Interprovincial Variation in University Tuition and the Decision to Attend University Immediately After High School Graduation

Evidence from the Youth in Transition Survey (YITS) in Canada

David Johnson

MESA2008-4

MESAMEASURING THE EFFECTIVENESS OF STUDENT AID

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Toronto, Ontario, Canada - June 2008 www.mesa-project.org

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

This paper is part of a series of research papers solicited from some of the leading Canadian researchers in the field of post-secondary education; the researchers were asked to write about issues of access and persistence in post-secondary education in Canada. The requirements for the papers were that the researchers use one of several currently-existing Statistics Canada databases or another source of Canadian data. Each of the papers commissioned during this project is available for downloading from the MESA Project website at www.mesa-project.org.

The findings and conclusions expressed in this paper are those of the authors and do not necessarily represent those of the MESA Project or its partners.

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Abstract

The Youth in Transition Survey allows identification of decision points from 1996 to 2003 at which a youth who has just completed secondary school (CEGEP in Quebec) either accesses university in the next academic year or takes another path. Beyond a set of social and economic factors that affect the access decision as expected, there is only very weak evidence that a higher level of tuition in a province alters the probability that a student, having just completed high school or CEGEP, continues into university. The most compelling evidence of a tuition barrier to university access comes from a sample where neither parent has a university education. Although such evidence has a number of interpretations, it does suggest that the policies in place over this period were reasonably effective at removing financial barriers and that new policy efforts around access to university from high school should focus on lower-income students and non-tuition factors in access decisions from university to high school.

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Please cite as:

Johnson, David (2008). *Inter-Provincial Variation in University Tuition and the Decision to Attend University Immediately After High School Graduation: Evidence from the Youth in Transition Survey in Canada. MESA Project Research Paper 2008-4*. Toronto, ON: Canadian Education Project. (www.mesa-project.org/research.php)

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Acknowledgements

I owe an enormous debt to Alex Usher and Ross Finnie as coordinators of the MESA project. In particular the work of Ross, Theresa Qui and Yan Zhang in the documentation of the YITS-A and YITS-B surveys was and is an invaluable contribution for all YITS users. Theresa's programming to create the persistence measures is particularly appreciated. Pat Newcombe-Welch and Cindy Tremblay, at the South-Western Ontario Research Data Centre and its branch at Laurentian University are also to be thanked for their help.

Introduction

In most countries, tuition fees at public universities are significantly less that 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 access, and those who favour a higher tuition fee for a wide variety of reasons. Every change in tuition fees is controversial. 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 asking if variation in the level of tuition fees across Canadian provinces has a measurable impact on the decision by a student who has just completed secondary school (CEGEP in Quebec) to continue directly into university in the next academic year for the pool of young Canadians born in 1979, 1980, 1981 and 1984. This is the group described in the Youth in Transition Survey (YITS). There is some evidence in this paper that a higher level of tuition fees reduces the probability of a direct transition from completing high school to university for students. Any such barrier appears to be restricted to the population of young persons where neither parent has a university educational experience. Such barriers only appear in the overall Canadian data when Quebec, the province with by far the lowest tuition fees and the province with a very different post-secondary system is included in the analysis. It is not clear that the modeling strategy can fully distinguish between Quebec's low tuition fee and other differences in post-secondary policies. It is clear that variation in tuition levels does not drive variation in access rates for the young persons in Canada in the other nine provinces and that, for all 10 provinces, such barriers are low for the population of young persons from families where at least one parent has a university experience. The contribution of the study is necessarily modest. The evidence suggests strongly that the level of tuition is not the central variable in the decision to start a university program immediately after high school completion. The debate on university access out of high school needs to move beyond a debate about university tuition fees.

It is important to stress that simply finding that tuition fees have a very weak relationship to university access decisions made by youth in Canada over the sample period does not mean that lower tuition (or higher tuition) is necessarily a good or bad policy choice. The policy choice of the optimum level of tuition is much more complex and depends on the sharing of private and public benefits of a university education, social mobility, intergenerational equity and the effectiveness of student aid programs already in place. There is also a much more general question relating to the allocation of students into the different forms of post-secondary education. In looking specifically at the access decision at the end of high school over 10 provinces and over a number of years, this paper makes a contribution to the American and Canadian literature that looks at the relationship between university participation and tuition levels.

The American literature on postsecondary participation (usually measured as the proportion of a population either at university or with a degree) 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, students rarely attend out-of-province universities, and in most provinces, tuition fees have been set as a provincial policy at the same level across all universities within a province. There has been a great deal of variation across Canadian provinces in the level of tuition fees both across provinces and over time. A variety of studies measure the effect of tuition fee variation on overall participation rates across Canadian jurisdictions at a point in time. These studies have not produced the clear result that participation falls in jurisdictions with higher tuition fees.

More recent and interesting studies of the Canadian data use individual data on university participation and generate the result that higher tuition fees do reduce participation by a very small amount in well-specified models looking at behaviour over the very long term. Neill (2005) and Johnson and Rahman (2005) make use of the individual data from the Labour Force Survey (the LFS) which begins in 1976. 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. Neill (2005) 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 estimates of reduced participation fall between one and three percentage points per 1000 dollar increase in real (1992 dollars) tuition. A 1000 dollar increase in real tuition is an enormous increase in real tuition. Real tuitions are in the 1000 to 5000 dollar range in the provinces studied over time. Johnson and Rahman find a negative effect on participation only relative to a strong increasing time trend in university participation between 1976 and 2003. Neill includes Canada-wide 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. This information is available in about 60% of Neill's sample and in none of the Johnson-Rahman sample.[1] Coelli (2005) makes some progress around this limitation by using household responses in the Survey of Labour Income Dynamics (SLID). Coelli finds university participation by lower income families is reduced when tuition is increased for a very small sample of low-income youth in SLID. The YITS considers a very large sample of youth and is an improvement over the SLID sample. The Coelli, Johnson and Rahman, and Neill studies of individual survey data are rare in that the level of tuition is even considered as a determinant of university participation. Most other studies of similar survey data do not have an explicit role for tuition variation.

1 Although both papers use the Labour Force Survey, the public use version used by Johnson and Rahman does not contain the links from youth to parent. The Research Data Centre master files used by Neill contain those links if a youth is deemed to live at home. This is the 60% of the sample referred to above.

Frenette (2005) explicitly compares post-secondary participation in Canada and the United States where the National Longitudinal Survey of Youth (1997) is the American survey and the SLID is the corresponding Canadian survey. Frenette's results indicate that income plays a larger role in the American participation decision than in the Canadian decision. Frenette (2007a, 2007b) then uses the YITS Cohort A data to ask why youth in lower income families and male youth are less likely to attend university in Canada. The YITS-A data contain a direct measure of ability, a test score on a standardized reading assessment. These variations in ability are the dominant factors in the decision to attend university. After accounting for variation in reading scores, high school grades and a parental influence question, only 12% of the gap in university participation in YITS-A between the top and bottom income quartile of families is explained by financial factors. In comparing men and women, the participation gap is explained by academic ability.

The studies cited above consider overall university participation. In fact, you can conceptually divide university participation into access behaviour into university and persistence behaviour between years once in university ending in graduation. Barr-Telford et.al (2003) use data from a survey similar to YITS, the Postsecondary Education Participation Survey (PEPS) which is a single sample of 5000 persons across Canada aged 17-24 in 2002. 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% graduated and 16% left without graduating. Of the leaving group, only 29% of that 16% reported they left for financial reasons. This pattern of responses is indirect evidence that financial constraints do not drive decisions to exit post-secondary education between 2000 and 2002.

Three papers to date, Bowlby and McMullen (2002), Lambert et. al (2004) and Shaienks et. al (2006) have used YITS to describe patterns of persistence. There is a general sense that the same social factors that are associated with post-secondary access decisions are those associated with post-secondary dropout decisions. 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.

Johnson (2008) shows that, in a tighter specification of the decision to persist at university using the YITS data, the only social and economic factor that actually affects persistence is membership in a two-parent family during high school. The only other factor that is associated with persistence in Johnson (2008) is high school grades; the better the high school grades, the more likely is persistence. YITS does ask if respondents perceive a financial barrier to post-secondary participation. For the persons who left post-secondary education, only 34% in YITS reported financial barriers to continuing. For the persons who stayed in post-secondary education, only 29% reported a financial bar-

rier. Once again this indirect evidence points to a small role for financial issues in this decision. All three studies find there is substantial variation across provinces in the rate at which respondents leave post-secondary education. Johnson (2008) links 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 in YITS. There is no evidence of any relationship between persistence decision and either the change in tuition or the level of tuition. Day (2007) finds that students who received financial aid are more likely to persist. Finnie and Qui (2007) find that students who are older on entry are more likely to drop out of university.

I am not aware of any other study of access decisions using Canadian data at a point in time where the role of tuition at that point in time is considered directly. The advantage of the approach taken in this paper is that each survey participant, upon completing secondary school and thus becoming eligible for university, does so at a specific point in time and in a specific province facing a specific level of tuition within that province. The level of tuition varies across time within the same province and across provinces at the same time. Thus if the level of tuition plays a role in making the decision to move from high school completion into university, this role should be observable with this type of data. Since tuition is not found to be associated with access decisions, it is reasonable to conclude that variation in tuition is not the central variable in access.

The paper proceeds as follows. The extraction of the measure of access to 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 from YITS as well as a discussion of the tuition variable and a provincial-level unemployment variable that are merged to the YITS data. Section 4 presents models of the access decision where the effect of the level of tuition on access is measured. There is a brief conclusion and a discussion of possible extensions to the paper.

Establishing the Persistence Sample

The responses to the Youth in Transition Survey (YITS) allow the creation of a sample of specific points in time, defined between academic years, where young persons who graduate from high school (CEGEP in Quebec) make a choice; respondents choose to enter a bachelor's program at university in the next academic year or does not. 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). Each respondent represents a component of the entire population of Canada in the age categories above. Young persons in small provinces are oversampled 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 records life choices made during 2000 and 2001. Cycle 3 records life

choices made in 2002 and 2003. 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. The result is a longitudinal history of a group of Canadian youth aged 15, 18, 19 and 20 on December 3, 1999 from birth to the end of 2003.

The access decision studied in this paper considers a high school student who graduates in May or June in a calendar year in a specific province and then enters or does not enter a bachelor's program in September of the same calendar year. Because YITS-B and YITS-A present information on different age groups, the number of observed transition points 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 of the respondents are already in post-secondary education or a bachelor's program at that time. Their educational history identifies both the academic year when they graduated from high school and whether they were enrolled in a bachelor's program in the next academic year.

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, Grade 12 would be completed in June 2002 and the student would enter post-secondary education in September 2002. This would be the "normal" path for students in 8 of 10 Canadian provinces. In the two largest provinces, Ontario and Quebec, the "normal" path was different at the time of the survey. In Ontario a formal Grade 13 secondary school year was still in place in June 2002 but some students did complete secondary school in 4 years, that is, at the end of Grade 12.[2] In other English-speaking provinces where Grade 12 was the "normal" path, some students also choose 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) with the intention of continuing to university. There are other programs at these colleges that do not lead to university and some of the college programs are three-year programs.

By the time of the interviews held between January and June 2004 that record the activity between January 2001 and December 2003, a "normal" respondent in Ontario and Quebec has made an initial university access decision. The variation in access across time and provinces is explored in Tables 1 and 2. Tables 1 and 2 show the percentages of students who access university by pairs of academic years and then by province. The left-hand side of Table 1 presents, for the combined YITS-A and YITS-B sample, the number of observations of access deci-

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2 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.

sion in that pair of academic years with values rounded to the nearest 100. The right-hand side presents estimates of access rates for youth in Canada in the universe sampled by YITS. First it is striking that access rates in the pair of years 2000-01 to 2001-02 are much lower than in any of the other pair of years. This reflects the sequencing of the YITS cohorts. All respondents are 15, 18, 19 or 20 on December 31, 1999. In all provinces, those where 4 years of high school is the "normal" completion period and those where 5 years of high school (treating the 2 pre-university years at CEGEP as high school) is the "normal" completion period, none of the YITS respondents in the 4 specific age categories above would normally obtain high school (or 2-year CEGEP) graduation in 2000-01. Thus Table 1 shows that those persons whose high school graduations are outside the normal path have lower access rates. This is not a problem for the analysis but an important caution in the interpretation of the data.

Table 2 presents provincial access rates in 5 ways. There are access rates by year of birth: 1979, 1980, 1981 (the components of YITS-B) and 1984 (YITS-A). There is some year-to-year variation in access rates within a province. In particular, the access rate in Ontario for those born in 1981 is very low and the reasons for this are not clear. To look at variation across provinces without the year-to-year variation, the access rate aggregating across all respondents to YITS-B is presented in the fourth row of Table 2. Provincial access rates for YITS-B vary from 42.6% in Nova Scotia to 21.6% in Ontario. The access rate for the larger Cohort A (youth born in 1984) also varies enormously by province. The overall access rate in Quebec for YITS-B is 25.4% but the access rate in Quebec for YITS-A is only 14.9% as of the end of Cycle 3. However these respondents are only 19 years of age. Access to university is a different process in Quebec and thus requires further investigation and perhaps a different treatment in the analysis.

It is clear even at this point in the analysis that since Nova Scotia is the province with some of the highest tuition levels and Quebec is the province with the lowest tuition level, it will be difficult to find a simple relationship between access rates and the level of tuition. It is also the case that the access rate in seven of 10 provinces for those born in 1984 is higher than the access rate for those born in 1979, that is, access rates in Canada appear to increase even over this short period of time. Since tuition levels have also increased over time in almost all provinces, it will again be difficult to tie higher tuitions in a simplistic way to lower access rates. All of this variation in access rates across provinces and years does allow for the possibility that variation in tuition levels across provinces and years could be associated with variation in access rates. It is also true that the other characteristics of persons making access decisions in these provinces vary systematically across provinces. To investigate the role of tuition in access decisions, variables that describe the characteristics of persons in each province must be constructed and then models must be estimated that allow for provincial and year-specific fixed effects. Only then can the association of tuition and access can be considered.

The Social and Economic Variables Available for the Analysis of Access

Three types of variables are considered in the analysis of the access decision in this paper. In each academic year, three different measures of the level of university tuition in the province are linked to the observations of access decision. In a similar way, provincial level observations of aggregate unemployment rate by gender at the time are linked to the individual access decisions. The third set of data, described immediately below, are the personal, social and economic variables that describe individual respondents. Although there are many variables available in YITS, the variables used must be available in both YITS-A and YITS-B because observations of access are used from both surveys in this study. Using both surveys allows a much longer time span of analysis and thus more variation in tuition across provinces.

Respondents are identified by age, gender, language spoken at home (official or non-official), as a member of a visible minority, and by the age at which they entered Canada. 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 reports the number of high schools attended over their high school career.

There are three variables related to the respondent's family. YITS-A and YITS-B report slightly different information about parental education so that the variable that can be created from both surveys is a dummy variable that equals one if at least one parent figure has some university education or a university degree. There is also one subjective variable, often used in other studies, that measures the perception of the youth as to the attitude of their parent(s) about the importance of education beyond high school. This variable is set equal to one when the youth perceives post-secondary education is important to the parent. Finally there is a variable that asks if the youth lived with one or two adults during most of their high school period, a single parent indicator variable. It is noteworthy that there is no family income variable in YITS-B. This variable appears only in YITS-A.[3]

There are 3 measures of the level of tuition used in this study. Figure 1 illustrates the nominal tuition measure provided by Statistics Canada. The year in the graph is such that 1996 refers to the tuition level in 1996-97. Quebec has by far the lowest nominal tuition fees over the entire period. The measure of tuition in Figure 1 is neither adjusted for inflation nor inclusive of the wide variety of compulsory fees paid by students. Usher (2006) constructs a nominal measure of the direct cost of university attendance which includes compulsory fees. Figure 2 illustrates Usher's measure adjusted for inflation using the Consumer Price Index for each province calculated over the 12-month academic year beginning in September. Provinces that did not allow nominal tuition in line with inflation show reductions in real fees. There are also two provinces, Manitoba

3 There is limited and difficult-to-interpret information in YITS on income earned and income spent by the respondent. Among other problems the income data refer to the second of the two calendar years between cycles, that is, 2001 and 2003. There is some information on employment periods as well as some information on scholarships and loans that are not tied in a clear way to specific academic years. These are areas that require further investigation.

and Newfoundland, where nominal tuition fees were directly reduced. Usher (2006) also calculates (as shown in Figure 3) a measure of the reduction in taxes due associated with a year of university attendance in a province. The reduction in taxes varies quite substantially across provinces and even more over time. Both the provincial and federal government increased various tax credits associated with post-secondary education over the sample period. When the amounts shown in Figure 3 are subtracted, for each province and year, from the amount shown in Figure 2, the result is a measure of real tuition net of taxes. This measure, the level of real tuition and fees before taxes, and the direct measure of nominal tuition are the three measures of tuition fees, and changes are joined to the individual data by province and academic year at each decision point.

The other variable added to the model of the individual access decision is the province and gender specific unemployment rate. The unemployment rate is defined as the average of monthly levels of the provincial unemployment rate over the academic year from September to August for persons aged 15-24 of that gender. The unemployment rate controls for labour market conditions. The effect of higher unemployment on the access decision is not obvious. Higher unemployment may induce persons to have a stronger desire to attend university since they may believe getting the extra qualification may give them an advantage in the weaker labour market. But a high level of unemployment in the province may make it more difficult to attend university if the probability of employment and thus income was lower during the term preceding the point of access. A low level of unemployment may directly increase current job prospects and make university less attractive. A secondary purpose in introducing the province specific unemployment rate variable is to help in the interpretation of the province and Canada-wide year effects used in the estimated models. These indicator variables play an important role in the models estimated. Their meaning, as with all such indicator variables, is relatively difficult to interpret.

Results

The estimated equations take the form

$$\begin{aligned} Access_{i,j,t} = & \\ & f(\text{observable personal characteristics}) \\ & + t(\text{tuition measure}) \\ & + i(\text{indicator variables}) \\ & + u(\text{unemployment measure}) \\ & + \text{Error} \end{aligned} \quad (1)$$

The variable $Access_{i,j,t}$ equals 1 if the individual "i" in province j between a pair of academic years t completes high school (or completes CEGEP in Quebec) in the first of the pair of academic years and then moves directly to university in the second of the pair of academic years in question. Otherwise the variable equals zero. The sample is individuals who completed high school or CEGEP in YITS-A and YITS-B.

Table 3 presents coefficient estimates for the modeling equation (1) using equations that do not contain tuition variables. The coefficients on the linear probability model and the marginal effects presented in the Probit model have the same interpretation. They

measure the change in the probability of access with a one unit change in the relevant variable on the right-hand side of equation (1). A very large proportion of the variables are indicator variables so in both models the relevant change is from zero to the state indicated when the value of the indicator variable is one.

Table 3 also presents the coefficients on indicator variables for Canada-wide year fixed effects and province fixed effects discussed above. The coefficients on the year effects are clearly different from zero and all coefficients are negative relative to the omitted pair of years, the last pair of years in the data. They are slightly difficult to interpret. The dummy variable for the specific pair of years discussed in Table 1, 2000-01 to 2001-02, has a very large negative coefficient of -0.182. This coefficient means that a respondent who graduated high school in 2000-01 relative to a respondent who graduated high school in 2002-03 has an 18.2 percentage point lower probability of attending university in the year immediately after high school graduation.

In Table 1, it was argued that the persons here are the students in the sample who are not finishing high school along the "normal" path in Canada, that is, the part of the sample that required an extra year of high school. Beyond that pair of years, the negative values of the other year effect coefficients indicate access probabilities are lower relative to the last pair of years, 2002-03 to 2003-04. Thus access in Canada has been increasing over time, even in the relatively short time studied in YITS. Table 1 shows that the final year has the highest access rates and, made the argument that that pair of years is dominated by students in Ontario and Quebec from YITS-A. But the estimated models in Table 3 include province fixed effects, dummy variables active for all observations of secondary school completion from a specific province where Ontario is the omitted province. Provincial composition effects are not driving the significance of the year fixed effects. It seems likely that age composition effects are related to the year effects given that 8 or the 10 provinces, as already mentioned, have a similar age structure in the completion of high school.

The coefficients in Table 3 indicate that most of the other provinces have, other factors equal, higher access rates than Ontario. Once again, this is difficult to interpret in a straightforward way. Ontario has a much larger college system than other provinces. It is notable that the access rates in the Maritimes, where the college system is smaller, is, once again, conditional on other factors, higher than all the other provinces in Canada.[4] Alberta and Ontario, on the other hand, have similar access rates, all other factors being equal. The coefficients on the fixed effect variables associated with provinces do not imply that one province has a better post-secondary system than another. They simply show that, given the other factors, access probabilities in that province are different than those in Ontario for reasons associated with variables not already included in the model. The role of the other factors

4 You cannot introduce province-year indicator variables into these models because the tuition variables and the aggregate unemployment variables (gender aside) are defined over a province and a year.

beyond the fixed effects on access is shown by the other coefficients in Table 3.

The set of variables associated with access is reasonably consistent with those in the university participation literature. Only one variable has a surprising coefficient, at least at first glance. Conditional on the other factors in the model, the point estimates of -0.0138 and -0.011 suggest it is slightly less likely (one percentage point) that a female accesses university. However the effect is not statistically significant in either the linear probability model or the Probit model. We know that over this period, the relative proportion of females in university increased but this result says that if the increase in female university participation rate is to be found at the access point, it is related to other variables already included in the model. High school grades, considered later, are the obvious suspect. If females completing high school have higher average grades and these grades lead to a higher probability of access, this effect is measured in the model and discussed below.

A similar statement can be made about place of birth, conditional on values of the other factors in the model; there is no effect on the university access decision related to a survey respondent status as born in Canada because the coefficients on the born in Canada indicator variable are not statistically significant in either model. However, a member of a visible minority is about seven percentage points more likely to access university relative to a non-member of a visible minority, all other factors equal. A respondent who had only one parent during high school is less likely to access university. The single parent effect is statistically significant at three percent in the linear probability model but at only eight percent in the Probit model. A respondent where at least one parent had some university experience is considerably more likely to attend university.

Parental attitude, as perceived by the youth, is also positively associated with access. Both effects are strong and precisely estimated, for example, holding other factors constant, both models predict that a respondent coming from a household where at least one parent has some university experience is 14 percentage points more likely to attend university in the year following high school completion than a respondent coming from a household where no parent has a university experience. Moving frequently between high schools is associated with a lower rate of access. Each additional high school attended, conditional on other factors, reduces the probability of access by about four percentage points. A one percentage point higher unemployment rate in that youth's segment of the provincial labour market reduces the probability of access by about two percentage points. This is an interesting finding since the expected sign on this variable was not obvious. It is straightforward to make arguments that higher unemployment rates might raise or lower access probabilities.

Finally high school grades play an enormous role in the access decision. High school grades are scaled using the YITS responses so that a one unit increase in the measure of high school grades is a movement from a grade range of 50-59% to a grade range of 60-69%, from 60-69% to 70-79% and so on up to the 90-100% range. An increase in your

high school average grade in the order of 10 percentage points, increases the probability of university access by about 11 percentage points. This is not surprising since university positions are granted based on partly on high school grades. It may well be the optimal allocation mechanism. It is interesting and a bit more surprising that an increase in your high school mathematics grade of 10 percentage points has an additional independent effect on the access decision of about 3 percentage points. The R-squared on the linear probability model is a respectable 0.190. In the YITS data, a standard set of factors seems to explain a reasonable amount of the variation in university access decisions. The purpose of this project is to measure what effect, if any, variation in provincial tuition rates has on access probabilities. This measurement takes place in a variety of specifications.

Table 4 presents estimates of coefficients on the three measures of tuition level in a number of different models of access. Different measures of the level of tuition are added separately to the models estimated in Table 3. Because it is very difficult to provide an absolutely clear interpretation of either the Canada-wide year effects or the province fixed effects, Table 4 presents coefficients on the three tuition variables in five specifications and asks if there is any robust evidence that the level of tuition, however measured, tends to reduce the probability of access. Tuition is measured in thousands of dollars so a one unit change in tuition corresponds to one thousand dollars change in tuition. In four of five cases, tuition is measured in thousands of real (1992) dollars. One set of models is estimated with the measure of nominal tuition.

Nominal tuition is the variable directly under the control of the provincial governments in most cases. It may be the case that student loan limits are set in nominal terms. It seems that a brief look at the association of nominal tuition would be worthwhile in understanding the overall association of tuition and access. First higher levels of nominal tuition are generally associated with increased probability of access. These are the coefficients found in the first column and the fourth column of numbers. This actually makes some sense. Table 1 showed over time there was an overall increasing Canada-wide propensity to access university. If you measure tuition in nominal terms, even in a period of relatively low inflation, then the coefficients on a measure of nominal tuition which is increasing in level with inflation will pick up some of these trends. In any case it is clearly better to adjust the level of tuition for inflation. This is done in the other columns of data.

The second and fifth columns present a series of estimates of the effects of higher real tuition (including compulsory fees) on the access decision. Here the measured association of the level of tuition, various measures, and access, depends strongly on the specification. Two specifications have no year fixed effect variables. These are the first two rows of coefficients. The association of the level of real tuition (before or after tax) with the probability of access is negative when there are no province fixed effects and positive when there are province fixed effects. The latter finding is not surprising. The year

fixed effect coefficients in Table 3 and Figures 1 and 2 show that, over time, both access and real tuition levels have increased. Without year fixed effects in the model and with province fixed effects (row 2) there is a strong and significant positive relationship between the level of real tuition and fees and the probability of access. Read literally, the coefficient 0.058 is interpreted as saying that a 1000 dollar increase in real fees is associated with a 5.8 percentage point increase in access probabilities (three percentage points in the Probit estimate)

Two specifications have no province fixed effects. In the first row, the specification with neither province fixed effects nor year fixed effects, there is a negative but statistically insignificant effect of higher real tuition and fees on the access decision. The interpretation of the coefficient -0.0088 (Prob Value 0.13) is that a respondent facing a 1000 dollar higher level of real tuition and fees would reduce the probability of university attendance in the year following high school graduation by 0.88 percentage points in the linear probability model and 0.49 percentage points in the Probit estimation.

The effect is slightly larger and is statistically significant when the effect of real tuition and fees on access is measured when there are no province fixed effects and year effects are included. These are the values in the third row. The largest negative statistically significant effects of higher tuition on access are found in this row. Both coefficients are -0.019. This value is interpreted as saying that when tuition and compulsory fees are one thousand dollars higher in real terms, then the probability of enrolment at university in the year immediately following high school graduation falls by 1.9 percentage points. This reduction is relative to a probability of access over time that varies across the years in the data in all provinces in Canada for reasons associated with those years and not associated with other factors already included in the model.

It is interesting that the coefficient is virtually identical (-0.023 or -0.022) on the net of tax real tuition measure in the third row of coefficients. Using either the real level of tuition and fees or the net of tax real level of tuition and fees in the specification with no province effects and individual year effects is the strongest case for an overall association of higher tuition and reduced access. However when province fixed effects are absent from the specification, all of the effects associated with being in a different province are forced onto province variation in tuition levels. Table 3 strongly suggests this may not be the desirable specification because in Table 3, the coefficients on the provincial indicator variables are not zero, in fact, they are very far from zero. In addition, it is clear that the provinces do have very different systems of post-secondary education in which universities do play different roles in different provinces. Thus the preferred specification is found in the fourth and last row of coefficients.

When there is a full set of indicator variables as suggested by the coefficients in Table 3, the association between a higher level of real tuition and fees (gross or net of taxes) is never of statistical significance. The Prob. Values on the net of tax real tuition measures are very far from zero. The values are 0.98

and 0.77. It is quite clear there is no association of a lower level of net real tuition and higher enrolment. The point estimates of the increase in the probability of enrolment suggest that a one thousand dollar increase in real tuition including required fees is associated with a decrease in enrolment probability of about three percentage points. Here the Prob. Values are 0.15 and 0.17 respectively. There is some chance that these overall coefficients estimated using the full sample of data might not be zero. It is more interesting that the point estimates of the decrease in access probability is about the same size decrease in overall participation rates at university found in the Labour Force Survey studies done by Neill (2005) and Johnson and Rahman (2005) mentioned in the introduction. In those studies of the Labour Force Survey data with either year fixed effects or a simple trend through 26 years of data, the enrolment decrease was statistically significant and between one and three percentage points per thousand dollar increase in real tuition. The YITS allows two further robustness checks on the results. It is important to recall that these reductions in access probabilities are very small for very large increases in real tuition.

Table 5 presents estimates of the effects of tuition on access probabilities for a sample drawn from YITS where neither parent has exposure to a university education. The model includes both year fixed effects and province fixed effects. This sub-sample of YITS can be thought of in two ways. This may be a sample where the household has the least knowledge of the benefits of university attendance and the least knowledge of admittance procedures and similar information about universities because neither parent has exposure to university. It may also be thought of as a lower income sample since we know a higher level of parental education will be on average be associated with higher family income. In this sample, there is no statistically significant relationship between the level of nominal tuition and enrolment probabilities. There is no significant relationship between the level of net real tuition and fees and the probability of enrolment. But there is a statistically significant association between the level of real tuition and fees and the probability of enrolment. It is much stronger that the same relationship in Table 4. In the linear probability model in Table 5 the predicted effect of a one thousand increase in tuition is a 4.8 percentage point decrease in the enrolment probability and the effect is statistically significant at the four percent level. In Table 4, the predicted decrease in the enrolment probability in the same specification with province and year fixed effects was 3.2 percentage points and it was statistically significant only at 15% level.

Since the Linear Probability Model is (by definition) a linear estimator, the estimates for the overall sample are a weighted average of the estimates from the sample where at least one parent has a university experience and the sample where neither parent has a university experience, the results in Table 5 and 4 respectively. Table 5 suggests that any negative association between higher tuition and reduced access are concentrated in families where neither parent has a university experience. That is an interesting finding. A second interesting finding in Table 5 is that the coefficients real tuition and fees are quite different than the equivalent coefficients on

net tuition. The coefficients on net tuition are -0.11 and -0.00005 in the two models and are clearly not statistically different from zero. This suggests a difference in the effects of gross and net tuition in the sub-sample without a university-experienced parent. There is room for further research on this issue. However before Table 5 leads us to too strong a conclusion that higher tuition reduces access for the sub-sample, there is one further robustness check.

The second robustness check on the results relates to a better understanding of the role of Quebec in the results. Figures 1 and 2 make it clear that tuition in Quebec, whether nominal or real, gross or net, is much lower than in other Canadian provinces. Table 6 presents results where all observations from Quebec are excluded. Quebec's tuition levels are at least 1000 dollars lower than tuition levels in any other province. Quebec's access rate after CEGEP graduation, is quite low. It is not clear how to handle the differences between the post-secondary system in Quebec and the system in the rest of Canada. Table 5 simply excludes the Quebec observations from the sample and estimates the relationship between the measures of tuition and access for the other nine provinces where there are both year fixed effects and province fixed effects. The results then show that there is simply no negative association of any type between a higher level of any measure of tuition and the probability of enrolment in university in the year after high school. All the estimated coefficients in Table 6 are positive. Figures 1 and 2 show that, even excluding Quebec, there is substantial variation over time and between provinces in the level of tuition. The bottom line is, over the YITS survey period, there is very little evidence of a strong negative association between higher levels of tuition and reduced access across Canadian provinces within the YITS sample period.

Conclusions and Future Work

There are enormous differences in the level of tuition across Canadian provinces and over time during the period of the YITS surveys. As a general conclusion, if province fixed effects are included, then these differences in the level of tuition do not have a negative association with access rates. There is one exception. If Quebec is included in the data and a sample of youth from parents where neither parent has a university educational experience, then there is an observed and statistically significant reduction in the probability of university enrolment when tuition is higher. The effects of changes in gross tuition and fees and net tuition and fees are not equivalent in this case. This is a concern since some of the recent attempts to increase access and lower the direct cost of university attendance have focused on tax relief associated with university attendance. It may be that these changes do not have an impact on families where neither parent has a university experience and, by inference, on lower income families. This requires further investigation.

The general result of this study is that higher tuitions have had little impact on university access. One interpretation is that the monetary net benefit of university completion is so large that even very large differences in the level of tuition across provinces and time simply do not affect the behaviour

of students. Another interpretation is that, in provinces where tuitions are substantially higher, student aid programs compensate for any differences. In either interpretation of the results of this study, there is no strong association of a higher level of tuition and a lower probability of enrolment following high school or CEGEP graduations. Barriers to university access, if they exist, are not strongly associated with direct tuition costs of attendance.

There is work left to be done. How did students pay for higher levels of tuition across the different provinces? Are student loan and debt levels very different across provinces? Do students in different provinces work with different levels of parental support? Do students work more either in higher tuition provinces and does this have positive or negative impacts on other aspects of their lives? The YITS surveys do contain more data to be analyzed concerning work choices. The data on student financial choices are much more limited. This is an area where more data are needed.

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Tables

Table 1. Access to university in the combined YITS-A and YITS-B sample

Transition Years	Number of observations in the combined YITS-A and YITS-B samples rounded to nearest 100	Canadian percentages using survey weights
1996-97 to 1997-98	3500	20.9
1997-98 to 1998-99	5500	25.7
1998-99 to 1999-00	6000	30.4
1999-00 to 2000-01	1700	28.7
2000-01 to 2001-02	1600	14.5
2001-02 to 2002-03	12500	24.3
2002-03 to 2003-04	3900	36.5

Table 2. Access to university immediately after high school graduation by province and year. Survey weights are used.

Year of Birth	Canada	Province									
		NL	**PEI**	**NS**	**NB**	**Que**	**Ont**	**Man**	**Sask**	**Alta.**	**BC**
1979	28.6	30.8	29.8	38.1	39.5	31.9	25.6	27.3	31.5	25.9	31.6
1980	26.9	33.7	38.3	47.7	32.5	25.7	25.8	33.3	29.4	19.2	27.2
1981	22.6	36.7	37.3	42.3	34.5	20.0	13.4	27.4	32.9	28.9	33.9
1979, 1980, 1981	26.1	33.7	34.9	42.6	35.4	25.4	21.6	29.4	31.3	24.9	30.9
1984	28.3	35.8	44.6	52.3	41.8	14.9	28.7	33.6	29.6	25.9	30.5

Notes for Tables 1 and 2:

The percentage of students who complete high school (CEGEP in Quebec) during the first academic year and then move directly of university is calculated. Survey weights are used to estimate proportions by province and across the country using YITS respondents from Cycle Three. The percentages represent decisions by persons aged 15, 18, 19 and 20 year-olds in Canada who completed high school (CEGEP in Quebec) and then proceeded into a bachelors program in the next academic year. In Table 1-A high school or CEGEP is completed in the first year of the pair of academic years under discussion.

Table 3. Access coefficients on social and economic variables in a model estimated without tuition variables

	LPM (Prob Value)	**Probit Marginal Effect** (Prob Value)
Female	-0.0138 (0.36)	-0.011 (0.45)
Born in Canada	-0.0076 (0.74)	-0.0057 (0.77)
Visible Minority	0.072 (0.00)	0.070 (0.00)
Single Parent	-0.026 (0.03)	-0.020 (0.08)
Parent with University	0.145 (0.00)	0.14 (0.00)
Positive Parental Attitude	0.089 (0.00)	0.11 (0.00)
High School Grade	0.114 (0.00)	0.108 (0.00)
High School Math Grade	0.032 (0.00)	0.026 (0.00)
Number of High Schools	-0.041 (0.00)	-0.050 (0.00)
Unemployment rate for youth	-0.022 (0.00)	-0.021 (0.00)
1996-97 to 1997-98	-0.186 (0.00)	-0.125 (0.00)
1997-98 to 1998-99	-0.134 (0.00)	-0.095 (0.00)
1998-99 to 1999-00	-0.106 (0.00)	-0.081 (0.00)
1999-00 to 2000-01	-0.125 (0.00)	-0.093 (0.00)
2000-01 to 2001-02	-0.182 (0.00)	-0.12 (0.00)
2001-02 to 2002-03	-0.159 (0.00)	-0.11 (0.00)
2002-03 to 2003-04	Omitted	Omitted
British Columbia	0.128 (0.00)	0.14 (0.00)
Alberta	0.029 (0.15)	0.030 (0.17)
Saskatchewan	0.074 (0.00)	0.072 (0.00)
Manitoba	0.036 (0.12)	0.035 (0.11)
Quebec	0.085 (0.00)	0.087 (0.00)
Ontario	Omitted	Omitted
New Brunswick	0.25 (0.00)	0.30 (0.00)
Nova Scotia	0.32 (0.00)	0.38 (0.00)
Prince Edward Island	0.24 (0.00)	0.28 (0.00)
Newfoundland	0.42 (0.00)	0.54 (0.00)
R^2	0.190	NA
Sample Size	26137	26137

Access is a 0-1 variable equal to one if the respondent moves directly from high school completion in one academic year to a bachelor's program in the next academic year. Female equals one if respondent is female. Born in Canada equals one if respondent is born in Canada. Visible minority equals one if respondent is a member of a visible minority. Single Parent 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 Positive 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 percent) and 7 is the lowest grade of less than 50 percent. Year Effects are Canada-wide dummy variables for the pairs of academic years. Province effects are dummy variables for all observations from that province. Standard errors are estimated robustly with survey weights.

Table 4. Coefficients on tuition variables in different specifications of fixed effects (Prob. Values in parentheses)

Fixed effect specification	Linear Probability Model			Probit Model		
	Nominal Tuition	**Real Tuition and Fees**	**Net Real Tuition**	**Nominal Tuition**	**Real Tuition and Fees**	**Net Real Tuition**
No Year Effects and No Province Effects	0.011 (0.02)	-0.0088 (0.13)	-0.018 (0.01)	0.0074 (0.02)	-0.0049 (0.18)	-0.010 (0.02)
No Year Effects and Province Fixed Effects	0.063 (0.00)	0.058 (0.00)	0.023 (0.23)	0.030 (0.00)	0.030 (0.00)	0.015 (0.19)
Year Effects and No Province Fixed Effects	-0.009 (0.09)	-0.019 (0.00)	-0.023 (0.00)	-0.010 (0.08)	-0.019 (0.00)	-0.022 (0.00)
Year Fixed Effects and Province Fixed Effects	0.017 (0.35)	-0.032 (0.15)	-0.0005 (0.98)	0.0087 (0.62)	-0.031 (0.17)	0.0067 (0.77)

The variables added to the list of social and economic variables in Table 3 are the tuition measures in the left-hand column. The level or change in tuition is measured in 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. The coefficients are estimated in models with survey weights.

Table 5. Coefficients on tuition variables in the access decision with year and province fixed effects estimated for the sample of young persons where neither parent has any university education

Tuition Measure	**LPM** (Prob)	**Probit** (sign, prob)
Level of Nominal Tuition	-0.005 (0.78)	-0.0002 (0.46)
Level of Real Tuition and Fees	-0.048 (0.04)	-0.0010 (0.04)
Level of Net Real Tuition	-0.11 (0.68)	-0.00005 (0.88)
Year Effects	YES	YES
Province Fixed Effects	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. The coefficients are estimated in models with survey weights. There are year fixed effects and province fixed effects.

Table 6. Coefficients on tuition variables in the access decision with year and province fixed effects, where all observations from Quebec are excluded

Tuition Measure	**LPM** (Prob)	**Probit** (sign, prob)
Level of Nominal Tuition	0.033 (0.13)	0.00033 (0.10)
Level of Real Tuition and Fees	0.019 (0.42)	0.00032 (0.22)
Level of Net Real Tuition	0.045 (0.09)	0.00066 (0.03)
Year Effects	YES	YES
Province Fixed Effects	YES	YES

The variables added to the list of social and economic variables 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. The coefficients are estimated in models with survey weights.

There are year fixed effects and province fixed effects.

Appendix A: Supplementary Tables and Figures

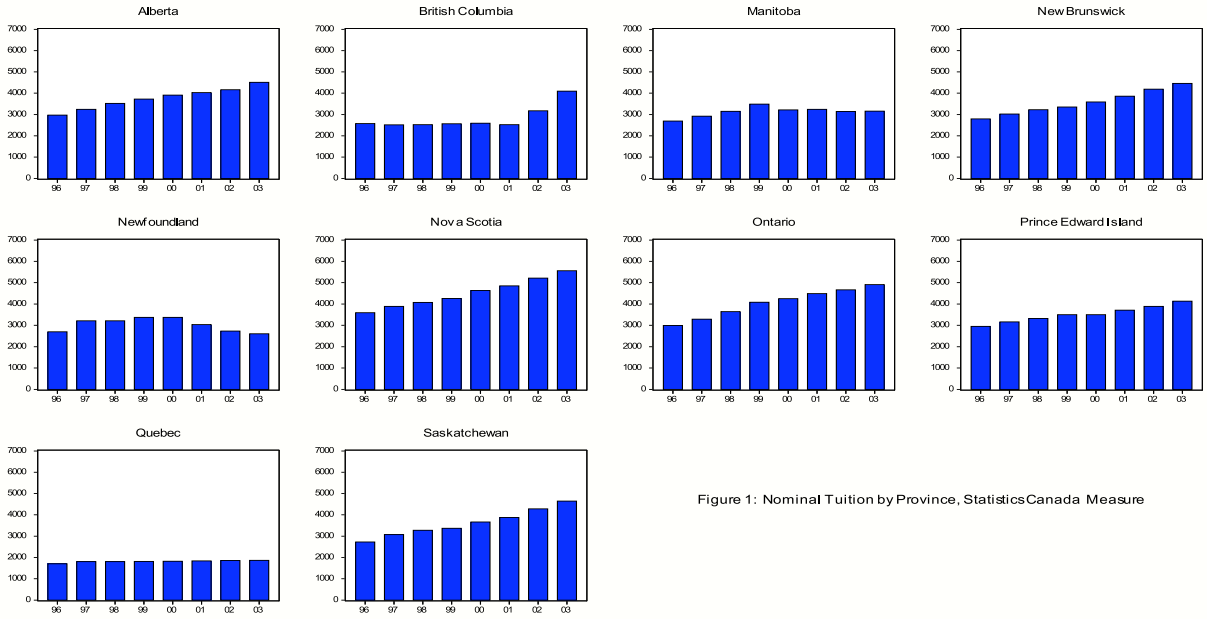

Figure 1: Nominal Tuition by Province, Statistics Canada Measure

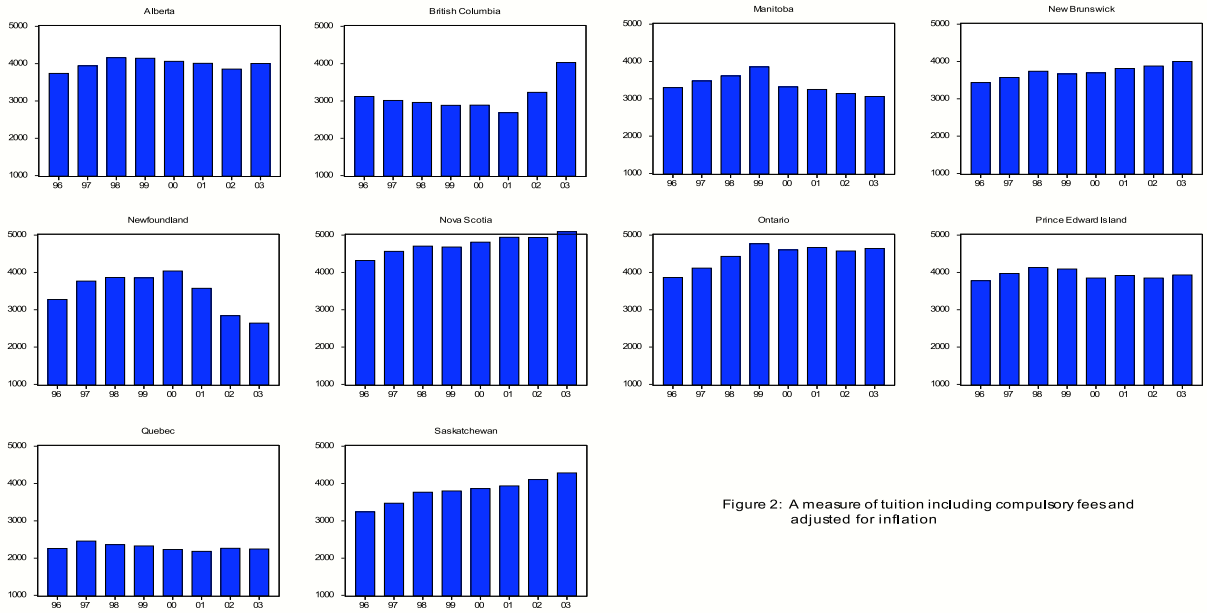

Figure 2: A measure of tuition including compulsory fees and adjusted for inflation

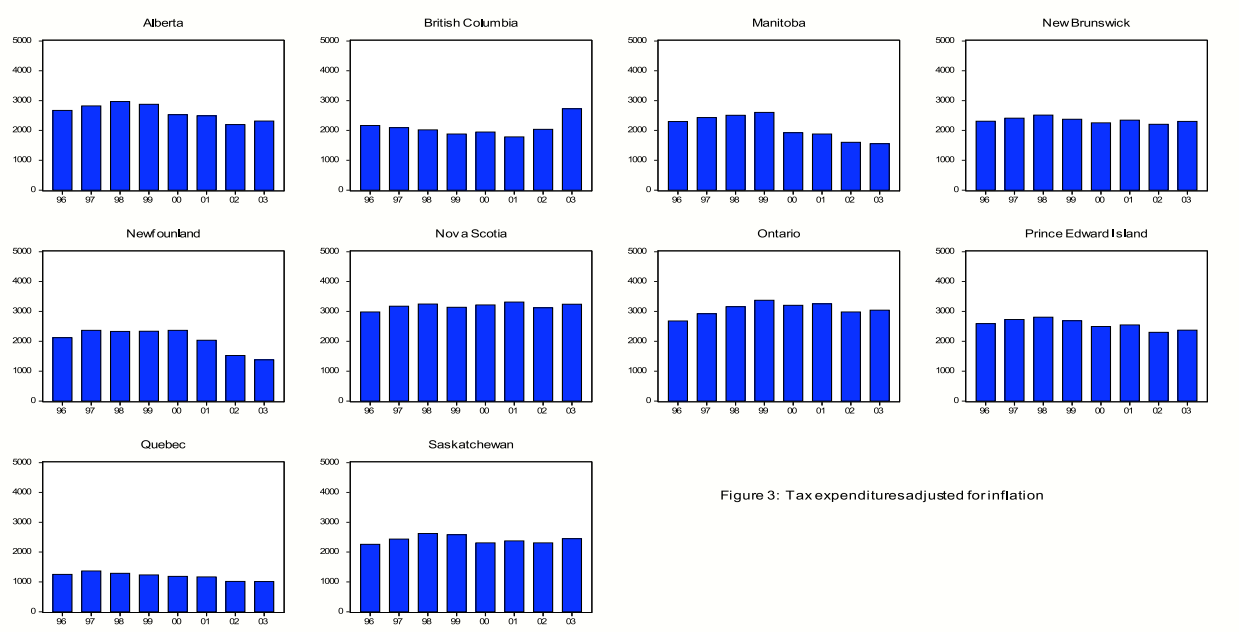

Figure 3: Tax expenditures adjusted for inflation