The Impact of Rising Tuition Fees on University Undergraduate Enrolment: An Empirical Study of Canada

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Abstract

Post-secondary education (PSE) tuition fees have risen significantly in the last decade. Studies show that the rise in tuition has no negative effect on PSE participation in Canada at all. Few studies, however, compare the Canadian provincial results with the national result. Since some differences exist at the provincial level, the impacts of rising tuition fees at the provincial level may be different from the national level. Our study attempts to address this issue by using a cross-section time series from both provincial and national data sets (1980-2004). Results suggest that some provinces, such as Alberta, Manitoba, New Brunswick and Saskatchewan, have different results compared to the national result. A negative impact of rising tuition fees occurs in these provinces.

1. Introduction

Based on human capital theory, investments in education allow individuals to increase their stock of human capital. This process is beneficial both for individuals and for societies. Since human capital is an important factor in production, increasing its stock will lead to improvements in productivity. Education is a source of innovation, which is very important to economic growth. In addition, in the context of globalization, more firms will require workers to have higher degrees of education. A number of empirical papers support these ideas; the studies suggest that the knowledge, the ability, and the technical skills of the labor force are key factors in a country's economic performance. Taubman and Wales (1975) state that investment in education yields a 'profit' both to the educated individuals and to society as a whole. Individuals' earnings increase with their education level, and the social rate of return to the country is at least equal to the rate of return from other investments.

In their pre-adult life, youths have to decide whether to obtain a post-secondary education (PSE) or to enter the labor force. As mentioned above, not only will these decisions have a significant influence on the individuals' lives, but they will also be crucial to the nation's economy. As a result, we would like to study some factors that influence one's decision to participate in PSE in Canada.

Some important changes have occurred in post-secondary education in Canada since 1970. Average university tuition fees increased at a real annual rate of 6.53% between 1972 and 2005 (figure 1). One reason for this increase is declining government funding

for post-secondary institutions. Despite the increase in tuition fees, we observe that total enrolment has increased at an annual rate of 2.78% between 1973 and 2005 (figure 2).

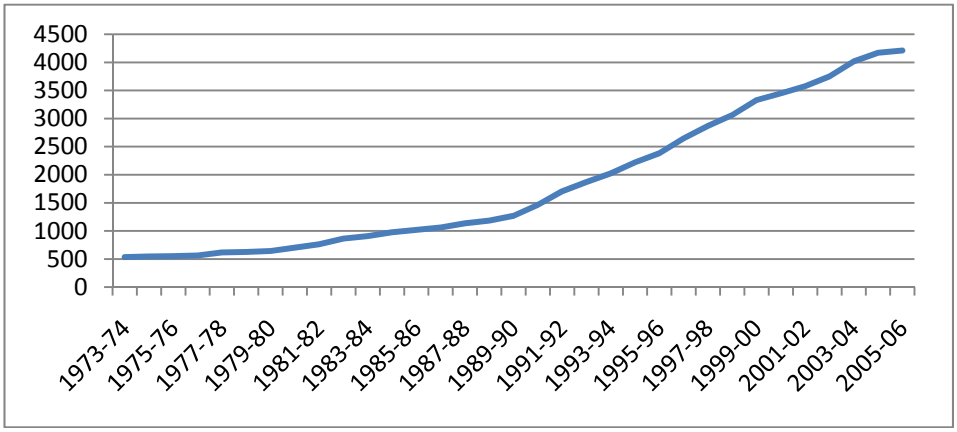

Figure 1. Average university tuition fee in 2005 Canadian Dollars from 1973 to 2005

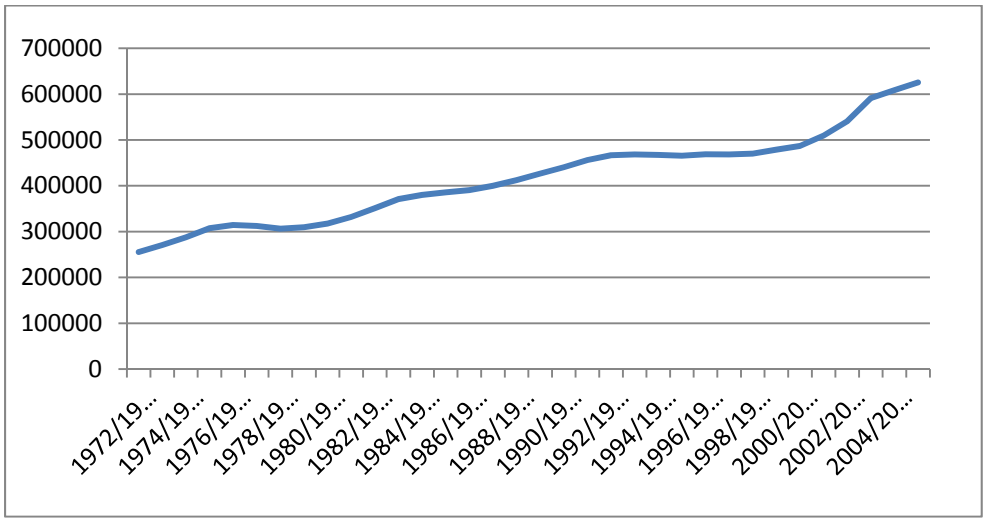

Figure 2. Average university enrolments in Canada from 1973 to 2005

Why do people want to participate in PSE? According to the human capital theory of investment in education, one of the major factors influencing a person's decision to obtain PSE is the return associated with it, which is called the private rate of return. The private rate of return is composed of two parts: costs of and benefits from education.

Student	
Costs	Direct costs: Total value of tuition Fees and related expenses
	Indirect costs: Income not received during education (opportunity cost) Availability of student loans
Benefits	Additional earnings received as a result of obtaining education

Based on this theory, tuition fees do not solely determine whether an individual will enroll in a PSE or not. The potential student's behavior may be more dependent on indirect costs and benefits. Thus, our paper will not analyze the demand and supply of PSE. The main purpose of this paper is to study the relationship between the individual's decision to pursue higher education (represented by enrolment) and the various costs and benefits (represented by the tuition fees and salaries).

We limit the scope of this paper to undergraduate programs for several reasons. First, data for undergraduate programs are easy to retrieve and consistent with our assumptions; second, graduate programs are restricted to individuals with highly specialized abilities, and are not readily accessible to the population at large. In addition, we exclude colleges from the study because compared to university students, college students take less time to graduate, which implies a lower indirect cost. The benefits of a college degree may be less than a university degree, since university students have more alternatives after they graduate. Furthermore, as we are university students, we are more concerned with the effect of tuition fees on university undergraduate programs than on colleges.

Our paper is organized as follows: section two reviews previous studies on PSE participation both in Canada and in the U.S.; section three sets out our estimation method and data source; section four presents the estimation results by using the data and method from section three; section five contains analysis based on section four; and in section six, we present the conclusion and the limitations of our study.

2. Literature Review

Few previous studies have addressed the relationship between tuition and enrolment in Canadian universities. Several researchers, however, have performed studies on tuition fees and PSE participation. Hoy, Christofides and Cirello (2001) use information on parental income from a series of cross-sectional surveys for the period 1975 to 1993. They observe a link between family income and PSE participation. The result shows that while income levels are certainly an important factor in determining PSE participation, income variations have a disproportionately low impact on the

participation rate of low-income families. They document that higher income families are much more likely to have their children attend PSE; lower income groups, however, experience relatively greater increases in participation over time. They conclude that tuition fees do not have a negative effect on PSE participation. Since this study examined only the period prior to 1993, it does not capture the fact that a significant increase in tuition fees occurred during the 1990s.

Corak, Lipps and Zhao (2003) reexamine Hoy, Christofides and Cirello's model (2001); they extend the period to 2000, divide the sample by gender, and examine participation both in colleges and in vocational schools. They find that although children from higher income families are more likely to attend university, the proportion of children from higher income families in universities did not change dramatically during the 1990s with the introduction of higher tuition fees. They also find that tuition fees had little impact on PSE attendance. Observing that both tuition fees and financial support have risen in the 1990s, they suggest that the reason for their result is the increase in the level of financial support available to students.

In summary, the two studies try to determine whether rising average incomes across Canada during the 1970s and the 1980s have contributed to the increase in the PSE participation rate for individuals from low-income families. Their results show that the relationship between PSE participation and the rising average income is weak, and that tuition fees have no effect on the PSE participation rate. The results in Hoy, Christofides and Cirello (2001) and in Corak, Lipps and Zhao (2003), however, may contain some measurement errors due to the imprecise nature of their data set. The data set they used does not identify which programs the youth participated in. Tuition fees vary across programs: the increase in participation in some programs with lower tuition fees may offset the decrease in some programs with higher tuition fees. Another problem is that the sample they used contains both high school graduates and high school drop-outs. Tuition fees have no relevance for high school drop-outs, or for the high school graduates in the sample who do not meet the GPA requirement for entry to university.

Rivard and Raymond (2003) address the weaknesses mentioned in the previous paragraph, and they develop a study based on the work of Hoy, Christofides and Cirello (2001) and Corak, Lipps and Zhao (2003). Rivard and Raymond (2003) focus on whether higher tuition fees reduce the participation in PSE among high school graduates. They use the variable PSE *entrance* instead of PSE *attendance* to eliminate the bias caused by senior students. For example, senior students who are already enrolled in a program are less likely to drop out, even when tuition increases. Similar to the results of Hoy, Christofides and Cirello (2001) and Corak, Lipps and Zhao (2003), this study shows that rising tuition fees have no negative impact on PSE entrance. Contrary to Hoy, Christofides and Cirello's finding (2001), Rivard and Raymond (2003) conclude that family earnings have no effect on PSE enrolment. One explanation, according to Rivard and Raymond (2003), is that the low-interest student loans funded by the government are readily accessible in Canada. The limitation of Rivard and Raymond's analysis is that they did not include Ontario and Quebec in the data set. Compared with other provinces, Ontario and Quebec have different institutional features. Prior to 2003, Ontario students

who wanted to attend university were required to complete Grade 13. This regulation was removed after 2003. Because of this change, students graduating from both Grade 12 and 13 could enroll in university, causing a substantial increase in Ontario university enrolment for the 2003-2004 academic year. This situation is commonly known as the "double cohort effect." In Quebec, students must complete a two-year preparatory college program before they can enroll in university. As a result, it takes them only three years to complete a university degree, as opposed to the four years it takes in other provinces.

Contrary to Canadian studies, American studies that investigate the relationship between tuition fees and participation yield different outcomes. According to Heller (1997), every $100 increase in tuition results in a 0.5 percent reduction in the participation rate. In Heller's research, tuition fees are measured as a cost for the high school students who want to continue their studies at post-secondary institutions. This study discovers a strong negative relationship between PSE participation rate and the cost of attendance. In addition, people from low-income families and African-American communities are more sensitive to cost increases. Long (2004), on the other hand, states that labor market conditions are an important factor influencing the enrolment decision. By controlling for family status and labor market conditions, Long's (2004) results show that although college cost is still an important factor in the decision, tuition fees do not have a significant effect.

The previous studies suggest, for the most part, that tuition fees do not have a significant effect on PSE participation. The only paper that shows a strong negative relationship is Heller's research in the U.S. (2004). The explanation may be due to the differences between the two countries. Unlike in Canada, the majority of top U.S. universities are privately owned. Tuition fees in private universities are higher than in public universities. The gap between high-income families and low-income families is also larger in the U.S. than in Canada. As a result, students in the U.S. may be more sensitive to fluctuations in tuition fees. The difference between Canada and the U.S. raises an interesting question: will the Canadian provincial data yield different outcomes when compared to the national data?

In our model we assume that rising tuition fees in some provinces may yield a reduction in university undergraduate enrolment. We will not include family status, because we are not able to control for it in this study. We will introduce some variables in our study based on other papers. Appleby, Fougère and Rouleau (2002) state that the rate of return from education is sensitive to the state of economic activity. Rates of return tend to be higher during economic recessions, and lower during economic expansions. A positive correlation appears between rates of return and unemployment rates. Therefore we will include GDP growth rate in Canada, as well as the unemployment rate across the provinces as explanatory variables in our analysis.

Coelli (2004) indicates that cohort size has an impact on the probability of university enrolment for Canadians. Youth from larger cohorts are found to be less likely to attend university, even after controlling for different individual characteristics. This study suggests that the increased level of competition for PSE resulting from larger cohorts

prevents some youths from obtaining PSE. Evidence also implies that the negative impact of cohort size on university attendance is much stronger for youth from low-income backgrounds. Applying these ideas, we will choose a sample of 15 to 19 year old individuals to estimate the effect of the cohorts' size. We will use this age group because it comprises the people who are most likely to face the decision of whether to enroll in university or to enter the labor force.

Taubman and Wales (1975) indicate that the lifetime income obtainable by an individual increases with schooling. The return to education does not favor individuals who come from high income families, or who have high abilities; the returns to education are similar for all individuals. Higher education is a critical element for obtaining a high-paying job. Wachtel (1975) studies the relationship between the cost differences and the quality differences among colleges. The result shows that the variation in investment costs among colleges is an important determinant of earnings: "Students with higher earning potential [tend] to make more expensive investments" (Wachtel, 1975, 169). This suggests that we should add separate wage variables – one for those with a university degree, and one for those with only a high school degree.

The literature outlined above aided us in the construction of our model, which we will introduce in the next section.

3. Estimation method and Data Source

In our model, we use the following multiple regression model:

$$\text{Enrol}=\beta_0+\beta_1*\text{tuit}+\beta_2*\text{unem}+\beta_3*\text{pop}+\beta_4*\text{ggr}+\beta_5*\text{wage1}+\beta_6*\text{wage2}+\beta_7*\text{t}+u$$

1. The right hand side is the dependent variable, which is the number of students enrolled in undergraduate programs. We did not use 'entrance' instead of 'attendance' because we speculated that students might drop out of university if they could not afford the increased tuition fees, or if they could find a high-paying job that did not require a university degree. The data was retrieved from CANSIM for the period 1973/1974 to 2004/2005. The data set contained both national and provincial data.

2. On the left hand side, "tuit" is the real tuition fee for undergraduate programs. We found the data for tuition in different provinces from the Internet Data Library System. We used the weighted average of undergraduate domestic tuition fees for full-time students across provinces in 2004 Canadian Dollars for the academic years 1972/1973 to 2004/ 2005.
3. "Unem" represents the unemployment rate. The data for unemployment rate were taken from CANSIM in Statistics Canada from 1976 to 2007. We chose the unemployment rate for the age group 15 and older across the provinces.

4. "Pop" represents the population in the 15-19 age group. The reason for choosing this age group was stated in section two. The data set was retrieved from the Census of Canada Public Use Individuals File System for the period 1980 to 2005. This data was available for both national and provincial levels.

5. "Ggr" represents GDP growth rate as reported in CANSIM. We selected the years from 1980 to 2004. This was a national data set. The reason we used national data, and not provincial data, is because we wanted to see how economic performance in Canada affected the enrolment decision.

6. "Wage 1" is the average wage for people with only a high school diploma, whereas "Wage 2" is the average wage for people with a university degree. All figures are stated in terms of annual salaries. The data set was available in the Census of Canada only every five years. Since we could not obtain figures for each year, we had to use the available data to formulate an estimation for the wage in the remaining years. For example, we observed the wage for 2000 (A) and 2005 (B), but we do not know the wages for the years 2001, 2002, 2003, and 2004. By taking the difference B-A/5=σ, we determined the average difference for each year. Then, we get the number for 2001 by A+σ, 2002 by A+2 σ, etc. In addition, we transformed all values to 2004 Canadian Dollars.

7. After adjusting the above data sets, we combined them in a time series data set. We added the time variable "t" into it. For example, we take t=1 for the period 1980/1981 and t=2 for the period 1981/1982, etc. Since the data are time series data, we added the additional variable "t" to account for any possible time trend errors.

In summary, our data set contains the independent variables "tuit", "unem", "pop", "ggr", "wage1", "wage2" and "t", and the dependent variable "enrol". The time series data are from 1980 to 2004. Our study tested both national data and provincial data, mainly because different provinces have different policies toward university education. For example, Quebec gives higher financial subsidies to universities, and consequently, the growth rate of tuition fees in Quebec is less outstanding than the in rest of the provinces. Therefore, we will run eleven regressions using our model.

4. Results

Summary of regression analysis: national and provincial

		tuition fee	unemployment rate	GDP growth rate	population	wage1	wage2	t
Canada	coefficient	43.54193	483.9385	-1495.916	0.0946898	87.552	-59.527	9965.762
	t-stat	0.69	0.842	0.315	0.414	7.28	-7.08	0.96
Ontario	coefficient	2.7575	0.3577155	902.6314	54.6	55.8157	-38.3697	8016.734
	t-stat	0.11	2.62	1.05	0.06	4.87	-4.57	1.92
Quebec	coefficient	0.7566805	-0.0311786	107.0044	-128.2932	7.389936	-5.13545	1589.039
	t-stat	0.15	-1.19	0.16	-0.44	2.53	-2.64	3.13
Alberta	coefficient	-5.5149	0.1069728	268.4106	49.76818	2.4356	-1.56413	2159.161
	t-stat	-5.29	4.87	2.38	0.64	4.41	-4.1	12.68
British Columbia	coefficient	0.811636	0.12964	602.3609	-194.5132	3.318841	-2.37782	869.9047
	t-stat	0.67	3.1	2.32	-1.45	1.34	-1.42	3.75
Manitoba	coefficient	-2.565806	0.1616796	742.4663	-7.358815	1.032906	-0.69451	684.3239
	t-stat	-1.34	1.64	3.1	-0.07	0.67	-0.68	5.32
New Brunswick	coefficient	-3.608053	0.4310314	296.626	28.5957	2.119644	-1.41408	1449.377
	t-stat	-2.2	2.04	2.18	0.48	4.3	-4.7	2.98
Newfoundland	coefficient	0.7978645	-0.2014606	-120.3241	-30.59425	0.551732	-0.35242	-67.6804
	t-stat	2.1	-1.38	-1.43	-0.54	1.08	-1.02	-0.41
Nova Scotia	coefficient	-1.489466	0.3179276	375.4733	-22.08071	2.075322	-1.39693	1373.994
	t-stat	-1.16	2.25	3.64	-0.39	5.91	-5.63	3.33
Prince Edward Island	coefficient	-0.673289	0.1664541	6.150338	-7.106731	0.455489	-0.31648	211.3429
	t-stat	-0.79	0.69	0.16	-0.33	3.1	-3.13	1.4
Saskatchewan	coefficient	-1.911922	577.5413	43.6604	0.1045135	1.276331	-0.8947	715.9577
	t-stat	-2.37	2.99	0.86	1.51	2.07	-2.14	3.47

From our initial results, the signs on tuition fees are as we expected. The difference appears when we test each province individually. The coefficients of unemployment rate are positive in most provinces, which coincides with our predictions. We did not expect GDP growth rate to have a huge negative effect on enrolment at the national level, given that GDP growth rate has mostly positive effects at the provincial level. Moreover, the signs on wage1 and wage2 are totally opposite to our prediction. Since there are some statistically insignificant variables in the preliminary results, we can drop some of them, which may lead to results closer to our hypothesis.

Our secondary results are as follows:

1. Canada

Enrol= 70365.25 + 103.5718 tuit + 91.21361wage1-62.82869 wage2
R-squared= 0.9785

After dropping the statistically insignificant variables, the result suggests that with a one dollar increase in tuition fees, total enrolment will increase by 103. This is consistent with the previous studies that find tuition fees having no negative effect on enrolment. The result shows, however, that as wages for those who have only a high school degree increase, enrolment will rise. But as wages for those who have a university degree increase, enrolment will go down. This result is not the same as our hypothesis, since it shows that people either will not attend university or will drop out of university when wages for having a university degree increase. This is hard to explain now, so we will first look at the provincial data.

2. Quebec

Enrol= 51311.81+ 10.14373 wage1 -6.99472wage2 + 1998.174 t
R-squared= 0.9554

In the Quebec case, "tuition fees" has been dropped from the model. The signs of wage1 and wage 2 are the same as in the national data. The effects of wages on enrolment are smaller than in the national data. It seems that time has the greatest effect on enrolment. For every year that passes, about 1998 more students enroll in universities in Quebec.

3. Ontario

Enrol= -88994.43+ 51.31168 tuit + .1024987 pop + 75.78425 wage1 - 53.26758 wage2
R-squared = 0.9771

The result in Ontario is very similar to the national result. It is not surprising that population is significant due to the "double cohort effect".

4. Alberta

Enrol= -6838.659 -5.153073 tuit + 304.8063unem + .1022953 pop + 2.358589 wage1 -1.508741wage2 + 2099.825 t
R-squared =0.9967

The results for Alberta are very interesting. Compared with other results, only GDP growth rate is dropped from the model. The coefficient on tuition fees in Alberta is negative, which implies that an increase in tuition fees makes people less likely to enroll in universities. Unemployment rate tends to have an effect on people's behavior in the sense that enrolment increases when unemployment rate rises. The sign of the wages coefficient is the same as the previous results. Time is also a factor in enrolment in Alberta.

5. British Columbia

Enrol= 7748.093+ 2.014587tuit + 231.0028unem + .0583364pop + 631.4577 t
R-squared= 0.9820

In British Columbia, wages no longer have an effect on enrolment. All the independent variables have positive signs.

6. Manitoba

Enrol=12275.35 -3.825926tuit + 561.8036 unem + 660.0147 t
R-squared =0.7499

Manitoba has the lowest R-squared among all the results; however, it does not mean that the result is poor. Like Alberta, Manitoba has a negative sign on the tuition fees coefficient. Unemployment rate is very important here, as is the effect of time on increasing enrolment rates. Wages have no effect on enrolment in Manitoba.

7. New Brunswick

Enrol= -25691.57 -3.205319 tuit + 329.295unem + .3778592pop + 1.990699 wage1 -1.338793 wage2+ 1329.07 t
R-squared= 0.9719

Tuition fees have a negative effect on enrolment in New Brunswick. The coefficients from the New Brunswick regression are similar to Alberta's results.

8. Newfoundland

Enrol= 14476.66+ .4100103 tuit -70.55776unem -.1383221pop
R-squared=0.9550

Newfoundland is the only province that has a negative sign on the unemployment rate. This implies that when the unemployment rate increases, people are not likely to increase enrolment in university. This is inconsistent with the results of the other provinces. One explanation may be that when people are losing their jobs, they are not able to afford their children's tuition. Unlike the other provinces, the sign on the population coefficient is negative. Thus, we will treat Newfoundland as an exception in our studies.

9. Nova Scotia

Enrol=-6399.757+ 262.2236unem+ .1575838pop + 2.23098wage1 -1.5333wage2 + 891.7109 t
R-squared=0.9919

No relationship between tuition and enrolment has been found in Nova Scotia. The signs on unemployment rate and population are positive. Wages have an effect on enrolment and the sign on wages is the same as other provinces.

10. Prince Edward Island

Enrol= 667.4896+ .3857453wage1 -.2718298 wage2 + 89.70795 t
R-squared= 0.9322

The tuition fees variable is dropped from the Prince Edward Island regression. Only wage and time have a significant effect on university enrolments.

11. Saskatchewan

Enrol= 10795.42 -0.9563109tuit + 631.5771unem + 419.7816 t
R-squared= 0.9530

A negative relationship between tuition and enrolment is found in Saskatchewan. The sign on the unemployment rate is positive. Time is a factor in enrolment in Saskatchewan.

In summary, there are major differences between the national and provincial regressions. The next section investigates the implications of our results.

5. Analysis

GDP growth rate is dropped in all regressions, implying that there is no relationship between GDP growth and university enrolment. We believe individuals who are in the labor force are more sensitive to a country's economic performance than students are. On the other hand, the results show that the unemployment rate has an influence on enrolment in Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia and Saskatchewan. Most signs on the unemployment rate coefficient are positive, except for Newfoundland. The results are consistent with our hypothesis and with previous studies.

Originally, we predicted the sign to be negative on "wage1" and positive on "wage2". The results are opposite to our prediction. The positive sign on the coefficient of wage1 suggests that enrolment will increase when wages for those with high school diplomas increase; the negative coefficient of wage2 implies that an increase in wages for those with university degrees will lead to a reduction in enrolment. This is surprising, because normally people tend to enter university when they believe their wages will be higher after they graduate. The reason for the disparity may be that we used estimated numbers for the wage variables. Recall from section three, we estimated wages for individual years by adding on the average difference. We do not know whether the wage coefficients would change if the correct data on wages could be found. Another issue is time lag; in our regressions, we used the same year for both the dependent variable and the independent variables. But youths who decide to enroll in university may not be aware of the wages for that year. Moreover, even if they were aware of current wage levels, they probably would be more concerned about post-graduation wages. The results for wage1 and wage2 are weak, since we used the same year for both enrolment and wages. Unfortunately, we are not able to control for time lags. As we mentioned above, we calculated the estimated numbers by adding average differences, and thus, the differences in each year are the same. For example, the trend started from 1980 will be the same as the trend which started at 1976. By adding time lags to our model, the results do not yield different outcomes. One explanation for the negative marginal effect of wage2 may be the reduction of benefits received from a university degree. As the number of undergraduate degree holders increases, greater competition may force people to obtain higher degrees.

According to the results, we can divide provinces into three groups. Group one includes Quebec, Nova Scotia, and Prince Edward Island. In the first group, tuition fees have no effect on university enrolment. Group two includes Alberta, Manitoba, New Brunswick, and Saskatchewan. In the second group, there are negative signs on the tuition fees coefficient. Ontario, British Columbia, Newfoundland, and Canada are in the third group, in which no negative relationship between tuition fees and enrolment is observed.

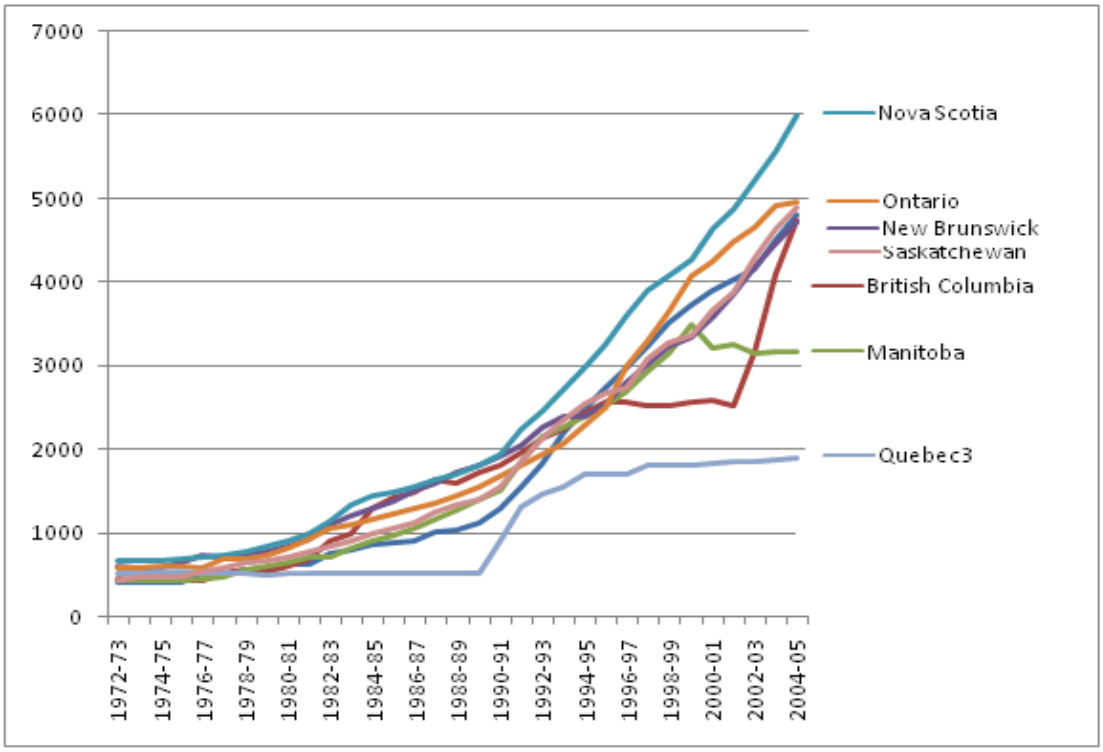

Figure 3 : Weighted average undergraduate domestic tuition fees for full-time students by province in current dollars.

The results for group one are the same as our prediction. Compared with the other provinces (figure 3), Quebec has the lowest average tuition fees for undergraduate programs, and tuition fees in Quebec increased significantly. Nova Scotia, on the other hand, has the highest average tuition fees, and tuition fees increased significantly. We do not include Prince Edward Island in the graphs because the enrolment number is too low, which limits the influence of tuition fees. Figure 4 shows that the increase in tuition fees did not dramatically change enrolment in Quebec or Nova Scotia.

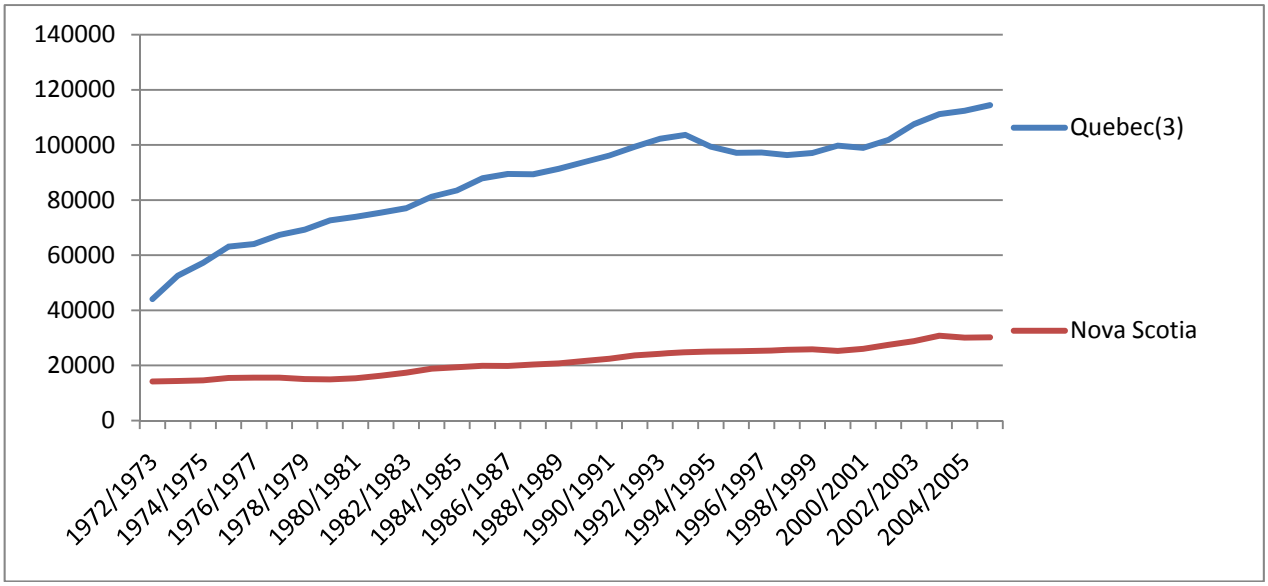

Figure 4. Average enrolment in university undergraduate programs in Quebec and Nova Scotia

Since the lack of a negative relationship between tuition fees and enrolment in group three is consistent with the previous studies on Canada, only group two needs to be further analyzed. Recall the estimation from group two:

Enrol= -6838.659 -5.153073 tuit + 304.8063unem + .1022953 pop + 2.358589 wage1 -1.508741wage2 + 2099.825 t (Alberta)
Enrol=12275.35 -3.825926 tuit + 561.8036 unem + 660.0147 t (Manitoba)
Enrol= -25691.57 -3.205319 tuit + 329.295unem + .3778592pop + 1.990699 wage1 -1.338793 wage2+ 1329.07 t (New Brunswick)
Enrol= 10795.42 -0.9563109tuit + 631.5771unem + 419.7816 t (Saskatchewan)

These four equations have a positive unemployment rate coefficient. From the other groups, only British Columbia and Nova Scotia have a positive unemployment coefficient. The average unemployment rates from 1980 to 2004 in Alberta (6.5%), Manitoba (6.7%), and Saskatchewan (6.1%) are much lower than the national level (8.6%). Low unemployment rate compounds the negative effect of unemployment. In regions with low unemployment rates, people may save less money because it is easier to find jobs. As unemployment rates increase, total wealth for those people decreases. If tuition fees increase at the same time, some youth may not be able to get funds. Some part-time jobs may be taken away from students who are already enrolled in university, forcing them to drop out of school. The assumption that a low unemployment rate reduces savings cannot be proved in this paper right now; more studies are required. In addition, we cannot explain why New Brunswick, the province with the highest unemployment rate (11.8%), is in this group. We decided to disregard this fact, because New Brunswick has a relatively small economy.

In summary, the relationship between tuition fees and university enrolment is weak. Different provinces yield different outcomes due to important variables such as unemployment rate, population, and wages.

6. Limitations and Conclusion

Like other econometric studies, our paper has some limitations. This section will be dedicated to elaborating on these limitations.

Our first limitation is that we were not able to control for family status like the previous studies did. Many studies show that parents with a university degree prefer to send their children to university. Unfortunately, we were not able to distinguish between students whose parents have a university degree and students whose parents do not. Therefore, the results may contain some errors due to the effect from family status. Our second limitation is that we excluded family income from the model. Although previous studies show that family income does not have a huge effect on PSE participation, excluding this element in our model may have caused some bias. The biggest limitation of our model is the data on wages. Since the precise data on wages could not be retrieved, estimation numbers may contain too much bias for us to use in the study. Nevertheless, we could not exclude wage completely because we believe wages have a strong effect on enrolment rates.

To conclude, university enrolment depends on many factors, and tuition fees may not be as important as many people believe. The return on investment from a university degree and the general economic conditions may play a bigger role in explaining enrolment rates.

References

Appleby, John, Maxime Fougère, and Manon Rouleau. 2002. Is post-secondary education in Canada a cost-effective proposition? Applied Research Branch, Strategic Policy, Human Resources Development Canada Working Paper W01-9E. Ottawa: Human Resources Development Canada. http://www.rhdcc.gc.ca/eng/cs/sp/hrsd/prc/publications/research/2002-000150/SP-504-06-02E.pdf

Blaug, Mark. 1970. *Economics of education*. London: Allen Lane.

Boudarbat, Brahim, Thomas Lemieux, and W. Craig Ridell. 2003. Recent trends in wage inequality and the wage structure in Canada. TARGET Working Paper 006. University of British Columbia, Department of Economics. http://faculty.arts.ubc.ca/criddell/rectrend.pdf

Caponi, Vincenzo, and Miana Plesca. 2007. Post-secondary education in Canada: Can ability bias explain the earnings gap between college and university graduates? The Rimini Centre for Economic Analysis Working Paper 14-07, Rimini, Italy. http://www.rcfea.org/wp/wp14_07.pdf

Clift, Robert, Colleen Hawkey, and Ann Marie Vaughan. 1998. A background analysis of the relationships between tuition fees, financial aid, and student choice. Mimeo, Confederation of University Faculty Associations of British Columbia (CUFA.BC). http://www.cufa.bc.ca/Clift/A_Background_Analysis.doc

Coelli, Michael. 2004. Tuition increases and inequality in post-secondary education attendance. Paper presented to the Canadian Economic Association Annual Meeting, 4-6 June, Toronto. http://economics.ca/2004/papers/0065.pdf

Corak, Miles, Garth Lipps, and John Zhao. 2003. Family income and participation in post-secondary education. Statistics Canada Analytical Research Paper Series No. 210. Reprinted as IZA Discussion paper number 977, January, 2004. http://ssrn.com/abstract=491484

Dubois, Julie. 2002. What influences young Canadians to pursue post-secondary studies? Working Paper Series. Catalogue No. 578-06 03E. Ottawa: Human Resources Development.

Frenette, Marc. 2005. The impact of tuition fees on university access: Evidence from a large-scale price deregulation in professional programs. Statistics Canada, Analytical Studies Branch Research Paper. Catalogue No. 11F0019MIE - No. 263. Ottawa: Statistics Canada. http://www.statcan.gc.ca/pub/11f0019m/11f0019m2005263-eng.pdf

Heller, Donald. 1997. Student price response in higher education. *Journal of Higher Education,* 68 (6): 624-659.

Hoy, Michael, Louis N. Christofides, and Jim Cirello. 2001. Family income and post-secondary education in Canada. *The Canadian Journal of Higher education* 31(1): 177-208.

Keane, Michael P., and Kenneth I. Wolpin. 2001. The effect of parental transfers and borrowing constraints on educational attainment. *International Economic Review* 42 (4): 1051-1103.

Long, B. Bridget Terry. 2004. How have college decisions changed over time? An application of the conditional logistic choice model. *Journal of Econometrics* 121 (1-2): 271-296.

Looker, E. Dianne, and Graham S. Lowe. 2001. Post-secondary access and student financial aid in Canada: Current knowledge and research gaps. Background paper for a workshop sponsored by the Canadian Millennium Scholarship Foundation. Ottawa: Canadian Policy Research Network. http://www.millenniumscholarships.ca/images/publications/cprn-bkgnd.pdf

Raymond, Mélanie, and Maud Rivard. 2003. Have tuition fee hikes in the late 1990s undermined access to post-secondary education in Canada? Presentation to the Canadian Employment Research Forum, Ottawa, May 2003. http://www.cerforum.org/conferences/200305/papers/S1Raymond.pdf

Rivard, Maud and M élanie Raymond. 2004. The effect of tuition fees on post-secondary education in Canada in the late 1990s. Department of Finance Canada Working Paper No. 2004-09. Ottawa: Department of Finance Canada.

Statistics Canada. University tuition fees, additional fees and living accommodation costs at residences (TLAC). [machine readable data file]. Ottawa: Statistics Canada [producer(s)], Statistics Canada, Data Liberation Initiative [distributor(s)].

Statistics Canada**.** Table 282-0002: Labour force survey estimates (LFS), by sex and detailed age group, annual. CANSIM (database)**.** Ottawa: Statistics Canada. http://cansim2.statcan.gc.ca

Taubman, Paul, and Terence Wales. 1975. Education as an investment and a screening device. In *Education, Income and Human Behavior*, ed. F. Thomas Juster, 95-122. Cambridge MA: National Bureau of Economic Research. http://www.nber.org/chapters/c3694.pdf

Wachtel, Paul. 1975. The returns to investment in higher education: another view. In *Education, Income and Human Behavior*, ed. F. Thomas Juster, 151-170. Cambridge MA: National Bureau of Economic Research.