 2005 were more likely to have returned to education in the autumn, compared to low achievers. And finally, high achievers who were inactive in spring 2005 were considerably more likely than low achievers to return to education in the autumn of 2005 compared to low achievers. Generally speaking, these patterns were similar for both males and females.

Thus, not only is higher achievement associated with higher educational attainment as shown in the previous section, it is also associated with more positive transitions to education. The results also confirm the need for policy to focus on lower-achieving students, to develop ways in which to support these students at key decision stages and to actively intervene as early as possible when a period of inactivity is experienced.

Table 5.3

School and labour market transition rates, from spring to autumn 2005, by gender and PISA reading scores

Males

	All			Low PISA reading score			High PISA reading score		
	Autumn 2005			Autumn 2005			Autumn 2005		
Spring 2005	Education	Work	Inactivity	Education	Work	Inactivity	Education	Work	Inactivity
Education	90.5	8.0	1.5	86.5	11.1	2.4	94.8	4.6	0.6
Work	12.5	82.7	4.8	9.6	84.9	5.5	21.3	74.4	4.3
Inactivity	12.5	44.9	42.7	7.1	46.9	46.0	15.8	43.2	41.0

Females

	All			Low PISA reading score			High PISA reading score		
	Autumn 2005			Autumn 2005			Autumn 2005		
Spring 2005	Education	Work	Inactivity	Education	Work	Inactivity	Education	Work	Inactivity
Education	92.9	6.2	0.9	88.6	10.1	1.3	95.7	3.7	0.5
Work	15.4	80.6	4.0	11.9	82.6	5.4	24.7	70.8	4.5
Inactivity	15.6	39.2	45.2	9.5	41.2	49.3	28.2	37.1	34.7

Note: Low scores are in the bottom quintile and high scores are in the top quintile.
Source: OECD PISA and HRSDC.

CHARACTERISTICS THAT PREDICT TRANSITIONS BETWEEN EDUCATION, WORK AND INACTIVITY

The principle purpose of the second set of results presented here is to examine the extent to which PISA scores predict patterns of transition after adjusting for background characteristics of the students. The results also provide more subtle insights that add to the first set of results reported in this section.

Tables 5.4 and 5.5 show the results of the multinomial analyses of transition to and from education, work and inactivity, separately for males and females. (The detailed results of the models are in Tables B5.3a, b, c and B5.4a, b, c in Annex B.)

These complex results are in themselves illustrative of the complicated nature of these transition patterns. In each case, three models were developed, depending on the status of youth during the spring of 2005. The three models were as follows:

- Youth transitioning from education to education, work or inactivity.
- Youth transitioning from work to education, work or inactivity.
- Youth transitioning from inactivity to education, work or inactivity.

In total, then, there are six models – three for males and three for females.

Three key observations may be made in considering these results. First, even after adjusting for the effects of a range of background variables, effects for achievement on PISA remained significant, although these effects were different for males and females. Second, educational attainment had a significant effect, over and above achievement on PISA, for the models that examined transitions from education. Third, the majority of variables were not statistically significant, particularly those from the models that examined patterns of transition from inactivity.

Considering first the results for males who were in education in the spring of 2005 (the left portion of Table 5.4), it can be seen that higher PISA reading scores predicted a transition to education in the autumn, as well as a transition to work. In contrast, educational attainment, while having a positive relationship with transitioning to education in the second period, had a negative relationship with transitioning from education to work. This finding is of interest since it suggests that achievement and attainment are operating in different ways when it comes to education-work transitions in males.

Table 5.4
Summary of three models predicting transitions from education, work and inactivity – Males

	From education to…			From work to…			From inactivity to…		
	Education	Work	Inactivity	Education	Work	Inactivity	Education	Work	Inactivity
PISA reading									
PISA mathematics									
Minority language									
Number of siblings									
Second-generation immigrant									
Family income (100 000 USD)									
Nuclear family									
Mother's education									
Secondary school									
Post-secondary school									
Father's education									
Secondary school									
Post-secondary school									
School activities									
Paid or unpaid work									
Highest grade completed									

Significant positive effect ($p < 0.05$)
Not significant
Significant negative effect ($p < 0.05$)

Source: OECD PISA and HRSDC.

Table 5.5
Summary of three models predicting transitions from education, work and inactivity – Females

	From education to…			From work to…			From inactivity to…		
	Education	Work	Inactivity	Education	Work	Inactivity	Education	Work	Inactivity
PISA reading									
PISA mathematics									
Minority language									
Number of siblings									
Second-generation immigrant									
Family income (100 000 USD)									
Nuclear family									
Mother's education									
Secondary school									
Post-secondary school									
Father's education									
Secondary school									
Post-secondary school									
School activities									
Paid or unpaid work									
Highest grade completed									

Significant positive effect ($p < 0.05$)
Not significant
Significant negative effect ($p < 0.05$)

Source: OECD PISA and HRSDC.

Table 5.4 also shows that for males, transitions from education to inactivity were negatively associated with being in paid work while still in school and also negatively associated with educational attainment. Thus, males who had worked while in school and had higher levels of attainment were less likely to move from a period of education to inactivity. This indicates that supporting work while at school whilst at the same time promoting higher educational attainment in males might protect against the likelihood of experiencing inactivity after being in education.

The model for females moving from a period of education is not the same as that for males (shown in the left portion of Table 5.5). One of the main differences was that PISA mathematics scores, not PISA reading scores, remained significant after adjusting for the other characteristics. Females' mathematics achievement was positively associated with an education-education transition and negatively associated with education-work and education-inactivity transitions. It is not possible to infer from these models why achievement is differentially related to transitions from education in males and females and it would be well worth while to follow up on this finding as subsequent waves of YITS data become available.

The effects of educational attainment for females moving from a period of education were similar to those of males, and again confirm the advantages of both high achievement and high attainment in securing more positive transitions. Similarly, working while in school was significant for females, but appears to be more relevant for females than for males since it was associated with all three transition patterns rather than just the move from education to inactivity.

Turning now to the model for males in work in the first period examined (the middle portion of Table 5.4), it can be seen that the model is better suited to predicting work-work and work-education transitions than work-inactivity transitions. A return to education was associated with higher PISA mathematics scores and also higher educational attainment and negatively associated with being in paid work while at school. The results for work-work transitions indicated that these were more likely with lower PISA mathematics scores, lower educational attainment and working while at school. Lower paternal education was also associated with work-work transitions.

The model for females transitioning from work (shown in the middle portion of Table 5.5) is different to that for males. The only pattern that the two models have in common is that PISA mathematics scores were associated in a similar manner with work-work and work-education transitions. And in considering these two transitions, maternal rather than paternal education was significant. Also for females there was a marked association for second-generation immigrants, which was not the case in males, where females with an immigrant background were more likely to have experienced work-work and work-education transitions compared to non-immigrant groups. Finally, participating in extra school activities by females was positively associated with work-education transitions.

Thus, a key finding of the work transition models (for both males and females) is the positive relationship between positive transitions and higher achievement in PISA and more years of education (educational attainment). Again, the reasons for the gender differences cannot be inferred from the models but would be worth examining in more depth since these differences may have implications for gender-specific policy interventions.

As already mentioned, the models that examined transitions from inactivity in males and females did not generally yield many significant results (the model for males is in the right-hand portion of Table 5.4 and the model for females is in the right-hand part of Table 5.5). One possible explanation for this is that the reasons for being inactive are likely to be very varied and in the majority of cases, inactivity is likely to be a transitory state that is dependent on factors that were not included in the models. However there is some evidence for the positive relationship between PISA mathematical proficiencies and securing a transition from inactivity to education in females while in males, lower mathematics scores were associated with a transition from inactivity to work.

CONCLUSION

The results presented in this chapter demonstrate the importance of achievement, as measured by PISA, in securing higher levels of educational attainment. That is, higher proficiency had a substantial contribution to lower rates of non-completion of secondary school and participation in at least some post-secondary

education. Increases in PISA scores could also potentially raise educational attainment levels and these effects were both significant and of substantial importance.

If one goal of the Canadian education systems is to increase levels of educational attainment, then policy interventions may focus on improving the achievement levels of lower achievers while at the same time maintaining the high levels of achievement at the middle and upper ends of the achievement distribution. The diversity of the Canadian population, coupled with provincial variations in education systems, levels of achievement and other socio-economic and cultural factors, implies that successful policy will need to be tailored to meet this diversity.

An examination of the patterns of transition to and from education, work and inactivity indicate, in the case of education and work, that a majority of youth who were in education and work in the spring of 2005 remained in the same state in the autumn of 2005. A small minority, however, transitioned to other states, and the models that included PISA achievement scores and background characteristics give some clues as to why this might be the case.

Transition patterns from inactivity in spring 2005 were more diverse and although this represents only a small set of the population, it was found that about two-fifths of youth that were inactive in the spring of 2005 were still inactive in the autumn of the same year. In general, lower achievers were more likely to remain inactive than higher achievers. This sub-group of students represents a group that would benefit from a targeted intervention such as active assistance in job-seeking or up-skilling.

High achievers were more likely to persist in their education while low achievers were more likely to cease education and take up work. Again, the lower achievers who transitioned from education to work represent a target group for policy, particularly if the work that they are doing is short-term or otherwise transient in nature.

When the patterns of transition were considered by adjusting for a range of background variables, the most striking finding to emerge is that, even with these adjustments, both achievement in PISA and educational attainment were associated with a higher likelihood of continuing in education and a lower likelihood of proceeding to work or a period of inactivity. Hence, even at this early stage in young people's pathways, the importance of both achievement and attainment was confirmed. It is possible that the effects associated with achievement and attainment will increase as students progress further into their adult lives and for this reason, it would be well worth investigating these transitions as subsequent waves of data from YITS and other PISA longitudinal studies become available.

While other characteristics were found to predict some of these transition patterns and some of these findings confirm the importance of certain background characteristics, others, perhaps surprisingly, did not. Parental income for example did not predict any transition pattern. Again, it is possible that the effects of these characteristics will emerge as significant in future cycles of YITS.

Finally, some gender differences were observed in transition patterns. For example, reading achievement was more relevant to the transition patterns in males, while for females, mathematics achievement was more important. The possible reasons for these gender differences should be explored further, since they may be indicative of gender-specific policy interventions.

In conclusion, policy interventions to promote higher attainment and persistence in education begin with ensuring high quality compulsory education, particularly for low performers and those at risk of disengagement from secondary school.

Note

1. Recall from Chapter 2 that although participants were surveyed only every two years, the YITS dataset has information on participants' education and work statuses on a month-by-month basis.

6

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

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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.

7

Competent Pathways to Work: PISA Scores and Labour Market Returns

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Abstract

An important societal and individual outcome of a country's education system is the level of success experienced by youth as they enter the labour market. In 2006, the point at which the latest data from YITS are available for this report, Canadian youth were 21 years old and many were only beginning the journey into the world of work. Hence, this chapter represents an initial analysis of the labour market outcomes of Canadian youth. It examines the associations between achievement in PISA 2000 and a number of background characteristics with respect to two key labour market outcomes: earnings and the likelihood of unemployment. By age 21, there is some evidence about the relationship between skills, as measured by PISA and labour market outcomes, but it is most likely still too early to tell whether any potential impact could strengthen the youths' careers. These results represent an important first look at these outcomes that can be built on as the results of YITS 2008 and 2010 become available.

INTRODUCTION

International evidence supports the assumption that PISA achievement matters, showing significant associations between cognitive skills and labour market outcomes. (See Drewes, 2009, for a review.) One limitation of much of the available research is that it relies on measures of competences and labour market outcomes that are taken at the same time. Hence, while the labour market recognises and rewards ability, it is not known whether prior levels of competence or are predictive of positive labour market outcomes, employability and earnings power.

In the combined PISA/YITS data, the achievement scores were measured well before any higher education or labour market experience. This mixture allows for an estimation of the impact of prior competencies. PISA scores will have been influenced by early parental investments in human capital and the quality of the individual's primary and early secondary school experiences, so adjustments to account for these are required.

Since there is generally a period of time between compulsory education and labour market entry, it is imperative to improve competencies and thereby improve later labour market outcomes. There is not yet any Canadian literature on the subject, so it is of considerable importance that the combined PISA/YITS data are the first to provide the capability to explore the link between early cognitive skills and later labour market outcomes.

As noted in Chapter 4, even at age 21 (*i.e.* in 2006, the latest available wave of YITS data collection available for this project), many individuals were still transitioning within and across education and work, so it is likely that an examination of early labour market outcomes at this point in Canadian's youth's lives will coincide with a period of relative instability. Nonetheless, the results presented in this chapter provide important baseline data on these outcomes. The next wave of data is likely to provide a better picture.

This chapter addresses the following research questions:

- Do early achievement measures of cognitive ability, such as PISA, predict earnings from work?
- Are any relationships between PISA and earnings robust and independent of other factors?
- Do measures of cognitive ability, such as PISA, reduce the risk of unemployment?
- Is the relationship between PISA scores and the probability of unemployment independent of other factors?

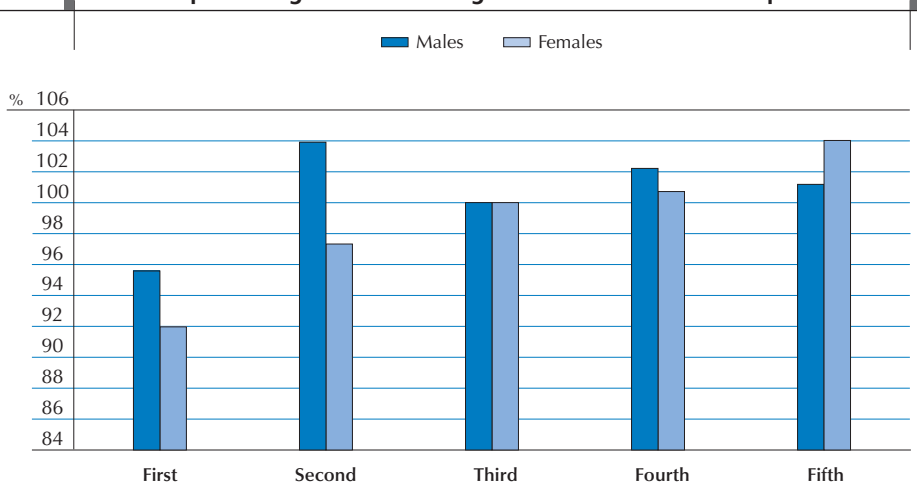
The results presented in this chapter are based on analyses conducted by Drewes (2009).

RELATIONSHIP BETWEEN PISA SCORES AND EARNINGS AT AGE 21

Figure 7.1 (Table 7.1) shows the relationship between hourly earnings in 2006 and achievement in PISA reading in 2000. It should be noted that the average earnings of males was about 23% higher than that of females. The figure shows that, in the case of females, there was a steady increase in earning power with increases in achievement. In fact, already by age 21, females in the top quintile were earning 12% more than their peers scoring in the bottom quintile. The pattern is not clear for males, since earnings are similar for the second to the fifth quintiles. Nevertheless, males scoring in the top quintile had hourly earnings about 5.5% higher than males in the lowest quintile.

These gender differences indicate that it is appropriate to analyse the earning patterns separately for males and females.

Figure 7.1
Hourly earnings of males and females in 2006 by achievement quintile expressed as a percentage of the earnings of those in the middle quintile



Source: Youth in Transition Survey, Special Analysis, Learning Policy Directorate, HRSDC.

What characteristics predict hourly earnings of young Canadians at age 21?

To address this question, males and females were examined separately using multilevel regression techniques (Raudenbush, Bryk and Congdon, 2004). Along with PISA reading scores, a number of characteristics were included in the model. The analysis was done in multiple stages: first, examining the association with PISA reading scores on their own and then adjusting for background and educational variables. This approach allowed for an analysis of whether the association between PISA reading scores and earnings is occurring independently from the background characteristics.

Thus, the model included hourly earnings as the outcome, with the following explanatory variables: PISA reading score, family factors (parental income, parental education), school factors (physical infrastructure, educational resources, student-teacher ratio), employment factors (total time in labour force, time in current job), demographic factors (immigrant status, language group), early work exposure (hours worked during secondary school, hours worked during post-secondary education), educational attainment and province of residence.

Table 7.1 shows the results of multilevel regression models for hourly earnings for males and Table 7.2 shows the results for females.

Taking the model for males with no adjustments for background characteristics first, there was a weak association between PISA scores and hourly earnings. However, when adjusting for background characteristics, the relationship disappears. The model that includes all variables indicated that, at least at age 21, males with more total time in the labour force who worked during secondary school and who had graduated from college, accrued an earning advantage. Some provincial variations were evident and these may be related to differences in local labour markets (*e.g.* sectoral differences in occupational opportunities), GDP and unemployment rates. Anglophones, not Francophones, in Québec, had lower predicted hourly earnings. However, the explanatory power of the model is weak as it accounts for 12% of the total variance in hourly earnings.

Table 7.1

Results of multilevel regression model for hourly earnings – Males

	Unadjusted	Adjusted for background characteristics	Adjusted for educational variables
PISA reading score	0.021	0.018	0.008
Parental income (in thousands of CAD)		0.003	0.003
Mother's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		-0.026	-0.028
College		0.027	0.022
University		-0.017	-0.024
Father's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		-0.016	-0.021
College		-0.026	-0.031
University		-0.017	-0.013
School's physical infrastructure index		0.018	0.014
School's educational resources index		-0.011	-0.011
Student teaching staff ratio		0.003	0.003
Time in labour force (months)		0.002	0.003
Tenure in current job (months)		-0.001	0.000
1st generation immigrant		-0.076	-0.068
1st gen. immigrant * PISA score		-0.016	0.001
2nd generation immigrant		0.014	0.012
2nd gen. immigrant * PISA score		-0.024	-0.017
Anglophones in Québec		-0.133	-0.137
Anglophones * PISA score		-0.044	-0.042
Francophones Outside Québec		0.079	0.064
Francophones * PISA score		0.04	0.036
Hrs. worked while in secondary school		0.022	0.022
Sec sch hours * PISA score		-0.001	-0.001
Hrs. worked while in post-secondary education		0.003	0.002
Hrs. worked while in post-secondary education * PISA score		0.000	0.001
Province of job: (ref. group: Ontario)			
Newfoundland and Labrador		-0.205	-0.213
Prince Edward Island		-0.191	-0.200
Nova Scotia		-0.155	-0.152
New Brunswick		-0.173	-0.174
Québec		-0.007	0.011
Manitoba		-0.096	-0.086
Saskatchewan		-0.022	-0.031
Alberta		0.212	0.214
British Columbia		0.094	0.091
Educational attainment (ref. group: sec sch)			
Secondary school graduate			0.079
College leaver			0.062
University leaver			0.026
College graduate			0.178
University graduate			0.187
R^2	0.003	0.11	0.12
Number of observations	2 988	2 988	2 988

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

Source: OECD PISA and HRSDC.

In contrast, higher reading scores were related to higher hourly earnings in the model for females. The relationship between reading achievement and hourly earnings is present even after accounting for background characteristics, again confirming the need for separate gender analysis. Also, the estimated strength of the relationship between reading achievement and earnings was largely independent of the other characteristics and remained apparent even with adjustments for both background and educational characteristics. The results for females showed some consistency with those for males in other respects. Like males, females who had been longer in the labour force had higher expected hourly earnings, indicating a return for work experience. Also, graduations from both college and secondary school were associated with higher hourly earnings. However, similar to the model for males, its explanatory power is not strong since the model explains just 10% of the total variance in hourly earnings.

Table 7.2
Results of multilevel regression model for hourly earnings – Females

	Unadjusted	Adjusted for background characteristics	Adjusted for educational variables
PISA reading score	0.050	0.048	0.041
Parental income (in thousands of CAD)		0.004	0.003
Mother's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		0.089	0.088
College		0.009	0.006
University		0.021	0.026
Father's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		-0.102	-0.112
College		-0.005	-0.009
University		0.015	0.021
School's physical infrastructure index		0.002	0.005
School's educational resources index		0.009	0.009
Student teaching staff ratio		0.003	0.002
Time in labour force (months)		0.000	0.002
Tenure in current job (months)		-0.001	-0.001
1st generation immigrant		0.079	0.084
1st gen. immigrant * PISA score		0.069	0.055
2nd generation immigrant		-0.035	-0.039
2nd gen. immigrant * PISA score		0.002	0.007
Anglophones in Québec		-0.064	-0.070
Anglophones * PISA score		-0.057	-0.076
Francophones Outside Québec		0.032	0.003
Francophones * PISA score		-0.058	-0.060
Hrs. worked while in secondary school		0.002	0.001
Sec sch hours * PISA score		0.000	0.000
Hrs. worked while in post-secondary education		0.003	0.002
Hrs. worked while in post-secondary education * PISA score		-0.002	-0.002
Province of job: (ref. group: Ontario)			
Newfoundland and Labrador		-0.239	-0.245
Prince Edward Island		-0.156	-0.161
Nova Scotia		-0.169	-0.166
New Brunswick		-0.107	-0.109
Québec		0.01	0.028
Manitoba		-0.004	0.005
Saskatchewan		-0.033	-0.030
Alberta		0.068	0.071
British Columbia		-0.019	-0.017
Educational attainment (ref. group: sec sch)			
Secondary school graduate			0.077
College leaver			0.054
University leaver			0.050
College graduate			0.219
University graduate			0.157
R^2	0.020	0.070	0.100
Number of observations	2 380	2 380	2 380

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

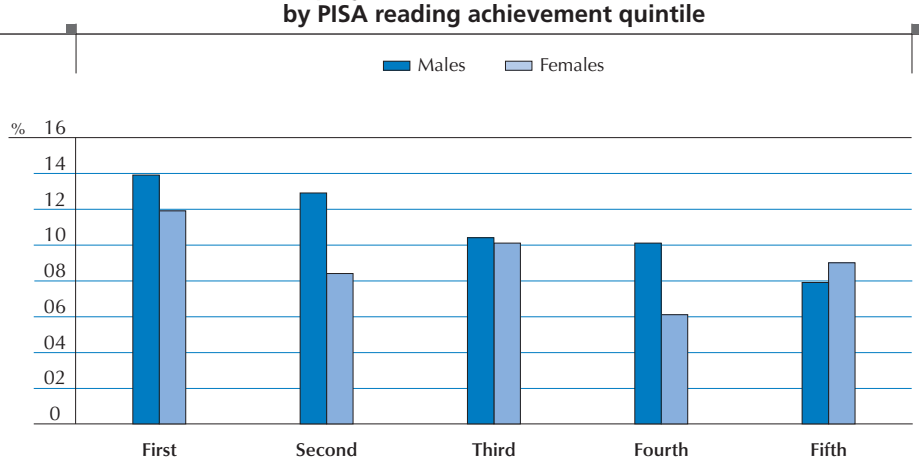
Source: OECD PISA and HRSDC.

THE RELATIONSHIP BETWEEN PISA SCORES AND UNEMPLOYMENT

In the fourth cycle of YITS, participants were asked whether they had looked for work in the last six months. This measure was taken as an indication of unemployment in the analyses presented in this section. In all, 12% of males and 9.3% of females were classified as unemployed (Table 7.2).

Figure 7.2 shows unemployment rates of males and females by PISA reading quintile. Results varied depending on gender. For males, there was a clear linear increase in unemployment rates as achievement decreased. In fact, the unemployment rate of males in the lowest quintile was 1.8 times greater than males scoring in the top quintile. In contrast, the relationship between achievement and unemployment was less clear-cut for females. Nonetheless, about 1.3 times as many low-achieving females (*i.e.* in the lowest quintile) reported being unemployed compared with those in the highest quintile.

Figure 7.2
Unemployment rates of males and females, by PISA reading achievement quintile



Source: Youth in Transition Survey, Special Analysis, Learning Policy Directorate, HRSDC.

What characteristics predict unemployment of young Canadians?

To address this question, a similar analysis technique was undertaken as was done with hourly earnings. The same set of background characteristics was included and results reported separately for males (Table 7.3) and females (Table 7.4).

The explanatory power of the models is weak (4% for males and 5% for females), so a large majority of the variation in unemployment rates was due to other characteristics that were not included in the models.

In the case of males, when PISA reading scores were considered on their own, a standard deviation increase in the score reduced the probability of unemployment by 2.5 per cent, but after adjusting for other background characteristics the relationship vanishes. The adjusted results for males showed a more pronounced provincial pattern in an expected way, with unemployment significantly lower in Québec and the Prairie provinces relative to Ontario. Also, working while in high school and while in post-secondary education (for those that go on to post-secondary education) was associated with a reduction in the unemployment probability, albeit a small one.

Table 7.3
Results of multilevel regression model for unemployment – Males

	Unadjusted	Adjusted for background characteristics	Adjusted for educational variables
PISA reading score	-0.025	-0.018	-0.020
Parental income (in thousands of CAD)		-0.017	-0.018
Mother's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		0.038	0.034
College		-0.001	0.000
University		-0.008	-0.009
Father's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		0.036	0.037
College		0.009	0.006
University		-0.034	-0.036
School's physical infrastructure index		-0.011	-0.011
School's educational resources index		0.002	0.002
Student teaching staff ratio		0.000	0.000
Time in labour force (months)		0.000	0.000
1st generation immigrant		0.042	0.046
1st generation immigrant * PISA score		-0.038	-0.036
2nd generation immigrant		0.003	0.007
2nd generation iimmigrant * PISA score		0.033	0.034
Anglophones in Québec		0.109	0.106
Anglophones * PISA score		0.002	0.000
Francophones outside Québec		0.002	0.001
Francophones * PISA score		0.000	-0.001
Hrs. worked while in secondary school		-0.001	-0.001
Sec sch hours * PISA score		0.000	0.000
Hrs. worked while in post-secondary education		-0.002	-0.003
Hrs. worked while in post-secondary education * PISA score		0.000	0.000
Province of job: (ref. group: Ontario)			
Newfoundland and Labrador		0.011	0.010
Prince Edward Island		-0.036	-0.036
Nova Scotia		-0.038	-0.036
New Brunswick		-0.013	-0.013
Québec		-0.060	-0.059
Manitoba		-0.052	-0.051
Saskatchewan		-0.052	-0.051
Alberta		-0.067	-0.064
British Columbia		-0.027	-0.026
Educational attainment (ref. group: sec sch)			
Secondary school graduate			0.002
College leaver			0.026
University leaver			-0.004
College graduate			0.010
University graduate	0.010	0.040	0.203
R^2	0.010	0.040	0.040
Number of observations	3 809	3 809	3 809

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

Source: OECD PISA and HRSDC.

Similarly, for females, the unadjusted advantage associated with higher PISA reading scores was significant, but it disappears after introducing the background characteristics. Provincial differences were not as marked as for males and there was no advantage of having worked while in secondary school or while in post-secondary education for females.

Table 7.4

Results of multilevel regression model for unemployment – Females

	Unadjusted	Adjusted for background characteristics	Adjusted for educational variables
PISA reading score	-0.019	-0.017	-0.012
Parental income (in thousands of CAD)		-0.042	-0.042
Mother's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		-0.033	-0.033
College		0.005	0.006
University		-0.002	-0.008
Father's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		0.016	0.017
College		0.005	0.006
University		0.063	0.059
School's physical infrastructure index		0.021	0.021
School's educational resources index		-0.027	-0.027
Student teaching staff ratio		-0.003	-0.001
Time in labour force (months)		-0.001	-0.001
1st generation immigrant		0.081	0.081
1st generation immigrant * PISA score		-0.019	-0.017
2nd generation immigrant		0.034	0.039
2nd generation iimmigrant * PISA score		0.015	0.014
Anglophones in Québec		0.032	0.036
Anglophones * PISA score		-0.024	-0.019
Francophones outside Québec		-0.051	0.059
Francophones * PISA score		0.075	0.074
Hrs. worked while in secondary school		0.000	0.000
Sec sch hours * PISA score		0.000	0.000
Hrs. worked while in post-secondary education		-0.001	-0.001
Hrs. worked while in post-secondary education * PISA score		0.001	0.001
Province of job: (ref. group: Ontario)			
Newfoundland and Labrador		0.081	0.082
Prince Edward Island		0.087	0.096
Nova Scotia		0.000	-0.001
New Brunswick		0.001	0.01
Québec		-0.005	-0.004
Manitoba		-0.021	-0.021
Saskatchewan		0.016	0.018
Alberta		-0.002	0.001
British Columbia		0.028	0.032
Educational attainment (ref. group: sec sch)			
Secondary school graduate			-0.039
College leaver			-0.020
University leaver			0.000
College graduate			-0.036
University graduate			-0.014
R^2	0.006	0.050	0.050
Number of observations	3 198	3 198	3 198

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

Source: OECD PISA and HRSDC.

CONCLUSION

The results presented in this chapter analysed the relationship between cognitive competencies acquired prior to completing compulsory schooling and labour market outcomes in the Canadian context. Specifically, the analyses examined the extent to which achievement on PISA 2000 predicted hourly earnings and likelihood of experiencing unemployment six years later. Males and females were examined separately.

The first research question addressed in this chapter was the extent to which achievement on PISA predicted hourly earnings. The results indicated that for females, higher scores on PISA did translate into higher hourly earnings (*i.e.* a 12% earnings advantage for females with a PISA score in the highest quintile relative to those scoring in the lowest one). In contrast, there was only a slight earnings advantage associated with PISA reading scores for males. Hence, in the absence of background characteristics, the predictive value of PISA competencies in earnings power was confirmed, particularly for females.

As an aside, it should be noted that at age 21, males were earning about 23% more than females. This gap may be monitored as further cycles of YITS are completed in the interest of identifying barriers to gender equity in distributions of earning.

The second research question was the extent to which the relationship between PISA scores and earnings were robust when considered in the context of background characteristics. In the case of males, the small earnings advantage associated with PISA competencies was no longer evident when other characteristics were included. The results suggest that the earnings advantage of PISA scores, at least at the age of 21, were associated with more experience in the workforce rather than higher competencies.

In contrast, the earnings advantage for females associated with reading competencies was robust in the presence of the other characteristics. Similar to males, more time in the labour force was associated with an earnings advantage.

The finding that competencies accrued an advantage for females but not for males is an extremely interesting finding that merits more in-depth research when more data from YITS becomes available.

The third research question examined the extent to which PISA competencies were associated with rates of unemployment. The results suggested that for males, lower reading scores were associated with increased rates of unemployment, while the relationship between competencies and unemployment rates was weak for females.

The final research question the chapter sought to examine was the extent to which reading competencies remained significant in the presence of other background characteristics. The results indicated that higher PISA reading scores did not significantly reduce the probability of unemployment in males or females. Overall, the analyses for unemployment explained only very small amounts of the variations in unemployment rates.

In conclusion, it is probably too early in these youths' labour market careers to be able to identify characteristics related to earnings and unemployment, since for many youth at age 21, patterns of employment are likely to be erratic. Revisiting this important issue when these youth are 23 and then 25 would be well worthwhile as employment patterns become more stable.

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Abstract

This report examined a range of evidence from the Canadian experience with PISA and YITS and evaluated the value of combining international assessments of competences in real-life activities with longitudinal follow up data as tools for developing evidence for policy making. It demonstrates the significant long term investment in the linkage of data on individuals over several points in time in relation to their early competencies, as well as their choices, aspirations and behaviours, can have a major pay-off in understanding educational and labour market outcomes in young adulthood. Replicating this experience at an international level could only increase the advantages and benefits of such an effort.

SYNERGIES BETWEEN PISA AND YITS

The demand for internationally comparable evidence by government decision makers has increased the appetite for solid assessments of competencies gained through schooling and a better understanding of the future outcomes that might be expected from various levels of competencies. This is important for the choice of successful government policies based on reliable measures of the returns to public investments in education.

This report had two major objectives. The first goal was to examine a range of evidence from the Canadian experience with the longitudinal Youth in Transition Survey that was integrated with the OECD PISA assessment. The second goal was to evaluate the value of combining international assessments of competence in real life activities with longitudinal follow up data as tools for developing evidence for policy making based on the findings from the first objective.

OVERVIEW OF EVIDENCE FROM LONGITUDINAL ANALYSES

Canada was an interesting laboratory for the test of the first objective. In order to conduct analysis at the national and provincial educational system level, 30 000 15-year-olds participated in PISA in 2000. In addition, for more accurate information regarding parent education, occupation and income, parents of these children were also interviewed. These same 30 000 children, whose competencies were measured through PISA were interviewed every two years from age 15 to 25 through the longitudinal Youth in Transition Survey.

These results of the long run longitudinal analyses of the pathways of a representative cohort of children born in 1984, whose competencies were measured in the penultimate year of compulsory schooling and who made choices through the ages of 17 to 21 that impacted their educational and labour market outcomes, provide an overview of the type of predictive evidence related to the outputs of education that can inform policymaking by governments of OECD member countries.

In 2000, Canadian 15-year-olds performed well compared to other countries indicating that high quality education was being provided despite the complexity and diversity of the educational systems. Almost three quarters of all 15-year-olds scored at Level 3 or higher on the PISA 2000 reading assessment. Though there were variations in the performance within Canada, performance variation between schools as well as between socio-economic groups was comparatively low.

Canadian youth had 48 pathway options to further education and work. About three quarters of the students took a linear pathway to university and also had the highest PISA scores at age 15. Regardless of the pathway, those in university scored at a PISA Level of 4 or 5 and those in college scored at Level of 3 or 4. Indeed, all students in university or college in 2006 at age 21 had PISA scores well above the OECD average of 500. The pathways to college were more diverse, often with spells of work. A significant number of youth followed indirect pathways, shifting between education and work. Half of the youth that were working in 2006 sought employment directly after secondary education and had lower average PISA scores. The dispersion of reading scores among youth who were working in 2006 was much wider than both the university- and college-going youth.

There was a strong correlation between reading skills and educational attainment in longitudinal multivariate analyses. Higher achievement made a substantial contribution to completion of secondary school and participation in at least some post-secondary education. Students in the bottom quartile of PISA reading scores were much more likely to drop out of high schools or to have completed a grade beyond grade 12 than those in the top quartile. High achievers were more likely to be still in education at age 21 and less likely to work. If they did work, they were more likely to return to education later. Among men, higher reading and mathematical proficiency had a positive relationship with transitions to education and lower proficiency to work. However, among women, lower mathematics proficiency was associated with more frequent transitions to work and low mothers education had a negative association as well. Interestingly, parents' education did not have an apparent association.

Though students may access post-secondary education, success is dependent on persistence and course choice. How much of these outcomes are affected by competencies compared to background characteristics, since education is intended to provide equal life chances? Higher PISA proficiencies were strongly related to access, persistence and course choice at university. Students at the top PISA level were 20 times more likely than those at or below Level 1 to access university. There remains a strong intergenerational transmission effect on access through parent's education because students with university educated parents were 4.5 times more likely to attend university. Participation in university was more sensitive to background characteristics than college. Almost two thirds of students from high income households attended university compared with a third from the lowest income group. Surprisingly, 61% of youth born outside of Canada attended university compared to 43% of Canadian born youth. Therefore, it followed that almost two thirds of youth speaking a language other than English or French attended university. Women were more likely to access university but men were five times more likely to choose a pure science course than women.

PISA competencies at age 15 predicted labour market outcomes as well, though it is probably too early to draw conclusion since at age 21, youth are barely launching their work careers. By age 21, women with high reading scores earned 12% more than those with low scores. The relationship was weaker for men. However, gender based earning disparities persist since men earned 23% more than women.

This overview of results shows that the combining of a reliable measure of student performance with a longitudinal follow-up lives up to expectations by providing invaluable information for policy makers. Through the wider dissemination of these results, they may be sensitively generalised to other countries. Furthermore, this strategy generated policy relevant evidence to:

- Compare Canadian student performance to other countries participating in PISA and to examine the life chances of high and low performers.
- Track the diversity of traditional and emerging pathways and their impact on higher education as well labour market pathways based on early measures of competence.

- Monitor participation in higher education by different groups of young people and factors affecting the choice of discipline and type of higher education.
- Identify the factors that influence access to different education and labour market options and whether these pathways were completed, interrupted or unachieved.

The strategy also confirms the value of assessing competencies in relation to application in real life situations because of the strong predictive impact of such measured proficiencies on later educational and labour market outcomes. The importance of regular and long run waves of data collection in a longitudinal survey provided invaluable information on changing patterns of pathways to education and work with multiple transitions. This monitoring of pathways is important for policies directed to second chance education as well as for education that is work-based.

THE IMPORTANCE OF INTEGRATING PISA WITH LONGITUDINAL SURVEYS FOR EFFECTIVE POLICY MAKING

The measurement of individual competencies by PISA followed by a longitudinal survey in order to understand choices made at different ages and the consequent education and labour market outcomes offer significant new policy insights. The Canadian experience has shown that the significant long term investment in the linkage of data on individuals over several points in time in relation to their early competencies as well as their choices, aspirations and behaviours had a major pay-off in understanding educational and labour market outcomes in young adulthood. The improved quality of antecedent data and the ability to better adjust for background factors improve analytical power. The Canadian example has demonstrated that the value of PISA linked to longitudinal follow up can be a model for other OECD countries that are contemplating a strategy to seek a better understanding of the social and economic impact of competencies acquired at school and provide insights on the causal nature of these relationships. There may be additional benefits for a joint enterprise, where not only the developmental costs are shared but where there are spin-off benefits from joint and cross-national analyses.

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Annex A

COUNTRIES OTHER THAN CANADA IMPLEMENTING A LONGITUDINAL RESEARCH COMPONENT WITH PISA

Six countries other than Canada are implementing longitudinal research in conjunction with PISA in their countries. These are listed below, together with a short summary of the design of the study, with references to websites for further information.

Australia: The Longitudinal Surveys of Australian Youth (LSAY) track young people as they move from school into further study, work and other destinations. Survey participants (collectively known as a "cohort") enter the study when they turn 15 years. Studies began in 1995 (Y95 cohort), 1998 (Y98 cohort), 2003 (Y03 cohort) and more recently in 2006 (Y06 cohort). Since 2003, the initial survey wave has been integrated with PISA.
http://www.lsay.edu.au/cohort/introduction.html

Czech Republic: PISA-L was launched in PISA 2003. The main aim of the survey was to gain insights on the impact of student abilities and home backgrounds on student aspirations, choice of upper secondary track and success in transition to tertiary education. In 2004, information was collected about transition from lower secondary to upper secondary studies. In 2006 and 2007 students were approached once again and asked about their experience in secondary studies and their transition from secondary studies to labour market or to further education. In 2008 students who had entered the labour market were asked about their labour market experiences.
http://www.soc.cas.cz

Denmark: In Denmark, the students that participated in PISA 2003 were followed up in PISA Longitudinal. The results of analyses of a 2004 follow-up data collection, when participants were 19, can be found in T.P. Jensen & D. Andersen (2006). Participants in 2000 – Four Years Later. In J. Medjing & A. Roe (eds.), Northern lights on PISA 20003: A reflection from the Nordic countries. Copenhagen: Nordic Council of Ministers.
http://www.akf.dk/ and *http://www.sfi.dk/*

Germnay: In Germany a pseudo-longitudinal study was conducted that capitalised on the fact that approximately 360 schools had participated in both PISA 2000 and 2003. The matched results were used to examine the stability of achievement and school effects.
http://pisa.ipn.uni-kiel.de/index_eng.html

Switzerland: TREE (Transitions from Education to Employment) surveys the post-compulsory educational and labour market pathways of the PISA 2000 cohort. TREE is based on a sample of approximately 6,000 young people. The sample has been followed up by TREE each year since then.
http://www.tree-ch.ch/html_en/index_en.htm

Uruguay: In 2007, a research team from the University of Uruguay did the first follow up to a random sub-sample of about one-third of students that participated in PISA 2003. A report was published in 2008, with further analysis and reporting taking place in 2009. Results examine issues such as trajectories through upper secondary school, pathways to work and further education and patterns of early school leaving.
http://www.anep.edu.uy/

Annex B

TECHNICAL INFORMATION AND DATA TABLES FOR CHAPTER 5

TECHNICAL INFORMATION

The likelihood functions for the grade transition model

The probability of transiting from one grade level (g-1) to the next (g) is modelled as follows:

$$\Pr(D_g = 1 \mid \mathbf{X}_g, D_{g-1} = 1) = H_{g-1,g}$$

where

$$H_{g-1,g} = \frac{\exp(\hat{\mathbf{a}}'_g \mathbf{X}_g)}{1 + \exp(\hat{\mathbf{a}}'_g \mathbf{X}_g)}$$

where $\mathbf{X}_g$ is a vector of observable characteristics, including PISA scores and $\hat{\mathbf{a}}'_g$ represents grade specific effects of these characteristics. Completed schooling can be written as $\sum_{j=1}^{\bar{G}} D_j$ where $\bar{G}$ is the highest attainable grade. The probability of acquiring grade level G, $\Pr\left(\sum_{j=1}^{\bar{G}} D_j = G \mid \mathbf{X}_g\right)$, is then given by

$$\Pr\left(\sum_{j=1}^{\bar{G}} D_j = G \mid \mathbf{X}_g\right) = [1 - H_{G+1,G}] * \prod_{s=1}^{G} H_{s-1,s}$$

where $H_{\bar{G}+1,\bar{G}} = 0$. One can derive expected level schooling by

$$E\left(\sum_{g=1}^{\bar{G}} D_g \mid \mathbf{X}_g\right) = \sum_{g=1}^{\bar{G}} g \Pr\left(\sum_{j=1}^{\bar{G}} D_j = g \mid \mathbf{X}_g\right)$$

The effects of unmeasured characteristics is assumed to be represented by α and it is assumed that

i) $\Pr(D_g = 1 \mid \mathbf{X}\beta, D\mathbf{X}_{g-1} = 1, \alpha_g) = F('_g \quad _g + \alpha_g)$

ii) α_g is independent of $\mathbf{X}_g$

iii) $\alpha_g = \alpha$ for all g.

iv) α is distributed normal with a mean of zero and a variance equal to one.

DATA TABLES

Table B5.1 Comparison of characteristics for students included and excluded from the analysis – Males

	Included (N=2156)		Excluded (N=1933)	
	% Missing	Mean	% Missing	Mean
PISA reading score	0	545.00	0	509.00
PISA mathematics score	0	558.00	0	526.00
Minority language	0	0.05	1933	-
Number of siblings	0	1.73	38	1.75
Second-generation immigrant	0	0.20	1933	-
Family income (in thousands of CAD)	0	80.00	1933	-
Nuclear family	0	0.89	0	0.6
Mother's education				
High school	0	0.29	732	0.32
Post-secondary school	0	0.62	732	0.56
Father's education				
High school	0	0.23	732	0.23
Post-secondary school	0	0.65	732	0.62
Participation in school activities	0	0.66	130	0.62
Paid or unpaid work	0	0.54	6	0.48
High school graduate in cycle 3	4	0.92	32	0.79
Some post-secondary education in cycle 3	4	0.64	32	0.48

Source: OECD PISA and HRSDC.

Table B5.2 Comparison of characteristics for students included and excluded from the analysis – Females

	Included (N=2156)		Excluded (N=1933)	
	% Missing	Mean	% Missing	Mean
PISA reading score	0	573.00	0	543.00
PISA mathematics score	0	545.00	0	521.00
Minority language	0	0.05	1 761	-
Number of siblings	0	1.82	24	1.93
Second-generation immigrant	0	0.20	1 761	-
Family income (in thousands of CAD)	0	77.70	1 761	-
Nuclear family	0	0.88	0	0.57
Mother's education				
High school	0	0.30	745	0.35
Post-secondary school	0	0.61	745	0.52
Father's education				
High school	0	0.24	745	0.27
Post-secondary school	0	0.63	745	0.58
Participation in school activities	0	0.71	132	0.63
Paid or unpaid work	0	0.69	1	0.65
High school graduate in cycle 3	3	0.95	26	0.87
Some post-secondary education in cycle 3	3	0.78	26	0.64

Source: OECD PISA and HRSDC.

Table B5.3 Effects of PISA reading and mathematics scores on the probability of grade completion

	Grade 11	Grade 12	Grade 13	Grade 14	Grade 15	Grade 16
Males						
PISA reading score/100	0.014	0.029	0.057	0.123	0.085	0.070
S.E.	-0.005	-0.011	-0.017	-0.020	-0.028	-0.033
PISA mathematics score/100	-0.007	0.024	0.103	0.122	0.036	0.102
S.E.	-0.005	-0.012	-0.02	-0.024	-0.031	-0.035
Females						
PISA reading score/100	0.008	0.043	0.073	0.034	0.042	0.085
S.E.	-0.004	-0.010	-0.016	-0.019	-0.022	-0.027
PISA mathematics score/100	0.004	0.005	0.071	0.093	0.069	0.024
S.E.	-0.004	-0.010	-0.018	-0.021	-0.023	-0.027

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

Note: The entries in the first column show the effects on the probability of completing grade 11 (transitioning from grade 10 to grade 11). The other columns show similar effects.
Source: OECD PISA and HRSDC.

Table B5.4a Estimated marginal effects on the conditional probability of being in education, working or being inactive in autumn 2005 for males who were in education in spring 2005

	Probability of being in education		Probability of working		Probability of being inactive	
	Marg. Effect	S.E.	Marg. Effect	S.E.	Marg. Effect	S.E.
PISA reading score/100	0.008	0.003	-0.006	0.003	-0.001	0.001
PISA mathematics score/100	0.005	0.004	-0.005	0.003	0.000	0.001
Minority language	-0.002	0.007	0.003	0.007	-0.001	0.002
Number of siblings	0.000	0.002	0.001	0.002	-0.001	0.001
Second-generation immigrant	0.002	0.007	0.001	0.007	-0.003	0.002
Family income (in thousands of CAD)	0.000	0.000	0.000	0.000	0.000	0.000
Nuclear family	0.003	0.008	-0.002	0.008	-0.001	0.002
Mother's education						
High school	-0.006	0.009	0.006	0.009	0.000	0.002
Post-secondary school	0.006	0.009	-0.007	0.008	0.001	0.002
Father's education						
High school	-0.004	0.009	0.003	0.008	0.002	0.003
Post-secondary school	-0.002	0.008	0.002	0.007	0.001	0.002
School activities	-0.007	0.005	0.008	0.005	-0.001	0.001
Paid or unpaid work	-0.005	0.005	0.007	0.005	-0.003	0.001
Highest grade completed	0.030	0.001	-0.025	0.001	-0.005	0.000
Average probability	**0.935**		**0.058**		**0.007**	

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

Source: OECD PISA and HRSDC.

Table B5.4b Estimated marginal effects on the conditional probability of being in education, working or being inactive in autumn 2005 for males who were in work in spring 2005

	Probability of being in education		Probability of working		Probability of being inactive	
	Marg. Effect	S.E.	Marg. Effect	S.E.	Marg. Effect	S.E.
PISA reading score/100	0.007	0.009	-0.014	0.010	0.008	0.006
PISA mathematics score/100	0.049	0.011	-0.037	0.012	-0.013	0.007
Minority language	0.024	0.023	-0.007	0.025	-0.017	0.010
Number of siblings	-0.007	0.007	-0.003	0.007	0.010	0.003
Second-generation immigrant	-0.006	0.018	0.021	0.021	-0.015	0.011
Family income (in thousands of CAD)	0.000	0.000	0.000	0.000	0.000	0.000
Nuclear family	0.029	0.018	-0.027	0.022	-0.002	0.013
Mother's education						
High school	0.040	0.032	-0.069	0.036	0.029	0.022
Post-secondary school	0.022	0.027	-0.05	0.031	0.028	0.017
Father's education						
High school	0.017	0.028	-0.027	0.032	0.010	0.018
Post-secondary school	0.057	0.024	-0.062	0.028	0.004	0.015
School activities	0.017	0.013	-0.018	0.015	0.001	0.009
Paid or unpaid work	-0.029	0.013	0.045	0.016	-0.016	0.010
Highest grade completed	0.028	0.008	-0.026	0.009	-0.002	0.004
Average probability	**0.106**		**0.849**		**0.045**	

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

Source: OECD PISA and HRSDC.

Table B5.4c Estimated marginal effects on the conditional probability of being in education, working or being inactive in autumn 2005 for males who were inactive in spring 2005

	Probability of being in education		Probability of working		Probability of being inactive	
	Marg. Effect	S.E.	Marg. Effect	S.E.	Marg. Effect	S.E.
PISA reading score/100	0.028	0.028	0.036	0.044	-0.064	0.044
PISA mathematics score/100	0.006	0.029	-0.090	0.042	0.083	0.043
Minority language	0.070	0.105	-0.078	0.111	0.008	0.116
Number of siblings	-0.024	0.017	0.008	0.029	0.016	0.027
Second-generation immigrant	0.086	0.080	-0.059	0.098	-0.027	0.086
Family income (in thousands of CAD)	0.000	0.001	-0.001	0.001	0.001	0.001
Nuclear family	0.015	0.039	0.014	0.083	-0.029	0.084
Mother's education						
High school	0.143	0.099	0.062	0.115	-0.205	0.095
Post-secondary school	0.082	0.057	0.066	0.102	-0.149	0.097
Father's education						
High school	0.056	0.067	0.019	0.100	-0.075	0.092
Post-secondary school	0.108	0.050	-0.096	0.098	-0.012	0.093
School activities	-0.011	0.035	-0.073	0.061	0.084	0.058
Paid or unpaid work	-0.022	0.035	0.076	0.062	-0.053	0.061
Highest grade completed	-0.013	0.016	-0.007	0.033	0.020	0.032
Average probability	**0.102**		**0.461**		**0.437**	

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

Source: OECD PISA and HRSDC.

Table B5.5a Estimated marginal effects on the conditional probability of being in education, working or being inactive in autumn 2005 for females who were in education in spring 2005

	Probability of being in education		Probability of working		Probability of being inactive	
	Marg. Effect	S.E.	Marg. Effect	S.E.	Marg. Effect	S.E.
PISA reading score/100	0.004	0.003	-0.005	0.003	0.000	0.000
PISA mathematics score/100	0.007	0.003	-0.006	0.003	-0.001	0.000
Minority language	0.002	0.005	-0.003	0.005	0.001	0.001
Number of siblings	-0.001	0.001	0.001	0.001	0.000	0.000
Second-generation immigrant	0.004	0.004	-0.003	0.004	-0.001	0.001
Family income (in thousands of CAD)	0.000	0.000	0.000	0.000	0.000	0.000
Nuclear family	0.003	0.005	-0.002	0.005	-0.001	0.001
Mother's education						
High school	-0.002	0.006	0.004	0.006	-0.002	0.001
Post-secondary school	0.003	0.005	-0.002	0.005	-0.001	0.001
Father's education						
High school	0.005	0.005	-0.004	0.005	-0.001	0.001
Post-secondary school	0.005	0.005	-0.005	0.005	-0.001	0.001
School activities	0.002	0.004	-0.003	0.004	0.000	0.001
Paid or unpaid work	-0.007	0.004	0.009	0.003	-0.002	0.001
Highest grade completed	0.021	0.001	-0.018	0.001	-0.002	0.000
Average probability	**0.959**		**0.038**		**0.003**	

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

Source: OECD PISA and HRSDC.

Table B5.5b Estimated marginal effects on the conditional probability of being in education, working or being inactive in autumn 2005 for females who were in work in spring 2005

	Probability of being in education		Probability of working		Probability of being inactive	
	Marg. Effect	S.E.	Marg. Effect	S.E.	Marg. Effect	S.E.
PISA reading score/100	0.022	0.014	-0.018	0.015	-0.004	0.007
PISA mathematics score/100	0.033	0.013	-0.032	0.014	0.000	0.006
Minority language	-0.028	0.022	0.027	0.025	0.001	0.015
Number of siblings	0.000	0.008	-0.001	0.008	0.001	0.003
Second-generation immigrant	0.061	0.028	-0.070	0.030	0.009	0.014
Family income (in thousands of CAD)	0.001	0.000	0.000	0.000	0.000	0.000
Nuclear family	0.031	0.021	-0.027	0.025	-0.004	0.014
Mother's education						
High school	0.043	0.031	-0.039	0.032	-0.005	0.012
Post-secondary school	0.085	0.028	-0.069	0.030	-0.016	0.012
Father's education						
High school	0.004	0.026	0.001	0.028	-0.005	0.013
Post-secondary school	0.010	0.024	-0.018	0.026	0.007	0.011
School activities	0.040	0.017	-0.034	0.019	-0.006	0.009
Paid or unpaid work	-0.014	0.020	0.017	0.022	-0.003	0.011
Highest grade completed	0.014	0.008	-0.005	0.009	-0.009	0.005
Average probability	**0.134**		**0.830**		**0.036**	

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

Source: OECD PISA and HRSDC.

Table B5.5c Estimated marginal effects on the conditional probability of being in education, working or being inactive in autumn 2005 for females who were inactive in spring 2005

	Probability of being in education		Probability of working		Probability of being inactive	
	Marg. Effect	S.E.	Marg. Effect	S.E.	Marg. Effect	S.E.
PISA reading score/100	-0.013	0.028	-0.035	0.055	0.048	0.054
PISA mathematics score/100	0.095	0.036	-0.020	0.060	-0.075	0.058
Minority language	0.111	0.101	-0.209	0.094	0.099	0.106
Number of siblings	-0.035	0.021	0.057	0.029	-0.023	0.029
Second-generation immigrant	-0.021	0.045	0.099	0.092	-0.077	0.091
Family income (in thousands of CAD)	-0.001	0.001	0.000	0.001	0.001	0.001
Nuclear family	0.023	0.051	-0.008	0.093	-0.015	0.095
Mother's education						
High school	0.045	0.056	-0.120	0.098	0.075	0.097
Post-secondary school	0.199	0.064	-0.152	0.104	-0.047	0.102
Father's education						
High school	-0.053	0.040	0.006	0.109	0.047	0.106
Post-secondary school	-0.053	0.046	0.096	0.106	-0.043	0.102
School activities	-0.050	0.047	-0.062	0.073	0.112	0.070
Paid or unpaid work	-0.035	0.044	0.056	0.072	-0.022	0.072
Highest grade completed	0.032	0.021	0.026	0.037	-0.058	0.037
Average probability	**0.111**		**0.410**		**0.479**	

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

Source: OECD PISA and HRSDC.

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Pathways to Success

HOW KNOWLEDGE AND SKILLS AT AGE 15 SHAPE FUTURE LIVES IN CANADA

After completing compulsory education, are today's youth equipped to participate fully in society? In 2000, Canada explored this question and launched the Youth in Transition Survey (YITS), a follow-up to the OECD Programme for International Student Assessment (PISA). YITS is a longitudinal study that tracks 30 000 Canadian students who took part in the PISA 2000 assessment and, with interviews every two years, follows their progress from secondary school into higher education and the labour market.

YITS complements PISA's measurement of individual competencies and offers significant new policy insights in understanding students' choices at different ages and the impact of these decisions on consequent education and labour market outcomes. The Canadian example serves as a model for other OECD countries seeking a strategy to better comprehend the social and economic impact of competencies acquired in school and the causal nature of these relationships.

Pathways to Success is a collaborative effort between the OECD and Human Resources and Skills Development Canada. It presents findings from this study and showcases the potential of a longitudinal component of PISA such as YITS.

FURTHER READING

PISA 2006: Science Competencies for Tomorrow's World (OECD, 2008)

THE OECD PROGRAMME FOR INTERNATIONAL STUDENT ASSESSMENT (PISA)

PISA is a collaborative process among the 30 member countries of the OECD and nearly 30 partner countries and economies. It brings together expertise from the participating countries and economies and is steered by their governments on the basis of shared, policy-driven interests. Its unique features include:

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