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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

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Abstract: The Youth-in-Transition Survey allows identification of a series of decision points where youth already in university decide whether to continue or to exit without graduating. This is a specific aspect of university participation. Beyond a set of social and economic factors that affect the persistence decision as expected, there is little evidence that either a higher level of tuition or a change in tuition alters the probability that a student leaves without obtaining their degree. There is no statistical effect of tuition on the persistence decision. The effect of tuition on participation should therefore occur at the transition from high school to university. This explicit mechanism remains to be investigated within YITS.

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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 subsidizes university attendance. A significant policy debate occurs between those who favour a lower tuition fee and larger subsidy, expected to encourage participation, and those who favour a higher tuition fee for a variety of reasons. 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 after the first year of this pair of year without a degree. The Youth-In-Transition Survey, known as YITS, begins with a large sample of youth in Canada on December 31, 1999 and tracks these youth through their life choices to December 31, 2003. Many of these youth participated in university over that time and a substantial number left without obtaining their degree. Preliminary results find that the level of tuition, whether real or nominal, before or after tax, plays no role in the persistence decision when there are Canada-wide year fixed effects. This is consistent with a human capital model of the decision to attend university. The student who enters 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, persistence should not be affected. The empirical analysis is broadly consistent with this view in that, as long as there are Canada-wide year fixed effects in the analysis, there is no effect of the level in tuition across provinces on persistence. However it is also true that increases and decreases in tuition do not have a statistically significant effect on persistence. If these changes in tuition were unexpected, we might have thought

some students would be pushed into leaving university. If students had binding credit constraints then an increase in tuition might also prevent some students from continuing. 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 to be further investigated. In particular there are two unfinished pieces of analysis. First the technique used in this paper can be used to look at the transition from completed high school to university and the role of the level of tuition in that decision. Second, the data in YITS can be used to tell us how a student who persists pays the extra tuition.

It is important to stress that simply finding that changes in tuition do or do not change persistence does not mean that lower tuition (or higher tuition) is necessarily good or bad for society as a policy choice. 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 as well as issues around social mobility and equity. This paper does not pretend to resolve the question of the optimal level of university tuition fees. This paper does contribute in a modest way to a very large literature on post-secondary participation and tuition fees and to beginning a better understanding of the effect of the level of tuition fees on university progression.

The American literature on postsecondary participation and tuition fees is reviewed in Leslie and Brinkman (1988), Heller (1997) and updated in Heller (1999). 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 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. Further there has been a great deal of variation across provinces in the level and the timing of changes in tuition fees. A variety of studies relate this variation in tuition fees across states and 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 always produce the clear result that participation falls in jurisdictions with higher tuition fees. More recent studies of the Canadian data have made use of individual data on university participation and do seem to generate a clearer result that higher tuition fees do reduce participation. Neill (2005) and Johnson and Rahman (2005) make use of the individual data from the Labour Force Survey (the LFS). 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 (2005) and Johnson and Rahman (2005) find a statistically negative response of participation at university to an increase in tuition although neither effect is large in an economic sense. Johnson and Rahman find a negative effect on participation only relative to an increasing time trend in university participation between 1976 and 2003. Neill includes year and 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 a portion of Neill's sample. Coelli (2005) 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 but the sample is very small since the SLID is not aimed at younger persons. This paper uses a different survey, the Youth-in-Transition Survey (YITS). The sample

of young persons is large. There is some information on family background and some information on the financing of post-secondary participation. The most interesting aspect of the YITS is that it follows young persons over 5 year calendar years and records a portion of their earlier life history. It is this feature of the YITS that allows the study of year-to-year persistence decisions and the interaction of tuition changes and the persistence decision at universities across Canada. This process separates two aspects of participation at university. The first is the transition from secondary school to university, the access decision. This paper does not consider the access decision. Rather it considers the year-by-year decision to continue once a respondent is in university, that is, the decision to persist.

There is a small 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 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 completion. Most of the literature is descriptive and models are sociological rather than economic. The economic question is secondary to these studies when it is considered at all.

This 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 had no deliberate longitudinal component. It is a single sample of

5000 persons across Canada aged 17-24 in 2002. Persistence can be inferred from the respondent's educational history. Barr-Telford et.al (2003) report that if a respondent 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. Three papers to date, Bowlby and McMullen (2002), Lambert et. al (2004) and Shaienks et. al (2006) have used YITS to consider various aspects of persistence. None of these papers 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 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. The survey does ask if respondents perceive a financial barrier to post-secondary participation. For the persons who do leave post-secondary education, 34% report financial barriers to continuing. For the persons who stay in post-secondary education, only 29% report a financial barrier. 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 tax treatment of tuition) in the sample years across Canadian provinces to the respondent record and ask whether the level or change in tuition and tax treatment has, given the 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 at university from the Youth-in-Transition survey is described in the next section. In the next section there is a discussion of the social and economic variables that can be constructed from YITS as well as a discussion of the tuition variable. I then estimate models of the persistence decision where either the level of tuition or the change in tuition is allowed to play a role. There is a brief conclusion and a discussion of extensions to the paper.

2. Establishing the sample

The responses to the Youth-in-Transition Survey (YITS) are used to create a sample of specific points in time, implicitly defined between academic years, where a university student makes a choice to either continue in university for another year or to stop their studies at the end of the first year in a 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). Responses to interviews from January to 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. Every effort was made to follow these youth through the years 2000, 2001, 2002, and 2003. Re-interviews of 18,779 youth in Cohort B and 24,390 youth in Cohort A took place in the period between January to June 2002. These persons are Cycle 2 of the data. Then 14,817 youth from Cohort B and 20,794 youth from Cohort A were re-interviewed between January to June 2004. These persons constitute Cycle 3 of the data.

The Cycle 2 interviews in 2002 described choices made during 2000 and 2001. The Cycle 3 interviews in 2004 describe choices made in 2002 and 2003. Appendix A presents tables comparing the characteristics of the persons in each Cycle of YITS A and YITS B. Substantial attrition from the YITS samples was expected given the age of the groups interviewed. At least in a visual test, the only obvious change in the composition of the sample in YITS, either Cohort A or Cohort B, 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 but the effect looks to be quite small.

Persistence and transition issues at university do not usually take place over calendar years. The most common entering month is September and the exiting month, with or without completion, is concentrated in April and May. The changes in tuition occur between academic years, that is, tuition is increased or decreased in various provinces between August and September of each calendar year. Thus the activities of the respondents must be sorted into activities by academic year and province to investigate the role of tuition in persistence issues at universities. In this sense the 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.

Because YITS-B and YITS-A present information on different age groups, the persistence years and the number of observations are quite different across Cohort A and Cohort B. In the older Cohort B sample, the respondents were 18, 19 or 20 as of December 31, 1999 and thus many of the respondents are already in post-secondary education as of the initial survey date. Many actually complete university degrees over the survey period. In the Cohort A sample, the typical respondent is in Grade 10 on December 31, 1999. 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 would be the “normal” path for students in most Canadian provinces. The two provinces where this is not the case over the YITS period are the two largest provinces, Ontario and Quebec. In Ontario at that time, a Grade 13 secondary school year was still in place but some students did complete secondary school in 4 years.¹ In other provinces some students also chose to complete secondary school in five rather than four years. In Quebec, students finish secondary school at the end of Grade 11 and then many students attend a 2-year college (a CEGEP) and then may attend university. By the time of the interviews held between January and June 2004 that record the activity between January 2001 and December 2003, respondents who entered university in September 2002 may or may not have progressed to year 2 of their postsecondary program between September 2003 and December 2003 when reporting stops. The YITS-A sample is relatively straightforward to work with because most respondents have had time to attend only one university. The YITS-B sample is more complicated because the respondents, being older, can and do have more complicated educational pathways through this period of their lives. In YITS there are two types of information about a young person’s post-secondary educational path. In one method, each person reports the start and end of a program where a program is defined by the type of qualification being obtained. Obtaining a bachelors degree is the most common

¹ 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 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.

program choice. One unit of persistence analysis is a program. The second unit of persistence analysis defines the educational pathway by institution. In both cases switching to another university or bachelor's program within the same province is defined as a persisting student since the provincial level variable, the tuition fee, is similar across programs or institutions within the same province.

The data report whether the respondent is attending a university or some other form of post-secondary institution. To consider the university persistence issue, the YITS samples are first reduced so that only persons who have ever attended university appear in the sample. In YITS-B, 7347 persons report having ever enrolled in university at any point in their life up to December 31, 2003. In YITS-A, 6748 persons enrol in university at some point in the sample. The respondent reports the date, by year and month of first enrolment at each postsecondary institution attended. They also report the last year and month of being a full time student at that institution. Thus if the persistence period over the two academic years falls between the start date and the end date at that institution, the person persists through two academic years. All the complications arise when a person is enrolled at a university in the first academic year of a two-academic-year pair but not in 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 who leave are not making a persistence decision and are removed from the set of persons making a persistence choice. How do we know if someone graduates? The survey asked directly if the respondent is not attending that particular institution in the second pair of the two academic years because they are a leaver, that is, their status at that institution is a person

who attended that institution and left without obtaining a degree.² The final complication is obtaining a measure of university persistence that allows for the attrition from the YITS, particularly from YITS-B. In YITS-B if a person is in all three cycles, then a complete history of institutional attendance can be constructed ending December 31, 2003. The last persistence choice (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 at that institution into the fall term from September to December 2003 and they declare that they are a continuer at that institution as of December 31, 2003. For a person who remained in the survey to the very end, then persistence choices in the record can begin as early as 1996-97 to 1997-98 and end with the pair of academic years 2002-03 and 2003-04 as described above. There is a similar choice to be made for the persons who leave the sample on December 31, 2001. Their last persistence observation is a decision to continue (or not) from the academic year 2000-2001 to 2001-02. Since they left the sample as of December 2001, we observe only the fall term from September 2001 to December 2001. If the respondent has declared that they continued at that institution as of December 31, 2001 then they are defined as persisting for the purposes of this analysis. Finally there is a group who leave the sample as of December 31, 1999, that is, there is only the first interview in the data. These persons are treated as persisting from academic year 1998-99 to academic year 1999-00 if we observe them full time in the fall term of 1999 and they declare themselves as a continuer. Many of the YITS-A respondents are on

² The reference dates for the interviews are December 31, 1999, December 31, 2001 and December 31, 2003. Using a designation for a particular institution as of the reference date, if a respondent obtains a degree from that institution as of the reference data, you infer is the non-continuation in the two persistence periods investigated is due to completion of the degree from that institution.

the third and last interview when the first observation of university persistence is possible.

The second method of measuring persistence in YITS is to look at the educational pathways by program. Here all persons are organized with start date and end dates by program rather than post-secondary institution. As already noted, the program considered is a bachelor's degree program. These are organized chronologically and a person may start (and end) as many as five bachelor's programs. If the two persistence years fall between the start date and end date of the program and the person does not obtain a bachelor's degree within these two years, the person has persisted. Otherwise, the person is leaver from the program. The respondent has declared that they are a leaver and not a graduate or a continuer from the reference program.

Table 1 presents counts of the number of leavers and persisting students in each pair of academic years available to be studied. These observations combine respondents from YITS A and YITS B. 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 in 1996-97. There are not many university students in those age categories. After that first pair of years there are at least 2000 students and up to 9000 students making a persistence decision between pairs of academic years. The persistence rates are fairly similar to those observed in the persistence literature mentioned in the introduction. The lowest leaving rate is 5.12 percent. The highest leaving rate is 15.55 percent. It is important to note that Table 1 shows, even to the eye, that the pairs of years where the largest proportion of students are in the first year of their

program have the highest leaving rates. Because of the cohort nature of the YITS samples, the percentage of students in first year varies enormously from year to year.

The next task is to consider what social and economic variables are available in the YITS data and how these variables interact with the persistence decision and whether or not the student is in first year. Some of these variables are related to the individual respondent's characteristics and outcomes and are directly recorded in YITS. The other variables are various measures of the tuition levels and the changes in tuition facing all respondents in a province in which the individual is located.

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

There are three types of variables that could be considered in the analysis of the persistence decision in this paper. One data set describes the level and change in tuition across provinces around the persistence decision. A second set of data describe the information in YITS pertaining to income and post-secondary financing arrangements. Although this data are described below, I defer the use of this data to a later version of this paper or to another paper. The third set of data, described immediately below, are the personal, social and economic variables that describe the individual. Although there are more variables available in YITS, many of these additional variables are the responses to or constructed from the responses to a variety of subjective questions concerning the educational, work and social experience of the young person. In the discussion below, variables are chosen that have a quantifiable aspect. This may be the set of variables with which economists have the highest comfort level. They may not necessarily be the most important variables. 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 points. These reference points will arise several times in this analysis. For some data, the responses relate to the answer to a question to the specific date, always one of the three reference dates: December 31, 1999; December 31, 2001 or December 31, 2003. For example, we only know if the respondent is married or living common-law at each reference dates. We also only know if the respondent has a dependent child as of each reference date.

The other personal data relates to their grades. The survey reports their average grade (by range) for their last year in high school as well as their grade (by range) for their last high school mathematics course. The survey also reports their grade point average in the first year of the post-secondary experience but there appear to be 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. Many of these responses are also missing.

Finally there are two personal variables related to the respondent's family. YITS-A and YITS-B report slightly different information about parental education. The variable that can be created from either survey is a dummy variable that asks if at least one parent figure has some university education or a university degree. The former variable is the variable used. There is also one subjective variable that 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. There is some data on the income of the respondent as well as some data on the respondent's financing of their post-secondary education.

The respondents report their own income (not their family's income) from various sources in 3 calendar years. In YITS-B, the older cohort, we have detailed income reports for calendar year 1999, 2001 and 2003. For the YITS-A cohort, we have similar information in only 2001 and 2003. When these respondents are 15 years old, they report their allowances. For the remaining 5 calendar-year income observations in the two surveys, the survey responses provide measures of total income, wage income, scholarship income and income the respondent considered as a gift from parents, spouses or other family members. The difference between total income and specified sources is actually included in the survey. Other income may be income from capital, from employment insurance, from child support and the like. There are some very large income values that do not seem sensible, for example some persons report total incomes from scholarships of over 50,000 dollars. The second set of income-related data reflects an attempt by the survey to have respondents specify in dollar amounts (as well as with yes/no categorical responses) how they perceived they financed their post-secondary education in a particular period. But these dollar amounts are neither calculated over the calendar year nor over the academic year. For both YIT-A and YITS-B, the respondent is asked for the dollar value of sources of funds for their post-secondary education over two 2-year periods between reference points, that is, for the 24-month period from January 2000 to December 2001 and then again for the 24-month period from between January

2002 and December 2003. In addition, the YIT-B respondent are asked for the same information for the period ending on December 31, 1999 and implicitly beginning whenever the respondent began their post-secondary education. For the funding of post-secondary education, respondents are asked to identify the flow amounts of scholarships, and bursaries over the 2-year periods. They are also asked to give both the amount of government loans and the total amount of loans outstanding as of December 31, 2001; December 31, 2003 and, for the YITS-B cohort, December 31, 1999.

It is also possible to discern if the respondent had a period of full-time or part-time employment in the months preceding the reference dates. There is information about hours worked, wages and whether, if the respondent is not working, if they are seeking a job. There is information on start dates and end dates for jobs. However the full integration of employment history and earnings in the non-school period as well as the annual and self-reported data on income are not analyzed in this version of this paper. In this paper for this presentation the focus is on the variation in tuition across provinces, the final set of “economic” variables in the analysis.

There are a number of possible measures of the level of nominal tuition. The first is the measure provided by Statistics Canada which does not include compulsory fees. This is shown in Figure 1. The variation in this measure across time and provinces (the year in the graph refers to the first year of the pair of calendar years that constitute an academic year so that 1996 is the tuition in 1996-97). There is a lot of variation in the level of nominal tuition fees, the direct choice of the provincial government in most cases. Quebec has by far the lowest fees over the period. Figure 2 shows a measure constructed in Usher (2006) which does include compulsory fees. Usher’s measure of nominal tuition and compulsory fees is adjusted for inflation using the Consumer Price

Index for each province calculated over the 12-month academic year beginning in September. Provinces with fixed or very slow to move nominal fees over specific periods do generate small reductions in real fees. Usher(2006) also calculates, for each province, a measure of the net tuition paid in each academic year. The reduction in the cost of university attendance related to tax treatment varies quite substantially across provinces and even more over time. This variation is shown in Figure 3. Both the provincial and federal government have increased various tax credits associated with post-secondary education over the sample period. One obvious comment is that, since the federal tax credit depends on the level of tuition, when tuitions rise or fall, the level of the tax expenditures also rises and fall. Figures 4 and 5 show the changes in these variables. Figure 4 shows the change in net tuition fees. Figure 5 shows the change in just the tuition fees itself, adjusted for inflation. These measures of tuition fees and changes are joined to the individual data by province and academic year where the relevant academic year 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. What is the expected effect of these variables on persistence?

There is no sophisticated model presented that interprets the effect of tuition on the persistence decision. In both a human capital and signalling model of the decision to attend university, the decision maker is forward looking. In a human capital model, the decision to attend university is interpreted to mean that the present discounted value of extra earnings (and presumed productivity) associated with an additional year at university are worth the additional year of expenses to attend university. An unexpected increase in tuition could move a few marginal students from staying to not staying in the

human capital model. In a signalling model, the signal sent from the additional year at university is similarly associated with additional wages (and presumably productivity) in the future and the effect on the marginal student would be similar. In both cases, you would predict that an (unexpected) increase in tuition would reduce persistence and an (unexpected) decrease in tuition would increase persistence. In a world where the student decision makers are not credit-constrained or who are at least aware of their next tax return, any impact effect of a change in tuition should be felt from an unexpected change in net tuition, that is, the decision makers should be fully aware of the relevant changes in taxes. In a forward-looking model, the level of tuition does not have an obvious impact on the persistence decision. When a student decides to attend in year one, they should have made a calculation that took into account future tuition in subsequent years.

Variation in the level of tuition, real or nominal, with or without the tax adjustment should not play a role in persistence. In a world where a significant number of students are credit constrained or respond to the sticker price rather than the net price of university, the level of tuition and its change could play a direct role in the persistence whether or not an increase in tuition was expected at the time the student initially went to university. If the student is not fully forward-looking, then the level of tuition could play some type of role on a year-to-year basis as more information arises. It will be difficult to know whether a given change in tuition was expected or unexpected as of the time of the change for a particular student. In the empirical work that follows, the goal is to look for patterns in the response to the level of nominal and real tuition, to the level of net real tuition and to the change in nominal and net tuition to ask what patterns are revealed.

The model of the persistence decision is implicit and this can be thought of as looking for patterns in the model's estimated.. It is to those results that I now turn.

4. Some preliminary results

The estimated equations take the form

$$\text{Persist}_{i,j,t} = f(\text{Observable Personal Characteristics}) + g(\text{tuition measure}) + \text{error} \quad (1)$$

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. The discussion above presented the types of variables available for inclusion in the estimated equations. Table 2 presents various estimates of equations that do not contain tuition variables. The estimated equations include Canada-wide year effects, that is, a dummy variable for each academic year.³ The coefficients on the year effects are all statistically different from zero and have a distinct pattern. There is a strong tendency for persistence to increase over time in all provinces in Canada. The coefficients on the year dummies, where 2003 is the base year, are negative and increase in absolute values as the academic years are further back in time. 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 the same person over different persistence decisions by that person. Hence the standard errors on the coefficients are adjusted for clusters at the individual level. Results from three models of persistence are presented in Table 2. The linear probability model is the simplest model to interpret. Probit and Logit models

³ I also estimated these equations with province dummies. Only the coefficients on the dummies for New Brunswick and Nova Scotia are significantly different from zero. These are negative indicating persistence is less in those two provinces. The issue of province fixed-effects arises again shortly. None of the coefficients in Table 2 are sensitive to the inclusion or exclusion of provincial dummy variables.

of the decision are also estimated in each presentation of the results. Only the significance and sign of the coefficients is reported for the Logit and Probit models in this version of the paper. Prob. Values on the null hypothesis that the coefficient is zero are reported below each coefficient estimate or sign.

The set of variables that predict persistence is consistent with those in the literature. A person is much more likely to persist out of upper years at university than out of first year of university. The coefficient of $-.11$ in the linear probability model is directly interpreted. If a student is in first year in the first of the pair of academic years studied, they are 11 percentage points more likely not to persist. In the linear probability model women are about 2 percentage points more likely to persist than men. A native-born Canadian has the same probability of persistence as a non-native born Canadian. Students who are part of a visible are slightly more likely to persist. Here the effect is stronger with the institutional definition of persistence than with the program definition of persistence. There is no significant effect of family structure in high school on university persistence. The effect of parental education is relatively weak. Here the measure of parental education is a variable that takes on a value of one if there is a parent in the households with some experience of university experience. It is quite interesting that the self-reported variable (self-reported by the youth) that provides an index of youth's perception of the importance of post-secondary education to the youth's parents. If post-secondary education was perceived as either "fairly important" or "very important", the variable takes on a value of one and the youth is much more likely to persist at university. It is encouraging that better high school grades, both overall grades and the last mathematics grade, also make persistence more likely. The units here are grades from 1 to 7 where 1 presents a grade higher than 90% the numbers decline in approximate

increments of 10 percentage points. A way to interpret the coefficient of -0.40 in the linear probability model means that a 10 percentage point increase in your high school grade average means you are 4 percentage points more likely to persist. There is an additional effect of a higher mathematics grade which is smaller in magnitude but statistically significant. Finally there is no effect of attending additional high schools, although the negative sign is as expected, the coefficients in the various models are not statistically significant. The linear probability model has, for this type of model, reasonable explanatory power with an R^2 of around 0.05. The coefficients on the Probit and Logit versions are consistent with the coefficients on the linear probability model. As noted at the bottom of the table, none of these coefficients change when dummies for provincial fixed effects are added to the model. Provincial fixed effects do become important when the effects of tuition are considered in the persistence decision.

Tables 3, 4 and 5 then report the results of taking the Table 2 models and adding, separately, various measures of the level of tuition and the change in tuition, the measures that were presented in Figures 1 through 5. Here the presence or absence of year fixed effects and province fixed effects does have a very impact on the interaction of tuition and the persistence decision. Tables 3 presents estimates of equation (1) with tuition variables and without either year or province fixed effects. Table 4 adds only year fixed effects. Table 5 adds both year and province fixed effects to the estimates of equation (1). I do not report the coefficients on the social and economic control variables. These stay roughly the same when the tuition variables are added.

In Table 3 the coefficients on various tuition variables are added in the absence of either year or province fixed effects. None of the coefficients on the level of nominal tuition are significant. If we look at the level of real tuition, either before or after taxes,

then a higher level of tuition reduces persistence. This is, as discussed earlier, somewhat difficult to interpret. Students entering university in a province with a high level of fees in year one should already have incorporated the higher level of fees into their decision making. It is not clear why these provinces would have a higher drop-out rate if students were rational and forward-looking. It is perhaps more interesting to look at changes in tuition, real or net of taxes, and persistence. These effects are measured in the last two rows of Table 3. Here the estimated effect of increases in tuition is to increase the likelihood of persisting. The effect is positive and statistically significant. Figures 4 and 5 show that increases in tuition are more common than decreases in tuition in the sample period. The analysis in Table 2 hinted at the importance of year fixed effects. Table 4 confirms the importance of these year effects.

In Table 4 and again in Table 5 there are no statistically significant effects of either the level of tuition or the change in tuition on persistence. Not one coefficient is statistically different from zero. This is consistent with two conclusions. First, that the student who have decided to attend university as of first year and reasonable aware of the level of tuition costs and that, as we would expect, persistence is not related to the variation in the level of tuition across the provinces. As is well known and as is shown in Figures 1,2 and 3 the level of tuition is very different across Canadian provinces. In a human capital model, given an expected level of tuition over the next four years, you would not expect the level of tuition to affect the persistence decision. You might expect an increase or decrease in tuition to affect the persistence decision if these changes were unexpected. In both Table 4 and Table 5, there is no effect of the change in tuition on persistence. These are the last two rows of these tables. You could make a number of arguments why this might be the case. All the tuition increases might have been expected

when the students entered. This is not very plausible. 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 likely unexpected. In several provinces there were quite large decreases in tuition and it seems unlikely these were expected. You could also make the argument that when tuitions were increased, other forms of aid to students were also increased. Thus there was no change in persistence behaviour through a wide range of increases and decreases in tuition over the 6 pairs of academic years and 10 provinces studied. However the level of tuition blocks access, it does not appear to be through forcing existing university students to exit university.

5. Conclusion and future work

There needs to be further consideration of how to interpret the interaction of persistence, the level of tuition and the change in tuition. It makes sense that the variation in the level of tuition does not play a large role in persistence decisions. It is little more puzzling that changes in tuition, even very large changes in tuition, have no effect on persistence. This requires further investigation. How did students pay for the increased tuition? Were students taking out more loans? Did they receive more parental support? Did they receive more scholarships and bursaries? Did student work more? The YITS surveys do contain more data to be analyzed. There is a great deal of information concerning the incomes of the continuers.

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

Transition Years	By Institution			By Program		
	Leavers (Percent)	Persisters (percent)	Percent in First Year	Leavers (Percent)	Persisters (percent)	Percent in First Year
1996-97 to 1997-98	Suppressed with low cell counts		76.11	15 (14.29)	90 (85.71)	13.33
1997-98 to 1998-99	304 (14.07)	1857 (85.93)	14.67	335 (15.55)	1819 (84.45)	16.16
1998-99 to 1999-00	621 (11.00)	5026 (89.00)	16.10	641 (12.07)	4669 (87.93)	17.57
1999-00 to 2000-01	680 (8.48)	7338 (91.52)	10.06	754 (10.23)	6616 (89.77)	11.78
2000-01 to 2001-02	684 (7.57)	8352 (92.43)	8.17	728 (8.98)	7377 (91.02)	9.52
2001-02 to 2002-03	361 (5.12)	6695 (94.88)	2.24	378 (6.29)	5627 (93.71)	5.20
2002-03 to 2003-04	625 (6.99)	8322 (93.01)	44.28	680 (8.54)	7278 (91.46)	52.29

Notes:

A leaver is a person who is enrolled as a full time student in university in the first of the pair of academic years listed and does not continue into the second of the pair of academic years listed and does not graduate from that university. A persister does continue into the next academic year. The persistence decision is defined over the institution, university within the same province, in the left-hand three columns and over the program of study, a bachelor's degree within the same province in the right-hand three columns.

The upper number in the cell is the number of persons in that category in the combined sample from YITS A and YITS B. The lower number is the percentage of all university students in the first academic year in that category.

The third column under each definition is the percent of students in first year in the first of the two academic years listed.

Table 2: Coefficients on social and economic variables in the persistence decision

	Institutional Persistence			Program Persistence		
	LPM (Prob)	Logit (sign, prob)	Probit (sign, prob)	LPM (Prob)	Logit (sign, prob)	Probit (sign, prob)
First Year	-.11 (0.00)	Neg. (0.00)	Neg. (0.00)	-.11 (0.00)	Neg. (0.00)	Neg. (0.00)
Gender	.026 (0.00)	Pos. (0.00)	Pos. (0.00)	.024 (0.00)	Pos. (0.00)	Pos. (0.00)
Born in Canada	.00 (0.95)	Pos. (0.95)	Pos. (0.84)	.007 (0.66)	Pos. (0.67)	Pos. (0.59)
Visible Minority	.027 (0.02)	Pos. (0.02)	Pos. (0.01)	.022 (0.10)	Pos. (0.10)	Pos. (0.09)
Family Structure	-.007 (.45)	Neg (0.42)	Neg (0.41)	.003 (.73)	Pos (0.75)	Pos (0.77)
Parent with University	.010 (0.12)	Pos. (0.06)	Pos. (0.08)	.012 (0.10)	Pos. (0.07)	Pos. (0.09)
Parental Attitude	.027 (.01)	Pos (0.01)	Pos (0.01)	.023 (.03)	Pos (0.05)	Pos (0.06)
High School Grade	-.040 (0.00)	Neg (0.00)	Neg (0.00)	-.043 (0.00)	Neg (0.00)	Neg (0.00)
High School Math Grade	-.014 (0.00)	Neg (0.00)	Neg (0.00)	-.013 (0.00)	Neg (0.00)	Neg (0.00)
Number of High Schools	-0.008 (0.21)	Neg (0.30)	Neg (0.10)	-0.007 (0.30)	Neg (0.79)	Neg (0.53)
Year Effects	YES	YES	YES	YES	YES	YES
R squared	0.062	NA	NA	0.059	NA	NA
Sample Size	15482	15482	15482	14813	14813	14813

Persistence is a 0-1 variable equal to one if the respondent persists. 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 one adult. 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. Results are very similar if there are province fixed effects. With province fixed effects only the coefficients are Nova Scotia and New Brunswick dummies are significant.

Prob. Values are calculated with robust standard errors clustered at the individual level. There are 8175 individuals (clusters) at the institution level and 8209 individuals (clusters) at the program level

Table 3: Coefficients on tuition variables in the persistence decision without year effects

Tuition Measure	Institutional Persistence			Program Persistence		
	LPM (Prob)	Logit (sign, prob)	Probit (sign, prob)	LPM (Prob)	Logit (sign, prob)	Probit (sign, prob)
Level of Nominal Tuition	0.000 (0.186)	Pos (0.19)	Pos (0.17)	0.000 (.473)	Pos (.466)	Pos (.445)
Level of Real Tuition and Fees	-.0000084 (0.03)	Neg (.03)	Neg (.04)	-.0000084 (.03)	Neg (.03)	Neg (.04)
Level of Net Real Tuition	-.000016 (.00)	Neg (.00)	Neg (.00)	-.000016 (.00)	Neg (.0)	Neg (.00)
Change in Level of Real Tuition and Fees	.000019 (.09)	Pos (.15)	Pos (.15)	.000028 (.02)	Pos (.02)	Pos (.02)
Change in Level of Net Real Tuition and Fees	.000033 (.00)	Pos (.00)	Pos (.00)	.000048 (.00)	Pos (.00)	Pos (.00)
Year Effects	NO	NO	NO	NO	NO	NO

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

Table 4: Coefficients on tuition variables in the persistence decision with year effects

Tuition Measure	Institutional Persistence			Program Persistence		
	LPM (Prob)	Logit (sign, prob)	Probit (sign, prob)	LPM (Prob)	Logit (sign, prob)	Probit (sign, prob)
Level of Nominal Tuition	-.000004 (0.17)	Neg (0.04)	Neg (0.16)	-.0000079 (.016)	Neg (.01)	Neg (.02)
Level of Real Tuition and Fees	-.0000074 (0.06)	Neg (.06)	Neg (.047)	-.0000074 (.06)	Neg (.06)	Neg (.07)
Level of Net Real Tuition	-0000021 (.61)	Neg (.65)	Neg (.71)	-.0000061 (.17)	Neg (.21)	Neg (.24)
Change in Level of Real Tuition and Fees	.0000057 (.64)	Pos (.72)	Pos (.71)	.00000028 (.82)	Pos (.89)	Pos (.83)
Change in Level of Net Real Tuition and Fees	.000012 (.39)	Pos (.44)	Pos (.46)	.000012 (.41)	Pos (.44)	Pos (.41)
Year Effects	YES	YES	YES	YES	YES	YES

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

Table 5: Coefficients on tuition variables in the persistence decision with year and province fixed effects

Tuition Measure	Institutional Persistence			Program Persistence		
	LPM (Prob)	Logit (sign, prob)	Probit (sign, prob)	LPM (Prob)	Logit (sign, prob)	Probit (sign, prob)
Level of Nominal Tuition	.000005 (0.44)	Pos (0.89)	Pos (0.90)	.0000001 (.99)	Neg (.63)	Neg (.71)
Level of Real Tuition and Fees	-.0000024 (0.84)	Neg (.43)	Neg (.32)	-.0000024 (.84)	Neg (.43)	Neg (.32)
Level of Net Real Tuition	-.00000017 (.99)	Neg (.85)	Neg (.95)	-.00000017 (.99)	Neg (.85)	Neg (.95)
Change in Level of Real Tuition and Fees	.0000059 (.69)	Pos (.78)	Pos (.73)	.0000105 (.52)	Pos (.70)	Pos (.56)
Change in Level of Net Real Tuition and Fees	.000011 (.53)	Pos (.32)	Pos (.70)	.000016 (.38)	Pos (.66)	Pos (.52)
Year Effects	YES	YES	YES	YES	YES	YES
Province Fixed Effects	YES	YES	YES	YES	YES	YES

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

The significant province fixed effects are negative for New Brunswick and Nova Scotia in every model estimated. No other provinces have significant fixed effects.

Appendix: Attrition from the YITS samples

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

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)

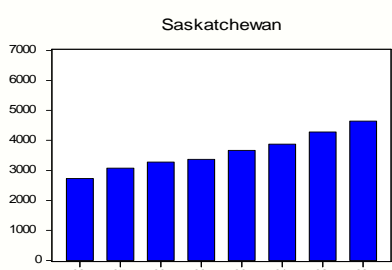
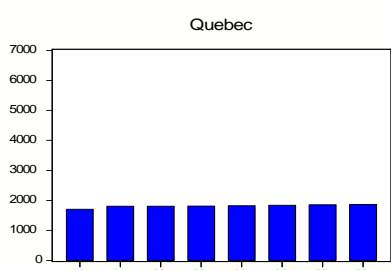
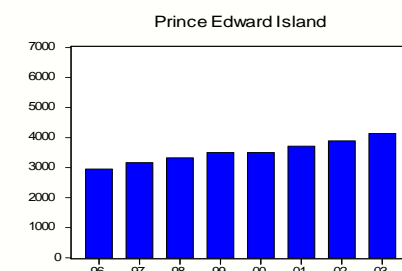
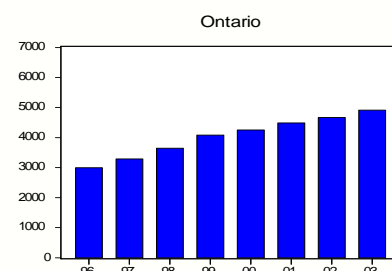
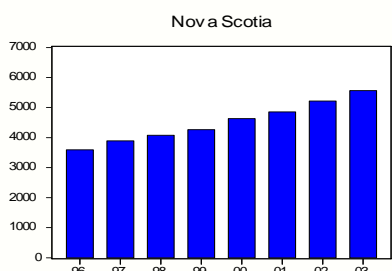
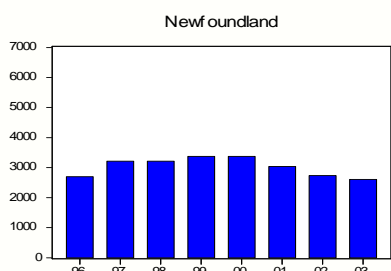
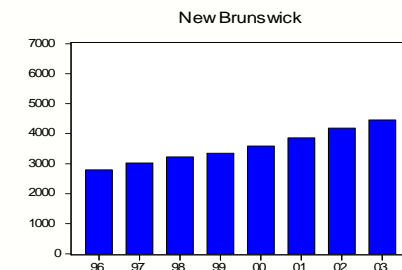
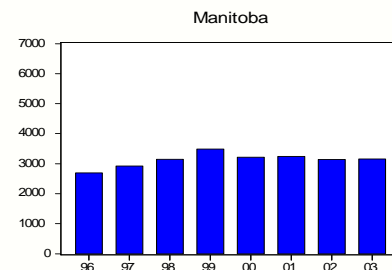
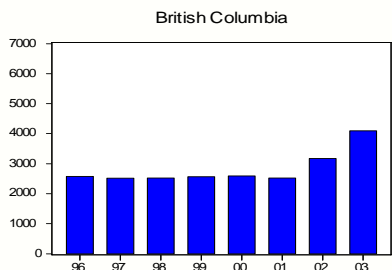
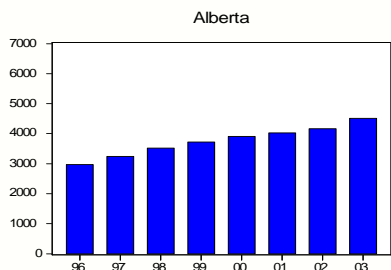


Figure 1: Nominal Tuition by Province, Statistics Canada Measure

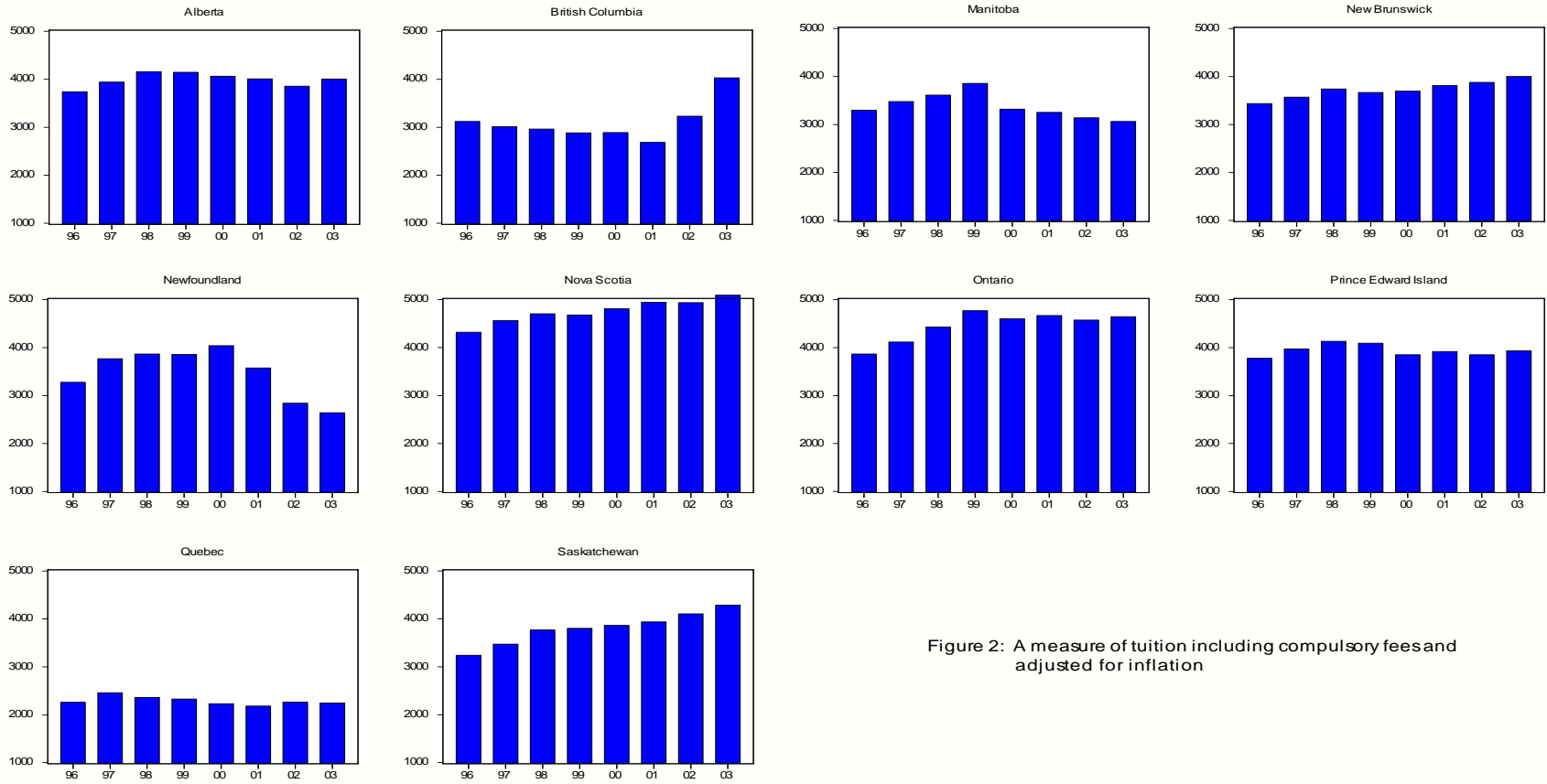


Figure 2: A measure of tuition including compulsory fees and adjusted for inflation

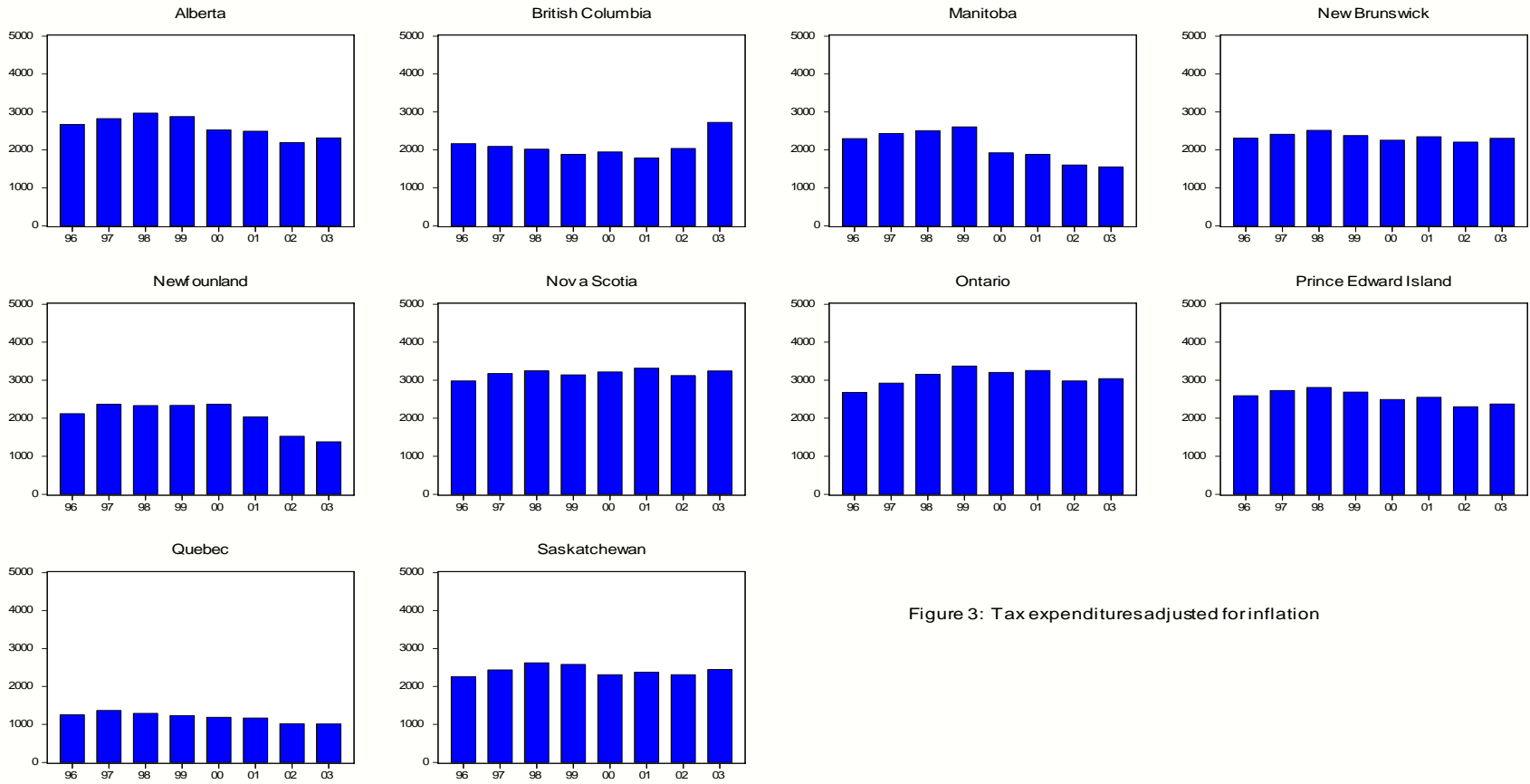


Figure 3: Tax expenditures adjusted for inflation

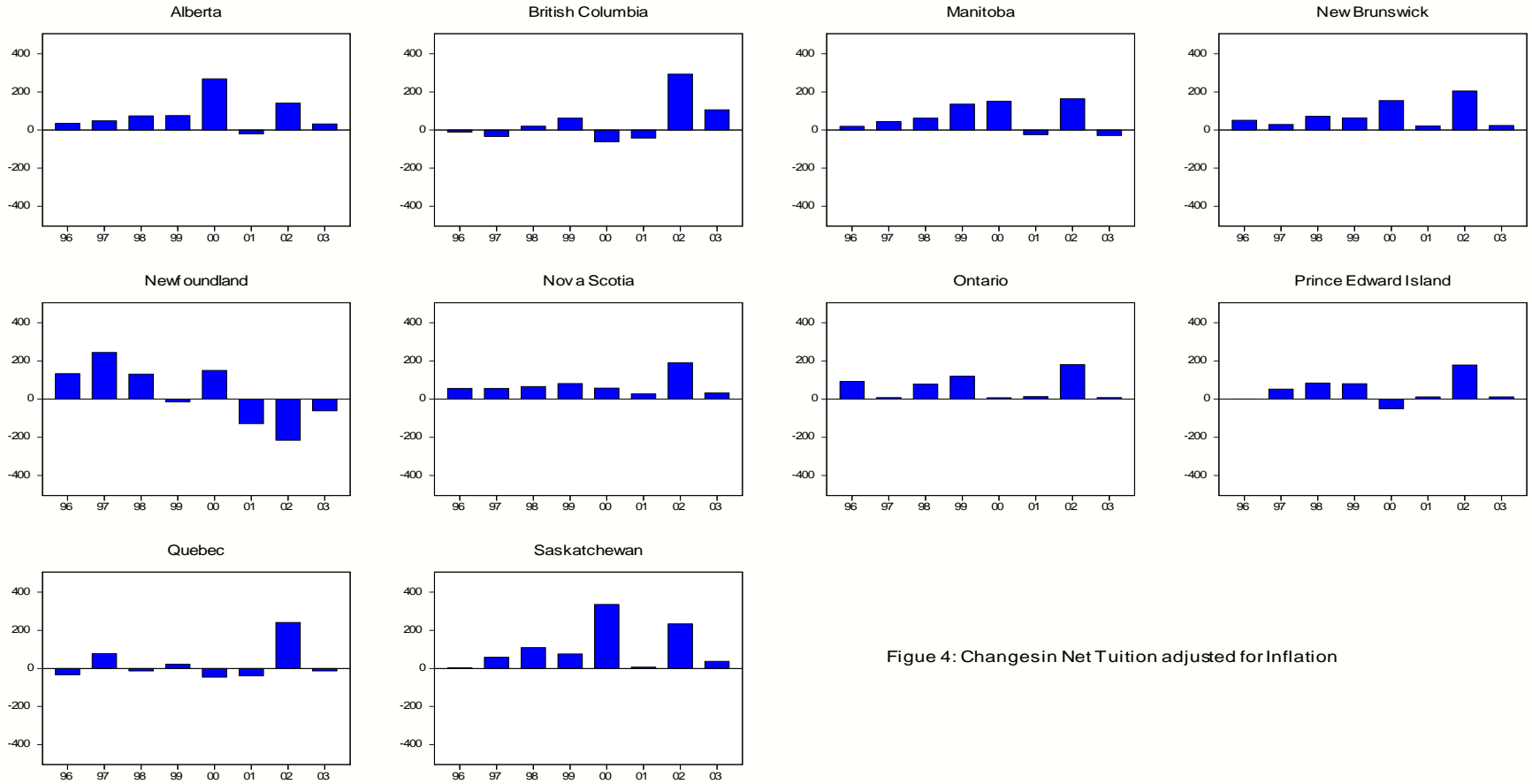


Figure 4: Changes in Net Tuition adjusted for Inflation

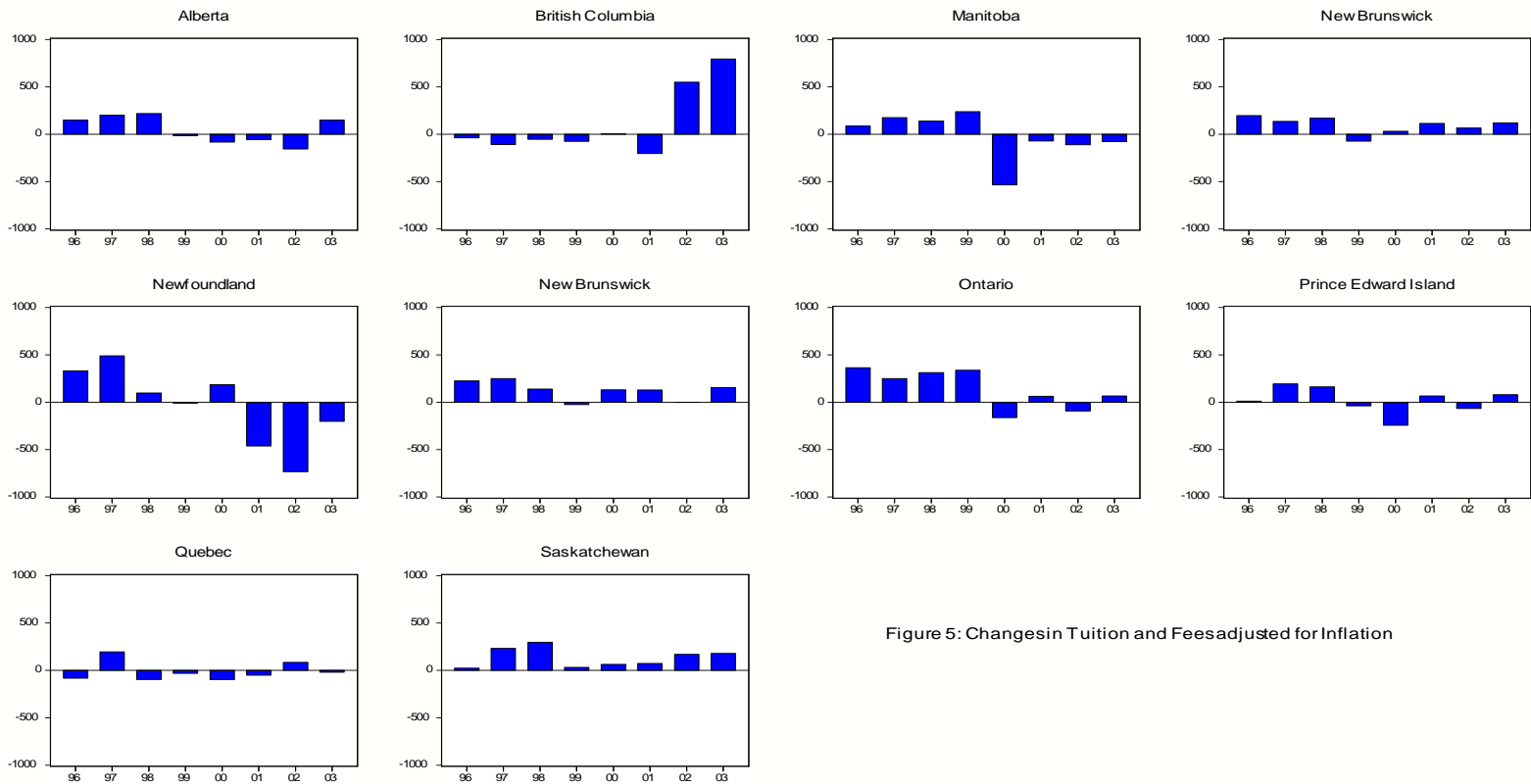


Figure 5: Changes in Tuition and Fees adjusted for Inflation

