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Interprovincial variation in university tuition and the decision to continue to attend university: Evidence from Youth in Transition Survey in Canada

David Johnson
Professor of Economics
Wilfrid Laurier University
Waterloo Ontario
Canada N2L 3C51.

Canada-U.S. Fulbright Visiting Research Chair
University of California, Santa Barbara January-June 2008

djohnson@wlu.ca

Abstract: The Youth-in-Transition Survey allows identification of a series of decision points where youth already in university decide whether to continue in university or exit without graduating. This is a specific aspect of university participation. There is little evidence that either a higher level of tuition or a change in tuition alters the probability that a Canadian youth, once in university, leaves university without obtaining their degree. Thus any policy effort around university persistence for youth should focus on non-tuition factors and debate around the appropriate level of tuition should not focus on persistence.

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1. Introduction

In most countries, tuition fees at public universities are significantly less than the cost of attending university and the taxpayer heavily subsidizes university attendance. A significant policy debate occurs between those who favour a lower tuition fee and larger subsidy, expected to encourage participation and completion, and those who favour a higher tuition fee, usually for a wider variety of reasons. Every change in tuition fees is controversial. Increases in fees are accompanied by claims that students will be forced to leave university or that many students will choose not to attend due to higher fees. There is a great deal of research on the effects of variation in tuition fees on overall participation at university. This paper makes a specific contribution by measuring the effect of variation in tuition fees, whether levels or changes, on the decision by a student already in university to progress into their next year of study. If the student does not progress, he or she leaves the university without a degree. In Canada there is large variation in the level of tuition fees across provinces. There is very little evidence from this paper that a higher level of tuition fees induces students to leave without a degree. This is partly consistent with the standard human capital model of the decision to attend university. The student who enters university understands the need to pay tuition over the four years and, even though the level of tuition is higher in one province than in another, once the decision is made to attend university, choices about persistence may not, in the absence of credit constraints, be affected by the level of tuition. It is more surprising that there is little evidence that increases in tuition fees, even quite large increases and decreases, are unrelated to decisions to continue at university. If these changes in tuition were unexpected, we might have thought some students at the margin would decide to

leave university because the perceived expected net benefit of attendance swung from positive to negative when tuition increased. Even if this were not the case, if large numbers of students faced binding credit constraints then an increase in tuition fees might also prevent some students from continuing and reducing tuition would relax credit constraints. There are several possible policy interpretations of the result that departures from university did not increase with increased tuition fees. First, it may be that tuition fees were initially set so low that the net benefit of attendance is so large that the observed increases were not large enough to move any student from attendance to non-attendance. Second, it may be that there are relatively few credit constraints that prevent students from continuing when tuitions rise. Either the government student grant and loan programs function well or students are able to obtain the additional funds needed from other sources, work, parents or non-government loans. The bottom line: substantial increases in tuition fees were not accompanied by increases in drop-out rates for the respondents to the Youth-in-Transition Survey.¹

The result that neither the level of tuition nor increases in tuition change persistence rates means that other results in the literature that do find a small impact of higher tuition on overall university participation need further investigation. In particular there are two remaining pieces of analysis. First, in Johnson (2007) the technique used in this paper is used to look at the transition from completing high school to university and the role of tuition in that decision. The evidence again shows that, for the period of the YITS sample, even though there were very large differences in the level of tuition fees across Canadian provinces, variation in tuition is not the central issue in variation in

¹ The results do not then apply to adult students at university who are not included in the Youth-in-Transition Survey.

access to university from high school. Second, it may be important to understand how students (and their families) university pay the increased tuition. The financial data in the YITS survey are not organized in a way that makes this task straightforward. That task requires a different kind of data where the contributions of student earnings, student families, loans, bursaries and scholarships add to total student resources in each academic year. Such data is being created.²

It is important to stress that simply finding that changes in tuition does or does not change persistence behaviour does not mean that lower tuition (or higher tuition) is necessarily a good or bad policy. The results here say nothing about whether tuition in any Canadian provinces is at the optimum level. The choice of the appropriate level of tuition is much more complex and depends on the sharing of private and public benefits of a university education. If access is affected by tuition, then tuition policy relates to issues of social mobility. Even if access and completion is unrelated to tuition, there are equity issues related to tuition policy because university use is related to current and future family income. None of these issues are addressed in this paper. The literature to which this paper is a contribution has simply looked at the relationship between participation and tuition and has not, in general, asked about the optimality of tuition levels across Canadian provinces or American states.

The American literature on postsecondary participation and tuition fees is reviewed in Leslie and Brinkman (1988), Heller (1997) and updated in Heller (1999). Persistence is implicit in the measures of participation used, measures like the proportion of persons within a certain age bracket at university (or with university degrees). If more

² The Millennium Scholarship Foundation in Canada is engaged in the creation of a longitudinal survey where the financial data are going to identify more precisely the sources of funding for post-secondary education.

students were to persist, then a larger proportion would be enrolled and a larger proportion would obtain degrees. The large body of Canadian evidence on tuition and participation is reviewed in Looker and Lowe (2001) as well as Junor and Usher (2002, 2004). In many ways the Canadian studies are more useful than the American studies since the role of private universities in Canada is very small and in most provinces, tuition fees have been set as a provincial policy at the same level across all universities within a province. In Prince Edward Island and Newfoundland, two very small provinces, there is only one university. There has been a great deal of variation across Canadian provinces in the level and changes in tuition fees. A variety of studies relate this variation in tuition fees across provinces and measure the effect of tuition fee variation on overall participation rates within a jurisdiction at a point in time. These studies do not usually produce the clear result that participation falls in jurisdictions with higher tuition fees. More recent studies of the Canadian data make use of individual data on university participation and can generate a result that higher tuition fees do reduce participation by a very small amount in well-specified models. Neill (2006) and Johnson and Rahman (2005) make use of the individual data from the Labour Force Survey (the LFS) from 1976 onwards. Although the main purpose of the LFS is measurement of unemployment and participation rates, there are questions about post-secondary and university participation as well as the respondent's level of education. Both Neill (2006) and Johnson and Rahman (2005) find a statistically negative response of participation at university to an increase in tuition. Neither effect is large in an economic sense, the participation rate falls between 1 and 3 percentage points per 1000 dollar (1992 dollars) increase in tuition. Johnson and Rahman find this negative effect on participation relative

to positive province-specific time trends in university participation between 1976 and 2003. Neill includes Canada-wide year fixed effects as well as province fixed effects in obtaining her estimates of the negative effect of higher tuition levels on enrolment probabilities. One limitation of the LFS is that very little information is available on family background. The education level of the parent is known for about 60% of Neill's LFS sample.³ Coelli (2004) makes some progress around this limitation by using individual responses concerning post-secondary choices in the Survey of Labour Income Dynamics (SLID), the Canadian equivalent of the PSID. He finds that access by lower income families is reduced when tuition is increased. The low-income youth in SLID is very small. The studies cited above consider university participation rather than specifically university persistence.

There is a smaller literature studying the university persistence decision. Reviews of both the American and the more limited Canadian literature are found in Grayson and Grayson (2003), McIlroy (2005) and Mueller (2007). The data studied are usually administrative records of specific post-secondary institutions. It is clear that the most common dropout point is the end of year one. Students do not continue at university for a wide variety of reasons. Students continue at widely differing rates across institutions and, in America, across different types of institutions. There is a strong correlation between family background and university completion. Most of the literature is descriptive and the estimated models focus on sociological rather than economic variables. Marks (2007) concludes, in a study very similar to the study in this paper, that once a student enters the Australian university system, student socioeconomic

³ The LFS comes in two versions, a public use file used by Johnson and Rahman where there are no links to parental education, and a master file used by Neill where links to parental education exist for a subset of the file.

background play little role in completion. This is indirect evidence that financial factors are not central in persistence. In Australia tuition is set at the national level. Stinebricker and Stinebricker (2007) use direct survey evidence for a sample from Berea College to conclude that financial issues are not central in the persistence decision.

My paper is not the first study to use the YITS or similar data to consider persistence issues in Canada. Barr-Telford et.al (2003) use data from a survey similar to YITS, the Postsecondary Education Participation Survey (PEPS). The difference between PEPS and YITS is that PEPS is a single sample of 5000 persons across Canada aged 17-24 in 2002. Persistence is inferred from the respondent's educational history. Barr-Telford et.al (2003) report that of the PEPS respondents who started post-secondary education in September 2000, 75% were still in post-secondary education 18 months later. Of the remaining 25%, 7% had graduated and 16% left without graduating. Of the 16% that had left, 29% reported they had left for financial reasons. Five papers to date, Bowlby and McMullen (2002); Lambert et. al (2004); Shaienks et. al (2006); Day (2007); and Finnie and Qiu (2007) use YITS to consider various aspects of persistence. The first three papers do not estimate a model of persistence, they describe the data. There is a general sense that the same social factors that are associated with post-secondary access decision are those associated with post-secondary dropout decision. Women are more likely to attend and persist at post-secondary education. Respondents from families with both parents present during high school and with at least one parent with a high degree of education are more likely to attend and persist at post-secondary education. Students with better grades and with a better attitude to post-secondary education are more likely to enter and to persist. YITS does ask if respondents perceive a

financial barrier to post-secondary participation. For the persons who leave post-secondary education, 34% report financial barriers to continuing. For the persons who stay in post-secondary education, 29% report a financial barrier. Day (2007) limits her study of persistence in YITS to students who enroll in a post-secondary program in September 1999 and then measures the effect of financial aid variables on the status of these students as of December 31, 2001. Leavers are less likely to have received financial aid. Finnie and Qiu (2007) take a very long view of persistence in YITS using YITS-B respondent's activity from 1996 to December 31, 2003. They focus on the role of family variables and variation in drop-out rates by age of enrolment in a post-secondary program. Students who are older when starting a program are more likely to drop out. All studies find there is substantial variation across provinces in the rate at which respondents leave post-secondary education after it has commenced. The contribution of this paper is to link the level and changes in tuition (as well as changes in the tax treatment of tuition) in the sample years across Canadian provinces to the respondent record and then to ask whether the level or change in tuition and tax treatment has, given the other observable characteristics of the respondent, any impact on the decision to persist at university.

The paper proceeds as follows. The extraction of measures of persistence and stage of education at university from the Youth-in-Transition survey is described in the next section. In the third section there is a discussion of the social and economic variables that can be constructed, both from YITS and from other sources. I then estimate models of the persistence decision where the effect of either the level of tuition

or the change in tuition on persistence is measured. There is a brief conclusion and a discussion of extensions to the paper.

2. Establishing the persistence sample

The responses to the Youth-in-Transition Survey (YITS) are used to create a sample of specific periods of time, defined between academic years, where young person currently enrolled in a bachelor's program makes a choice to either continue in university for another year or to stop their studies at the end of the first year in the pair of academic years at a university in that province without completing their program of studies. YITS is a Canadian longitudinal survey with two groups of youth: Cohort A aged 15 on December 31, 1999 (26,055 participants as of December 31, 1999) and Cohort B aged 18, 19 or 20 on December 31, 1999 (22,378 participants as of December 31, 1999). YITS is a complex survey where each respondent represents a component of the entire population of Canada in the age categories above. Young persons in small provinces are enormously over-sampled to allow statistical work to be undertaken at the provincial as well as the national level. Responses to interviews undertaken between January and June 2000 describe the respondent's background and family as well as their educational and other activities during the year 1999 and earlier in their lives. Cycle 2 re-interviews describing activity during 2000 and 2001 of 18,779 youth in Cohort B and 24,390 youth in Cohort A took place between January and June 2002. Cycle 3 re-interviews describing activity during 2002 and 2003 of 14,817 youth from Cohort B and 20,794 youth from Cohort A took place between January and June 2004. Table A-1 and A-2 compare the characteristics of the persons in each cycle of YITS-A and YITS-B. At least in a visual test, the only obvious change in the composition of the sample in YITS for either cohort

is that persons with a parent with some university education are slightly more likely to stay in the sample than a person where neither parent has graduated from high school. The weights on observations in Cycle 2 and Cycle 3 are adjusted so that at each cycle, the observations continue to represent the universe of Canadian youth in the relevant age group. To remind the reader, the relevant universe represented by YITS A and B together is slightly odd; it is the population of youth in Canada aged 15, 18, 19 or 20 on December 31, 1999.

Persistence and transition issues at university do not take usually take place over calendar years. The most common entering month for a program is September and the exiting months, with or without completion, are heavily concentrated in April and May.⁴ The changes in tuition occur “between” academic years, that is, tuition is increased or decreased in various provinces to coincide with the beginning of the academic year in September of each calendar year. Thus the activities reported by YITS respondents are sorted into activities by academic year, province and bachelor’s program to investigate the role of tuition in persistence issues at universities. The spring and summer between two academic years is treated as a decision point where one piece of information is the level of tuition in the second academic year of each pair. YITS are presents two types of information about a young person’s post-secondary educational path. In one method of reporting, each person reports the start and end of an educational program where a program is defined by the type of qualification being obtained. Obtaining a bachelors degree is the most common program choice at the university level. This is the

⁴ Universities in Canada typically operate with three terms: Fall- September to December; Winter - January to April; and Spring - May to August; with very few classes offered in the Spring Term.

information used in this study.⁵ Here a respondent is a persister if, when enrolled in a bachelor's program in a province he or she stays stay for an additional academic year toward obtaining the bachelor's degree. If they leaver without obtaining a degree, they are a leaver.

Because YITS-B and YITS-A present information on different age groups, the number and structure of observations of persistence decisions between a specific pair of academic years is quite different across Cohort A and Cohort B. In the Cohort B sample, the respondents were 18, 19 or 20 as of December 31, 1999 and thus many, but not all, of the respondents are already in post-secondary education or a bachelor's program at that time. Some complete university degrees over the survey period. In the Cohort A sample, the typical respondent is in Grade 10 on December 31, 1999. Table A-3 illustrates the "normal" path of a respondent through secondary school and, if they go, university. If a Grade 10 respondent progresses through secondary school at the "normal" pace and then moves directly into post-secondary education, then Grade 12 would be completed in June 2001 and the student would enter post-secondary education in September 2001. This is the "normal" path for students in eight of ten Canadian provinces at this time. The two provinces where this was not the case are the two largest provinces, Ontario and Quebec. In Ontario a 1999-00 Grade 10 student completing Grade 13 in Ontario in 2002-03 would enter university in 2003-04 and not appear in the YITS-A university transition sample period. Some Ontario students, even in the Grade 13 period in Ontario that formally

⁵ It is also possible in the data to work with a series of start dates and end dates at specific post-secondary institutions, colleges and universities. In earlier versions of this study, all results also used definitions of persistence defined by institutions rather than program. No results were affected by this choice.

ended with the 2002-03 academic year, were able to complete high school in 4 years.⁶ In Quebec, students finish secondary school at the end of Grade 11 and then a university-bound student attends a college (a CEGEP in the French acronym). If a student in Quebec is in the CEGEP university-bound stream,, this is two years in length. A Quebec 1999-00 Grade 10 student would not enter university until 2003-04. Thus YITS-A provides very few university students from the two largest provinces and most of the YITS-A university transitions are observed from first year to second year in the other eight provinces.⁷

Pairs of academic years listed in Table 1 (and Table A-3) define potential persistence decisions between academic years. If the two academic years fall between the start date and the end date of a program that leads to a bachelor's degree in the same province, the person is defined as a respondent who persisted through this pair of academic years. All the complications arise when a person is enrolled in the first academic year of a two-academic-year pair is not enrolled in the program through the second of the two academic years. Not all these persons are leavers, that is, are persons who departed that university without a degree. Some persons left with a degree, that is, the first academic year in each two-academic-year persistence cycle was the last year needed to complete their degree. These graduates are not making a persistence decision

⁶ In Ontario, where a last formal Grade 13 year ended in 2002-03, a considerable number of students actually stay for an additional year after Grade 12 and take further university-level courses or repeat courses already taken to raise grades. This practice of staying in secondary school for the additional year is known as the "victory lap." It is estimated (very roughly) that 30% of students in the Waterloo Region stay for the victory lap. There is no provincial data on this choice at this time. In the 2001-02 academic year, some high school students who would have finished Grade 13 in 2002-03 actually completed one year early to avoid competition for post-secondary spots in the 2002-03 group that finished high school, the "double" cohort. In provinces outside Ontario and Quebec Grade 12 students also may choose to stay for an extra year of high school.

⁷ A fourth cycle of YITS A and YITS B interviews covers the years 2003 and 2005 but the results of these interviews are not yet released. A fifth cycle of interviews covering the period 2006 and 2007 will take place after January 2008.

and are removed from the set of persons making a persistence choice. A graduate is identified in the survey. A final potential complication is obtaining a measure of university persistence that could allow for the attrition from the YITS. In YITS if a person is in all three cycles, then a complete history of program attendance can be constructed ending December 31, 2003. The last persistence pair (in the chronological sense) investigated is from the 2002-03 academic year to the 2003-04 academic year. All persons leave the survey as of December 31, 2003. The person is defined as persisting for this last pair of years if they continued in their bachelor's program into the fall term from September to December 2003 and they declare that they are a continuer in that program as of December 31, 2003. Persistence choices can be identified as early as the pair of years 1996-97 to 1997-98 and end with the pair of academic years 2002-03 and 2003-04.⁸

YITS is a complex sample where the weights attached to observations allow the observations to represent the Canadian population in the sample. At each cycle, the weights on individual responses are re-adjusted. The left-hand side of Table 1 presents counts (with percentages of the sample below) of the number of leavers and persisters between each pair of academic years studied. These observations combine respondents from YITS-A and YITS-B. These observations are then weighted with Cycle Three weights to measure the percentages of the Canadian youth population aged 15, 18,19 or

⁸ Respondents also exit YITS at the end of Cycle One on December 31, 1999 and at the end of Cycle Two on December 31, 2001. Persistence choices from 1998-99 to 1999-00 can be recorded for those who exit on December 31, 1999 using the Fall Term information from September 1999 to December 1999. Persistence choices from 2000-01 to 2001-2002 can be recorded for those who exit on December 31, 2001 using the Fall Term information from September 2001 to December 2001. This adds about 10 percent more observations of persistence but means that analysis with weights so that the sample represents the Canadian population is no longer possible. The estimates are carried out using only respondents who last all three cycles. A large proportion of results were estimated with the larger unweighted sample. There is no difference in the tuition results. There can be differences in coefficients on some of the other variables.

20 on December 31, 1999 who are attending university in the first of the pair of academic years listed and who then face a persistence decision between that pair of academic years. These values are found on the right-hand side of Table 1. The first transition studied is from 1996-97 to 1997-98. The last transition studied is from 2002-03 to 2003-04. All samples are quite large except for the first pair of years (1996-97 to 1997-98) where there are only slightly more than 100 persons. This is not surprising, the persons in YITS-A are 12 years old and the oldest person in YITS-B is 17 years old on December 31, 1996. There are not many university students that age in Canada. The rate of leaving for the population is 1.0%, the rate of leaving in the sample is 7.7%. This is useful example of the role of weights in the analysis. If you were from the universe of Canadian persons aged 15, 18, 19 or 20 on December 31, 1999 and you were enrolled in university in 1996-97, the probability that you continued into university in 1997-98 was 99 percent.⁹ The difference between the two percentages reflects that fact that persistence rates are a lot larger for persisting respondents representing the larger provincial units. In the remainder of the table, the persistence rates are much more similar but there are not identical across the pairs of academic years considered. The pairs of academic years contain specific mixtures of students at different stages of post-secondary education.

Table 1 also presents a measure of the stage of post-secondary education. Measuring the stage of post-secondary education was not straightforward. The ideal variable would identify respondents in the early stage of a program where dropping out is more likely and less costly and respondents in a stage of the program where the respondent is close to degree completion. YITS does not directly identify the respondent's year of a bachelor's program. In any case, such a response may not be that

⁹ This is clearly not a very interesting number since there are so few university students of this age.

useful. In Canada some bachelor's programs in some provinces are three years in length thus a student in year two is one year from completion. Some bachelor's programs are 4 years in length so a year two student is two years from completion under "normal" conditions. Many students have slower than expected progress through what is normally a four year program so that in year three they may be one or two years from graduation. The variables constructed from YITS counted the number of academic years of a respondent after the last academic year in which the respondent was a full time high school student. In Quebec the "end year" of high school was adjusted so it would reflect year 2 of CEGEP. Thus each academic year for each respondent was tagged as 1,2,3,4,5,6 and 7 years after last high school attendance. If the respondent was in year one after high school then a dummy variable for Year One was equal to one, this was the first academic year after full time high school enrolment. Similar indicator variables (Year Two and Year Three) were created for the second academic year after graduation and the third academic year after high school graduation.¹⁰ Table 1 shows the percentages of the sample and of the Canadian population of 15, 18, 19 and 20 year olds as of December 31, 1999 in university who were in university in the first year after last high school enrolment.¹¹ Table 1 tells us that the mix of students in pairs of academic years is different at different times. It is not surprising that the first pair of academic years with the very small group of persons aged 17 at university is dominated by Year One students.

¹⁰ Two other variables were also used in the analysis. A dummy variable was created if the academic year in the first of the pair of academic years was the first year of the bachelor's program. A dummy variable was created if the persistence decision observed in one pair had been immediately preceded in time by a previous persistence decision. Results on tuition were not sensitive to the choice of stage of PSE variable used.

¹¹ It would be possible to use the age of the respondent as indicator of stage of program. There are slight variations across provinces in the school starting age and variation in the date chosen as the point in the calendar year at which school-entry age is measured. There is variation across provinces and across people in number of grades repeated. Calendar year age, even measured in months, seems like a less useful measure than number of academic years after high school graduation.

As the YITS B sample ages, there are fewer students in the initial year after leaving high school. Then in the university transition studied from 2002-03 to 2003-04, there is again a large group of year one students. As a proportion of the Canadian population at university this group in Year One much smaller since they are all from the smaller and over-sampled provinces.

The role of provincial variation is also illustrated in Table 2. The data present, using sample weights, the percent of leavers by provinces for all university transitions, for Year-One transitions and then for all non-Year-One transitions. Table 2 confirms the finding in the rest of the literature that a student early in a program is more likely to leave in all provinces. It also shows that the leaving rates across Canadian provinces vary greatly, both in Year One and in all years.

3. The social and economic variables used in the analysis of persistence

There are three types of variables that are considered in the analysis of the persistence decision in this paper. In each academic year, different measures of the provincial level of university tuition are linked to the persistence observation. In a similar way, provincial level observations of aggregate youth unemployment rate are linked to the individual observation. The third set of data, described immediately below, is the social, economic and other variables that describe the individual. One restriction is that variables must be available in both YITS-A and YITS-B because observations of persistence are used from both surveys. The two surveys sometimes ask slightly different questions.

On the personal side, respondents are identified by age, gender, language spoken at home (official or non-official), as a member of a visible minority, by the age at which they entered Canada and by their marital status as of the reference dates. When responses relate to the answer to a question to the specific date, the dates are December 31, 1999; December 31, 2001 or December 31, 2003. For example, we only know if the respondent is married or living common-law on a reference date. A respondent could, in principle, be married and divorced between reference dates without reporting. We also only know if the respondent has a dependent child as of each reference date.¹²

The survey responses include a self-reported average grade (by range) for their last year in high school as well as their grade (again by range) for their last high school mathematics course. The survey also reports a grade point average in the first year of the respondent's post-secondary experience but there are a large number of missing observations for this variable. The survey reports the number of high schools attended over their high school career. Finally the survey has a self-reported measure of educational effort, a range of hours of work done outside of class in the first year of their PSE experience. Again there were too few observations with this variable to allow its use.

There are two variables related to the respondent's family. YITS-A and YITS-B report slightly different information about parental education. The variable that can be constructed using both surveys is an indicator variable that asks if at least one parent figure related to the youth has some university education or a university degree A

¹² There are some small inconsistencies across reference dates. The most interesting ones for this study are found when a respondent indicates on one reference date that they have attended a specific educational program and then, on a subsequent reference date appears to forget they ever attended such a program. Fortunately this is a rare occurrence.

subjective variable measures the perception of the youth as to their parent's attitude about the importance of education beyond high school. Finally there is a variable that asks if the youth lived with one or two adults during most of their high school period, a family structure variable. It is noteworthy that there is no family income variable in YITS-B. The respondent's family provides a measure of family income when the youth is aged 15 in YITS-A.¹³

There are a number of possible measures of the level of tuition. Statistics Canada provides a measure of nominal tuition in an arts and science program by province, averaging over universities, which does not include compulsory fees. These values are shown in Figure 1. The year in the graph is labeled so 1996 is tuition in 1996-97. Nominal tuition in arts and science programs is essentially set by provincial policy. Quebec has by far the lowest tuition fees over the period. Usher (2006) constructs a similar nominal measure of tuition which includes compulsory fees paid by students. Many universities have substantial mandatory fees that vary across universities.¹⁴ These fees are generally self-imposed by student governing bodies and include activity fees, extended health care fees, bus passes, various capital project fees and other such fees. Usher's measure of fees is then adjusted for inflation using the Consumer Price Index for each province calculated over the 12-month academic year beginning in September and

¹³ There is limited and difficult-to-interpret information in YITS on income earned and income spent by the respondent. In principle, it would seem that you might be able to calculate, in a year when tuition increased, how the increase was paid for. In practice, the data are not up to this task. The income data refer to the second of the two calendar years between cycles, that is 2001 and 2003 and questions about debts are asked as of the reference dates as of the end of every other calendar year. Further work is needed on the interpretation of the income data in YITS. There is some information on employment periods as well as some information on scholarships and bursaries. Day (2007) begins to use the income data by defining a persistence cycle for respondents who start postsecondary education in September 1999. Persistence is then considered as of December 2001 so that the persistence data match the available financial data.

¹⁴ For example Acadia University charged a mandatory annual fee of \$1906 in 2006-07, the highest in the nation. Tuition was slightly over \$6000 at Acadia.

shown in Figure 2. If provinces were slow to adjust nominal nominal tuition with inflation then there are periods of time where real fees drop. Two provinces, Manitoba and Newfoundland also reduce nominal tuition fees in this period. Usher (2006) also calculates the variation in savings in taxes related to university attendance by province. These tax savings are shown in Figure 3. The tax savings varies quite substantially across provinces and even more over time. A net of tax measure of tuition and fees results when the entries from Figure 3 are subtracted from the corresponding entry in Figure 2.¹⁵ Figure 4 illustrates the change in real tuition fees including the compulsory fees. Figure 5 shows the change in real net tuition fees adjusted for inflation and for tax changes. These measures of tuition fees and their changes are joined to the individual data by province and academic year where the relevant academic year for the persistence decision is the second year of the persistence decision, that is, the level of tuition relevant to the persistence decision from 1999-00 to 2000-01 is the level of tuition in 2000-01 or the change in tuition from 1999-00 to 2000-01.

The second provincial variable added to the model of the individual decision to persist is the provincial-level unemployment rate. The unemployment rate is defined as the average of monthly levels over each academic year from September to August of the provincial unemployment for persons aged 15-24 of that gender. The unemployment rate controls for labour market conditions in the province as they pertain to youth. The a priori effect of higher unemployment on the persistence decision is not obvious. Higher unemployment may induce persons to persist since they may believe getting the extra

¹⁵ There is a non-refundable but transferable to parents tax credit for tuition with an annual cap. However unused credits can be carried forward until the student graduates and is employed. There is also a tax credit associated with each month of being a full time or part time student. There is now a book tax credit. Provinces have different rates for each of these credits. Recent tax changes have complicated the system even further.

qualification may give them an advantage in the weaker labour market. Higher unemployment may make it more difficult to persist if the probability of employment and thus income was lower during the spring term preceding the second of the two academic years.¹⁶ In fact, the unemployment variable plays little role in the decisions.

4. Results

What is the expected effect of tuition variables on persistence? There are two cases where an increase in tuition would reduce persistence. If universities in a province accept all students who are willing to pay, then the last student admitted should equate the expected cost of attendance, including the tuition cost, to the discounted present value of benefits. An unexpected increase would cause the student to reassess the decision and leave if the cost then exceeded the benefits. The increase in tuition and fees, if unexpected, reduces persistence and induces leaving.¹⁷ The second possible interaction of tuition and persistence relates to borrowing constraints. Suppose a student entered expecting to be able to borrow to finance their education. If the capacity for loans is constrained then an unexpected increase in tuition without an increase in borrowing limits could induce leaving. You could also make an argument in a credit constrained world a higher level of tuition might make leaving more likely to occur. If we had two provinces with similar borrowing constraints but in one province tuition was higher, then bad luck in the high tuition province, for example, fewer hours of employment than expected,

¹⁶ It should be possible in YITS to actually know if the individual was employed during the months immediately preceding the decision point to persist to leave. That variable is not created at this time.

¹⁷ It is not perfectly clear that the university system in any given province takes the last student willing to pay. The political language used to describe access refers to all “qualified” students. It is clear that in multi-university provinces access to specific universities and to specific programs within specific universities is rationed using high school grades. It is also clear that some universities do take students with weak academic records. The implicit assumption is that a student who wanted a space could find a space somewhere in the university system in their province. The interaction of academic ability and family background on access is an area that needs further research.

could induce leaving in the high tuition province and have no impact in the low tuition province when a constraint was binding in the high tuition province. Thus you could imagine that leaving could also be related to the level of tuition even though in a forward-looking model without borrowing constraints, the initial level of tuition would have no impact on the persistence decision. In the empirical work that follows, the goal is to look for patterns in the response of persistence rates to the level of nominal and real tuition, to the level of net real tuition and to the change in nominal and net tuition and ask what patterns are revealed. The rough priors, from the theory briefly outlined above, is that the level of tuition will have less impact on the persistence decisions than a change in tuition. The results find no relationship of any type between either tuition levels or tuition changes and persistence rates.

The estimated equations take the form

$$\begin{aligned} \text{Persist}_{i,j,t} = & f(\text{Observable Personal Characteristics}) + g(\text{tuition measure}) + \\ & + h(\text{indicator variables relating to province and year}) \\ & + c(\text{unemployment measure}) + \text{error} \quad (1) \end{aligned}$$

where $\text{Persist}_{i,j,t}$ equals 1 if the individual “i” in province j between pairs of academic years t is enrolled in both academic years at university. Persist takes on a value of zero when the individual is enrolled only in the first academic year of the pair of academic years. A zero denotes a leaver. The discussion above presented the types of variables available for inclusion in the estimated equations. Table 3 presents coefficients on estimates of three models when the models do not contain tuition variables. The linear

probability model is the simplest model to interpret. Probit and Logit models of the decision are also estimated in each presentation of the results. Only the sign of the coefficient is reported for the Logit and Probit models. Prob. Values on the null hypothesis that the coefficient is zero are reported below each coefficient estimate or sign for all models. There is more than one observation on some individuals since if the same individual persists from year 1 at university to year 2, we observe that individual's persistence decisions in subsequent pairs of years. Thus the error term in (1) will contain elements that are associated with individual unobserved characteristics and thus have an element in common across the observations of this same person over different persistence decisions. The standard errors on the coefficients are adjusted for clusters at the individual level. The parameter estimates are interpreted as parameters for Canadian youth as a whole and thus observations are weighted by the Cycle 3 sample weights. The estimated equations in Table 2 include Canada-wide year effects, that is, a dummy variable for each pair of academic years that takes on the value of one for all observations in Canada for that year. The coefficients on the year effects are usually statistically different from zero and have a distinct pattern. The coefficients on the year dummies, where the transitions from 2002-03 from 2003-04 represented the omitted base year, are negative and generally show an increase in absolute value in the linear probability model as the academic years are further back in time. An example of these coefficients is found in Table A-4. Thus over time in Canada, persistence has generally increased for reasons not related to the other variables in the model. Table A-4 shows the coefficient on a simple trend variable in place of the specific year dummies. That coefficient is 0.017 which indicates an average increase in persistence rates over the sample of 1.7 percentage

points per year. The equations in Table 3 also include a province fixed effect, an indicator variable for all observations from a province in all years. The coefficients on these variables reflect differences in persistence for reasons associated with a province and not associated with included variables in a model. Ontario is the omitted province in Table A-4. The coefficients on the province dummies indicate that persistence in the Prairie provinces, Alberta, Saskatchewan and Manitoba, are lower than in other provinces for the same type of individual.¹⁸

The set of variables that predict persistence is partly consistent with those in the literature. A person is much more likely to persist out of the later years of post-secondary education. In the academic year immediately following the last year of high school, the drop out rate is 3 percentage points higher than in other years, the coefficient from the linear probability model is found in the upper left hand corner of Table 3. This Year One effect is, oddly enough, not statistically significant in the Logit and Probit models. In the linear probability model this effect is, as expected, reversed as the student gets further in chronological time from high school. In the Logit and Probit estimates when a respondent is in the third academic year after high school exit, they are significantly more likely to persist as measured by the positive coefficient on the Year Three dummy.¹⁹ Most of the

¹⁸ There are a number of important differences across provinces in their educational systems. Four come to mind. Alberta, British Columbia and Quebec have province-wide medium stakes high school examinations. Alberta and British Columbia have post-secondary systems where college-university transfers are common. Ontario has the largest non-university college system but college to university transfers are difficult. And the four Maritime provinces have much smaller college systems than do the rest of the country. There may be other differences represented by the province fixed effects.

¹⁹ Other variants of the stage of university life were created and used in estimation without changing the pattern of coefficients on other variables including the provincial dummy variables and the year dummy variables. It was possible to try to create a variable that, by respondent, asked what consecutive year of the bachelors program the respondent was in in the first of the pair of academic years considered. You asked for each persistence decision, if you had observed a persistent student in the previous pair. Thus students could be in year 1, year 2, year 3 and beyond year 3 or year unknown. The observations were about one-quarter in each category. Three indicator variables were created for year 1, year 2, year 3 and then the rest of the years some of which are unknown. All the models were re-estimated with this set of variables and

other social variables have no role in the persistence process. Women are no more likely to persist than men. Native born Canadians are no more likely to persist than immigrants. Visible minority status has no impact on persistence. There is an effect of family structure in the expected direction. A young person who lives with two adults during high school is more likely to persist. There is no measurable effect on persistence of neither the measure of parental attitude to university nor the parental education experience measure. The former measure asks if the youth perceives that the parent(s) sees post-secondary education as either “fairly important” or “very important.” If so the parental attitude variable takes on a value of one. Finally there is no effect of a youth attending additional high schools. The coefficients on the unemployment rates from youth of that gender in that province in that academic year are not statistically significant. The presence or absence of the unemployment rate variable does not affect the other coefficients. The only variable that matters for persistence, once the respondent is in university, is better high school grades. Better high school grades matter a lot. The grade scale is from 1 to 7 where 1 represents a grade higher than 90% and the numbers decline in increments of 10 percentage points so that a grade of 1 is a grade of less than 50%.²⁰ The coefficient of -0.062 in the linear probability model means that a 10 percentage point increase in your high school grade average makes you 6.2 percentage points more likely to persist. There is no additional effect of a higher mathematics grade. The linear

the results do not change. The effect of being in year 1 on the persistence decision is much, much stronger than the effects of being in the other year of program categories which are often not significant relative to the omitted year. In particular the coefficients on the Canada-wide year effects are very similar. Thus the year effects do not appear to be related to composition effects of the cohort. The composition effects are not all that clear in any case. Bachelor programs across and within Canadian provinces can be 3 or 4 years in length so the variable that attempts to measure the year of the program may not capture how close a given student is to graduation.

²⁰ There are actually two 5 percentage point increments between a grade of 50 percent and a grade of 60 percent. Very few students have high school grades below 60 percent.

probability model has, for this type of model, reasonable explanatory power with an R^2 of 0.065. The coefficients on the Probit and Logit versions are consistent with the coefficients on the linear probability model. All three models include fixed effects for the pair of academic years across Canada and for observations within a province.²¹

Tables 4 through 9 report the results of taking the models in Table 3 and adding, separately, three measures of the level of tuition and two measures of the change in tuition, the measures discussed earlier. The bottom line is that there is no specification that leads to the conclusion that either increases in tuition or a higher level of tuition changes persistence rates. In Table 4, there are neither province nor year fixed effects and none of coefficients on the tuition variables are different from zero. In Table 5 when there are year fixed effects but no province fixed effects, none of the coefficients on the tuition variables are different from zero. The Table 5 specification allows the large differences in leaving rates across provinces to be associated with variation in the level or changes in provincial tuition policy rather than forcing province-fixed effects. This may make sense since the provinces have followed similar policies on levels of tuition over the time period studied (the one large exception is British Columbia). In Table 6, there are province fixed effects but no Canada-wide year fixed effects. There is no relationship between tuition and persistence. In Table 7 the year fixed effects are replaced by a Canada-wide trend. The coefficient on the trend is always strongly significant and positive. Over the 7 pairs of years studied, persistence rates increase by about 1 percentage point per unit of time studied. In Table 8, the models are estimated with both province fixed effects and year fixed effects rather than imposing the trend. In both Table

²¹ Table A-4 in the appendix presents values of coefficients on the dummy variables for years and provinces from various models.

7 and Table 8, prob. values reported on tuition-related coefficients are very large. Finally Table 9 allows the coefficients on the tuition-related variables to interact with the level of parental education. To make this more sensible, the parental education is reversed from that in Table 3 so that the 1 indicates a youth from a family where neither parent ever attended university. This is partly a proxy for family income. If the increases in tuition were associated with increases in dropping out for youth from low-education parents, then the coefficients on the interactions terms involving the tuition measures would be negative. They are not statistically different from zero. There is simply no evidence that higher levels of tuition decrease persistence rates. There is simply no evidence that increases or decreases in tuition alter persistence rates.

5. Conclusions and future work

There are enormous differences in the level of tuition across Canadian provinces. Even within the sample period studied, there are examples of quite large increases and decreases in tuition. There is no evidence of an association between measures of either the level of tuition or the change in tuition and persistence rates. It is perhaps not surprising that the level of tuition does not change persistence. Tuition is only a portion of the cost of attendance. Students entering university have a sense of the level of tuition to be paid over the next 3 or 4 years and in a human capital framework will have already decided that the cost of university, including tuition, is less than the benefit. It is much more surprising that the increase in tuition, which one might think of as unexpected in some cases, are not associated with changes in persistence. The coefficients on tuition changes, like the coefficients on tuition levels, are not different from zero. In British

Columbia there were very large increase in tuition in the last two years of the data and at least the first increase was unexpected. In several provinces there were quite large decreases in tuition and it seems very likely these tuition cuts were unexpected. Many of the changes in the tax treatment of university reduced net tuition over this period. None of this variation in tuition affected persistence. Several interpretations are possible. One is that the monetary net benefit of university completion is so large that even very large increases in tuition do not affect the behaviour of students. Tuition levels start at such a low level they are irrelevant to the decision to attend university everywhere in Canada. Another interpretation is that, in provinces where tuitions were increased substantially, student aid to existing students was also increased so there was no effect on persistence. A third interpretation is that as tuition increased, universities found it more desirable to keep students who would have previously been removed for poor academic performance. Universities could also have placed more resources into student retention strategies. In any interpretation of the results of this study, very large increases in tuition were not any change in drop out rates.

There is work left to be done. How did students pay the increased tuition? Did students taking out more loans? Did they receive more parental support? Did they receive more scholarships and bursaries? Did students work more either during the school year or in the term in which they are not taking courses? The YITS surveys do contain some useful data on student- work choices. The data on student financial choices and outcomes are much more limited. Answering the financial questions may have to await a different data source.

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Table 1: Persistence through university in the YITS-A and YITS-B sample

Transition Years	Observations in the combined YITS-A and YITS-B samples			Percentages of persons aged 15, 18,19,20 on December 31, 1999		
	Leavers (Percent)	Persisters (percent)	Year One %	Leavers	Persisters	Year One %
1996-97 to 1997-98	suppressed (7.7)	suppressed (92.6)	31.7	1.0	99.0	69.4
1997-98 to 1998-99	305 (15.8)	1626 (84.2)	33.5	16.2	83.8	32.9
1998-99 to 1999-00	649 (13.0)	4361 (87.0)	32.7	11.8	88.2	33.3
1999-00 to 2000-01	839 (11.4)	6500 (88.6)	29.6	9.8	90.2	29.9
2000-01 to 2001-02	846 (10.3)	7375 (89.7)	26.4	8.8	91.2	25.3
2001-02 to 2002-03	375 (6.3)	5600 (93.7)	21.5	4.8	95.2	21.8
2002-03 to 2003-04	670 (8.5)	7224 (91.5)	44.7	5.2	94.8	22.3

Notes:

A leaver is a person who is enrolled as a full time student in a bachelors program as a program of study in a province in the first of the pair of academic years listed and does not continue into a bachelor's program in the same province into the second of the pair of academic years listed and does not graduate from that program. A persister continues into the next academic year at a bachelor's program in the same province.

On the left hand side of the table, the upper number in the cell is the number of persons in that category in the combined sample from YITS A and YITS B. Percentage appear below. The number under Year One is the percentage of all university students in the first academic year after high school completion in that set of persistence decisions. The first pair of numbers is suppressed with small size restrictions on data release.

On the right hand side of the table is the percentage of students aged 15, 18,19 or 20 on December 31, 1999 in Canada that are leavers, persisters and in Year One using the same definitions. The percentages on the right hand side are estimated using the survey weights in YITS-A and YITS-B. The interpretation of the first row is that, for 15, 18 , 19 and 20 year-olds in Canada as of December, 31 1999 who were in a bachelors program and were not in their graduating year in 1996-97, 99.0 percent persisted into the next year of the program .

Table 2 Variation in leaving rates across Canadian provinces

Province	Overall Leaving Rate	Year One Rate	All other years
British Columbia	12.4	18.0	9.9
Alberta	16.5	18.5	15.7
Saskatchewan	12.8	16.7	11.1
Manitoba	12.9	17.3	10.9
Ontario	8.8	13.6	6.4
Quebec	4.8	5.3	4.6
New Brunswick	13.3	15.5	12.0
Prince Edward Island	9.4	15.8	6.3
Novas Scotia	14.5	18.5	12.3
Newfoundland	17.2	23.6	14.6

These values are leaving rates as a percentage of all persistence decisions observed in these provinces. They are weighted to represent the universe of persistence decisions made by persons aged 15, 18, 19 and 20 December 31, 1999. The Year One rate is for decisions made in the first academic year after high school completion.

Table 3: Coefficients on social and economic variables in the persistence decision

Variable	Model Estimates		
	LPM (Prob. Value)	Logit Sign, Prob. Value)	Probit Sign, (Prob. Value)
Year One	-.030 (0.05)	Neg.(0.92)	Neg.(0.30)
Year Two	-.005(0.70)	Neg.(0.59)	Neg.(0.56)
Year Three	0.010(0.30)	Pos.(0.03)	Pos.(0.03)
Gender	.018(0.30)	Pos.(0.22)	Pos.(0.30)
Born in Canada	-.009(0.67)	Neg. (0.54)	Neg. (0.69)
Visible Minority	.027(0.17)	Pos.(0.25)	Pos.(0.17)
Family Structure	.031(.02)	Pos(0.06)	Pos(0.08)
Parent with University	.007(0.66)	Pos.(0.46)	Pos.(0.74)
Parental Attitude	-.004(.78)	Pos.(0.28)	Neg.(0.26)
High School Grade	-.062(0.00)	Neg(0.00)	Neg(0.00)
High School Math Grade	-.005(0.39)	Neg(0.36)	Neg(0.29)
Number of High Schools	0.003(0.45)	Pos.(0.77)	Pos. (0.39)
Unemployment rate for youth	-.003(0.45)	Neg.(.19)	Neg.(.12)
Year Effects	YES	YES	YES
Province Effects	YES	YES	YES
R ²	0.065	NA	NA
Sample Size	13408	13408	13408

Persistence is a 0-1 variable equal to one if the respondent persists. Year One, Two or Three refers to the number of academic years after high school completion. Year Two is one year after Year One. Year Three is two years after Year One. Gender equals one if respondent is female. Born in Canada equals one if respondent is born in Canada. Family structure equals one if respondent spent most of high school with two adults. If at least one parent had some university then Parent with University equals one. If the youth perceived that the value of education beyond high school was either “fairly important” or “very important” to either parent, the value of Parental Attitude equals one. The variables High School Grade and High School Math Grade take on values of 1 through 7 where 1 is the highest grade (over 90%) and 7 is the lowest grade of less than 50%. Year Effects are Canada-wide dummy variables for the pairs of academic years. Prob. Values are calculated with robust standard errors clustered at the individual level. There are about 8000 individuals (clusters) in the data. Weights are used so that the estimates represent the as described in Table 1. Parameters from estimates represent parameter values for Canadian youth aged 15, 18, 19 and 20 on December 31, 1999 who ever entered university.

Table 4: Coefficients on tuition variables in the persistence decision when models are estimated without dummy variables for year or province effects

Tuition Measure	Model		
	LPM (Prob. Value)	Logit Sign, Prob. Value)	Probit Sign, (Prob. Value)
Level of Nominal Tuition	-0.000 (0.88)	Pos. (0.95)	Pos. (0.93)
Level of Real Tuition and Fees	-0.009 (0.42)	Neg. (0.47)	Neg. (0.53)
Level of Net Real Tuition	-0.009 (0.18)	Neg. (0.20)	Neg. (0.24)
Change in Level of Real Tuition and Fees	0.026 (0.16)	Pos. (0.13)	Pos (0.16)
Change in Level of Net Real Tuition and Fees	0.026 (0.13)	Pos (0.10)	Pos (0.15)
Year Effects	NO	NO	NO
Province Effects	NO	NO	NO

The variables added to the list of social and economic variable in Table 3 are the tuition measures in the left-hand column. The level or change in tuition is measured in both current or 1992 dollars where the units are thousands of dollars. These are added separately to the models estimated and presented in Table 2. Standard errors are estimated robustly with clusters and survey weights at the individual level.

Table 5: Coefficients on tuition variables in the persistence decision when models are estimated with dummy variables for year and without variables for province effects

Tuition Measure	Model		
	LPM (Prob. Value)	Logit Sign, Prob. Value)	Probit Sign, (Prob. Value)
Level of Nominal Tuition	-0.006 (.15)	Neg. (0.19)	Neg. (0.18)
Level of Real Tuition and Fees	-0.005 (0.35)	Neg. (0.41)	Neg. (0.40)
Level of Net Real Tuition	-0.004 (0.80)	Neg. (0.56)	Neg. (0.56)
Change in Level of Real Tuition and Fees	0.004 (0.80)	Pos. (0.93)	Pos. (0.91)
Change in Level of Net Real Tuition and Fees	0.024 (0.29)	Pos. (0.42)	Pos. (0.42)
Year Effects	YES	YES	YES
Province Effects	NO	NO	NO

The variables added to the list of social and economic variable in Table 3 are the tuition measures in the left-hand column. The level or change in tuition is measured in both current or 1992 dollars where the units are thousands of dollars. These are added separately to the models estimated and presented in Table 3. Standard errors are estimated robustly with clusters and survey weights at the individual level.

Table 6: Coefficients on tuition variables in the persistence decision when models are estimated without dummy variables for year and with dummy variables for province effects

Tuition Measure	Model		
	LPM (Prob. Value)	Logit Sign, Prob. Value)	Probit Sign, (Prob. Value)
Level of Nominal Tuition	0.036 (0.12)	Pos. (0.00)	Pos. (0.00)
Level of Real Tuition and Fees	0.013 (.47)	Pos. (0.45)	Pos. (0.40)
Level of Net Real Tuition	-.020 (0.33)	Neg. (0.20)	Neg. (0.19)
Change in Level of Real Tuition and Fees	0.037 (0.13)	Pos (0.14)	Pos (0.14)
Change in Level of Net Real Tuition and Fees	0.021 (0.32)	Pos (0.38)	Pos (0.43)
Year Effects	NO	NO	NO
Province Effects	YES	YES	YES

The variables added to the list of social and economic variable in Table 3 are the tuition measures in the left-hand column. The level or change in tuition is measured in both current or 1992 dollars where the units are thousands of dollars. These are added separately to the models estimated and presented in Table 3. Standard errors are estimated robustly with clusters and survey weights at the individual level.

Table 7: Coefficients on tuition variables in the persistence decision with a Canada-wide trend effects and province effects

Tuition Measure	Model		
	LPM (Prob. Value)	LPM (Prob. Value)	LPM (Prob. Value)
Level of Nominal Tuition	0.005 (0.73)	Neg. (0.92)	Neg. (0.93)
Level of Real Tuition and Fees	-0.002 (0.88)	Neg. (0.93)	Neg. (0.92)
Level of Net Real Tuition	0.000 (0.99)	Neg (0.90)	Neg (0.98)
Change in Level of Real Tuition and Fees	.019 (0.44)	Pos (0.33)	Pos (0.43)
Change in Level of Net Real Tuition and Fees	.010 (0.44)	Pos (0.52)	Pos (0.74)
Year Effects	Replaced by Canada-wide trend variable		
Province Effects	YES	YES	YES

The variables added to the list of social and economic variable in Table 3 are the tuition measures in the left-hand column. The level or change in tuition is measured in both current or 1992 dollars where the units are thousands of dollars. These are added separately to the models estimated and presented in Table 3. Standard errors are estimated robustly with clusters and survey weights at the individual level.

Table 8: Coefficients on tuition variables in the persistence decision with year and province fixed effects

Tuition Measure	Model		
	LPM (Prob. Value)	LPM (Prob. Value)	LPM (Prob. Value)
Level of Nominal Tuition	-.007 (.68)	Neg (.68)	Neg (.80)
Level of Real Tuition and Fees	-0.000 (.99)	Neg (.73)	Neg (.79)
Level of Net Real Tuition	0.009 (.68)	Pos. (.83)	Pos. (.80)
Change in Level of Real Tuition and Fees	0.016 (.54)	Pos (.94)	Pos (.96)
Change in Level of Net Real Tuition and Fees	0.024 (.36)	Pos (.85)	Pos (.86)
Year Effects	YES	YES	YES
Province Fixed Effects	YES	YES	YES

The variables added to the list of social and economic variable in Table 3 are the tuition measures in the left-hand column. The level or change in tuition is measured in both current or 1992 dollars where the units are thousands of dollars. These are added separately to the models estimated and presented in Table 3. Standard errors are estimated robustly with clusters and survey weights at the individual level.

Table 9: Coefficients on tuition variables and tuition variables interacted with parental education variable in the persistence decision with year and province fixed effects

Tuition Measure	Model			
		LPM (Prob. Value)	Logit (Prob. Value)	Probit (Prob. Value)
Level of Nominal Tuition	Base	0.01 (0.59)	Neg. (.91)	Neg. (1.00)
	Ed. Int.	-0.004 (0.61)	Neg. (0.91)	Neg. (0.61)
Level of Real Tuition and Fees	Base	0.009 (0.96)	Neg. (0.80)	Neg. (0.84)
	Ed. Int.	-0.001 (0.89)	Neg. (0.93)	Neg. (0.92)
Level of Net Real Tuition	Base	0.009 (0.70)	Neg. (0.92)	Neg. (0.84)
	Ed. Int.	-0.001 (0.96)	Neg. (0.85)	Neg. (0.85)
Change in Level of Real Tuition and Fees	Base	0.001 (0.97)	Neg. (0.41)	Neg. (0.59)
	Ed. Int.	0.027 (0.43)	Pos. (0.41)	Pos. (0.30)
Change in Level of Net Real Tuition and Fees	Base	0.019 (0.60)	Neg. (0.83)	Neg. (0.79)
	Ed. Int.	0.016 (0.50)	Pos. (0.54)	Pos. (0.46)
Year Effects		YES	YES	YES
Province Fixed Effects		YES	YES	YES

The variables added to the list of social and economic variable in Table 3 are the tuition measures in the left-hand column. The level or change in tuition is measured in both current or 1992 dollars where the units are thousands of dollars. These are added separately to the models estimated and presented in Table 3. Standard errors are estimated robustly with clusters and survey weights at the individual level.

Appendix

Table A-1: The characteristics of the YITS samples using Cohort B by Cycle

Variable	Cycle 1 N=22378	Cycle 2 N=18779	Cycle 3 N=14817
Gender	1.494	1.500	1.504
Initial Age	18.94	18.93	18.93
Visible Minority	1.95	1.95	1.95
B.C.	0.083	0.079	0.073
Alberta	0.084	0.080	0.086
Saskatchewan	0.073	0.073	0.080
Manitoba	0.069	0.071	0.071
Ontario	0.287	0.296	0.285
Quebec	0.197	0.202	0.205
New Brunswick	.0057	0.051	0.051
Nova Scotia	0.065	0.064	0.064
Prince Edward Island	0.027	0.027	0.028
Newfoundland	0.051	0.051	0.050
Language	0.92	0.92	0.93
Family Structure	0.71	0.73	0.75
At least one parent figure with university degree	0.22	0.23	0.24
All parent figures without any PSE	0.52	0.54	0.55
All parent figures with less than a high school education	0.17	0.16	0.15

Table A-2: The characteristics of the YITS samples using Cohort A by Cycle

Variable	Cycle 1 N=26063	Cycle 2 N=24397	Cycle 3 N=20794
Gender	1.50	1.49	1.49
Initial Age	15.31	15.31	15.31
Visible Minority	1.93	1.93	1.93
B.C.	0.101	0.100	0.092
Alberta	0.089	0.089	0.094
Saskatchewan	0.090	0.092	0.098
Manitoba	0.083	0.086	0.083
Ontario	0.145	0.146	0.146
Quebec	0.153	0.154	0.154
New Brunswick	0.098	0.093	0.093
Nova Scotia	0.100	0.099	0.098
Prince Edward Island	0.056	0.056	0.056
Newfoundland	0.079	0.082	0.081
Language	0.925	0.927	0.928
Family Structure	0.725	0.735	0.753
At least one parent figure with university degree	0.242	0.244	0.252
All parent figures without any PSE	0.684	0.688	0.700
All parent figures with less than a high school education	0.099	0.095	0.090

Notes to the tables:

These are the characteristics of the YITS samples after each attrition point. Provincial variables are dummy variables for that province. The other variables are either dummy variables for that characteristic or defined as Gender (1 male, 2 female); Initial Age (years); Visible Minority (2 indicates the respondent is not a visible minority)

Table A-3 : The structure of the “normal” path through Four Years of University in the YITS Surveys

			GRADE (non ON, QC)	GRADE ON(QC)		GRADE (non ON, QC)	GRADE ON(QC)		GRADE (non ON, QC)	GRADE ON(QC)		GRADE (non ON, QC)	GRADE ON(QC)
INITIAL YEAR	NEXT YEAR	AGE IN INITIAL YEAR YITS A			AGE IN INITIAL YEAR YITS B			AGE IN INITIAL YEAR YITS B			AGE IN INITIAL YEAR YITS B		
1996-97	1997-98	12			15	10	10	16	11	11	17	12	12 (CEGEP 1)
1997-98	1998-99	13			16	11	11	17	12	12 (CEGEP 1)	18	YEAR 1	13 (CEGEP 2)
1998-99	1999-00	14			17	12	12 (CEGEP 1)	18	YEAR 1	13 (CEGEP 2)	19	YEAR 2	year 1
1999-00	2000-01	15	10	10	18	YEAR 1	13 (CEGEP 2)	19	YEAR 2	year 1	20	YEAR 3	year 2
2000-01	2001-02	16	11	11	19	YEAR 2	year 1	20	YEAR 3	year 2	21	YEAR 4	year 3
2001-02	2002-03	17	12	12 (CEGEP 1)	20	YEAR 3	year 2	21	YEAR 4	year 3	22		year 4
2002-03	2003-04	18	YEAR 1	13 CEGEP 2)	21	YEAR 4	year 3	22		year 4	23		
2003-04		19	YEAR 2	year 1	22		year 4	23			24		

Notes: Ages refers to the normal age of the respondent in the first academic year of the pair of academic years. 8 provinces, excluding Ontario and Quebec (ON and QC) normally graduate students from high school at the end of Grade 12. Students are normally 15 years of age in Grade 10. In Ontario, during the period studied, students normally graduated high school at the end of Grade 13. In Quebec, students who are university bound normally graduate high school at the end of Grade 11 (Year 5 in Quebec terminology since high school starts in Grade 7) and then complete two years at CEGEP. University programs are normally either three or four years to degree completion.

Table A-3

Reports of the coefficients on year-effect and province effect indicator variables in the linear probability models in Table 2 as well as the trend variable used in place of year effects

Coefficient on dummy	Estimate (Prob. Value)
1996-97 to 1997-98	0.10 (0.00)
1997-98 to 1998-99	-0.081 (0.02)
1998-99 to 1999-00	-0.066 (0.00)
1999-00 to 2000-01	-0.055 (0.00)
2000-01 to 2001-02	-0.057 (0.00)
2001-02 to 2002-03	-0.005 (0.41)
2002-03 to 2003-04	Omitted dummy
Trend	0.017 (0.00)
B.C.	-0.033 (0.13)
Alberta	-0.070 (0.00)
Sask.	-0.047 (0.00)
Manitoba	-0.043 (0.00)
Ontario	Omitted dummy
Quebec	-0.00 (0.99)
N.B.	-0.021 (0.38)
N.S	-0.044 (0.12)
P.E.I.	0.023 (0.52)
Nfld	-0.029 (0.56)

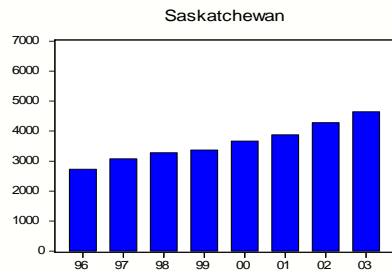
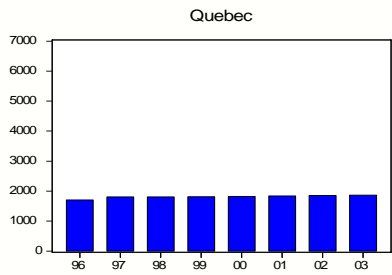
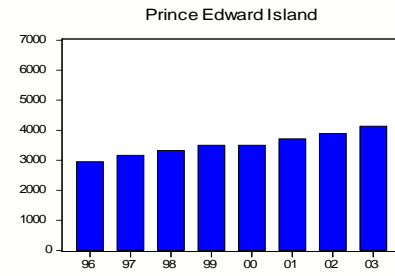
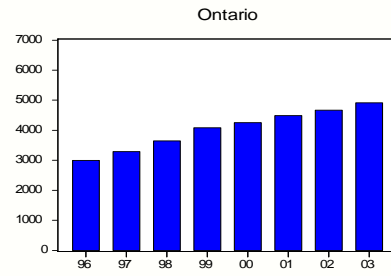
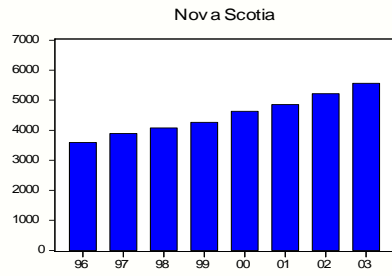
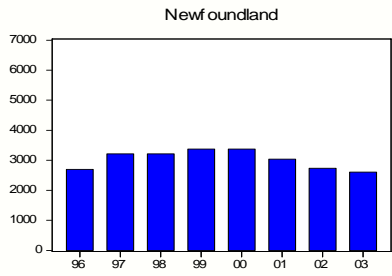
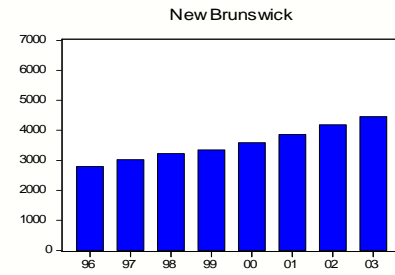
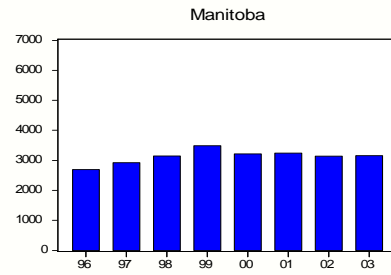
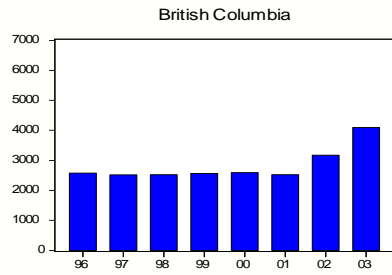
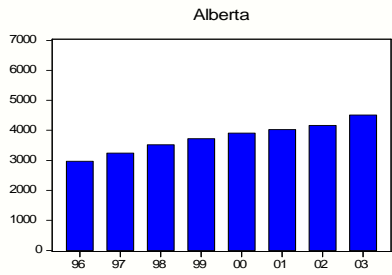


Figure 1: Nominal Tuition by Province, StatisticsCanada Measure

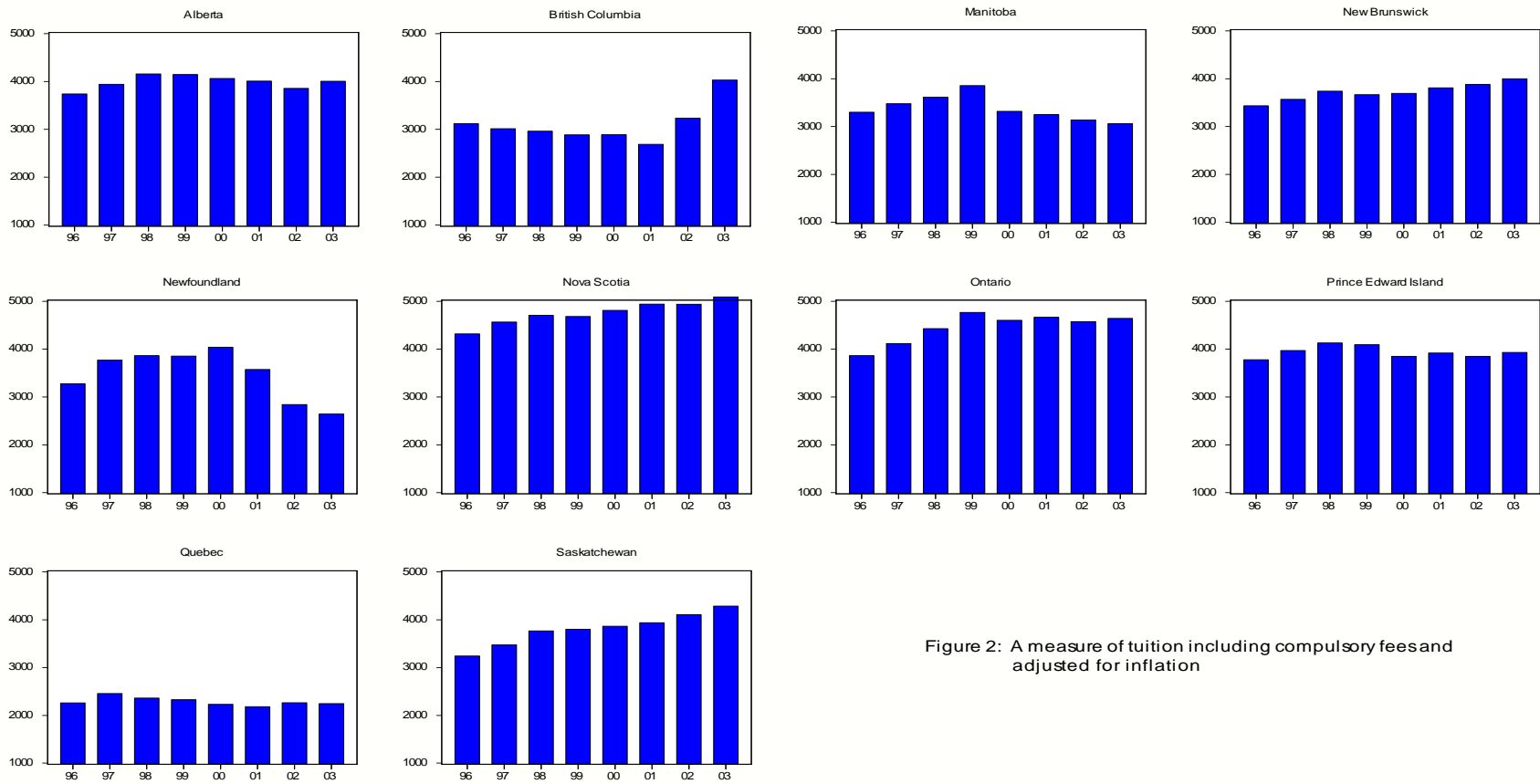


Figure 2: A measure of tuition including compulsory fees and adjusted for inflation

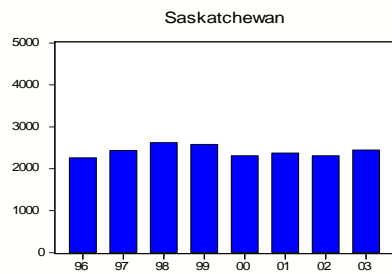
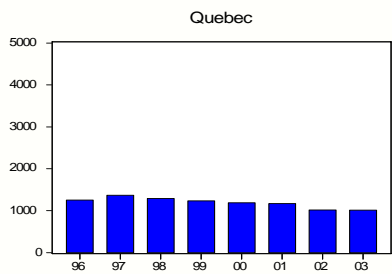
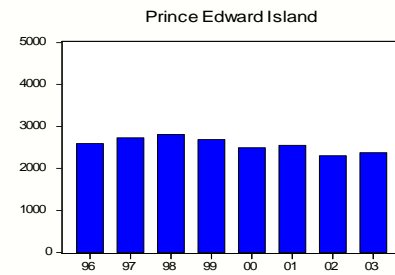
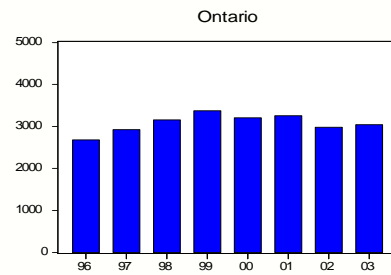
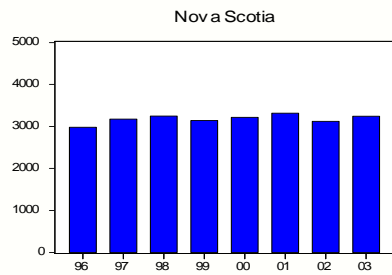
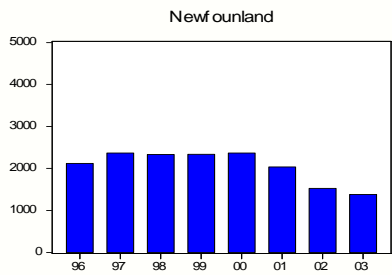
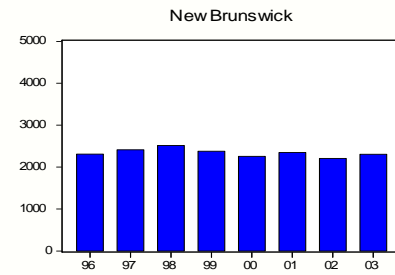
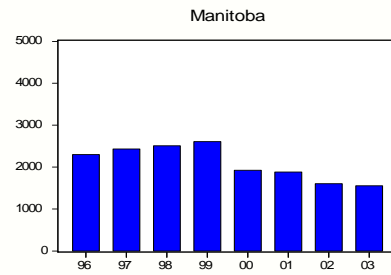
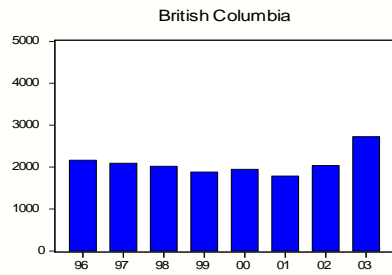
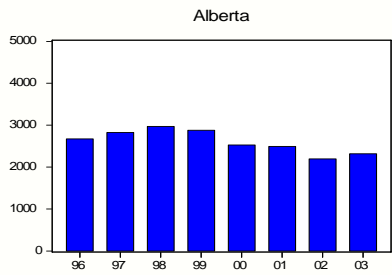


Figure 3: Tax expenditures adjusted for inflation

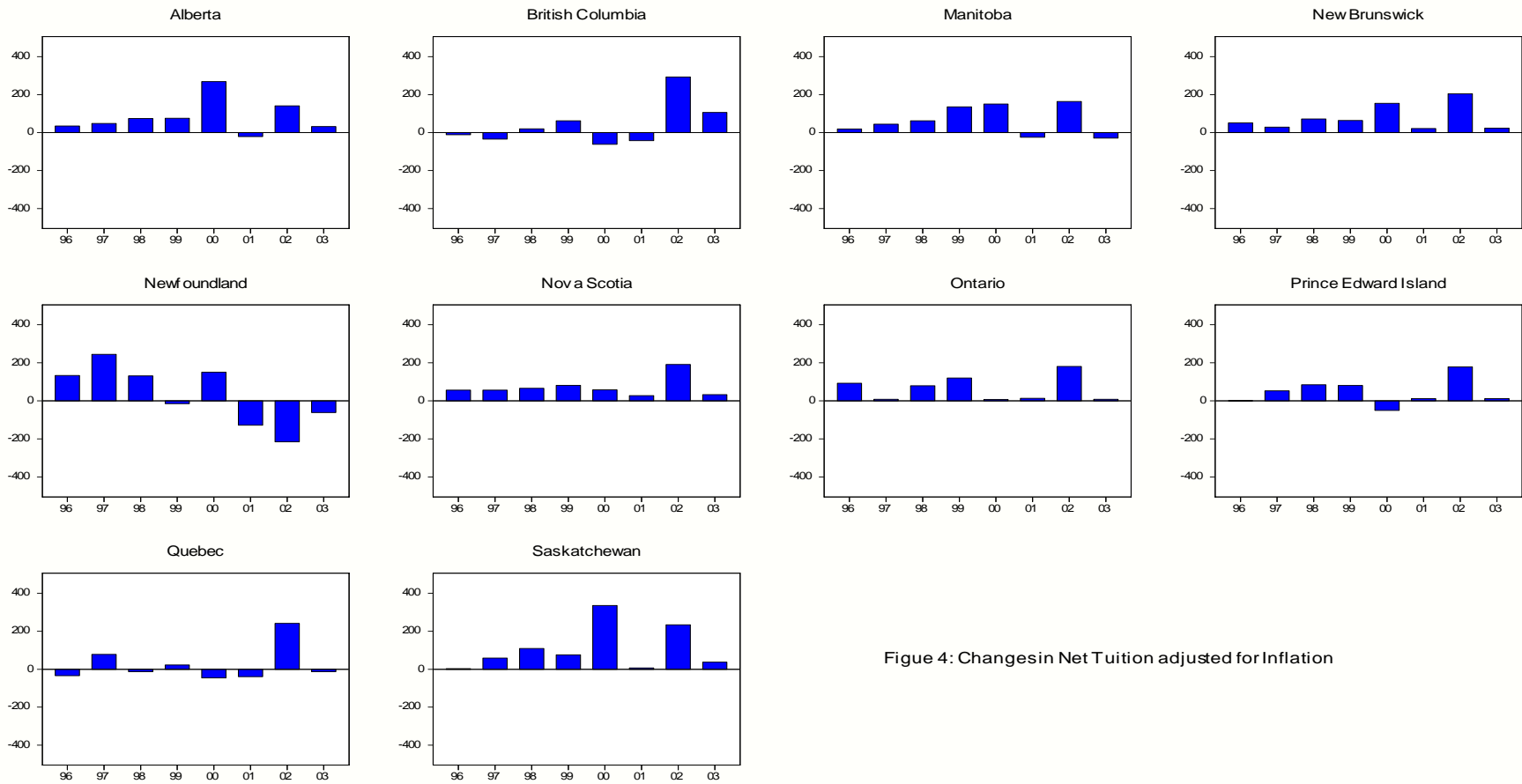


Figure 4: Changes in Net Tuition adjusted for Inflation

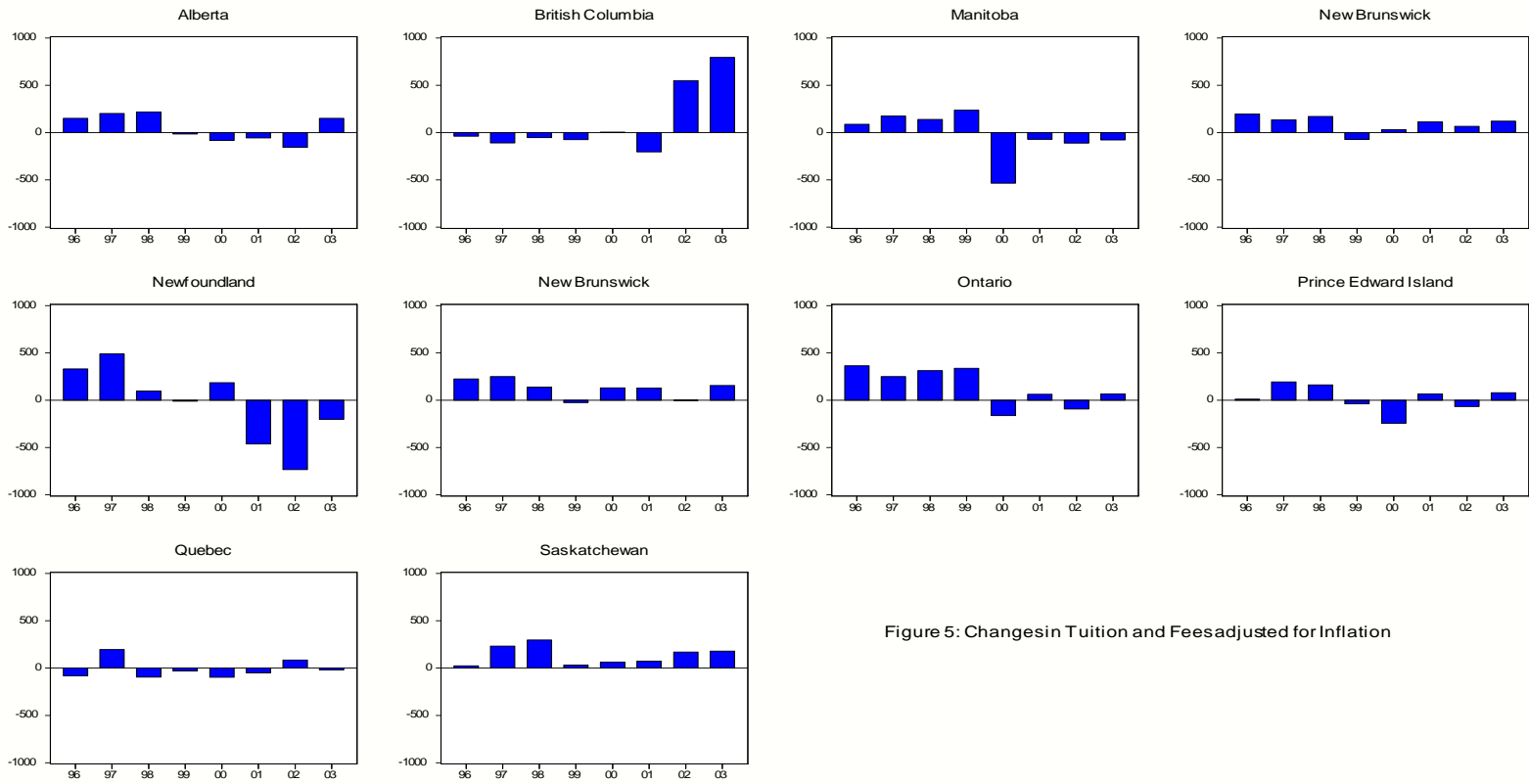


Figure 5: Changes in Tuition and Fees adjusted for Inflation