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How Does Academic Ability Affect Educational and Labour Market Pathways in Canada

Jorgen Hansen

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HOW DOES ACADEMIC ABILITY AFFECT EDUCATIONAL AND LABOUR MARKET PATHWAYS IN CANADA

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This research paper was prepared for Human Resources and Skills Development Canada by Tomasz Gluszynski Human Resources and Skills Development Canada and Justin Bayard, Human Resources and Skills Development Canada, as a background paper to the PISA Thematic Report - Pathways to Success.

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ABSTRACT

Using data from the Youth in Transition Survey (YITS), this paper provides an up-to-date description of educational and labour market pathways (or transitions) among Canadian youth. It also estimates the effect of academic abilities, measured by PISA math and reading scores, on such transitions. Descriptive statistics show that educational success is positively related to math and reading achievements as well as family background characteristics. Further, working while in high school reduces educational attainment while participation in school organised activities increases the probability of grade progression. The results also indicate that students with low reading achievements are not only less likely to remain in school; they are also less likely to return to school once they have left school. Finally, the risk of entering unemployment after school is inversely related to the level of completed schooling.

RÉSUMÉ

À partir des données de l'Enquête auprès des jeunes en transition (EJET), le présent document fournit une description actualisée des parcours (ou transitions) emprunté(e)s par les jeunes Canadiens dans les études et sur le marché du travail. Il évalue également l'effet de l'aptitude aux études, telle que mesurée par les scores PISA en mathématiques et compréhension de l'écrit, sur ces transitions. Des statistiques descriptives montrent que le succès dans les études est positivement corrélé à la réussite en mathématiques et en compréhension de l'écrit, ainsi qu'aux caractéristiques du contexte familial. Ensuite, on constate que le fait d'avoir un emploi lorsque l'on est encore dans l'enseignement secondaire exerce un effet négatif sur le niveau d'enseignement, tandis que la participation à des activités organisées par l'établissement scolaire augmente la probabilité d'obtenir de meilleures notes. Les résultats indiquent en outre que les élèves ayant obtenu de faibles scores en compréhension de l'écrit ne sont pas seulement moins susceptibles de rester dans l'éducation ; ils sont aussi moins susceptibles de retourner à leurs études une fois qu'ils les ont arrêtées. Enfin, le risque d'être au chômage après sa formation est inversement corrélé au niveau d'enseignement atteint.

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February 20, 2009

A report prepared for HRSDC

Jorgen Hansen[1]

Executive Summary

1. This report provides an up-to-date and detailed description of educational and labour market pathways (or transitions) among Canadian youth. Moreover, it estimates the effect of academic abilities, measured by PISA math and reading scores, and other observed individual and family characteristics on such transitions. The empirical analysis is carried out on a sample from the Canadian Youth in Transition Survey (YITS). The respondents to this survey were 15 years old at 1999 and initially interviewed in the spring of 2000. YITS is a longitudinal survey and this report utilises data from cycles 1 to 4, covering a period of 7 years (from 1999 to 2005).

2. The many findings in this paper can be summarised as follows:

- Data from YITS reveal that students with high PISA math and reading scores acquire more schooling than those with low scores. There is a clear link between test scores and educational attainment for both male and female students. Furthermore, the high school drop-out rate is higher for those with low scores while attendance in a post-secondary program is lower. Again, this is true for both males and females.

- Even after controlling for a number of observed characteristics - such as family composition and income, parents' education, minority language, immigrant status of the parents and activities outside of the normal school day - improvements in math and reading skills are shown to increase educational attainment. The effects are generally statistically significant and also quantitatively important.

- Students with low reading achievements are not only less likely to stay in school, they are also less likely to return to school given that they have previously left school. Among those with reading scores in the bottom quartile, the probability of going from school to inactivity (which includes unemployment and other forms of non-employment) is 18 percent for males. For males in the top quartile of the reading distribution, this figure is 11 percent. For females, this

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probability is around 12 percent in both quartiles. Hence, the risk of experiencing unemployment after school is inversely related to reading performance for males but not for females.

- The risk of unemployment after school is also inversely related to the level of completed schooling. The effect is larger for males than for females and suggests that education, in addition to improving wage offers, also serves as a sort of insurance against the risk of becoming unemployed. Further, among those who move from school to unemployment, those with higher levels of education have higher exit rates and experience shorter unemployment episodes. Although this effect was documented for both males and females, it is greater and only significant for females.

- The results also show that educational attainment is positively related to parents' education and family income while it is negatively related to broken home and number of siblings. These findings are consistent with previous results in the literature and were obtained in a very general model that includes controls for unobserved heterogeneity. Two other variables that significantly affected educational outcomes were participation in school activities and work while in school. The effect of participation in extra-curricular school activities is positive and significant while the effect of working is negative and significant. These findings are consistent with the results in Hansen (2008) who found that participation in school-organised activities improves high school grade averages while working at a young age (age 15) has a negative effect.

- This paper also confirms earlier results regarding differences in educational attainment between children of immigrants and children of natives (parents born in Canada). However, while the results show that this educational gap is significant for males they indicate no such gap for females. In order to assess if the male educational gap is due to differences in cognitive ability, the model was re-estimated without controls for PISA scores. The estimated marginal effects on the school progression probabilities were unaffected by this omission suggesting that the educational gap is not primarily due to differences in reading and math achievements. Similar findings were obtained for those belonging to a minority language group (*i.e.* males in these groups acquire more schooling than males in majority language groups while this is not the case for females).

- Finally, using the estimated grade transition model, a counterfactual school distribution was generated for females using estimates obtained for the male sample. The expected grade level for females when males' characteristics are used is very similar to that obtained when females' characteristics are utilised. Hence, the findings in this paper suggest that females are not acquiring more schooling than males because they have different levels of, say test scores or paretnal education. Instead, differences in how these factors influenced the expected grade level were driving the result.

3. To summarise, this paper shows that academic or scholastic skills are important determinants of educational attainment and improves the transition from school to work. This suggests that policies that provide more resources to schools at the elementary and secondary levels are likely to generate improved academic skills and improved future labour market outcomes.

1. INTRODUCTION

4. The purpose of this research report is to provide a description of educational and labour market pathways (or transitions) among Canadian youth and to assess the role of academic abilities, measured by PISA math and reading score, on such transitions. It is likely that scholastic achievements at young ages (during the first years of secondary school) affect educational opportunities and outcomes in the late teenage years. Further, academic aptitudes may also determine labour market outcomes over the entire life-cycle via the effect on educational choices. However, although this is a very important policy question, there exists little empirical evidence on this matter in Canada, mainly because of a lack of suitable data in the past. The availability of the Youth in Transition Survey (YITS) now provides an excellent opportunity to study how academic performance at an early age (age 15) affect school choices made in the late teens and subsequent school-to-work transitions.

5. This research is also related to the growing concerns in many countries that young school-leavers are facing adverse labour market conditions and that unemployment experiences at this young age may have long lasting impacts on future labour market outcomes. For instance, the youth unemployment rate in Canada in 2005 was more than twice the rate for adults (see Quintini, 2007). This observation of substantially higher unemployment rates among young adults and teenagers is not unique to Canada but exists in most OECD countries (Quintini, 2007). The unemployment experience, both among young and old, has been shown to depend greatly on educational attainment. Thus, policies aimed at improving academic skills of youth may have beneficial effects both in the short-run (reduce high school drop-out rates) and in the longer-run (ease the school-to-work transition and reduce youth unemployment).

6. Although the link between schooling and subsequent labour market experiences cannot be questioned, it is still not clear to what extent this relationship occurs because of individual differences in innate scholastic abilities (and preferences for school) and how much of it can be attributed to the existence of a causal effect of education. For example, it is possible that individuals with "high abilities to learn" also have "high abilities to earn". If this is the case, much of the differences in labour market success across educational levels are due to intrinsic individual characteristics and not to the fact that individuals acquire different amounts of education. Moreover, differences in educational attainment are then predominantly due to differences in such inherent characteristics and less affected by alternative policy measures. Hence, any empirical model used to assess the role of academic or cognitive skills on subsequent educational (and labour market) outcomes should attempt to control for unobserved individual-specific characteristics.

7. In addition to studying the role of academic skills on school and labour market outcomes, this research will also investigate the effects of working and participating in school activities on the same outcomes.[2] Hansen (2008) showed that working in the 10th grade significantly reduced students' grade

2 . The outcome variables considered in this research are: the highest grade completed, time between school graduation and first full-time job, and transitions between school, employment and other activities (which include unemployment and other forms of non-employment). These outcomes differ from those considered in Bayard (2007) who used YITS to study the effects of math and reading abilities on the decision to participate in post-secondary education and the choice of program among those who decided to participate. Further, this research is also related to Sun (2008) who used a sophisticated empirical model to estimate the

point average, both in grade 10 and in grade 11. Moreover, contrary to the effects of working, participation in school organised activities had beneficial effects and significantly improved academic performance. While Hansen (2008) focused on academic performance in high school, this research will study the impact of participation in such activities on educational and labour market pathways.

8. In this paper, educational pathways are described by years of schooling. Specifically, educational attainment is viewed as a sequential process where students evaluate the cost and benefit of acquiring another year of schooling (which in a majority of cases corresponds to the value of completing another grade level). One advantage with this grade-transition framework is that it is possible to estimate the effects of different characteristics on *each* grade transition, something that is not feasible in a setting where educational outcomes are aggregated into a few categories (such as high school dropout, high school graduate, college graduate etc.). Additionally, the grade-transition framework allows for post-estimation analysis and the aggregation of grade levels into discrete categories.[3]

9. Finally, it should be understood that the inclusion of PISA math and reading scores serves two objectives. First, the effects of these measures are themselves interesting and may guide the formulation of school policies at the secondary level. Secondly, they also remove the effect of scholastic abilities that, in their absence, may be picked up by other variables such as parents' education and income. Hence, the inclusion of these ability variables may improve the possibility of estimating causal effects of individual and family characteristics on educational attainment.

10. Specifically, in this paper, the following questions are addressed

- How do educational pathways (or attainment) differ across students with different PISA math and reading scores? What is the link between these scores and the decision to drop out of high school? How is the decision to enroll in post-secondary education related to these PISA scores?

- How do labour market pathways (in particular school-to-work transitions) differ across students with different PISA math and reading scores? How many school leavers can expect to experience unemployment right after leaving school and how is this related to their PISA scores? How is this unemployment risk related to the level of completed schooling?

- How do other observed characteristics of the respondents (minority language, gender, work while in school, parents' characteristics etc.) affect educational and labour market pathways? Are there differences between second-generation immigrants and third- or higher generation immigrants as some research indicate (*e.g.* Kucera 2008)? How do the effects of observed characteristics change when PISA scores are included?

11. The remainder of the paper is organised as follows. The following section contains an extensive literature review with a focus on the academic literature in economics. The next section describes the data while Section 4 briefly describes the empirical methodologies use (details are provided in appendix). Finally, Section 5 presents and discusses the results while Section 6 concludes the paper.

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effects of math and reading abilities on educational attainment. This research will use a similar methodology when estimating educational attainment but also include information from the fourth cycle of YITS.

3 . Since the educational system is provincial responsibility, there are provincial differences and the transition from grade 11 to grade 12 means different things in, for example, Quebec and Ontario. The empirical analysis utilised in this paper accounts for this matter.

2. LITERATURE REVIEW

12. Given that educational attainment is one of the most important determinants for individual (and societal) prosperity over a lifetime, it is not surprising to that it has been extensively researched. This review will focus on the academic literature in economics although important work in other disciplines will also be considered.

2.1 Educational attainment

13. Haveman and Wolfe (1995) provide an extensive survey of both the economic and sociological literature on educational attainment.[4] Most of the work they review use longitudinal data and apply linear or nonlinear regression methods (*e.g.* OLS, Probit, Logit). A main finding from their survey is that the level of human capital of parents is an important determinant of schooling attainment. This factor, regardless of how it is defined, consistently has a statistically significant effect and it is also quantitatively important. Other important determinants are family economic resources, family structure (*e.g.* living in a one- vs. two-parent family) and number of siblings.

14. More recent work in economics has often focused on decisions to drop out of high school (see for instance Eckstein and Wolpin, 1999; Tyler *et al*., 2000; Rumberger and Lamb, 2003; Bowlby and McMullen, 2005; Parent, 2006) or the determinants of higher education (see Coelli, 2005; Drolet, 2005; Finnie *et al*., 2005; Frenette, 2005; Corak *et al*., 2005; Rivard and Raymond, 2004; Frenette, 2003; and Christofides *et al*., 2001) for examples of Canadian studies. Some of these studies use structural economic models (Eckstein and Wolpin, 1999) while other relate the educational attainment to observed family and individual characteristics using regression methods.

15. In addition to papers focusing on either the high school drop-out decision or the post-secondary school enrolment decision, a number of papers have studied schooling attainments more generally. This branch of the literature has, in general, recognised the sequential nature of educational decisions. In the sociology literature, Mare (1980) was one of the first to estimate a schooling-transition model where schooling attainment is the outcome of a sequence of grade transition probabilities. Mare also estimated the effect of family background characteristics on the transition probabilities. A main result in his paper is that the effect of parental characteristics decline with grade levels. For example, the effect of parental income on grade transitions decline by more than 50 percent between elementary school and college. Similar reductions are found for the effects of parental education. While family income as well as parental education has large and statistically significant effects on the probability of completing elementary school the effects of these variables on the probability of completing college are much smaller. Although this model recognises the sequential nature of acquiring education, it has its limitations. One limitation is the inability of the model to deal with students who interrupt their schooling. Another limitation, pointed out by Cameron and Heckman (1998), is that the model ignores any omitted characteristics of the family or individual that influence schooling decisions but are unmeasured by researchers. The omission of such

4 . In addition to reviewing past work on determinants of schooling, Haveman and Wolfe (1995) also review research on economic mobility, fertility and earnings.

variables may lead to biased estimates of the effects of observed characteristics on schooling attainment and may also explain the pattern in Mare (1980) of declining effects of parental characteristics on grade progression.

16. Cameron and Heckman (1998) not only criticise the grade transition model in the absence of controls for unobserved heterogeneity but also propose an alternative model, the ordered discrete-choice model. They show that such a model, including controls for unobserved characteristics, fit data on educational attainment just as well as a grade transition model, that also controls for unobserved characteristics, but that uses many more parameters. Their results on the effects of family income and parental education show a pattern that is opposite that of Mare (1980). In particular, they show that the effect of family income is negative for those with less than elementary schooling, is largest for those who graduated from high school but attended no further education, and then decline for grade levels above high school completion.

17. Recent papers employing the ordered discrete choice model advocated by Cameron and Heckman (1998) include Kucera (2008), McIntosh and Munk (2007), Bauer and Riphahn (2007), Lauer (2003), Lucas (2001), and Ermisch and Francesconi (2001). Among these papers, Kucera (2008) is the only one using Canadian data and he focuses on educational attainment differences between those with immigrant parents and those with Canadian-born parents. His findings suggest that second-generation immigrants do better in terms of schooling attainment than their counterparts from non-immigrant families.

18. Another study using Canadian data and a general model of educational attainment is Belzil and Hansen (2006). They estimate, in addition to an ordered probit model, a grade transition model and focus on the role of expected future earnings and parental education on educational attainment in Canada. Their findings suggest that educational attainment increase significantly as expected future earnings increase. The effect was grade level dependent and largest for grade levels beyond high school. They also found smaller effects of parental education than what has previously been reported. Sun (2008) use an empirical model similar to that of Belzil and Hansen (2006) and applies it to data from the Youth in Transition Survey (YITS). She incorporates information on PISA reading and math scores in her estimations and her results show a positive effect of these scores on grade progression. Moreover, the effect of parental education, although still statistically significant, decline when she included PISA scores.

19. Although the previous literature on educational attainment and the effects of parental characteristics on school outcomes differ widely in terms data source used and methodology applied, there are a number of findings that consistently appear in most studies. First, parental education is an important determinant, both quantitatively and statistically. For example, Belzil and Hansen (2003), using a structural economic model applied to data from the National Longitudinal Survey of Youth (NLSY79), report that household background variables (especially parents' education) account for about two-thirds of the explained cross-sectional variation in schooling attainment while individual ability accounts for one third.

20. Second, the economic resources available within the family at the time students are in their early teenage years have also been documented to have important effects on student achievement and grade attainment. To what extent this reflects the existence of credit constraints or financial barriers is however unclear. Kane (1994) argues that college enrollment is sensitive to changes in the cost of attending college. On the other hand, Carneiro and Heckman (2002) suggest that, in general, long-run family factors are more important than short-term income constraints (see also Cameron and Heckman, 1998). However, they recognise that some individuals may be limited in their college opportunities and face short-term credit constraints. The issue of possible credit constraints in higher education has also been addressed using Canadian data; see for instance Coelli (2005), Drolet (2005), Finnie *et al*. (2005) and Corak *et al*. (2005).

21. Third, whenever measures of scholastic ability have been included they are generally significant determinants of educational attainment.[5] For example, Heckman *et al*. (2006) show that cognitive and non-cognitive abilities have positive effects on educational attainment. For Canada, Frenette and Zeman (2007), Thiessen (2007) and Belzil and Hansen (2006) have shown that high school grade-point average is significantly related to the probability of acquiring schooling beyond high school. Overall, measures of academic performance and ability are strongly connected to educational transitions.

2.2 School to work transitions

22. A common observation in most labour markets is that the unemployment rate among young people is higher than among the rest of the labour force.[6] Higher joblessness rate among youth may in part be due to a high degree of uncertainty among employers about their potential productivity. At the same time, new entrants to the labour market may need time to discover their own skills as well as the opportunities available to them. Regardless of the reason for high youth unemployment rates there is great policy concern about its existence and its sensitivity to the state of the economy. Consequently, a number of policies have been implemented in many countries to combat youth unemployment.

23. In a review of the literature on school-to-work transitions, Ryan (2001) shows how these transitions differ in seven countries. His focus is on young people with post-secondary education and he finds that most school leavers in Germany, Japan and the Netherlands move directly into regular employment.[7] In his review of alternative policies Ryan reports that vocational education, apprenticeship, and labour market programs all appear to increase employment opportunities for youths, at least in Europe. However, labour market programs appear not to increase the earning power of youths. Ryan further notes that changes in minimum wages have small effects on youth employment, both in the United States and in Europe. It appears as if the school-to-work successes in Germany and Japan are mainly due to nationally specific institutions; the apprenticeship system in Germany and school-employer recruitment networks in Japan.

24. Quintini *et al*. (2007) survey the school-to-work transition process in OECD countries. They found that the length of the transition from school to work varies significantly across countries, and it can take up to two or more years before many school leavers find their first job. Those with low educational attainments generally find it hard to avoid spells of unemployment. They also discuss the increased policy concern with youths' poor labour market performance in many countries and review some of the programs that have been implemented to promote employment prospects for this group, such as the New Deal for Young People in the United Kingdom.[8]

25. Another recent paper that studies school-to-work transitions and youths' labour market experience is Doiron and Gorgens (2008). They focus on the time dependence in different labour market states (employment, unemployment and out of the labour force) in Australia and use their estimated model to simulate effects of various policy experiments. Their results indicate that current unemployment experiences may have long-term effects on the probability of being unemployed in the future and on the

5 . Christofides *et al* (2008) show that students' aspirations are also a determinant of educational attainment.

6 . The Labour Force Survey released by Statistics Canada in February 2009 showed that the unemployment rate in Canada among youths (15-24) was 12.7% in January 2009. For men (women) 25 years of age and older, the unemployment rate was 6.7% (5.4%).

7 . The other countries considered in his study are France, Sweden, the United Kingdom and the United States.

8 . The New Deal for Young People program has been evaluated in Blundell *et al*. (2004) and De Giorgi (2005). Both studies show that the program, especially the job search assistance part of it, had positive effects on the transition from unemployment to employment.

duration of the unemployment spell. This finding suggests that the benefits from early interventions may be large.

26. In Hansen (2007) data from YITS are used to investigate early labour market outcomes in Canada. He reports that there is a significant relationship between educational attainment and subsequent labour market success. The employment rate is generally higher for those with more education and the unemployment rate is lower. As an illustration, one month after leaving school, 65 percent of high school dropouts were employed while this figure was 81 percent for post-secondary education graduates. These findings suggest that in Canada, like in other countries, youth labour market experiences depend on their educational attainment. Finally, consistent with the results in Doiron and Gorgens (2008), Hansen (2007) finds that students who are unable to find a job during the first year after leaving school may find it difficult to enter the labour market in subsequent years.

27. Betts *et al*. (2000) use data from three waves of the Canadian National Graduate Survey to analyse the time it takes graduates of Canadian Universities to start a full time job that lasts at least six months. They find that the transition takes a fairly long time, perhaps partly due to their definition of finding a job (one that lasts at least six months). Although a large proportion of graduates get jobs within a few months, the median duration to the start of the first job is over fifteen months in each graduating cohort. The results also indicate a great deal of heterogeneity in the school-to-work transition.

28. Finally, a number of papers have studied how working while in school affects the school-to-work transition. Student employment may ease the transition from school to work if the employment experience gained while in school is valued on the labour market. Indeed, this result is reported in Joensen (2007), Bacolod and Hotz (2006), Hakkinen (2006), Hotz *et al*. (2002) and Light (2001) among others.

29. To summarise, there is a great concern among policy makers about the transition from school to work and the experience of unemployment among young people. A number of different policies (such as vocational education, apprenticeship and active labour market programs) have been implemented trying to ease the transition and promote employment. Research in this area indicates that: (i) the unemployment risk is inversely related to accumulated education (*i.e.* those with more schooling have lower probabilities of experiencing unemployment), (ii) there is a time dependence in labour market outcomes meaning that current unemployment may increase the probability of being unemployed in the future, and (iii) active labour market policies appear useful, at least in terms of moving youths from unemployment or inactivity to employment.

3. DATA

3.1 Survey and sample selections

30. The data used in this paper are obtained from the Canadian Youth in Transition Survey (YITS). YITS is a longitudinal survey that was initiated in 1999 and collects information about major transitions in young people's lives, particularly those between education and work. Since the initial interview, follow-up interviews have been conducted every two years and the most recent interview took place in 2006. YITS consists of two different age groups: cohort A (who were 15 years old in 1999) and cohort B (who were 18 to 20 years old in 1999). Further, a subsample of respondents in cohort A (9 663 students) also completed student achievement tests as part of the Programme for International Student Assessment (PISA).

31. In this paper, information from all available interviews (four cycles) is utilised. The empirical analysis requires longitudinal information on both academic performance and school year participation in different activities. To be included in the sample, an individual respondent must have completed both the math and the reading PISA test in addition to having participated in all follow-up interviews. These requirements reduced the sample to 8 125 individuals and were imposed since these test scores and transitions play a central role in this paper. Moreover, all individuals with incomplete information on any individual or family background variable were dropped. This reduced the sample to 4 431 respondents.[9]

32. The analysis in this paper relies on data from all four cycles. In particular, information on parents and the family, such as if the respondent lived with both biological parents most of the time during high school, parents' education, and parents' income, were obtained from the first cycle. Information on high school grade average and participation in various activities while in high school were obtained from cycles 1 and 2. Highest grade completed was obtained from cycle 4 and reflects the status in December 2005. Time until first full-time job after leaving school can be obtained from any of the four cycles, depending on when the student permanently leaves school. Finally, sample weights provided by Statistics Canada have been used throughout this paper, both when calculating descriptive statistics and when estimating the transition models. The results are therefore representative of the corresponding population of Canadian youths (that is, youths who were 15 years old in 1999 and attended school that year).

3.2 Features of the data

33. Table 1 presents the highest grade completed in December 2005 separately for males and females.[10] The first two columns show the proportion of the male and female sample in each category,

9 . The removal of individuals with incomplete records may introduce bias in the estimated coefficients if non-response individuals differ in a systematic way from those who provided complete records. It is not known to what extent this is a problem in this paper.

10 . As mentioned in the introduction, this paper measures educational attainment using the highest grade completed and accumulated years of schooling. The reasons for using these measures instead of alternative measures were also outlined in that section. However, it is clear that these measures are not able to capture certain features of the Canadian educational system (which varies across provinces). For example, someone who has completed grade 14 may have obtained a diploma from a post-secondary vocational program or

respectively. In the third column, the grade distribution for males whose PISA reading scores falls in the first quartile is presented. The fourth column shows the grade distribution for males whose PISA reading scores falls in the fourth quartile. Finally, columns five and six show similar grade distributions, conditional on PISA reading scores, for females.[11] The entries show a pattern consistent with other recent descriptions of educational attainment in Canada. Females are less likely to drop out of high school (completing a grade less than 11 or 12 depending on the province) than males and they are also more likely to have completed some level of post-secondary education.

34. The table also shows a strong relationship between reading skills and grade completion. Males in the first (bottom) quartile of the PISA reading score distribution are much more likely to drop out of high school than males in the fourth (top) quartile. Similarly, males in the first quartile are much less likely to complete a grade beyond grade 12 (the proportion that has completed a grade above 12 in this group is 0.33) than males in the fourth quartile (the proportion that has completed a grade above 12 in this group is 0.66). A similar pattern can be observed for females and suggests that school attainment is strongly correlated with academic skills (measured by reading skills), a result that has also been documented in previous work (see section 2 above).

35. The purpose of this paper is to document both educational and labour market pathways among Canadian youths. While Table 1 shows educational pathways, the entries in Table 2 describe how Canadian youths move between different labour market states. The unit of time is a semester and the winter semester corresponds to the period January to April while the fall semester corresponds to the period September to December. Activities during the remaining moths (May to August) are ignored. The states were defined as follows. A person was classified as being in school in semester *t* if he/she was enrolled full-time in school in any of the months in that semester. If the person was not classified as a full-time student, he/she was classified as employed (working) if he/she was working in any of the months in that semester. Finally, if the person was not classified as a full-time student or as working, he/she was identified as "other", a category that includes any activity apart from studying or working, such as unemployment or consumption of leisure time.[12] Respondents are observed from the fall semester of 1999 (the year they turn 15) until and including the fall semester of 2005 yielding 13 time periods over which labour market transitions are observed. The top panel shows transition rates for males while the lower panel shows similar transitions for females. The table also shows transitions conditional on PISA reading scores.

36. Using the full sample of males (unconditional on PISA reading score), Table 2 shows that 90.5 percent of males who attended school in semester *t* also attended school in the subsequent semester (the one at *t+1*), 8 percent moved from school to work while 1.5 percent went from school to other activities. This suggests that there is a high degree of time dependence, or persistence, in school attainment and that, when students leave school, a majority of them work during the following semester. The entries in the table also indicate that 12.5 percent of males who worked in semester *t* went back to school in the subsequent semester, 83 percent remained employed (working) and 4.8 percent went to inactivity. Finally, among

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may instead have completed two years at university level. Extending the grade transition model used in this paper to account for such grade level differences is a challenging task that is beyond the scope of this paper. However, it is possible to use the information on highest grade completed, combined with information about province of residence and provincial school regulations, to infer the fraction of high school dropouts or the proportion that has completed any schooling beyond high school.

11 . The 'cut' points for PISA reading scores were 474.8 (511.3) for the first quartile and 601.6 (616.4) for the fourth quartile for male (female) students. For PISA math scores, the 'cut' points were 492.2 (492.1) for the first quartile and 610.0 (591.3) for the fourth quartile for male (female) students.

12 . This category may also include part-time students unless they also work, in which case they are classified as employed.

those in the "other" category in semester *t*, 12.5 were in school in *t+1*, 45 percent were working and 43 percent remained in this state.

37. The entries for the full sample of females reveal a pattern similar to that of males with a few exceptions. School persistence is somewhat higher for females than for males and this is consistent with the findings in Table 1 that females, on average, acquire more schooling than males. Further, females are less likely to transit from school to "other" than males and are much more likely to enter the labour market after leaving school than their male counterparts. Finally, females show higher entry rates into school than males, regardless of the state at semester *t* (working or other). This is again consistent with the observation that females attend school longer than males.

38. To illustrate the effect of academic skills on labour market transitions, Table 2 also provides details on transitions for those in the lowest quartile in the distribution of the PISA reading test and for those in the highest quartile. Again, this is done separately for males and females. For both groups, those with low reading scores are less likely to remain in school and more likely to leave school for inactivity than those with high reading scores. For example, the probability of remaining in school for another semester is 86.5 percent for males in the lowest quartile and 94.8 percent for those in the highest quartile. Further, the probability of going from school in one semester to unemployment (or another form of labour market inactivity) in the next is 4 times higher for those with low reading scores than for those with high scores. Once a student leaves school, those with low reading scores are less likely to return to school than those with high scores. Finally, low achievers are more likely to transit from work to inactivity or, if they are in the inactivity state in semester t, remain in that state than the high achievers. Overall, Table 2 provides some new and interesting features of how Canadian youths move between different labour market activities and how these flows are linked to a measure of scholastic or cognitive ability.

39. Further details on the school-to-work transition are provided in Tables 3a and 3b. Table 3a documents, by grade level and gender; (i) the proportion that goes directly from school to work without experiencing any for of inactivity, including unemployment; (ii) the average time until they obtain a full-time job (for those who do not move directly from school to work); (iii) how many of these that were still not employed in December 2005; and (iv) how many of all sample respondents that were enrolled in school during the fall semester. Like Table 2, the top panel describes the features of males while the bottom panel displays entries for females. Although not a monotonic relationship, there is a link between highest grade completed and the transition from school-to-work. For those with higher educational attainment, the probability of moving directly from school to work is higher. Moreover, among those who experience an intermediate period of inactivity, this is much shorter for those who have acquired more education. For instance, the average duration until the first full-time job after leaving school (for at least one semester) is 16 months for males who have obtained less than grade 11 while it is 7 months for those who have completed grade 15. The proportion of those with jobless spells that was right censored (*i.e.* they were still jobless in December 2005) varies with schooling level and is much higher for those who have completed grade 15. This is expected since the time frame between leaving school and the end of survey (December 2005) is much shorter for them. Similarly, the proportion that was attending school during the fall semester of 2005 is higher for those with higher educational attainment.

40. Table 3b shows the same information as Table 3a but instead of conditioning on highest grade completed, the entries are shown separately for those with low (bottom quartile) and high (top quartile) reading scores. Apart from the proportion attending school during the fall semester of 2005, there are no major differences between those with low and high reading scores. For males, high achievers are more likely to go straight from school to work than low achievers. However, the opposite is true for females. Further, there are no differences between the high and low achievers in terms of time until first job given an episode of joblessness after school. Similarly, the proportions with censored jobless spells are similar. The only entries that display differences across reading ability are the proportion attending school in the

fall of 2005. Those with high reading ability are much more likely to attend school. It therefore seems as if those with high reading skills (as measured by the PISA scores) who do *not* acquire high levels of schooling and who do *not* move directly from school to work are not more successful in finding a job than those with low readings skills. However, the entries also reaffirm the pattern that has emerged in the previous tables of a strong correlation between reading skills and educational attainment.

41. More details on the unemployment experience following school are provided in Tables 4a and 4b. These tables mimic Tables 3a and 3b in that they show outcomes by highest grade completed (Table 4a) and by PISA reading score (Table 4b). However, instead of displaying information on transitions from school-to-work the entries show how many youths went from school to unemployment and for how long they were unemployed (on average) if they experienced an unemployment episode. Overall, education appears to reduce the risk of becoming unemployed. The incidence for males varies between 8.5 percent (for those who have completed grade 14) and 21.4 percent (for those with grade 11 as their highest completed grade).[13] Similar figures apply for females. The average length of the unemployment spell also declines with schooling, both for males and females. As for the link between reading abilities and unemployment, Table 4b shows that the risk of being unemployed among males is higher among the low achievers and the opposite is true for females. Finally, the average time unemployed is similar across reading skill levels and gender.[14]

42. Table 5 provides a profile of youths in Canada by highlighting differences in selected observable characteristics between high school dropouts, high school graduates, and those with at least some post-secondary education (PSE). The gender difference in educational attainment is again shown as the high school drop-out rate is higher for males (16.4 percent) than for females (11.1 percent). Further, the proportion of respondents with some PSE is lower for males (50 percent) than for females (62.7 percent).

43. The link between PISA reading and math scores and schooling is clear, both for males and females. Interestingly, the average female score on the reading test is higher than the male average while the opposite is true for the math test. Number of siblings is negatively related to schooling while children of immigrants acquire more schooling. Further, family income is higher among those who have some PSE. The variable nuclear family equals one if the respondent lived with both biological parents most of the time during high school and has been found to be an important determinant of school attendance in previous studies (*e.g.* Belzil and Hansen (2002) and Belzil and Hansen (2006)). However, there are small differences in the average value of this variable across school levels for males. For females on the other hand, nuclear family appears to be correlated with school attainment. Differences in parents' education, both mother's and father's, may also explain school attendance and completion. Previous literature has documented significant intergenerational correlations in educational attainment, both in Canada and elsewhere. Such a relationship can also be observed in Table 5.

44. The last entries in Table 5 illustrate the link between educational attainment and after school activities in 1999 when (most of) the respondents were in grade 10. The activities are participation in school organised activities and working. Consistent with findings in Hansen (2008), participation in school organised activities is positively correlated with educational attainment while working is negatively correlated.

13 . One possible reason for the peak at grade 11 is that this grade level coincides (for the most part) with the minimum school leaving age in 2000 (which was 16 in most provinces).

14 . The descriptive analysis presented in Tables 1 through 4b conditioned on PISA reading scores. Similar results were obtained when PISA math scores were used and are available upon request. This is not surprising given the high correlation between reading and math skills.

4. METHODOLOGY

45. This paper considers alternative outcomes measures; (i) the highest grade completed (measure used to describe educational pathways), (ii) time until first full-time job after permanently leaving school (school-to-work transition), and (iii) probability of moving from one labour market state (school, work, or other) to another (or the same) between successive semesters (showing both school-to-school, school-to-work, work-to-work, and work-to-school transitions). Because of the different nature of the outcomes, different methodologies are applied to each of them. A brief description of each methodology is provided below while details on estimation issues are provided in Appendix.

4.1 Educational pathways

46. As mentioned by Cameron and Heckman (1998), much of the previous literature on educational attainment has either focused on a single transition, like entry in post-secondary education among high school graduates, or has used linear regressions to assess the relationship between observable characteristics of students (such as parents' education, family income, number of siblings and other characteristics) and highest grade completed. More recent work uses a schooling-transition model in which a sequence of probabilities of continuing in school (grade progression) is estimated.

47. This paper follows Cameron and Heckman (1998) and extends the basic schooling-transition model to also incorporate controls for unobserved student heterogeneity (a similar model was implemented in Belzil and Hansen (2006)). This avoids the critique of the Mare (1980) model that was brought up in Cameron and Heckman (1998).

48. The framework used in this paper provides much more details about educational decisions and educational pathways than for example estimating separate equations for the decision to drop out of high school and the decision to enrol in university. In particular, the proposed framework allows for dynamic self-selection which will occur if the educational options facing an individual at a certain age or grade level depend on his or her decisions in the past. This is an important point to consider when studying educational transitions and it means that educational decisions must be modeled sequentially so that, for example, the decision to complete high school is considered when analysing the decision to attend university.

49. Moreover, the methodology also allows for unobserved characteristics to be incorporated into the model. Many of the individual factors that determine educational choices, such as aptitude and preferences for school, are generally not observed in survey data. The YITS, with the inclusion of PISA test scores, is an exception in its richness in information on students' scholastic abilities, parental background information, and school information.[15] However, even with a data set like YITS there are likely to exist factors that help determine school outcomes that are not observed in the data and this possibility must be accounted for during estimation. In this paper the assumption is that unobserved heterogeneity is normally distributed.

15 . The YITS – survey also contains information on students' high school GPA in 1999 (a year in which most respondents were attending grade 10). These GPAs are self-reported and highly correlated with the PISA scores. For this reason, the information on GPA was not utilised in this paper. In alternative specifications (not reported in this paper), high school GPAs were included along with PISA scores and although the point estimates were not greatly affected by this, the associated standard errors were. Hence, while both scholastic abilities and high school grades improve educational outcomes, it is difficult to identify their individual contributions to educational success.

50. Once the estimates describing the transition probabilities have been obtained they can be used to describe the effects of changing various observed characteristics, such as PISA math and reading scores as well as working while in high school, on the probability of leaving school. This can be accomplished by calculating the change in the predicted grade transition probability (or in average completed schooling) from changes in the explanatory variables (see Appendix for details).

4.2 Labor market pathways

51. The empirical models used to estimate labor market pathways are similar to that described above. The pathways or transitions here will focus on school-to-work and work-to-school transitions. To assess the role of academic skills (PISA reading and math scores) and other characteristics of individuals, the conditional probabilities presented in Table 2 will be estimated using standard multinomial logit models. The results from these estimations will describe, for example, how transitions from school-to-work are correlated with observed characteristics of respondents holding other observed features of the individuals constant. In order to learn more about the unemployment experience for those who enter unemployment after leaving school, a duration model based was also estimated on the time it takes until a student obtains a full-time job after leaving school. In this case, only those who report themselves as unemployed after school are included in the sample.

5. RESULTS

52. This section presents results derived from estimates from the empirical models described above. Since all estimation methods considered here are non-linear which implies that it is difficult to interpret estimated coefficients, interpretable measures, such as marginal or partial effects and hazard ratios are presented instead. Detailed information on estimated coefficients is available upon request. This section is divided into two subsections, one presenting results pertaining to educational attainment or pathways and another showing results for school and work transitions.

5.1 Educational attainment

53. Results from the general grade transition model are presented in Tables 6-9. This section has been divided into two subsections where the role of cognitive measures is discussed next and the effects of other characteristics are presented in the following section.

5.1.1 The effects of PISA math and reading scores

54. Table 6 presents marginal effects of PISA math and reading scores on the probability of transiting from one grade level to the next.[16] In the first column, effects of these scores on the probability of moving from grade 10 to grade 11 are shown. In the following columns, effects on higher grade transitions are presented. Hence, the column label shows the destination grade level. The top panel shows marginal effects (derivatives of the probability of moving up one grade level) for the male sample while the lower panel shows these effects for the female sample. The marginal effects are calculated for every individual and then averaged across all individuals.[17]

55. A common observation is that PISA scores have a statistically significant effect on grade progression.[18] For males, the effect of reading scores is significant at the 5 percent level for all transitions while the effect of math scores is significant in 4 out of 6 cases. The statistical significance of the effects for females is similar. The effect of reading scores is lowest at the first grade transition (0.014 for males

16 . It should be noted that all survey respondents took the PISA math and reading tests during the spring of 1999, the year they all turned 15. At the time of the test, most respondents were in grade 10 but some were attending grade levels above or below grade 10 at this time. Thus, educational attainments at the time of the test differ across respondents. In this paper, a version of the grade transition model was estimated where the test scores were adjusted for this. The results were quantitatively similar to those obtained when the test scores were not adjusted. In this paper, the results are based on a specification using unadjusted test scores.

17 . For each grade level, the math and reading scores enter linearly. It is possible that the effects of these test scores are instead non-linear but this possibility is not considered in this paper.

18 . Each grade transition probability contains one parameter representing reading scores and one parameter representing math scores. The standard errors of the marginal effects were calculated in several steps. First, 1,000 draws from the asymptotic variance matrix were obtained. Then the marginal effect for each of these draws was calculated. Finally, the standard deviation of these marginal effects is used as an estimate of the standard error (and the mean is used as an estimate of the marginal effect).

and 0.008 for females) and increase by grade level. For males, the effect peaks at grade 14 (where it equals 0.123) and then drops but it remains at a much higher level at grade 16 than grade 11. This pattern suggests that reading skills are (at least statistically) important for success at every grade level but they are more important at grade levels beyond high school. The effect of math skills is more varied. It is small and not statistically significant at grade 11 but large and significant at grade 14 (the magnitude, 0.122, is virtually the same as that of reading scores).

56. The effects of reading and math skills for female students are similar to the effects for males but with some notable exceptions. Like males, the effect of reading skills for females increases by grade level until grade 13, where it equals 0.073. However, for grades 14 and 15, the effect declines (but remains significant) and then the effect increases for grade 16. For math skills, the effect increases by grade levels and peaks at grade 14 and then declines (and is not significant at grade 16). Overall, like the findings for males, academic skills are important for success at every grade level but they are more important at grade levels beyond high school.

57. While the entries in Table 6 show that the effects are statistically significant, they do not reveal if these effects are quantitatively important. To gauge the effect of these scores (which are re-scaled), we can compare the marginal effects or changes in the grade transition probability from a 100 point increase in either the reading or math score to the average transition probability. Using the entries in Table 1, the transition (or continuation/survival) probability for each grade level can be derived. For example, for males there were 2156 respondents at "risk" in grade 10.[19] They all have the possibility of moving up to grade 11. Of these at risk individuals, 112 (or 5.2 percent) choose not to continue to grade 11. This gives a transition probability equal to 0.948. Then, in grade 11 there were 2044 males at risk (2156-112). Of these, 334 (or 15.5 percent) choose not to continue to grade 12 which gives a continuation or transition probability equal to 0.837. These probabilities for each grade level and for both males and females can be calculated. The average value of these transition probabilities across grades is 0.778 for males and 0.843 for females. These are the numbers that should be used to judge the quantitative effect of math and reading skills on grade progression. For example, a 100 point increase in reading performance would increase the probability of moving from grade 13 to grade 14 with 0.123 percentage points for males, which corresponds to a 16 percent increase (0.123/0.778). This is relatively large effect although a 100 point increase in the reading score is also a very large performance increase, considering that the average value for high school drop-outs is 507 and 562 for those with some PSE, a difference of 55 points. However, even a more modest increase in the reading score may lead to increased educational attainment as the continuation probability is increased at all grade levels.

58. In order to further illustrate the effect of increases in PISA math and reading scores, Table 7 presents expected highest grade completed given different average values of these scores. The first two columns show the average grade level and a summary of the grade distribution observed in the data (column 1) and generated by the estimated model (column 2). The small differences in the entries in columns 1 and 2 indicate that the empirical model is able to fit the observed grade distribution very well, both for males and for females. Columns 3-5 show changes in average grade level and in high school drop-out rates as well as PSE attendance rates, from changes in reading and/or math scores. In the first case (column 3), a uniform increase in the reading score of one standard deviation was introduced (all other characteristics were unchanged). This resulted in a modest increase in the expected grade level for males, from 13.1 to 13.5 (or 2.8 percent). However, while the increase in the expected grade level was modest, the high school drop out rate was reduced by 20 percent (from 0.16 to 0.13) and the proportion with some PSE increased with 12 percent (from 0.512 to 0.573).

19 . At "risk" individuals are those who have the option of completing an additional grade. The assumption made here is that only those who have completed grade 10 may transit to grade 11 and so on.

59. A uniform increase in math scores of one standard deviation shows similar effects; a modest increase in expected, overall grade level, along with a sizeable decline in the high school drop-out rate and a substantial increase in PSE attendance.[20] Although the differences are not very large, it is noteworthy that the increase in reading scores reduced the high school drop-out rate more than the increase in math scores while the opposite is true for PSE attendance.

60. Finally, the effects of an increase in both math and reading scores are shown in the last column. Again, only a modest 5.5 percent increase in average grade level is observed for males. However, the changes in high school drop-out rates and PSE attendance rates are considerable (-27.5 and 26.5 percent, respectively).

61. The effects of changes in math and reading skills for females are generally similar to those for males. However, the effect of the increased reading performance on the high school drop-out rate is larger (a reduction of 31.5 percent compared to a reduction of 20.2 percent for males) and the effects of improved math scores are somewhat lower than those for males.

62. To summarise, improvements in math and reading skills are shown to increase educational attainment. The effects are in most cases statistically significant and also quantitatively important. However, it should be noted that average skill levels of Canadian youths are high compared to youths in other countries and it is not obvious to what extent these existing skills can be further improved. While uniform increases, such as those implemented in Table 7, are unrealistic they are useful as illustrations of how the grade distribution would change as a result. Assuming that more resources to schools at the elementary and secondary levels will generate improved academic skills they will also increase overall educational attainment.[21]

5.1.2 The effects of other characteristics

63. In addition to controls for academic abilities (measured by PISA reading and math scores), the estimated grade transition models include controls for a range of observed individual characteristics, such as family composition and income, parents' education, minority language, immigrant status of the parents and activities outside of the normal school day. Most of these variables have been shown in past research to play important roles in educational attainments.

64. Table 8 presents marginal effects from each of these variables on the grade progression probability for males at each grade level.[22] Generally, the effects show expected signs and correspond to the pattern that emerged from the descriptive statistics in Table 5. As mentioned above, the variable nuclear family equals one if the respondent lived with both biological parents most of the time during high school and it has been found to be an important determinant of school attendance in previous studies (*e.g.* Belzil and Hansen (2002) and Belzil and Hansen (2006)). However, the effect here is small and not significant at conventional significance levels.

65. The variable single equals one if the student lived only with one of the parents and if there was no other adult in the household and it equals zero otherwise. The effect of this variable is significant for all

20 . Note however that the variance (and standard deviation) in reading scores is higher than that in math scores. Hence, the increase in test scores was larger for reading scores than for math scores.

21 . It should be noted that this paper does not analyse to what extent increased resources to primary and secondary schools actually do improve academic skills.

22 . Even though there is only a single parameter associated with each of the variables for all grade transitions, the marginal effects will differ across grade levels because the specification also includes grade specific effects.

grade levels and suggests that male youth residing with a single parent are, holding other included variables constant, less likely to progress in school than similar students who live in households with two parents present (but not necessarily both biological parents). The magnitude (in absolute terms) is comparable to the effect of increasing PISA reading scores with 100 points (see Table 6).

66. Further, parents' education is strongly linked to educational success of young males, and especially the educational attainment of the father. In this paper, parent's education is described by three variables: (i) less than high school, (ii) high school but no further education, and (iii) some PSE. The first category is omitted and the effects associated with the other two are relative to the omitted category. Table 8 shows that students whose mother had completed high school but no further education do not acquire significantly more schooling than those whose mothers had not completed high school. The effect of having a mother with some PSE is however significant and the magnitude is similar to that of having a father with a high school degree but no additional schooling. Lastly, if the father has obtained some PSE, the effect of this is significant and relatively large (in the order of 0.13). The level of this effect is comparable to the effect of increasing PISA reading scores with 100 points (see Table 6).

67. The effect of family income on educational attainment has attracted much research. Here, the effect is positive and significant in a statistical sense. However, the magnitudes of the estimated effects are small since the income measure is expressed in USD 100 000s. Hence, to obtain an effect of the same order as that for PISA reading scores, family income would have to increase by about USD 250 000. Nevertheless, there is a significant relationship between family income and grade attainment and the effect is higher at higher grade levels suggesting that there may exists economic barriers for some students in accessing higher education.

68. Like in Table 5, number of siblings is negatively related to schooling while children who belong to a minority language group (speak a non-English language in all provinces except Quebec or speak a non-French language in Quebec) stay longer in school. The effect of siblings is quantitatively small but that is not the case for minority language. Moreover, similar to Kucera (2008), children of immigrants acquire more schooling. Like the effect of speaking a minority language, this effect is also significant and relatively large.

69. The last entries in Table 8 illustrate how participation in school-organised extra-curricular activities and working are linked to educational attainment. Participation is measured in 1999 when most of the respondents were in grade 10. Consistent with findings in Hansen (2008), participation in school organised activities improve school outcome while working worsens educational success.

70. Marginal effects for females are presented in Table 9. Similar to the male results in Table 8, female educational attainment is positively related to parents' education, family income and participation in school activities and negatively associated with working at age 15. However, the effect of mother's education is larger than the effect of father's education. Moreover, nuclear family has a positive and significant effect with a magnitude comparable to the effect of reading scores in Table 6. Single parent family has no effect while it had a negative effect for males and the same finding applies for belonging to a minority language group or having immigrant parents (that is no effects for females but significant effects for males).

71. To learn more about the gender difference in school attainment, model estimates for females were used along with average values of observed characteristics for males to generate a counterfactual grade distribution for females. By comparing this hypothetical distribution with that obtained using females' own characteristics we can see if the observed gender difference in schooling is mainly due to differences in endowments (or individual characteristics) or if it is instead due to differences in transforming these endowments into educational achievements. The expected grade level for females when

males' characteristics are used is 13.8 which just above that reported in Table 6 for females (13.7). Looking at the grade distribution, a slightly lower fraction of females is expected to drop out of high school when male characteristics are used and a slightly higher fraction is expected to attend PSE. These differences are quite small and suggest that females are not acquiring more schooling than males because they have different endowments (including different test score results). Instead, differences in estimated effects of these endowments are driving the result.

72. The framework above for analysing the gender gap in education can also be used to illustrate the sources for educational differences between minority and majority language groups. In particular, the educational gap between English-speaking and French-speaking Quebecers can be illustrated by comparing the actual grade distribution of the English-speaking minority in Quebec with a counterfactual grade distribution for this group based on characteristics of the French-speaking majority in Quebec. The expected grade level for English-speaking Quebecers is 13.4. This is only slightly greater than the (counterfactual) expected value that is obtained when using French-speaking Quebecers' characteristics, 13.2. Hence, like the results on the gender gap above, it appears as if the English-speaking minority in Quebec does not acquire more schooling than the French-speaking majority because of major differences in personal characteristics that are linked to educational success. Instead, just as for the male-female educational gap, differences in estimated effects of these endowments seem to generate the gap.

73. Finally, this decomposition analysis was carried out for the French-speaking minority in the rest of Canada (outside Quebec). Their expected grade level (13.7) was compared to the hypothetical grade level obtained using characteristics of the English-speaking majority in these nine provinces (14.2). This difference is larger than the ones above and suggests that a portion of the educational gap between these language groups may depend on differences in personal or family endowments (including different test score results).

5.2 School/work transitions

74. In this section, estimated transition probabilities using a multinomial logit model are presented. The probabilities being estimated are those that are shown in Table 2. For each of the three occupied labour market states in semester (or time period) *t*, there are three possible destinations the following semester: school, work or inactivity. Hence, for each gender there are nine sets of marginal effects. The ones for males are presented in Tables 10a, 10b and 10c while those for females are shown in Tables 11a, 11b and 11c. While the inactivity state in these transitions includes unemployment (which requires that the respondent is actively searching for a job) it also includes other activities such as being unemployed but not seeking a job. To provide some more details on the unemployment experience of youths that go straight from school to unemployment (with job search), the multinomial logit results are supplemented with estimated hazard ratios obtained from a standard duration model (Weibull regressions). These results are shown in Table 12. Like the presentation above, this section is divided into two subsections with one focusing on the effect of PISA scores and the other discussing the effects of other characteristics.

5.2.1 The role of PISA math and reading scores

75. For males who were in school in any given semester the effects of PISA reading and math scores on the probability of being in a certain labour market state the following time period are mixed. An increase in reading abilities will improve the likelihood of remaining in school and reduce the probability of transiting from school to either work or inactivity (shown by the entries in column 1 in Table 10a). For instance, the probability of being in school the following period increases with 0.008 percentage points or with about one percent if PISA reading scores increase with 100 points. Although this effect is statistically significant it is quantitatively small. For transitions from work, the effects of reading scores are all estimated without any statistical precision. However, an increase in math skills will increase the movement

from work to school and reduce persistence in non-school activities. More precisely, an increase in math scores by 100 points is expected to increase the flow from work to school by 4.9 percentage points (or with close to 40 percent). Most of this increase (about three quarters) will arise because of a reduction in the persistence in work; the rest is due to reduction in the transition from work to inactivity.

76. For females, changes in reading scores rarely have a significant effect on school-to-work or work-to-school transitions. On the other hand, and similar to the findings for males, increases in math scores have significant effects on most of these transitions. An increase in math scores will: (i) increase the likelihood of staying in school and (ii) improve the likelihood of going back to school (both from work and inactivity). The effect on the probability of going from inactivity to school is large (an increase with over 60 percent) and precisely estimated. Interestingly, this effect was small and not statistically significant for males.

77. Finally, the effects of PISA test scores on the length of the unemployment experience for those respondents that entered unemployment directly after leaving school are shown in Table 12. The entries show hazard ratios and their standard errors. Values greater than one (less than one) imply that the effect of a one-unit increase in the variable associated with the hazard ratio increase (reduce) the probability of leaving unemployment. Hence, for variables where the hazard ratios are greater than one, increases in these variables shorten the duration or length or the unemployment episode. For example, an increase in reading scores for males by 100 points increases the hazard rate by 13 percent while a similar increase in math scores reduce the hazard rate by about 18 percent. However, none of these effects on the hazard rate are statistically significant. For females, the opposite pattern is observed (*i.e.* an increase in reading performance reduces the hazard rate while a similar increase in math scores increases the hazard rate) but like the results for males, the effects are not statistically significant.

78. To summarise, like the findings in Section 5.1 above, improvements in math and reading skills are shown to increase educational attainment (both because such improvements lead to increased persistence in school and because they lead to increased inflow into education from other activities). Moreover, and not in contrast with the results above, the effects of math skills appear to be more significant than the effects of reading skills. One conclusion that emerges from this exercise is that improved academic skills lead to improved school-to-work transitions and better labour market opportunities, especially for females.

5.2.2 The role of other characteristics

79. Like the model for educational attainment discussed above, the labour market transition models also include controls for observed individual characteristics, such as family composition and income, parents' education, minority language, immigrant status of the parents and activities outside of the normal school day.

80. Most of the effects of these variables are not significant when the initial state is school (see Table 10a). The exception is the effect of highest grade completed which significantly increases the probability of staying in school and lowers the transition from school to other activities. This effect is observed for both males and females, although it is stronger for males. For females, having worked during the year they turned 15 increases the probability of going from school to work and reduces both the persistence in school and the probability of moving from school to inactivity. Hence, while working during the school year reduces school performance and educational attainment, it also reduces the risk of experiencing unemployment directly after school.

81. Considering transitions that originate in the working state, having worked during the school year reduce the probability of going back to school and increase persistence in work. The highest grade

completed is positively related to male work-to-school transitions. Participation in school organised extra-curricular activities increases the chance of returning to school and reduces the likelihood of remaining in the work state. Lastly, none of the marginal effects for the non-PISA variables are statistically significant for transitions that originate in the inactivity state. This holds true for both males and females.[23]

82. Looking at the duration of unemployment spells (Table 12) it appears as if children of immigrants leave unemployment faster than similar children whose parents were born in Canada. The hazard rate is more than twice as high for immigrant children, for both males and females. Further, males who grew up in an intact family (the variable nuclear family equals one) exit faster than those who lived in a broken home during most of the high school years. Participation in school activities at age 15 reduces the exit rate for males while it improves it for females. Finally, the length of an unemployment spell is inversely related to the highest grade completed for both males and females. However, the effect is only statistically significant for females.

23. A possible reason for this is that the inactivity state is a residual state (not in school and not working) and therefore includes a wide range of activities. Hence, it may be difficult to associate the incidence of inactivity to observed characteristics.

6. CONCLUSIONS

83. This paper provides an up-to-date and detailed description of educational and labour market pathways (or transitions) among Canadian youth. It also provides estimates of the effect of academic abilities and other observed individual and family characteristics on such transitions. The empirical analysis is carried out on a sample from the Canadian Youth in Transition Survey (YITS) whose respondents were 15 years old in 1999. YITS is a longitudinal survey and this report utilises data from cycles 1 to 4, covering a period of 6 years (from 1999 to 2005).

84. *One* major finding in this paper is that students with high academic abilities (high PISA math and reading scores) acquire more schooling than those with low scores. Thus, consistent with previous literature, there is a clear link between test scores and educational attainment. Even after controlling for a number of observed characteristics - such as family composition and income, parents' education, minority language, immigrant status of the parents and activities outside of the normal school day - improvements in math and reading skills are shown to increase educational attainment. The effects are generally statistically significant and also quantitatively important.

85. A *second* major finding in this paper is that students with low reading achievements are not only less likely to stay in school, they are also less likely to return to school given that they have previously left school. Among those with reading scores in the bottom quartile, the probability of going from school to inactivity (which includes unemployment and other forms of non-employment) is 18 percent for males. For males in the top quartile of the reading distribution, this figure is 11 percent. For females, this probability is around 12 percent in both quartiles. Hence, the risk of experiencing unemployment after school is inversely related to reading performance for males but not for females.

86. A *third* major finding in this paper is that the risk of entering unemployment after school is inversely related to the level of completed schooling. The effect is larger for males than for females and suggests that education, in addition to improving wage offers, also serves as a sort of insurance against the risk of becoming unemployed. Further, among those who move from school to unemployment, those with higher levels of education have higher exit rates and experience shorter unemployment episodes. Although this effect was documented for both males and females, it is greater and only significant for females.

87. A *fourth* major finding in this paper is that females are not acquiring more schooling than males because they have different endowments (including different test score results). Instead, differences in estimated effects of these endowments are driving the result. For members of a minority language group (English-speaking in Quebec and French-speaking in the rest of Canada), the results indicated that differences in observable characteristics might explain more than half the educational gap.

88. Finally, this paper documents the relationship between educational attainment and a number of personal characteristics. For instance, the effect of participation in extra-curricular school activities is positive and significant while the effect of working is negative and significant. These findings are consistent with the results in Hansen (2008) who found that participation in school-organised activities improves high school grade averages while working at a young age (age 15) has a negative effect. This

paper also confirms earlier results regarding differences in educational attainment between children of immigrants and children of natives (parents born in Canada).

89. To summarise, this paper shows that academic or scholastic skills are important determinants of educational attainment and improves the transition from school to work. This suggests that policies that provide more resources to schools at the elementary and secondary levels are likely to generate improved academic skills and improved future labour market outcomes.

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Table 1. Highest grade completed in December 2005, separately for males and females

Highest grade completed	Males (N=2156)	Females (N=2275)	Males, Low PISA reading scores (N=534)	Males, High PISA reading scores (N=532)	Females, Low PISA reading scores (N=555)	Females, High PISA reading scores (N=565)
Grade 10 or less	0.052	0.029	0.100	0.014	0.086	n.a.
Grade 11	0.155	0.110	0.200	0.094	0.177	n.a.
Grade 12	0.306	0.244	0.372	0.233	0.324	0.194
Grade 13	0.148	0.137	0.184	0.126	0.111	0.126
Grade 14	0.067	0.069	0.062	0.095	0.075	0.070
Grade 15	0.064	0.064	0.048	0.068	0.079	0.044
Grade 16 or more	0.209	0.347	0.034	0.370	0.149	0.524

Note: All figures are weighted by sample weights provided by Statistics Canada. Respondents with low PISA reading scores were observed in the first quartile of the distribution of PISA reading scores for this sample while high PISA reading scores refers to those observed in the fourth quartile. For an entry with n.a., there were not enough observations in the category for results to be released.

Table 2. School and labour market transition rates, by gender and PISA reading score

	Males								
	All			Low PISA reading score			High PISA reading score		
	State at semester t+1			State at semester t+1			State at semester t+1		
State at semester t	School	Work	Other	School	Work	Other	School	Work	Other
School	0,905	0,080	0,015	0,865	0,111	0,024	0,948	0,046	0,006
Work	0,125	0,827	0,048	0,096	0,849	0,055	0,213	0,744	0,043
Other	0,125	0,449	0,427	0,071	0,469	0,460	0,158	0,432	0,410

	Females								
	All			Low PISA reading score			High PISA reading score		
	State at semester t+1			State at semester t+1			State at semester t+1		
State at semester t	School	Work	Other	School	Work	Other	School	Work	Other
School	0,929	0,062	0,009	0,886	0,101	0,013	0,957	0,037	0,005
Work	0,154	0,806	0,040	0,119	0,826	0,054	0,247	0,708	0,045
Other	0,156	0,392	0,452	0,095	0,412	0,493	0,282	0,371	0,347

Note: See Table 1. Activities during the summer months (May-August) are ignored in this table.

Table 3a. School-to-work transitions, by gender and highest grade completed

Highest grade completed	Proportion that goes directly from school to work	Average time until full-time job (months)	Proportion still unemployed	Proportion that remain in school during the fall 2005 semester
		Males		
Grade 10 or less	0,631	16	n.a.	0,069
Grade 11	0,616	14	0,063	0,024
Grade 12	0,696	13	0,109	0,029
Grade 13	0,607	12	0,261	0,080
Grade 14	0,704	8	0,374	0,105
Grade 15	0,803	7	0,823	0,486
		Females		
Grade 10 or less	0,694	17	n.a.	0,136
Grade 11	0,662	14	0,081	0,059
Grade 12	0,734	14	0,135	0,016
Grade 13	0,709	10	0,178	0,058
Grade 14	0,750	6	0,246	0,064
Grade 15	0,620	7	0,895	0,468

Note: There were 737 males (1012 females) with missing information (either due to the fact that they did not satisfy the education condition (*i.e.* they were in school until the fall of 2005) or they did not remain in employment for 5 consecutive months after leaving school). All figures are weighted. For an entry with n.a., there were not enough observations in the category for results to be released.

Table 3b. School-to-work transitions, by gender and PISA reading score

PISA reading score	Proportion that goes directly from school to work	Average time until full-time job (months)	Proportion still unemployed	Proportion that remain in school during the fall 2005 semester
		Males		
First quartile	0,637	13	0,205	0,091
Fourth quartile	0,711	14	0,198	0,468
		Females		
First quartile	0,709	13	0,194	0,223
Fourth quartile	0,665	12	0,192	0,573

Note: See Table 3a.

Table 4a. Unemployment experience, by gender and highest grade completed

Highest grade completed	Proportion that went from school to unemployment[1]	Average time unemployed (months)[2]
	Males	
Grade 10 or less	0,096	8
Grade 11	0,214	6
Grade 12	0.113	5
Grade 13	0.178	7
Grade 14	0.085	4
	Females	
Grade 10 or less	0,100	17
Grade 11	0,196	8
Grade 12	0.091	6
Grade 13	0.102	5
Grade 14	0.111	2
Grade 15	0.041	2

Note: [1] The entries in this column show the proportion of respondents who experienced some unemployment after leaving school (and who did not return within 6 months). [2] Average time refers to the average duration first unemployment episode after leaving school.

Table 4b. Unemployment experience, by gender and PISA reading scores

PISA reading score	Proportion that went from school to unemployment[1]	Average time unemployed (months)[2]
	Males	
First quartile	0,155	6
Fourth quartile	0,114	5
	Females	
First quartile	0,116	7
Fourth quartile	0,132	5

Note: See Table 4a.

Table 5. Descriptive statistics, by educational attainment (highest garde completed as of December 2005)

Variable	High school drop-out	High school graduate	Some post-secondary school	High school drop-out	High school graduate	Some post-secondary school
		Males			Females	
Number of persons	353	724	1079	253	595	1427
Proportion (%)	16.4	33.6	50.0	11.1	26.2	62.7
PISA reading score	507	523	562	522	552	586
PISA math score	532	537	573	511	526	555
Minority language	0.04	0.03	0.05	0.05	0.05	0.05
Number of siblings	1.85	1.85	1.63	1.91	1.99	1.77
Second-generation immigrant	0.14	0.17	0.24	0.18	0.20	0.21
Family income ($1,000)	71.0	76.6	84.3	68.4	72.2	81.3
Nuclear family	0.87	0.87	0.89	0.76	0.85	0.90
Mother's education:						
High school	0.33	0.31	0.26	0.31	0.33	0.29
Post-secondary school	0.50	0.61	0.67	0.55	0.54	0.64
Father's education:						
High school	0.26	0.25	0.21	0.32	0.28	0.22
Post-secondary school	0.50	0.65	0.71	0.46	0.58	0.67
School activities	0.57	0.66	0.70	0.55	0.64	0.76
Paid or unpaid work	0.56	0.58	0.50	0.72	0.72	0.67

Note: All figures are weighted by sample weights provided by Statistics Canada. The highest grade completed was obtained by combining information on highest grade completed in 2000 and monthly school attendance between 2000 and 2005. High school drop-outs are those who had not completed grade 12 as of December 2005. Similarly, high school graduates are those who had completed grade 12 but not grade 13 as of that date. School activities and paid or unpaid work measures participation in each of these activities at age 15.

Table 6. Marginal effects of cognitive ability measures on the probability of grade completion

Variable	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**
	(0,005)	(0,011)	(0,017)	(0,020)	(0,028)	(0,033)
PISA math score/100	-0,007	0,024**	0,103**	0,122**	0,036	0,102**
	(0,005)	(0,012)	(0,020)	(0,024)	(0,031)	(0,035)
			Females			
PISA reading score/100	0,008**	0,043**	0,073**	0,034*	0,042*	0,085**
	(0,004)	(0,010)	(0,016)	(0,019)	(0,022)	(0,027)
PISA math score/100	0,004	0,005	0,071**	0,093**	0,069**	0,024
	(0,004)	(0,010)	(0,018)	(0,021)	(0,023)	(0,027)

Note: The entries in the first column show the effects on the probability of completing grade 11 (transiting from grade 10 to grade 11). The other columns show similar effects. Standard errors are shown in parentheses.

Table 7. Actual and expected grade levels

	Actual (data)	Expected	Increase in reading scores	Increase in math scores	Increase in both reading and math 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	0,130	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*	*-32,0*
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	0,200	0,157
Relative change (%)			*-15,4*	*-19,1*	*-36,5*
Post-secondary school	0,617	0,668	0,713	0,719	0,790
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. The entries represent weighted proportions.

Table 8. Marginal effects of observable characteristics on school hazard rates, males

Variable	Grade 11	Grade 12	Grade 13	Grade 14	Grade 15	Grade 16
Nuclear family	-0.001	-0.003	-0.005	-0.004	-0.004	-0.005
	(0.004)	(0.014)	(0.027)	(0.024)	(0.025)	(0.026)
Single	-0.023**	-0.079**	-0.150**	-0.136**	-0.138**	-0.148**
	(0.011)	(0.038)	(0.071)	(0.065)	(0.065)	(0.070)
Mother's education:						
High school	0.005	0.019	0.035	0.032	0.033	0.035
	(0.005)	(0.016)	(0.030)	(0.027)	(0.028)	(0.030)
Post-secondary school	0.011**	0.037**	0.070**	0.064**	0.064**	0.069**
	(0.005)	(0.016)	(0.030)	(0.027)	(0.028)	(0.030)
Father's education:						
High school	0.011**	0.038**	0.072**	0.066**	0.067**	0.072**
	(0.004)	(0.014)	(0.027)	(0.024)	(0.024)	(0.026)
Post-secondary school	0.021**	0.072**	0.136**	0.124**	0.125**	0.134**
	(0.005)	(0.014)	(0.026)	(0.023)	(0.024)	(0.025)
Family income ($100,000s)	0.008**	0.029**	0.055**	0.050**	0.050**	0.054**
	(0.002)	(0.007)	(0.014)	(0.013)	(0.013)	(0.014)
Number of siblings	-0.003**	-0.011**	-0.020**	-0.019**	-0.019**	-0.020**
	(0.001)	(0.004)	(0.008)	(0.007)	(0.007)	(0.007)
Minority language	0.013**	0.046**	0.088**	0.080**	0.081**	0.087**
	(0.006)	(0.020)	(0.038)	(0.035)	(0.035)	(0.038)
Second-generation immigrant	0.010**	0.036**	0.068**	0.062**	0.062**	0.067**
	(0.003)	(0.011)	(0.021)	(0.019)	(0.020)	(0.021)
School activities	0.008**	0.029**	0.055**	0.050**	0.051**	0.054**
	(0.003)	(0.009)	(0.017)	(0.015)	(0.016)	(0.017)
Paid or unpaid work	-0.008**	-0.026**	-0.050**	-0.045**	-0.046**	-0.049**
	(0.003)	(0.009)	(0.016)	(0.015)	(0.015)	(0.016)

Note: Standard errors are shown in parentheses. * indicates statistical significance at the 10 percent level while ** indicates statistical significance at the 5 percent level. School activities and paid or unpaid work measures participation in each of these activities at age 15.

Table 9. Marginal effects of observable characteristics on school hazard rates, females

Variable	Grade 11	Grade 12	Grade 13	Grade 14	Grade 15	Grade 16
Nuclear family	0.011**	0.046**	0.102**	0.101**	0.088**	0.097**
	(0.003)	(0.010)	(0.023)	(0.022)	(0.020)	(0.022)
Single	-0.005	-0.022	-0.048	-0.047	-0.041	-0.046
	(0.005)	(0.023)	(0.050)	(0.050)	(0.043)	(0.048)
Mother's education:						
High school	0.008**	0.034**	0.075**	0.074**	0.064**	0.071**
	(0.003)	(0.011)	(0.025)	(0.025)	(0.022)	(0.024)
Post-secondary school	0.009**	0.039**	0.087**	0.086**	0.074**	0.083**
	(0.003)	(0.011)	(0.025)	(0.025)	(0.022)	(0.024)
Father's education:						
High school	0.004**	0.017*	0.039*	0.038*	0.033*	0.037*
	(0.002)	(0.010)	(0.022)	(0.022)	(0.019)	(0.021)
Post-secondary school	0.008**	0.034**	0.075**	0.074**	0.064**	0.072**
	(0.003)	(0.010)	(0.022)	(0.022)	(0.019)	(0.021)
Family income ($100,000s)	0.004**	0.018**	0.041**	0.041**	0.035**	0.039**
	(0.002)	(0.007)	(0.016)	(0.016)	(0.014)	(0.015)
Number of siblings	-0.001	-0.005	-0.012**	-0.011**	-0.010*	-0.011**
	(0.001)	(0.003)	(0.006)	(0.006)	(0.006)	(0.006)
Minority language	0.003	0.013	0.029	0.029	0.025	0.028
	(0.003)	(0.014)	(0.032)	(0.031)	(0.027)	(0.030)
Second-generation immigrant	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.008)	(0.018)	(0.018)	(0.016)	(0.017)
School activities	0.010**	0.041**	0.091**	0.090**	0.078**	0.087**
	(0.002)	(0.007)	(0.015)	(0.015)	(0.013)	(0.015)
Paid or unpaid work	-0.009**	-0.040**	-0.088**	-0.087**	-0.076**	-0.084**
	(0.002)	(0.007)	(0.016)	(0.015)	(0.014)	(0.015)

Note: See Table 8.

Table 10a. Estimated marginal effects on the conditional probability of being in school, working or being inactive in semester t+1 given school attendance in semester t for males

	Probability of being in school in semester t+1		Probability of working in semester t+1		Probability of being inactive in semester t+1	
	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.
PISA reading score/100	0.008**	0.003	-0.006**	0.003	-0.001	0.001
PISA math 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 ($100,000s)	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	

Note: * indicates statistical significance at the 10 percent level while ** indicates statistical significance at the 5 percent level. School activities and paid or unpaid work measures participation in each of these activities at age 15.

Table 10b. Estimated marginal effects on the conditional probability of being in school, working or being inactive in semester t+1 given that the person was working in semester t, males

	Probability of being in school in semester t+1		Probability of working in semester t+1		Probability of being inactive in semester t+1	
	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.
PISA reading score/100	0.007	0.009	-0.014	0.010	0.008	0.006
PISA math 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 ($100,000s)	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	-0.050	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	

Note: See Table 10a.

Table 10c. Estimated marginal effects on the conditional probability of being in school, working or being inactive in semester t+1 given that the person was inactive in semester t, males

	Probability of being in school in semester t+1		Probability of working in semester t+1		Probability of being inactive in semester t+1	
	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.
PISA reading score/100	0.028	0.028	0.036	0.044	-0.064	0.044
PISA math 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 ($100,000s)	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	

Note: See Table 10a.

Table 11a. Estimated marginal effects on the conditional probability of being in school, working or being inactive in semester 1+1 given school attendance in semester t for females

	Probability of being in school in semester t+1		Probability of working in semester t+1		Probability of being inactive in semester t+1	
	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.
PISA reading score/100	0.004	0.003	-0.005	0.003	0.000	0.000
PISA math 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 ($100,000s)	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	

Note: See Table 10a.

Table 11b. Estimated marginal effects on the conditonal probability of being in school, working or being inactive in semester t+1 given that the person was working in semester t, females

	Probability of being in school in semester t+1		Probability of working in semester t+1		Probability of being inactive in semester t+1	
	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.
PISA reading score/100	0.022*	0.014	-0.018	0.015	-0.004	0.007
PISA math 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 ($100,000s)	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	

Note: See Table 10a.

Table 11c. Estimated marginal effects on the conditional probability of being in school, working or being inactive in semester t+1 given that the person was inactive in semester t, females

	Probability of being in school in semester t+1		Probability of working in semester t+1		Probability of being inactive in semester t+1	
	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.	Marg. Effect	Std. Err.
PISA reading score/100	-0.013	0.028	-0.035	0.055	0.048	0.054
PISA math 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 ($100,000s)	-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	

Note: See Table 10a.

Table 12. Estimated hazard ratios from a Weibull regression, by gender

	Males		Females	
Variable	Hazard ratio	Std. Err.	Hazard ratio	Std. Err.
PISA reading score/100	1.130	0.174	0.829	0.175
PISA math score/100	0.822	0.116	1.122	0.240
Minority language	1.077	0.444	1.167	0.394
Number of siblings	0.930	0.111	0.808*	0.090
Second-generation immigrant	2.528**	0.783	2.070**	0.535
Family income ($100,000s)	0.995	0.004	0.993	0.005
Nuclear family	2.133**	0.705	0.856	0.256
Mother's education:				
High school	1.773	0.810	1.807	0.768
Post-secondary school	1.927	0.932	0.931	0.436
Father's education:				
High school	1.324	0.614	2.110**	0.691
Post-secondary school	0.882	0.379	1.886*	0.652
School activities	0.508**	0.115	1.586*	0.410
Paid or unpaid work	1.281	0.327	1.382	0.369
Highest grade completed	1.100	0.127	1.533**	0.156

Note: The outcome is the duration or length of an unemployment episode initiated immediately after leaving school.

APPENDIX: THE LIKELIHOOD FUNCTIONS FOR THE GRADE TRANSITION MODEL.

In this paper, the probability of transiting from one grade level (g-1) to the next (g) is modeled as follows:

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

where

$$H_{g-1,g} = \frac{\exp(\boldsymbol{\beta}_g^{'}\mathbf{X}_g)}{1+\exp(\boldsymbol{\beta}_g^{'}\mathbf{X}_g)}$$

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

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

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

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

The effects of unmeasured characteristics is assumed to be represented by α, and I will assume that

i) $\Pr\left(D_g = 1 \mid \mathbf{X_i}, D_{g-1} = 1, \alpha_g\right) = F\left(\boldsymbol{\beta}_g^{'}\mathbf{X}_g + \alpha_g\right)$

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.

Given these assumptions along with the transition probabilities defined above, the contribution to the likelihood function for an individual whose highest grade completed is G (and who is not enrolled in school during the last survey date) can be written as

$$\int \Pr\left(\sum_{j=1}^{\overline{G}} D_j = G \mid \mathbf{X}_g, \alpha \right) dF(\alpha)$$

For respondents that are still enrolled in school at the last survey date (right censored observations), the contribution to the likelihood function is

$$\int \prod_{s=1}^{\overline{G}} H_{s-1,s|\alpha} fF(\alpha)$$

The integrals above are evaluated using Monte Carlo simulations. The expression for expected level of schooling in the presence of unmeasured characteristics also needs to be integrated over the support of the unobserved effect. Finally, marginal or partial effects are obtained by differentiating the probability of transiting from one grade level to the next with respect to observed characteristics.