

Evolution of Aspirations for University Attendance

A Gender Comparison

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MESA MEASURING THE EFFECTIVENESS OF STUDENT AID

Canadian Education Project | Queen's University School of Policy Studies | Canada Millennium Scholarship Foundation

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The MESA Project

The Measuring the Effectiveness of Student Aid Project, or the MESA Project, is a four year research effort being conducted by the Canadian Education Project and the School for Policy Studies at Queen's University on behalf of the Canada Millennium Scholarship Foundation. It has been designed to answer the following four questions:

- After graduating from high school, teenagers coming from low-income backgrounds face a choice as to attend college or university, or not. For those who did attend, how do they compare to those who did not?
- Does providing more funding in a student's first few years of further education attract more low-income students to post-secondary education?
- Does providing more funding in a student's first few years of further education make it more likely for low-income students to stay in and graduate?
- Are low-income students different across Canada?

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Abstract

A striking pattern that has emerged in university attendance in Canada is the so-called gender gap. Since the mid-1980's women have been increasingly more likely than men to attend universities and now outnumber men in the ratio (approx.) three to two. A similar pattern has arisen in the US and many other countries. Studies by Jacob (2002) and Goldin, et al. (2006) point to two main reasons for this gender gap. Firstly, the relative financial advantage of a university education is much higher for females. Secondly, women are better prepared for admittance to post-secondary education (PSE). Using the YITS-A data set, which provides information from interviews with high school children at ages 15, 17 and 19, we look at the decision to enter university as an evolutionary process involving both aspirations of students (and their parents expectations) and grade attainment. Females begin at age 15 with higher overall aspirations about PSE and are also more likely to revise upwards these aspirations. The result is that a significantly higher fraction of females end up deciding to attend university at age 19 and this holds even conditional on high school grades. We explore the reasons for this phenomenon and find, not surprisingly, that many of the same family background characteristics that appear to influence grade attainment are also correlated with aspiration levels. There are some differences in the initial formation and evolution of aspirations between males and females.

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Introduction

A striking pattern that has emerged in university attendance in Canada is the so-called gender gap. Since the mid-1980's women have been increasingly more likely than men to attend universities and now outnumber men in the ratio (approx.) three to two¹. Given the public concern in trying to increase the overall rate of post-secondary education attainment in Canada, understanding the reasons for the trend in the gender gap is an important policy issue.

A number of recent studies have attempted to explain the growing gender gap. It has been documented that females and males differ in their preparedness for PSE (i.e., school achievement) as well as in their non-cognitive abilities (see for example Jacob, 2002 and Goldin, 2006). However, many children of both genders who reach a sufficiently high achievement level in high school to qualify for university admission do not take up the opportunity. It is therefore important to also consider why it is that some children develop aspirations to attend post-secondary education (PSE) while others do not. Moreover, aspirations could be an important factor in determining success in achieving high grades that would qualify for admittance to a PSE institution.

There have been a number of studies, primarily in the sociology literature, that have addressed the importance and timing of aspirations to attend PSE. Hossler, Schmit, and Vesper (1999) found most students develop aspirations about PSE attendance by the end of the ninth grade². Carter (2001), for example, found that a long held desire to go to university was important in leading to the actual decision to attend PSE³. More specifically on this point, Alexander and Cook (1979) found student plans to go to university at the tenth grade more important than those who decided only by the twelfth grade to attend PSE (47 percent more likely if decided by 10th grade). A link between aspirations and attendance is also found by Carpenter and Fleishman (p. 79, 1987) who note that "favourable attitudes toward higher education, parental encouragement, and friends' college plans all lead to the formation of intentions to enter college. Intentions, in turn, predict actual college attendance." These results point to the importance of studying how such aspirations are developed earlier in life rather than focussing one's attention only at the time the decision to attend PSE is made.

We consider both the importance of children's aspirations (desire) for attending university while in high school as well as their preparedness in terms of high school grades as factors leading to PSE attendance. We use

¹ The same pattern has established itself in other countries (see Goldin, Katz, and Kuziemko (2006) for a discussion of this pattern in the United States). Also of interest are changes in the proportion of women across various fields (see Andres and Adamuti-Trache, 2006).

² Others have concluded that these aspirations evolve beyond tenth grade and later (see Parish, 1979).

³ Lakshmanan (2004) provides a review of the literature on the development of aspirations to PSE and the importance this has on actual attendance.

the panel data set called Youth in Transition Survey Cohort A (YITS-A) to explore factors underlying the formation of children's aspirations regarding future PSE experience at age 15 and how performance in high school changes these aspirations by age 17. We then analyze how these aspirations, along with grades and other individual and family characteristics, influence choices regarding PSE attendance⁴. The determination of separate influences from grades and aspirations on PSE decisions is complicated by the fact that some of the same explanatory variables, including innate ability and family background factors, are likely to influence both grades and aspirations. Moreover, grade achievement is likely to affect aspirations and vice versa. Finally, the decision to attend university is likely to be influenced by factors such as family background characteristics – both directly and indirectly - through grades and aspirations.

Although it is not possible to entirely disentangle all of these joint influences, the use of an information updating analysis allows us to go some way in assessing the independent importance of aspirations and other factors that determine the decision to enroll in PSE. This is a very important exercise when considering the effectiveness of measures designed to influence aspirations about PSE at a younger age in a way that leads to greater impact on ultimate decisions to attend PSE. We do this by allowing for a triangular system

of equations that is estimated in predetermined temporal stages. We first establish a relationship between a child's aspirations at age 15 about PSE and variables which are exogenous from the child's point of view (e.g., parent's education, income, etc.). This is stage one of our analysis. We then explore how aspirations are formed (updated) at age 17. Although one might argue that aspirations formed at a younger age (15) are exogenous to those formed at age 17 due to the temporal relationship, it is probably the case that certain factors and mental processes that determine aspirations at age 17 are also present in the child at age 15. That is, there is likely endogeneity despite the fact that these aspirations are formed at different points in time. Therefore, we use the fitted aspirations from the estimated regression in stage 1 (determination of aspirations at age 15) as one of the explanatory variables in the regression equation with aspirations at age 17 as dependent variable. We also include grades obtained just prior to age 17 in this second stage regression⁵. In our final (third) stage, we estimate the effect of various factors, including the fitted aspiration levels from our stage two regression (age 17 aspirations) and most recent grades, on the decision to attend university. Again, the use of fitted rather than actual aspirations is to avoid econometric issues relating to the likely correlation of idiosyncratic differences between individuals (i.e., unobserved heterogeneity).

⁴ Being able to follow the evolution of aspirations allows us to explore whether the stability of aspirations is relevant in making PSE decisions as the previous literature has suggested. As Lakshmanan (p. 23, 2004) notes, "most studies so far mainly focused on studying factors that influence the educational and occupational aspirations of students at one point in time." This is one way our work adds to the existing general literature on the role of aspirations.

⁵ We recognize that some factors will affect both these grades and aspirations at age 17 and hence possibly introduce an additional source of endogeneity bias, as it is likely the case that school achievement itself affects aspirations as well as will aspirations affect school achievement. Since we could not find any suitable instruments for grades, we have opted to "live with" the potential econometric problems inherent in the analysis.

We find that females at the outset (i.e., age 15) have higher aspirations regarding future PSE attendance and are more likely to revise their aspirations “upwards” (at age 17). We also see that the updating of PSE aspirations at the age of 17 is an important predictor for students’ later participation in PSE and this is especially so for students from low-income families. We tentatively suggest that more attention should be paid to developing these children’s aspirations for PSE (e.g., through high-school counseling) in order to provide them with a more equitable opportunity for PSE attendance and that this is particularly important for males. We also relate aspirations to academic preparedness and, not surprisingly, see strong links.

In the following section we lay the groundwork for our analysis, which is to explore the extent to which aspirations about PSE attendance and success in school differ between females and males (at ages 15 and 17) and to show how these factors then affect decisions about (and success at) entry into alternative PSE paths. We focus on the decision to attend university because it allows for a sharper econometric analysis and also because it is primarily at the university level that males and females attendance rates have become dramatically different over the past three decades. We draw some comparisons with some other relevant studies but do not attempt to provide a comprehensive review of the field. In section 3 we explain the data used for our empirical analysis. Section 4 contains a description of our econometric methodology. Results are presented in section 5 and discussion and conclusions are given in section 6.

Background Information and Literature Review

Before explaining how our research fits into the general literature on PSE attendance in general, and the gender imbalance issue in particular, we describe very briefly some of the types of empirical research in this literature. A much more complete survey can be found in Mueller (Feb., 2007). The most common type of empirical study regarding the determinants of university attendance use data sets that allow one to link the PSE decisions of children to the characteristics of their family, especially parental education and income. Not surprisingly, most of these studies find each of these two variables contributes significantly to the explanation. Recent examples using Canadian data include Christofides, Cirello, Hoy (2001), Corak, Lipps, and Zhao (2003), Johnson and Rahman (2005), and Christofides, Hoy and Yang (2006a,b). Knighton and Mirza (2002) in particular find that family income is a statistically significant determinant, but parental education is the more powerful predictor of university participation.

Many of these studies cover a long period of time through use of a series of cross-section data sets. This provides useful evidence on long-term trends and the gender imbalance is one very interesting and striking trend that has been observed in Canada over the past few decades. Documenting the gross pattern between family income and university attendance can be useful for determining the extent of some aspects of inequity associated with differential attendance rates by family income. In particular, since government subsidizes university education, understanding this relationship allows one to

measure one facet of the degree of regressivity of such a policy.

Naturally, the ability of parents to help finance a child's university education is a plausible reason for low family income to reflect a barrier to access to PSE. However, family income is not likely to be a direct reason for this relationship in its entirety as income levels could also represent many other indirect influences. For example, higher income families may spend more on nurturing of children in ways that allow them to prepare better cognitive and non-cognitive skills related to successful entry into PSE. The general social environment differs, on average, across income classes. Also, family income may be a signal of innate ability that is inherited by children⁶. There are other data sets, such as the YITS-A data set or the School Leavers Survey, which allow for a more detailed investigation into the role of income and other characteristics that influence the decision to attend post-secondary education. Frenette (2007, p. 4), for example, uses the YITS-A data set and discovers "that 96 percent of the gap in university attendance between youth from the top and bottom income quartiles can be accounted for by differences in observable characteristics", with only 12 percent of this gap being related to financial constraints. Finnie, Laporte, and Lascelles (2004) also use the YITS-A data set, and the School Leavers Survey, to investigate the importance of family background on PSE attendance in the 1990's. They find that parental education is

indeed a very important variable but that its effect varies across income classes and gender. Finnie, Lascelles, and Sweetman (2005) use the 1991 School Leavers Survey and the 1995 School Leavers Follow-up Survey and find that there are important indirect effects of family background variables that affect high school outcomes and related attitudes and behaviours.

Although all of the above studies offer insights into the determinants of university education, the reason for the rather recent rise in the male-female ratio in university attendance is still not completely settled. One argument that has been put forward to explain this trend is the claim that the education system has been feminized over recent decades. This process, it is argued, includes a trend towards more female teachers in elementary and high school as well as curriculum changes, such as more frequent testing, that favour females. If one accepts this claim, then studies such as ours and that of Frenette and Zeman (2007) and Jacob (2002) offer important insights into how this feminization process has led to an advantage for females in creating a successful path to university. If non-cognitive (behavioural) attributes of females are better suited to a changing education system, then analysis based on a single cohort analysis may indeed explain the increasing gender imbalance at Canadian universities.

⁶ Empirical work by Plug and Vijverberg (2003) and Rothstein (2004) suggests that parental intelligence has substantial impact on the ability of their children to succeed in university. Income and intelligence (of this sort) are likely to be positively correlated, although we have no ability to check this with our data set.

There is, however, substantial debate about the merits of the feminization of education hypothesis. In many countries the fraction of women teachers at the elementary and especially high school level has been increasing. Driessen (2007) argues, however, that the claim that females do better when taught by women teachers does not stand up to empirical scrutiny⁷. Dee (2005), on the other hand, does find children benefit from being taught by someone of the same sex. Studies which follow several cohorts and can address changes in non-cognitive abilities and the relative impact they have in a changing school system are, not surprisingly, difficult to carry out. Moreover, it isn't clear that females haven't always been "better students" at the high school level. Goldin, Katz, and Kuziemko (2006), for example, point out that over the past century females in the US have consistently outperformed males in post-secondary education. They argue that this advantage for females has only relatively recently led to higher PSE attendance rate for females because of the increased premium for educated labour for women compared to men in conjunction with increasing female attachment to the labour force⁸.

Besides the increased fraction of female teachers, some argue that the style of education and curriculum has recently changed to favour females. Burman (2005, p. 353) points out, for example, that the new AS level systems in the UK have been predicted to benefit females due to the fact that females do

best on continuous assessment. Or more generally, it is often suggested that society might becoming "more difficult for males (e.g., the argument that family dissolutions are more problematic for males)." Changes such as these are difficult to document, let alone measure objectively. The problem in completely resolving this question is that data sets which include PSE decisions taken by populations over long periods of time do not have the sort of detailed information about non-cognitive abilities and academic preparedness as do panel data sets such as the YITS-A. Therefore, we suggest that both types of studies can make important and complementary contributions to our understanding of the growing gender gap.

Our particular objective is to understand better why it is that females have recently been more likely to attend university by exploiting the interesting features concerning PSE aspirations available in the YITS-A (Youth in Transitional Survey Cohort A) data set. As noted in the introduction, it has been recognized in the literature that formation of aspirations by children concerning possible future post-secondary educational attainment is an important consideration in understanding enrolment rates and patterns. Hossler and Stage (1992) present a very good summary of both the methodologies used to understand the factors that influence children's predisposition (aspirations) towards post-secondary education as well as a review of findings to that date, while Lakshmanan (2004) provides

⁷ "This study confirmed that teacher sex has no effect whatsoever on the achievement, attitudes or behaviour of pupils. This finding holds for both males and females, for both minority and non-minority pupils and for both children from lower and higher social-economic milieus." (Driessen, 2007, p. 183.)

⁸ Goldin, Katz, and Kuziemko (2006) also attribute some of the gender imbalance to changing marital and fertility patterns for young women.

a more recent update on findings. We take as our premise that an individual will attend university only if (1) he/she wishes to attend and so applies (2) is qualified, and hence is admitted, and (3) can obtain the financial resources to do so. We focus on the first two of these conditions.

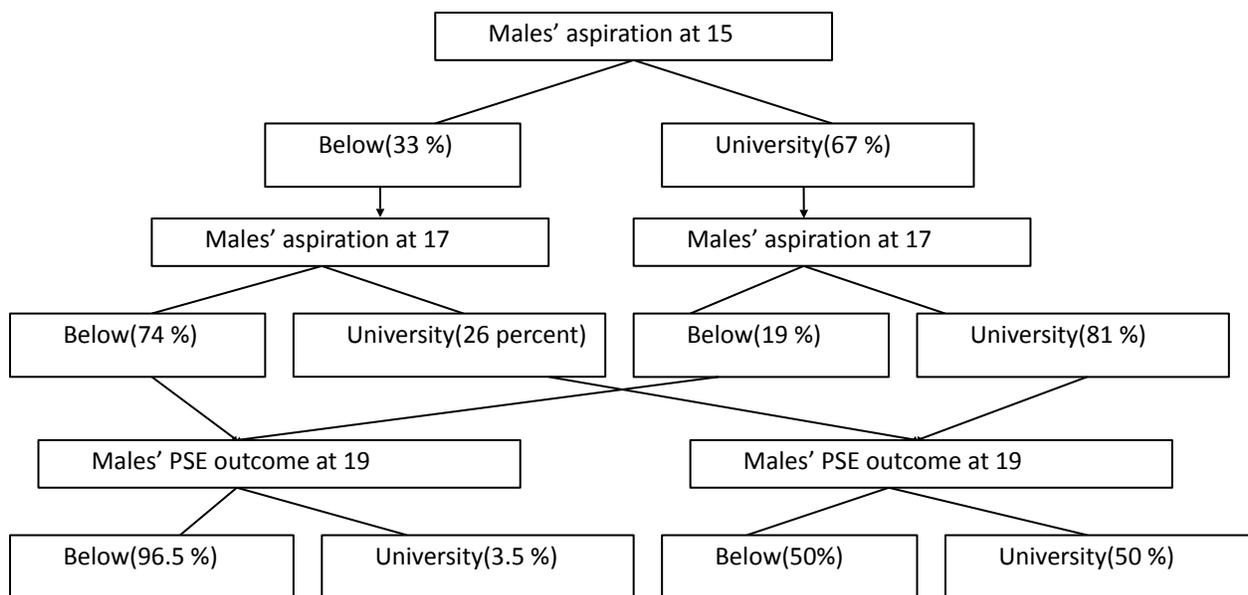
As for existing evidence on the gender difference in formation of aspirations, some studies that have included this factor have simply looked at whether there is an “intercept term difference” while others have looked for differences in the relationship of the aspiration formation process. Results have been mixed. Coleman (1962), for example, found little difference in the effect of high school on males and on females, although he found a significant high school effect on aspirations for both males and females when using data from (larger) metropolitan schools. Stage and Hossler (p. 301, 1989) found “subtle differences in family influence on male and female students’ college-going plans.” In their review of existing literature (p. 304), they note that “gender was unrelated to postsecondary plans; however, research suggested that family and environmental factors differentially affected the aspirations of males and females (Carpenter and Fleishman, 1987; Marini and Greenberger, 1978).” In Stage and Hossler (1989) they find, unlike previous studies, that level of father’s education had a stronger effect than mother’s education on student (9th-grader) plans, although they also found (p. 312) that “parents may be less committed to postsecondary education for their daughters than their sons.”

We now turn to the basic data describing the evolution of aspirations by children in high school. The YITS-A survey includes the question “What is the highest level of education you would like to get?” We use the response to this question, asked at age 15 and again at age 17, as an indication of the child’s aspirations about PSE. The possible responses include “one university degree” and “more than one university degree”. We code these as “university” and the others as “below university”, except for those who choose response “don’t know” or those who do not choose a response to this question. These two categories represent a little more than 13 percent of respondents and we ignore this group. We also exclude respondents from Quebec since those children attend CEGEP before university⁹.

We are also able to show how aspirations to attend PSE relate to grades in high school and the eventual decision whether to attend university by age 19. From Tables 1 and 2 we see that at age 15, females are more likely to have aspirations of attending university (78 percent of females compared to 67 percent for males). This higher level of aspiration for females is magnified by age 17 as a larger fraction of females who did not have aspirations of attending university at age 15 revise these aspirations upward (41 percent for females compared to 26 percent for males). Also, females with high aspirations at age 15 are more likely to stick with these high aspirations than are males (86 percent for females and 81 percent for males).

⁹ As a result of the CEGEP requirement only a very few Quebec youths in our data set have attended university by age 19.

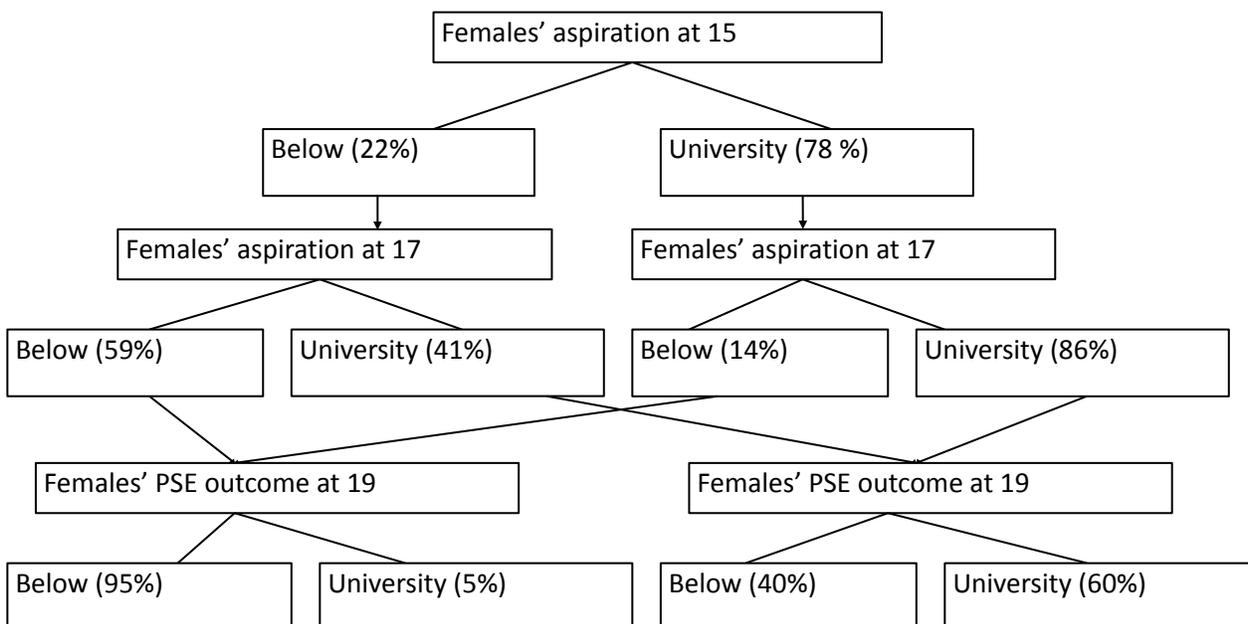
Fig. 1. Tree format of Evolution of Aspirations for Males



We also see how these aspirations carry over into actual PSE decisions by age 19. Again, females increase their “advantage” over males in that they are more likely to meet their high aspirations with 60 percent of females having “university aspirations” enrolling in university by the age of 19 compared to only 50 percent of males with high

aspirations. Very few of either gender attend university by age 19 if aspirations were below university at age 17. One must, however, interpret these figures with caution as many may attend university at a later age and “delayed attendance” may not be a symmetric phenomenon for males and females¹⁰.

Fig. 2. Tree format of Evolution of Aspirations for Females



¹⁰ By comparing the YITS-A and -B data sets, Lambert, Zeman, Allen and Bussière (2004) were able to show that in the age category 18 to 20, 17 percent of males and 24 percent of females had attended university while in the age category 20 to 22, these numbers had risen to 28 percent from males and 38 percent for females. These do not suggest a strong gender difference, with the male rate increasing by 65 percent and the female rate increasing by 58 percent by extending the age category.

Table 1: Males Aspirations in Cycle 2 (age 17), Dependent on Most Recent Overall Grades

Most recent grades	Aspirations in Cycle 2	
	Below	University
Low	61	39
Medium	38	62
High	12	88

Table 2: Females Aspirations in Cycle 2 (age 17), Dependent on Most Recent Overall Grades

Most recent grades	Aspirations in Cycle 2	
	Below	University
Low	61	39
Medium	38	62
High	12	88

It is, of course, one thing to have high aspirations about PSE but another to actually obtain the grades required to meet one’s aspirations. Moreover, obtaining low grades could affect one’s aspirations directly. Tables 3A and 3B describe the relationship between students’ aspirations in cycle 2 (age 17) based on their most recent high school performance. Among children with high overall high school grades, most (88 percent) have high aspirations regarding their future PSE decision, and this is the same for males and females. There is, however, a pronounced gender difference for those children with low or

medium overall grades. Males with low or medium overall grades in high school are less likely to have aspirations about attending university than are females with equivalent grades. Although one could interpret this as saying “males hold more reasonable aspirations given their previous grades” the direction of causality in these two-way tables cannot be inferred. We simply note here that females with low or medium grades are more likely to still consider university as a goal in life and there is a lower percentage of females who in fact obtain low grades. This suggests that there is more to the story of gender imbalance than “females simply do better than males in high school and so are more likely to be admitted to university.”

Finally, we describe the relationship between overall high school grades of children at age 18 and their participation outcomes at age 19 in Tables 4 and 5. We find (not surprisingly) that most children with low grades do not attend university (4 percent for males and 6 percent for females). However, gender differences arise again when looking at university attendance for males and females with medium overall grades, with only 23

Fig. 3. Tree format of Evolution of Aspirations for Females

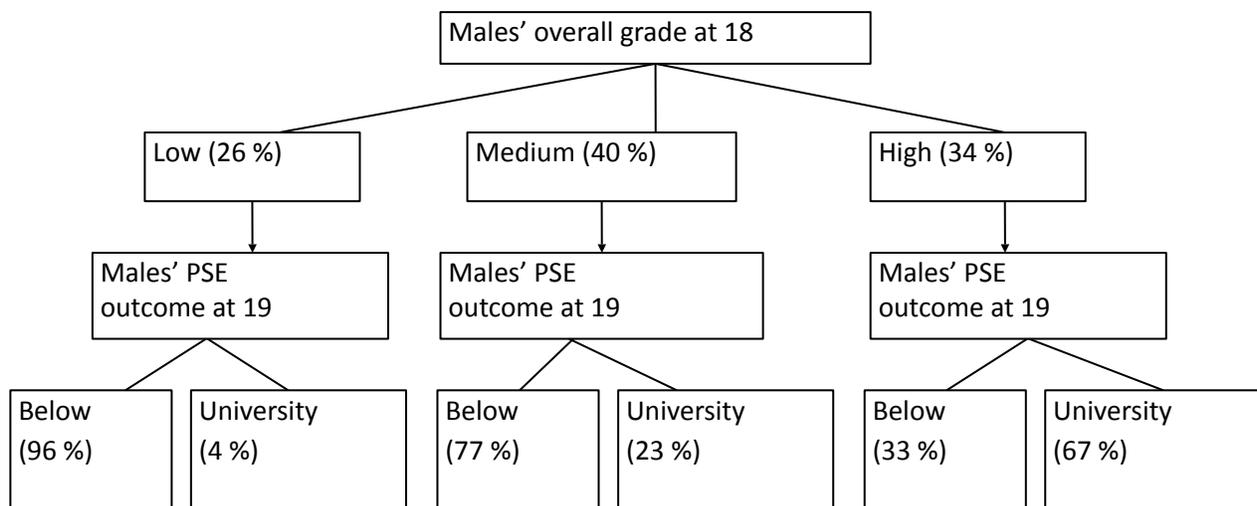
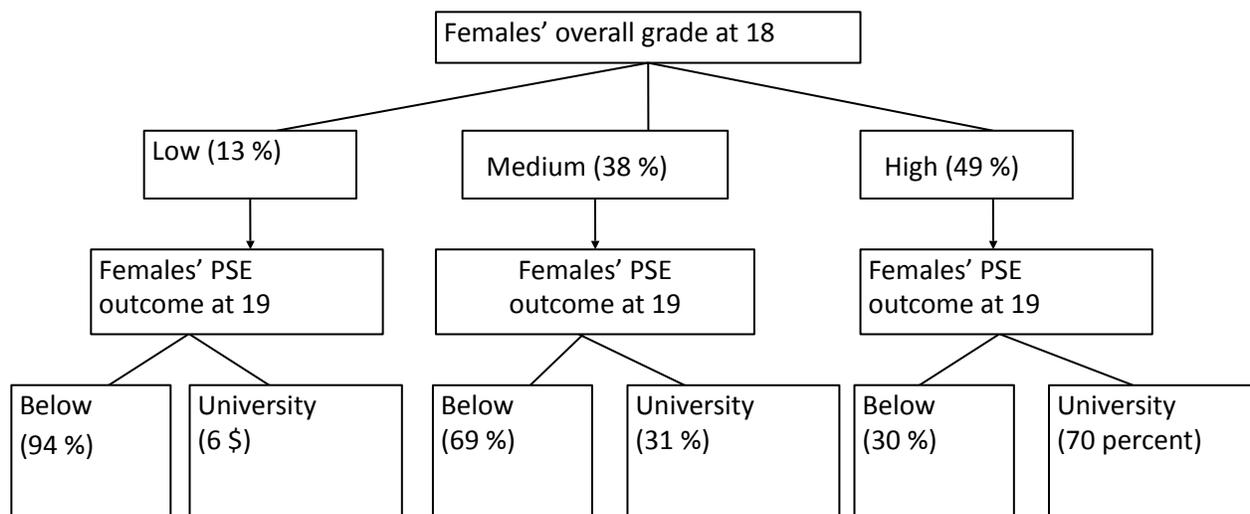


Fig. 4. Tree format of Evolution of Aspirations for Females

percent of males in this category attending university while 31 percent of females do.

the early stage of either labor force or PSE participation experiences.

So, we conclude that it is a mix of both differential grade level achievement in high school and different aspirations that lead to the current gender imbalance in university attendance. In section 4 of this paper we develop an econometric model to explore the reasons for this phenomenon. But first we briefly describe the data used in this exercise.

Data

The Youth in Transition Survey Cohort A (YITS-A) was first conducted in 2000 nationally with 30,000 students at the age of 15. The first cycle of this survey also includes the interview with students' parents, their school information and scores from the OECD's Programme for International Student Assessment (PISA) exam. In the years 2002 and 2004 only students were re-interviewed about their updated individual information of education and labor force experiences at the ages of 17 and 19. This panel data covers a period of 5 years containing most of the secondary school education performance and

The advantage of this survey is twofold. Firstly, its panel style with a group of students having been surveyed at ages of 15, 17 and 19 allows us to follow each student before and during PSE education attendance (at least the beginning of PSE for many of the youths). Previous research shows that early stage school performance is a good predictor for PSE participation. Through this type of survey design, we can analyze the PSE aspiration formation and updating process based on students' early stage academic performance. In particular, we focus on analyzing the different PSE aspiration formation of males and females in order to help understand the gender gap in PSE attendance, and in particular at the university level.

The second advantage of this YITS data set is the information availability of the aspirations on PSE participation from both students and their parents. There are parents' expectations of their children, students' perceived expectation of the importance their parents place on PSE attendance for their

children, and also aspirations from students about themselves. Along with the panel structure, we can further test the relationship between these aspiration levels and students' participation outcomes. By exploring the gender differences of aspiration formation and academic preparation (performance in high school), we hope to get a better understanding of the pathways of PSE attendance and to better understand the recent puzzle of gender imbalance of PSE participation.

The variables of interest that we have included thus far in our research focus on exploiting the determinants of PSE participation separated by students and parents respectively. For students, there are grades of overall, science, reading and math. Also we have indicators for minority status, PSE aspiration, perceived importance for parents on children's PSE participation, whether any sibling has ever dropped out of high school, and saving behavior for PSE participation.

For parents, variables include their education levels, PSE expectation for their children, parent's saving behavior for children's PSE participation, frequency of help on children's schoolwork, parents confidence about their children's PSE participation, mother's income share and family equivalent income. Equivalent income is defined as the ratio of family income divided by the square root of family size.

Econometric Methodology

In this section we explain the econometric methodologies applied in the paper. In order to find out the determinants of PSE attendance in general, we adopt an information

updating approach to study a student's decision path. In this information updating process, we make full use of the panel style of the data set and also the aspiration information collected from both parents and students. By updating, we mean the updating of PSE aspiration from the first cycle to the second cycle and then further to the third cycle as the PSE participation outcome. We compare students' aspirations for the PSE in the first and second cycles and then find out how the final outcomes of their PSE participation in the last cycle are determined. One can think of this updating process as a survival analysis of PSE aspiration or a belief updating process, conditional on previous environmental changes. During each of the three cycles of cohort A, students update their beliefs about their PSE participation.

In our empirical analysis, we make use of information about students' aspirations on PSE participation at the ages of 15 and 17 as well as a general analysis of the determinants of final PSE outcome at the age of 19. We construct a triangular system of equations that describes a three-stage model for this information updating process. The first stage is to find out how students' characteristics at the age of 14 can affect their PSE aspirations at the age of 15. Then the second stage is to perform a similar estimation for cycle 2 aspirations conditional on their predicted PSE aspiration from stage 1. We call this the first updating of the PSE decision (or path) since students have updated their aspiration based on their currently observed individual characteristics but conditional on their previous period's aspiration. We use the fitted current aspiration to predict next period's aspiration in order to take account of any self-selection

problems. In the third stage of this information updating process we estimate the last cycle's PSE outcome conditional on individual information surveyed in cycle 3 and predicted aspiration estimated in stage 2. We use a probit model to fit the survey data in each of the three stages.

$$\text{Stage 1: } Exp_{15} = \beta_0 + \beta_1 * X_{15} + \beta_2 * Y_{15}$$

where the subscript of 15 denotes the age of students. X_{15} is a vector for individual characteristics, excluding grade levels. Y_{15} is a vector for family background variables.

Stage 2:

$$Exp_{17} = \beta_0 + \beta_1 * X_{17} + \beta_2 \hat{Exp}_{15} + \beta_3 * Y_{17}$$

where \hat{Exp}_{15} denotes the expected level of aspiration as estimated from stage 1.

Stage 3:

$$PSE_{19} = \beta_0 + \beta_1 * X_{19} + \beta_2 \hat{Exp}_{17} + \beta_3 * Y_{19} \\ + \beta_4 (\hat{Exp}_{17} - \hat{Exp}_{15} |_{\hat{Exp}_{17} \geq \hat{Exp}_{15}}) + \beta_5 (\hat{Exp}_{15} - \hat{Exp}_{17} |_{\hat{Exp}_{15} \geq \hat{Exp}_{17}})$$

where PSE_{19} is the PSE participation outcome observed in cycle 3. In this final stage, we use both the predicted previous cycle's aspiration and the differences between previous two cycles' aspiration as regressors in order to investigate the path dependence among all three cycles. X_{19} used in cycle 3 includes the grade levels immediately before the PSE participation decision. In this way, we exclude the causality effect between aspiration and school performance in the first two cycles.

Note that there is a generated regressor problem in our estimation since the aspiration level variables that we use on the right hand side of stage 2 and 3 are generated from the previous stages. The inclusion of a generated regressor introduces an adjustment to the variance-covariance matrix in order to obtain reliable inferences (see Pagan (1984) for a discussion of econometric issues that are used in the context of generated regressors).

There are a number of advantages of using this three stage updating process. The first advantage of running three separate probit regressions is that we can test for differences among the same explanatory variables in different stages rather than pooling them together in which case we could only see the impact on the final participation outcome. This could also be valuable for policy considerations. We may need to concentrate on different factors in different secondary education stages in order to have the most effective impact on the final PSE participation outcome. Secondly, by conditioning on the predicted aspiration of cycle 2, we are in essence estimating a pooled model since the estimated aspiration is fitted through the individual information observed in cycle 2 along with the fitted aspiration of cycle 1, where the fitted aspiration of cycle 1 is estimated by using the individual information observed in cycle 1. So we use the whole information set but estimate the model in a more efficient way by taking the self-selection issue into consideration. This information updating process makes the best use of the available information set and has some useful by-products from the method of in-

formation updating. We summarize our econometric results in the following section.

Results and Policy Implications

In this section, we explain the empirical results from the methodology introduced in the previous section. In what follows, we discuss the effect of those variables that are statistically significant in our regressions (at the 10 percent level or better) at each relevant stage. The description of the variables used in the analysis and the tables with regression results are in Appendix A. Table A1 explores the determinants of the original aspirations reported in cycle 1 (i.e., age 15), table A2 provides results for the updating of aspirations at age 17 (cycle 2), while table A3 provides results concerning the actual PSE decision as of age 19.

First and foremost, fitted values of aspirations from cycle 1 have a positive and significant effect in the cycle 2 regression explaining aspirations. Moreover, even though we include a comprehensive battery of grade outcomes from cycle 3 for the year before the decision to go to university is made (i.e., final year high school grades), fitted values of aspirations from cycle 2 have a positive and significant effect on the decision to go to university. So this suggests that early formation of aspirations is indeed an important factor, over and above the ability to learn and do well at high school, in leading to university attendance. Moreover, the PISA test score (taken at age 15 and so reflecting an ability “at age 15” measure) also exerts a statistically significant positive effect on the attendance decision even in the presence of final year high school grades.

These two results suggest that early attention to learning and aspirations may make an important contribution in leading to a child’s eventual decision to attend PSE. Many variables are important in explaining the formation and updating of aspirations and, since aspirations have a role to play in determining university attendance decisions, these variables are worth considering as factors leading to a positive decision to attend university. Since cycle 1 aspirations are important in determining cycle 2 aspirations which in turn are important in determining the decision to go to university, we have established a chain of effects that are useful in thinking about how to enhance the likelihood of children eventually deciding to obtain a university education.

Variables that are statistically significant in explaining the formation of initial aspirations (at age 15) and/or the updating of aspirations (at age 17) are:

School Characteristics-

Percent females in the school oddly has a negative effect on females’ aspirations at age 15 and a positive effect on males’ aspirations at age 17. The percentage of highly educated teachers in English has a positive effect on females’ aspirations (age 15) but the same “quality variable” for science has a negative effect on males’ aspirations (age 17). So these aspects, or at least measures, of school quality do not paint a very clear or compelling picture regarding the importance of school quality on the formation of aspirations. However, going to a (government independent) private school does have a consistently positive effect (both cycles and decision time) for males so this is a clear and consistent effect

for males and not for females. This is noteworthy since it is over and above parental expectations, peer group effects, quality of teachers, grades, PISA score (natural ability), gender mix at the school, etc. This result suggests that the option of being able to send males to a private school may indeed promote PSE attendance for males but not for females. However, given the broad range of private schools covered by these variables (i.e., religious, academically or financially elite, etc.), it is not very clear just what is the cause of this effect and so this finding represents a question for further research.

Peer Effects-

Here we see a pretty consistent story from our variables. Except for the characteristic “many of my friends have a reputation for causing trouble”, which has a positive effect on females’ cycle 1 aspirations, all other peer effects are as one might expect. Having most of one’s friends smoke has a negative effect in all cases of aspiration formation except cycle 2 aspirations for males (including a negative effect even at decision time). Interestingly, males with friends who think it is okay to work hard at school and/or who expect to go on to university are consistently affected in cycle 1 and 2 aspiration formation – although no additional effect exists at decision time. This points to the importance of peer effects throughout high school on the formation of aspirations about going to university and hence is worthy of consideration as a target for parents and schools in order to enhance PSE opportunity take-up for students, especially males.

Family Characteristics-

Our results do not point towards a disadvantage for the children of immigrants or minority children per se in terms of developing a positive attitude towards PSE attendance. Of course, if these groups disproportionately have characteristics that reduce the likelihood of PSE attendance for their children, then some particular attention may be warranted, but not simply because children are from minority or immigrant backgrounds. In fact, there is evidence of a positive effect on aspirations from being the child of a minority group (cycle 2 aspirations for females and cycle 1 aspirations for males) or from immigrant parents (cycle 1 for females and cycle 2 for males). Family income is mostly not a statistically significant variable, except in the case of aspiration formation for females at age 15. Mother’s share of income has a positive effect on male’s aspirations in cycle 1. The effect of parents saving for PSE for their children is mostly not statistically significant in the process of aspiration formation (except for cycle 2 for females) but is important for the ultimate decision to go to university for males. For females, having had a sibling who has dropped out of high school has a negative impact on aspirations in cycle 2.

Parental Education-

As one would expect, parental education has a pretty consistent and entirely expected impact on aspiration formation, especially whether a child’s father and/or mother have a university degree. This variable continues to have an additional independent effect at the decision stage. Thus, it may be particularly useful for school counsellors to focus on drawing the attention of children from fami-

lies with lower levels of education to the merits of a university education.

Parental Expectations-

We see that parental expectations regarding their children's PSE attainment, importance placed on PSE by parents, and confidence in their child to attain PSE have an expected and quite consistent effect on children's aspiration formation. This effect diminishes at the decision stage but this just means that beyond the impact of high parental expectations regarding PSE on children's aspiration formation, there appears to be no additional effect on the PSE attendance decision of children. Overall then, these results point to an important effect of parental expectations. It is worth considering how schools could reinforce together both children's and parents' aspirations about PSE attendance.

Child's view of parental expectations-

Interestingly, both females and males initial aspirations are affected by their view of what is their parent's view about the importance of obtaining a university education. This reinforces our discussion in the above paragraph in that, not only is it helpful for parents to have high expectations about their children's future education choices, but also it appears important to clearly communicate this to children.

Additional Remarks concerning "Decision stage"-

Typically students with low grades would not qualify for university programs, or at least not many of them, and so it is natural to include grades in the decision stage regression. We included available results of grades from children's final year of high school in the

categories of overall grade, grade in English, and grade in mathematics. Not surprisingly having good grades (mid to high) shows up quite a lot in positive and significant variables. Natural (or early developed) ability as measured by the PISA reading test score at age 15 is also an important predictor of deciding to attend university over and above grades in coursework. The fitted aspirations of students from age 17 is also statistically significant, indicating the continued importance of aspiration formation in addition to ability and grade achievement in leading to a positive decision to attend university.

Parents' confidence in their children's PSE participation turns out to be positively significant at the decision stage for females but not males and there is also a significant negative effect on having a sibling who has dropped out of school for females but not males, consistent with a gender difference for this variable in aspiration formation. The variable 'non-birth parent', which indicates the presence of at least one parent who is not the birth parent of the child, has a statistically significant negative effect for both males and females on the decision to attend university. This may be the result of a stressful family environment earlier in the child's lifetime, although it is interesting to note that this variable does not show up as significant in any of the aspiration formation regression equations.

Students' own saving for PSE turns out to be statistically significant for males and females, and parents' savings for males, although it is not obvious what is the direction of causality; that is, is saving for PSE done in anticipation of a positive decision or existing

plan by children to attend university or is the decision affected by parent's (and own) financial commitment to support children's PSE.

We also explored the impact of revisions to aspirations between cycles one and two to see if there is an "extra effect" from persistence of aspiration. No consistent or clear result was discovered from this exercise, and no support for the importance of "unchanging" aspirations – and earlier aspirations – leading more strongly to university participation as has been found in some of the literature. However, from our updating methodology we do see that aspirations at age 15 have a positive effect on aspirations at age 17, and so in this sense there is a special importance in forming aspiration about PSE relatively early in life.

Differences between males and females in aspiration formation-

From our regression results we see some differences in the channels for the formation of males' and females' aspiration levels. We also checked for statistically significant differences in coefficients of regressors for males and females in order to help shed further light on this question, as well as in terms of the eventual decision making stage. These results reinforce the observation that confidence of parents in children's pursuit of PSE is more important for females (cycle 1 aspirations and decision stage) while the effect of what friends are thinking regarding further education is more important for males (cycle 1 aspirations). Evidence on the difference in the importance of minority status is mixed (more important for males in cycle 1 but more important for females in cycle 2 – a

positive influence in both cases). The fact that the percentage of females being in school is positive and significant for males (cycle 2 aspirations), but insignificant for females, is reinforced by the fact that there is a statistically significant difference between males and females for this variable.

Conclusion

Much previous research has shown that the main determinants of post-secondary education (PSE) attendance are family income and parents' education. However, when including additional variables relating to school achievement and other personal and family characteristics, the importance of the income variable especially is reduced (e.g., see Frenette, 2007). We use the panel data set called Youth in Transition Survey Cohort A (YITS-A) to study how these determinants affect their participation outcomes with an emphasis on the evolution of children's aspirations for PSE. Conditional on parents' expectation for students' PSE participation and students' aspiration for their PSE outcome, we show that the pathways for males and females from high school to PSE differ.

At the outset (i.e., age 15) females have higher aspirations regarding future PSE attendance. We also see that the updating of PSE aspirations at the age of 17 is more likely for females than for males and this turns out to be an important predictor for students' later participation in PSE even when grade attainment is included in the regression. We tentatively suggest that more attention should be paid to children's aspirations for PSE (e.g., through high-school counselling) in

order to provide them a more equitable opportunity for PSE attendance.

We introduced an information updating process to investigate the causes of the evolution of aspirations and how aspirations then affect the decision to attend university (by age 19). The evolutionary approach seems promising as we see that PSE aspirations appear as an important explanatory variable for when students finalize their PSE participation decision even when including students' most recent grades preceding the PSE decision.

At the beginning of secondary education, both males' and females' aspiration levels are significantly related to family background. Students adjust their aspirations at age 17 to a significant extent from their previous levels as of age 15. Peer group effects (and sibling effects for females) also have important effects on aspirations and decisions about PSE. By including changes in aspiration levels between age 15 and age 17 we find a statistically significant persistence effect for aspirations for females on the actual PSE attendance decision.

We conclude a different story for females from the results of the information updating process. We find that females are more likely to form a higher aspiration than males do at the early stage of secondary education. And females form their initial aspiration based

more on family background and parental communication. In gross terms females are less likely to revise downwards their aspirations at age 17 than are males (see Tables 1 and 2). Females who keep high aspirations from the beginning stage would be more likely to pursue PSE. We suggest for females, help on schoolwork may be more effective compared with motivating their aspirations to a higher level.

For males, we suggest that help on aspirations at an early stage of their secondary education and continuing to do so may significantly improve their PSE outcomes, possibly even compared with financial help at the time of PSE participation.

By using a three-stage model of the evolution of aspirations through to decision forming for PSE, we get a more detailed picture about males' and females' aspiration formation and the contribution of aspirations to final PSE participation decisions. Although our study will help explain in a cross-sectional sense why it is that a significant gender imbalance has occurred in PSE attendance, and especially for university attendance, more research is required to understand better the longer term trend in this imbalance and how one might affect in a positive way the development of aspirations.

References

- Alexander, K. L. and M. K. A. Cook (1979), "The Motivational Relevance of Educational Plans: Questioning the Conventional Wisdom," *Social Psychology Quarterly*, vol. 42(3), pp. 202-213.
- Anders, L. and M. Admamuti-Trache, (2007), "You've Come a Long Way, Baby? Persistent Gender Inequality in University Enrolment and Completion in Canada," *Canadian Public Policy*, 33(1), pp. 93-116.
- Malele, R. P. (1966), "The Effect of the High School on Students' Aspirations," *American Journal of Sociology*, vol. 71(6), pp. 628-39.
- Burman, E. (2005), "Childhood, neo-liberalism and the feminization of Education," *Gender and Education*, vol. 17, no. 4, pp. 351-67
- Carpenter, P. G. and J. a. Fleishman (1987), "Liking Intentions and Behavior: Australian Students' College Plans and College Attendance," *American Educational Research Journal*, vol. 24 (1), pp. 79-105.
- Carter, D. F. (2001), *A Dream Deferred? Examining the Degree Aspirations of African-American and While College Students*, New York: Routledge Farmer.
- Christofides, L. N., J. Cirello, and M. Hoy, (2001), "Family Income and Post-secondary Education in Canada," *Canadian Journal of Higher Education*, 31(1), pp. 177-208.
- Christofides, L.N., M. Hoy, L. Yang, (2006a), "The Determinants of University Participation," Department of Economics, University of Guelph discussion paper no. 2006-8.
- Christofides, L.N., M. Hoy, L. Yang, (2006b), "The Gender Imbalance in Participation in Canadian Universities (1977-2003)," Department of Economics, University of Guelph discussion paper no. 2006-10.
- Coleman, J. S. (1962), *The Adolescent Society*, Free Press, New York.
- Corak, M. G. Lipps, and J. Zhao, (2003), "Family Income and Participation in Post-secondary Education," *Analytical Studies Branch Research Paper Series*, Statistics Canada, no. 210.
- Dee, T. S. (2005), "Teachers and the Gender Gaps in Student Achievement," NBER working paper No. 11660.
- Driessen, G. (2007), "The Feminization of Primary Education: Effects of Teachers' Sex on Pupil Achievement, Attitudes, and Behaviour," *Review of Education*, vol. 53, pp. 183-203.
- Finnie, R., C. Laporte, and E. Lascelles (2004), "Family Background and Access to Post-Secondary Education: What Happened in the 1990s? Statistics Canada, *Analytical Studies Research Paper Series*, No. 226.

- Finne, R., E. Lascelles, and A. Sweetman (2005), "Who Goes? The Direct and Indirect Effects of Family Background on Access to Postsecondary Education," Statistics Canada, Analytical Studies Research Paper Series, No. 237.
- Frenette, M., (2007), "Why are Youth from Lower-income Families Less Likely to Attend University? Evidence from Academic Abilities, Parental Influences, and Financial Constraints," Analytical Studies Branch Research Paper Series, Statistics Canada, no. 295.
- Frenette, M. and K. Zeman, (2007), "Why are Most University Students Women? Evidence Based on Academic Performance, Study Habits and Parental Influences," Analytical Studies Branch Research Paper Series, Statistics Canada, no. 303.
- Goldin, C, L. F. Katz, and I. Kuziemko, (2006), "The Homecoming of American College Women: The Reversal of the College gender Gap," *Journal of Economic Perspectives*, 20(4), pp. 133-56.
- Hossler, D. and F. K. Stage (1992), "Family and High School Experience Influences on the Postsecondary Education Plans of Ninth-Grade Students," *American Educational Research Journal*, vol. 29(2), pp. 425-451.
- Hossler, D., J. Schmit, and N. Vesper (1999), *Going to College: How Social, Economic, and Educational Factors Influence the Decisions Students Make*, Baltimore, MD: The Johns Hopkins University Press.
- Jacob, B.A., (2002), "Where the Males Aren't: Non-cognitive Skills, Returns to school and the Gender Gap in Higher Education," *Economics of Education Review*, 21(6), pp. 589-98.
- Johnson, D. R. and F. Rahman, (2005), "The Role of Economic Factors, Including the Level of Tuition, in Individual University Participation Decisions in Canada," *Canadian Journal of Higher Education*, 35(3), pp. 83-99.
- Knighton, T. and S. Mirza, (2002), "Postsecondary Participation: The Effects of Parents' Education and Household Income," *Education Quarterly Review*, 8(3), pp. 25-32.
- Lakshmanan, A. (2004), "A Longitudinal Study of Adolescent Educational Aspirations and Their Relationship to College Choice Using Hierarchical Linear Modeling and Group-Based Mixture Modeling," PhD dissertation, Louisiana State University.
- Lambert, M., K. Zeman, M. Allen, and P. Bussière, (2004), "Who Pursues Postsecondary Education, Who Leaves and Why: Results from the Youth in Transition Survey," Ottawa: Statistics Canada, 81-595-MIE-No.026.
- Marini, M. M., and E. Greenberger (1978), "Sex Differences in Educational Aspirations and Expectations," *American Educational Research Journal*, vol. 15(1), pp. 211-30.
- Mueller, R. E., (2007), "Access and Persistence of Students from Low-Income Backgrounds in Canadian Post-secondary Education: A Review of the Literature," working paper version 1.1.
- A. Pagan, (1984), "Econometric Issues in the Analysis of Regressions with Generated Regressors," *International Economic Review*, 25, pp. 221-247.

Parish, R. (1979), *Survey of Educational Goals: Ocean County High School Juniors and Seniors*, Tom River, NJ: Ocean County College.

Plug, E., and W. Vijverberg, (2003), "Schooling, Family Background and Adoption: Is it Nature or is it Nurture?" *Journal of Political Economy*, 111(3), pp. 611-41.

Rothstein, J. (2004), "College Performance Predictions and the SAT," *Journal of Econometrics*, 121(1-2), pp. 297-317.

Stage, F. K. and D. Hossler (1989), "Differences in Family Influences on College Attendance Plans for Male and Female Ninth Graders," *Research in Higher Education*, vol. 30(3), pp. 301-14.

Turner, R. H. (1964), *The Social Context of Ambition*, Free Press, New York.

Appendix

Appendix A. Variable Descriptions and Detailed Regression Results

The names of variables consist of two parts separated by an underscore. The first part denotes the characteristics of school, students, peers or parents. And the second part denotes the number of the cycle. For example, we use “_c1” to indicate that the information is collected in Cycle 1. Some information is only available in the first cycle, we omit the second part of the variable name to make it simple and clear.

Dependent Variable

“out_c1” is students’ aspiration for PSE in the first Cycle. We set the aspiration level of university as “1”, college and no PSE as “0”. Similarly “out_c2” is students’ aspiration for PSE in the second cycle and “out_c3” is students’ PSE participation outcomes in the third cycle.

Independent Variables

School Characteristics

school size: denotes school size.

percent females: denotes percentage of females in school.

hours in school: denotes total hours spent at school per year.

hi quality Eng: denotes proportion of highly educated teachers for English courses.

hi quality math: denotes proportion of highly educated teachers for math courses.

hi quality science: denotes proportion of highly educated teachers for science courses.

gov indep private: denotes government-independent private school which is a school managed by a non-governmental organization (e.g., a church, a trade union, or a business enterprise) or has a board consisting mostly of members not selected by a public agency and the school receives less than 50 percent of core funding from the government.

gov dep private: denotes government-dependent private school which is the same as above except that it receives more than 50 percent of core funding from the government.

Peer Effects

complete HS imp: denotes most of friends think completing high school is very important .

skip classes: denotes most of friends skip classes once a week or more.

dropped out: denotes most of friends have dropped out of high school without graduating.

plans for PSE: denotes most of friends are planning to further their education or training after leaving high school.

cause trouble: denotes most of friends have a reputation for causing trouble.

smoke: denotes most of friends smoke cigarettes.

ok to work hard: denotes most of friends think it's okay to work hard at school.

have a job: denotes most of friends work for an employer or at odd jobs such as babysitting.

Family Characteristics (Minority/Immigrant/Income/Etc.)

For the indicator of minority, we have “minority” which is self-explanatory.

father immigrant: denotes if father has ever been a landed immigrant to Canada.

mother immigrant: denotes if mother has ever been a landed immigrant to Canada.

income and income²: denote the level of (family) equivalent income and its squared level.

mothers share income: denotes the income share of mother in a family.

parental saving: denotes whether parents had some plan to save for their child's PSE.

sib dropped out: denotes whether any of the student's siblings has ever dropped out of high school.

non-birth parent: denotes that there is at least one non-birth parent at home.

Family Characteristics (Parental Education)

“father college” and “father university” stand for father's education level as college and university (“mother college” and “mother university” stand for mother's education level as college and university).

Parental Expectations (Etc.)

expect PSE for child: is the indicator for whether parents expected their child to obtain some PSE.

PSE important: without a cycle designation indicates that parents thought it is important for their child to obtain some PSE (i.e., the parents actual view of PSE for their children rather than how important the child thought such aspiration is).

help with homework: denotes whether parents often help students on their schoolwork.

confident in child's PSE: denotes whether parents were confident in their child about pursuing PSE.

Child's View of Parents Expectations

“father_view_imp_c1” and “mother_view_imp_c1” are the indicators for whether the student thought in Cycle 1 that his/her father and mother, respectively, considered it important that the student will eventually obtain some PSE. For the same information considered in Cycle 2, we append _c2.

Region and Rural Area

We use Ontario as the base province. We have dropped observations surveyed in Quebec due to the different education system there since the CGEP system delays entry to university compared to the rest of the country.

rural: denotes that residence is in a rural area.

Initial (fitted) Aspirations and Change

We use “asp_c1” to denote predicted level of aspiration of Cycle 1 and “asp_c2” for that in Cycle 2. “asp_up” denotes that a student upgrades his/her aspiration in Cycle 2. “asp_down” denote that a student downgrades his/her aspiration in Cycle 2.

Grades of Grade 12

For grade levels we have four subjects: “overall” for overall grade, “Eng for English courses, and “math” for mathematics courses. And we have three levels for each subject: “hi” for grades above 79 percent, “mid” for grade between 70 percent and 79 percent, and “lo” for grades below 70 percent (which is used as the base level in the regressions). Grades are self-reported.

“Natural Ability”

PISA score: denotes the PISA reading score (test taken at age 15).

Child’s Financial Preparation

self saving for PSE: denotes that students had some type of self-saving plan for their PSE.

Table A1: Predicting First Cycle's Aspiration Only Through Family Background Variables in Cycle 1

out_c1	Females	Mean	Males	Mean	z-statistics
School Characteristics					
school size	3.21E-05	9.60E+02	1.03E-05	9.74E+02	7.00E-01
percent females	-1.84E-01*	4.96E-01	1.81E-01	4.83E-01	-1.60E+00
hours in school	-4.57E-05	9.63E+02	-3.03E-05	9.65E+02	-4.84E-01
hi quality Eng	7.34E-02*	7.84E-01	8.38E-02	7.89E-01	2.44E-01
hi quality math	-3.76E-02	7.16E-01	3.80E-02	7.18E-01	-1.17E+00
hi quality science	-2.28E-02	8.35E-01	-1.03E-01**	8.36E-01	9.37E-01
gov indep private	7.14E-02	2.26E-02	1.36E-01*	3.20E-02	-2.42E-01
gov dep private	2.55E-03	1.32E-02	-1.15E-03	1.94E-02	4.56E-02
Peer Effects					
complete HS imp	3.71E-02	8.89E-01	-4.36E-03	8.05E-01	9.64E-01
skip classes	-2.33E-03	1.04E-01	-8.66E-03	1.49E-01	9.15E-02
dropped out	-2.24E-02	1.47E-02	-1.31E-01	2.14E-02	6.23E-01
plans for PSE	4.60E-02	8.37E-01	6.56E-02**	7.43E-01	-5.44E-02
cause trouble	6.00E-02*	4.88E-02	-7.18E-03	1.28E-01	1.53E+00
smoke	-5.49E-02**	2.24E-01	-8.26E-02**	2.01E-01	1.40E-01
ok to work hard	3.53E-02	8.04E-01	9.33E-02***	6.72E-01	-1.01E+00
have a job	3.22E-02	6.58E-01	-3.44E-04	4.33E-01	1.20E+00
Family Characteristics					
minority	-5.23E-03	1.46E-01	1.50E-01***	1.27E-01	-2.13E+00**
father immigrant	3.89E-03	2.37E-01	-1.74E-02	2.15E-01	3.44E-01
mother immigrant	6.89E-02*	2.15E-01	-9.68E-03	2.04E-01	1.64E+00
income	1.82E-06**	3.51E+04	4.76E-07	3.58E+04	1.46E+00
income ²	-2.97E-12	1.90E+09	2.28E-12	2.00E+09	-1.38E+00
mothers share income	5.57E-02	4.35E-01	9.76E-02*	4.21E-01	-2.53E-01
parental saving	2.58E-02	7.10E-01	2.12E-02	7.11E-01	3.88E-01
sib dropped out	-2.51E-02	8.31E-02	2.10E-02	7.22E-02	-8.40E-01
non-birth parent	1.71E-02	2.57E-01	-3.65E-02	2.35E-01	1.20E+00
father college	4.22E-02**	2.75E-01	3.54E-02	3.01E-01	6.39E-01
father university	8.20E-02***	2.38E-01	1.88E-01***	2.37E-01	-1.33E+00
mother college	-4.93E-03	3.54E-01	4.55E-02*	3.48E-01	-1.35E+00
mother university	6.59E-02**	2.21E-01	1.12E-01***	2.32E-01	-2.77E-01
Parental Expectations (etc.)					
expect PSE for child	2.64E-01***	7.16E-01	3.30E-01***	5.97E-01	-2.00E-01
PSE important	1.02E-01	9.86E-01	1.75E-01	9.71E-01	-2.69E-01
help with homework	-2.25E-02	9.29E-01	-4.16E-02	9.22E-01	1.42E-01
confident in child's PSE	1.43E-01***	9.24E-01	7.14E-02*	8.84E-01	1.67E+00*
Child's View of Parents Expectations					
fath_view_imp_c1	3.30E-02	8.28E-01	7.25E-02	8.15E-01	-3.59E-01
moth_view_imp_c1	1.31E-01***	8.79E-01	1.54E-01***	8.49E-01	1.82E-01
Region and Rural Area					
Atlantic	7.76E-02***	1.15E-01	1.16E-01***	1.10E-01	2.88E-02
Man or Sask	5.50E-02**	1.07E-01	1.03E-01***	1.03E-01	-5.33E-01
Alberta	1.86E-02	1.45E-01	6.43E-02**	1.47E-01	-8.24E-01
BC	6.57E-03	1.32E-01	1.85E-02	1.47E-01	-1.75E-01
rural	1.65E-02	2.65E-01	-4.42E-02	2.49E-01	1.59E+00
Observations	4504		4355		
Log pseudo-likelihood	-1764.07		-2027.41		

* significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent,

Table A2: Updated Aspiration Based on Predicted Aspiration of Cycle 1 and Family Background Variables in Cycle 2

out_c2	Females	Mean	Males	Mean	z-statistics
Initial (fitted) Aspirations aspirations_c1	3.75E-01***	7.00E-01	3.86E-01***	6.41E-01	5.38E-01
School Characteristics					
school size	-2.69E-06	9.52E+02	5.03E-05	9.76E+02	-1.09E+00
percent females	-1.74E-01	4.96E-01	4.91E-01**	4.84E-01	-2.64E+00***
hours in school	-2.87E-05	9.61E+02	-2.09E-05	9.63E+02	-2.37E-01
hi quality Eng	3.93E-02	7.85E-01	2.85E-02	7.89E-01	2.75E-01
hi quality math	-4.63E-02	7.20E-01	1.13E-02	7.15E-01	-9.53E-01
hi quality science	3.52E-02	8.37E-01	-5.99E-02	8.37E-01	1.37E+00
gov indep private	4.58E-02	2.06E-02	2.24E-01***	2.86E-02	-1.65E+00
gov dep private	1.45E-02	1.34E-02	2.74E-02	1.92E-02	-7.07E-02
Peer Effects					
skip classes	3.68E-02	1.02E-01	2.84E-03	1.57E-01	8.50E-01
dropped out	-1.33E-01*	1.47E-02	-3.15E-02	2.46E-02	-1.03E+00
cause trouble	3.07E-02	4.85E-02	-3.24E-02	1.34E-01	1.15E+00
smoke	-6.27E-02**	2.21E-01	-4.22E-02	2.07E-01	-7.77E-01
ok to work hard	4.02E-03	7.91E-01	6.28E-02**	6.60E-01	-1.27E+00
have a job	-4.73E-03	6.54E-01	8.73E-03	4.28E-01	-3.99E-01
complete HS imp_c2	3.99E-02	8.73E-01	5.51E-03	8.49E-01	7.77E-01
plans for PSE_c2	2.87E-02	8.55E-01	1.39E-01***	8.05E-01	-1.92E+00*
Family Characteristics					
minority	1.03E-01**	1.42E-01	-1.29E-03	1.28E-01	1.79E+00*
father immigrant	2.72E-02	2.22E-01	9.59E-02**	2.11E-01	-8.97E-01
mother immigrant	-9.03E-03	2.01E-01	-8.04E-03	1.99E-01	-5.71E-02
income	-5.12E-07	3.48E+04	-1.06E-07	3.56E+04	-3.78E-01
income ²	1.63E-12	1.80E+09	4.91E-12	2.00E+09	-4.53E-01
mothers share income	-2.60E-02	4.40E-01	-2.34E-02	4.21E-01	-1.47E-01
parental saving	5.39E-02**	7.03E-01	1.55E-02	7.03E-01	1.41E+00
sib dropped out	-7.68E-02**	8.83E-02	3.83E-02	7.38E-02	-2.14E+00**
non-birth parent	-3.44E-02	2.67E-01	5.31E-02	2.39E-01	-2.01E+00**
father college	-5.14E-03	2.75E-01	4.43E-02	2.93E-01	-1.23E+00
father university	6.79E-02*	2.29E-01	1.38E-01***	2.30E-01	-7.41E-01
mother college	3.59E-02*	3.58E-01	1.16E-02	3.47E-01	9.18E-01
mother university	8.52E-02***	2.10E-01	6.02E-02	2.21E-01	1.01E+00
Parental Expectations (etc.)					
expect PSE for child	1.10E-01**	6.98E-01	2.00E-01***	5.83E-01	-7.66E-01
PSE important	-7.49E-02	9.85E-01	1.46E-01*	9.70E-01	-2.17E+00**
help with homework	8.65E-02**	9.26E-01	7.73E-02	9.23E-01	4.27E-01
confident in child's PSE	8.76E-02**	9.14E-01	1.26E-01***	8.80E-01	-2.56E-01
Child's View of Parents Expectations					
parent_view_imp_c2	1.22E-01***	9.40E-01	1.15E-01***	9.01E-01	4.93E-01
Region and Rural Area					
Atlantic	3.94E-02	1.15E-01	7.59E-02**	1.09E-01	-4.76E-01
Man or Sask	3.19E-02	1.09E-01	9.50E-02***	1.07E-01	-1.10E+00
Alberta	-3.47E-02	1.46E-01	4.59E-02	1.46E-01	-1.85E+00*
BC	6.80E-02**	1.34E-01	1.47E-01***	1.49E-01	-1.06E+00
rural	-1.18E-02	2.70E-01	-1.50E-02	2.57E-01	-1.51E-02
Observations	4638		4637		
Log pseudo-likelihood	-1986.93		-2293.23		

* significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent,

Table A3. Final Participation Outcome Regressed on Predicted Aspiration of Cycle 2, Grade Levels in Last Year of High School and Family Background Variables in Cycle 3

out_c3	Females	Mean	Males	Mean	z-statistics
Initial (fitted) Aspirations and Change					
aspirations_c2	7.90E-01***	6.90E-01	3.96E-01**	6.28E-01	7.38E-01
asp_up	-3.82E-01	2.29E-02	1.50E-01	2.31E-02	-1.14E+00
asp_down	9.35E-01**	4.34E-02	-4.19E-01	5.22E-02	2.93E+00***
Grades of Grade 12					
overall_hi_c3	3.03E-01***	4.49E-01	2.97E-01***	3.14E-01	-7.17E-01
overall_mid_c3	6.18E-02	3.28E-01	7.98E-02***	3.54E-01	-7.10E-01
Eng_hi_c3	4.05E-02	4.94E-01	6.98E-02**	3.09E-01	-8.04E-01
Eng_mid_c3	7.07E-02*	2.66E-01	4.15E-02	3.42E-01	3.07E-01
math_hi_c3	3.20E-02	3.14E-01	7.30E-02**	2.89E-01	-1.14E+00
math_mid_c3	-4.45E-02	2.70E-01	-3.04E-02	2.75E-01	-7.82E-02
“Natural Ability” (PISA score)	1.90E-03***	5.53E+02	1.25E-03***	5.24E+02	9.69E-01
School Characteristics					
school size	7.22E-06	9.63E+02	2.59E-06	9.74E+02	6.94E-02
percent females	-5.04E-02	4.96E-01	-3.95E-02	4.84E-01	5.08E-03
hours in school	4.05E-05	9.63E+02	4.83E-05	9.63E+02	-2.96E-01
hi quality Eng	-2.77E-02	7.88E-01	-1.37E-02	7.88E-01	-1.01E-01
hi quality math	-1.19E-02	7.17E-01	7.38E-04	7.14E-01	-1.45E-01
hi quality science	-6.96E-02	8.36E-01	-7.09E-03	8.35E-01	-6.45E-01
gov indep private	9.76E-02	2.05E-02	1.16E-01*	3.20E-02	-3.46E-01
gov dep private	-1.25E-01	1.38E-02	9.22E-03	2.04E-02	-1.17E+00
Peer Effects					
skip classes	2.41E-04	9.61E-02	5.15E-02	1.51E-01	-9.79E-01
dropped out	-6.19E-02	1.39E-02	8.92E-02	2.35E-02	-1.01E+00
cause trouble	6.46E-02	4.79E-02	7.09E-03	1.31E-01	6.23E-01
smoke	-6.46E-02*	2.11E-01	-1.01E-01***	1.87E-01	1.42E+00
ok to work hard	-3.15E-02	7.98E-01	-1.74E-02	6.71E-01	-1.54E-01
have a job	-2.95E-02	6.49E-01	1.82E-02	4.28E-01	-1.33E+00
complete HS imp_c2	8.08E-02	8.74E-01	-2.60E-03	8.42E-01	1.28E+00
plans for PSE_c2	2.05E-02	8.54E-01	8.18E-03	8.00E-01	1.17E-01
Family Characteristics					
minority	-1.28E-02	1.41E-01	7.66E-02*	1.31E-01	-1.36E+00
father immigrant	3.97E-02	2.25E-01	-3.99E-02	2.13E-01	1.20E+00
mother immigrant	-8.96E-03	2.03E-01	3.18E-02	2.01E-01	-6.92E-01
income	8.82E-07	3.52E+04	-7.12E-07	3.59E+04	1.19E+00
income ²	-4.06E-12	1.90E+09	6.22E-12	2.00E+09	-2.09E+00**
mothers share income	7.20E-02	4.42E-01	1.32E-01***	4.22E-01	-1.21E+00
parental saving	2.59E-02	7.10E-01	5.19E-02**	7.11E-01	-1.01E+00
sib dropped out	-1.15E-01**	8.37E-02	-4.42E-05	6.96E-02	-1.39E+00
non-birth parent	-1.04E-01**	2.64E-01	-1.08E-01***	2.36E-01	7.94E-01
father college	-1.07E-03	2.70E-01	3.23E-02	3.01E-01	-8.50E-01
father university	6.05E-02	2.34E-01	7.36E-02*	2.38E-01	-4.35E-01
mother college	-1.61E-02	3.67E-01	2.98E-02	3.54E-01	-1.25E+00
mother university	8.16E-02*	2.13E-01	8.65E-02**	2.33E-01	-4.41E-01
Parental Expectations (etc.)					
expect PSE for child	-6.85E-03	7.11E-01	8.14E-02	6.01E-01	-1.01E+00
PSE important	4.53E-02	9.87E-01	9.91E-02	9.78E-01	-6.68E-01
help with homework	-4.57E-02	9.31E-01	1.92E-02	9.24E-01	-9.18E-01
confident in child's PSE	1.77E-01***	9.23E-01	1.42E-02	8.93E-01	1.95E+00*

out_c3	Females	Mean	Males	Mean	z-statistics
Child's Financial Preparation					
self saving for PSE	5.94E-02**	5.93E-01	4.22E-02**	6.05E-01	8.81E-02
Region and Rural Area					
Atlantic	1.03E-01**	1.19E-01	1.96E-01***	1.13E-01	-2.08E+00**
Man or Sask	3.51E-03	1.06E-01	9.58E-02***	1.06E-01	-1.77E+00*
Alberta	-8.91E-02**	1.32E-01	1.81E-02	1.35E-01	-1.93E+00*
BC	-6.04E-02	1.39E-01	-7.63E-02*	1.53E-01	6.06E-01
rural	8.15E-03	2.63E-01	-3.62E-02	2.45E-01	1.15E+00
Observations	4695		4501		
Log pseudo-likelihood	-2128.29		-1682.36		

*significant at 10 percent, ** significant at 5 percent, *** significant at 1 percent,