The Impact of Macroeconomic Factors on Student Enrollment in Canadian Post-Secondary Institutions

Yury Andrianov

Business and Economics

Supervisor: Dr. Ehsan Latif

Abstract:

Using data from Statistics Canada (1992-2013), this study examined the impact of macroeconomic factors such as the unemployment rate, GDP growth, and the exchange rate on student enrollment in Canadian post-secondary institutions. In order to estimate regressions, this study used the Autoregressive Distributed Lag (ARDL) method. The results from the overall model show that both GDP growth and unemployment have a positive impact on enrollment in the long run. However, in the short run, only the unemployment rate has a positive effect on total enrollment. The study divided samples on the basis of gender, and the results show that the unemployment rate has a positive effect on male enrollment, while GDP growth has a positive impact on female enrollment. The study also examined the impact of the exchange rate on the enrollment of international students. The results show that a depreciation of the Canadian dollar leads to an increase in enrollment.

Introduction

This study examines the impact of macroeconomic factors such as the unemployment rate, gross domestic product (GDP) growth, and the exchange rate on student enrollment in Canadian post-secondary institutions. The Canadian post-secondary education system increasingly depends on tuition fees collected from students, which cover more than 50% of the budget in post-secondary institutions. In recent times, facing budgetary deficits, provincial governments have been cutting funding commitments to post-secondary institutions and, consequently, universities and colleges must find new ways to survive. The policy makers are interested in identifying the factors that have an impact on student enrollment, and such knowledge will help in forecasting future enrollment levels. This study focuses on macroeconomic factors that became important particularly after the 2008-2009 recession.

The results of this study may also generate interest among broader audiences, since it sheds light on the costs and benefits of economic recession and expansion. For example, a finding that recession has a negative impact on student enrollment will suggest the non-economic cost of a recession. On the other hand, recessions will have a beneficial impact on future productivity if the study finds that recession forces students to go back to school for an education and to learn new skills.

Literature review

Primarily using data from the United States, European countries, and Japan, a number of studies have examined the impact of macroeconomic factors on student enrollment. Using data from the United States, Goh (2009) analyzed the empirical relationship between graduate educational attainment and the business cycle. This research found evidence which suggests that the business cycle does have a direct effect on enrollment in graduate school. The study further found that the dynamics of graduate school enrollment have a close relation to the type of graduate program. Using data between 1870 and 1990 from Germany, Italy, France, the United States, and Japan, Windolf and Haas (1993) found a counter-cyclical pattern in European universities and a procyclical pattern in American and Japanese universities. The research also found that short-term business cycles have no impact on student enrollment in European countries. Using macro-level data from 1970 to 2011, Bastola and Sapkota (2014) researched the relationship between economic cycles and college enrollment in the United States. Their studies suggest that, in the short run, student enrollment fluctuates with the change of education costs. In the long run, enrollment shows growth with an increase in

economic growth. Furthermore, Dellas and Sakellaris (2003) and Betts and MacFarland (1995) provide evidence that enrollment in colleges is counter-cyclical and that the number of students tends to increase during times of economic recession.

To the best of my knowledge, no study has used Canadian data to examine the impact of macroeconomic factors on student enrollment. This study aims to fill this gap in Canadian economics literature. Furthermore, this study will add to the overall literature by focusing on international students as well as on full-time and part-time enrollments.

Theoretical Framework

Economic recession (or expansion) may have a positive or a negative impact on student enrollment. During a recession, the unemployment rate increases. However, recession usually has a disproportionately more severe impact on the younger population (Bell & Blanchflower, 2011). Younger people tend to go back to school as they find it very difficult to get jobs during times of recession. Similarly, many unemployed older people also go back to school to enhance their skills so that they can retain their current job or to find a new one. Thus, there are reasons to believe that recession increases student enrollment.

However, during recession, provincial governments face financial shortfalls and as a result they may have to cut funding to post-secondary institutions. Under these circumstances, post-secondary institutions may also need to cut their programs and their support to students. In this sense, we can expect that recessions may actually decrease student enrollment.

Thus, it is difficult to predict the impact of a recession or expansion on student enrollment. This study will employ empirical investigation. The gross domestic product (GDP) is one of the primary macroeconomic indicators used to assess the health of the economy. GDP growth means that the size of the economy has increased in comparison to the last fiscal year. In the long run, GDP growth increases the population's prosperity and, as a result, more people can afford tuition fees.

Exchange rates should have an impact on the enrollment of international students in Canadian post-secondary institutions. When the Canadian dollar value goes down, international students may find it less expensive to study in Canada. Thus, we can expect that enrollment will go up when the Canadian dollar value goes down. However, there is no conclusive answer, as other factors such as what is happening in the rest of the world may also affect international enrollment. Again, empirical investigation will help to understand the impact of exchange rates on international student enrollment.

Data

Estimating the impact of the business cycle on the decision of individuals to enter a university program requires detailed information about economic factors and enrollment data from 1992 to 2013. The data span has been chosen based on the availability of the data for the whole series. This study uses variables including province, year, GDP per capita, total enrollment, enrollment of males, enrollment of females, part-time and full-time enrollment, the seasonally adjusted unemployment rate, the spot exchange rate for the US Dollar, and student enrollments based on major instructional programs of: science, business, humanities, law, health, and related fields.

Our primary data sources are the Statistics Canada data tables. Total enrollments are based on students enrolled in post-secondary institutions at the time of the fall snapshot date, that is to say, a single date chosen by the institution which falls from September 30th to December 1st. Therefore, students who are not enrolled during this time period are excluded, and enrollment totals do not represent a full academic year. It should also be noted, enrollment is based on program counts and not student counts. If a student is enrolled in more than one program as of the snapshot date, then all of their programs are included in the count.

GDP per capita is based on two data sets from Statistics Canada: expenditure-based annual provincial and territorial gross domestic product (in dollars x 1,000,000), and annual estimates of population from 1992 to 2015. The dataset for annual foreign exchange spot rates for the US Dollar from 1992 to 2015 is supplied by the Bank of Canada.

Methodology

In the estimation, this study uses the Autoregressive Distributed Lag (ARDL) framework (Pesaran, 2001; Pesaran and Shin, 1999). The ARDL approach has some distinct advantages over traditional co-integration techniques: this approach can be applied irrespective of whether the variables are purely I(0), purely I(1) or mutually co-integrated. The ARDL approach is better suited for small samples, such as the present study; this framework can estimate the long run and short run components of the model simultaneously and thus removes the problem associated with omitted variables and autocorrelation. This approach can distinguish dependent and independent variables. In the empirical model we represent the long-run relationship between total enrollment and its major determinants in a linear logarithmic form as follows:

$$\ln(ENRT) = \beta_0 + \beta_1 \ln(GDP) + \beta_2 \ln(UNEMA) + \varepsilon \quad (1)$$

Empirical Results

The results of the long run model, shown in Table 1, suggest that a one percent increase in GDP per capita will increase enrollment by 1.48%, and a one percent increase in the unemployment rate would increase enrollment by 0.21%. In contrast,, the short run model, as shown in Table 2, suggests that GDP growth has no impact while the unemployment rate has a positive impact on the enrollment. Thus, the model confirms that, in the long run, increases in both the GDP and the unemployment rate will increase the overall enrollment. In the short run, only increases in the unemployment rate will increase the enrollment level.

The second model divides the student population into two groups based on gender: male and female, and examines the impact of the unemployment rate and GDP growth separately on each group. In the empirical model, we represent the long run relationship between total enrollment of males (Eq.2) and for females (Eq. 3), and its major determinants in a linear logarithmic form are given as follows:

$$\ln(ENRM) = \beta_0 + \beta_1 \ln(GDP) + \beta_2 \ln(UNEMA) + \varepsilon \quad (2)$$

$$\ln(ENRF) = \beta_0 + \beta_1 \ln(GDP) + \beta_2 \ln(UNEMA) + \varepsilon \quad (3)$$

The results of the models are shown in Table 3 and Table 4. The results of the long run model on male data, (Table 3), suggest that-in the long run a one percent increase in GDP per capita will increase enrollment by 1.12%, and a one percent increase in unemployment rate would increase enrollment by 0.34%. In the short run (Table 4), both GDP growth and the unemployment rate have no impact on the enrollment of males.

The long term and short term impact of macroeconomic factors on the total enrollment of females are shown in Table 5 and Table 6 respectively. The results suggest that in the long run, a one percent increase in GDP per capita will increase enrollment of females by 1.15%, and a one per-cent increase in the unemployment rate would increase enrollment by 0.25%. In the short run, both GDP growth and the unemployment rate have no impact on the enrollment of females.

Overall, the results show that GDP growth has more impact on enrollment of females, while an increase in the unemployment rate would bring more males into post-secondary institutions. The major reason behind these results might be the loss of labor jobs for males during the recession, while females are not affected that much by the economic downturn.

The third model focuses on the impact of the exchange rate of the Canadian dollar on the enrollment rate of international students. The empirical model representing the long run relationship is shown below:

$$\ln(ENRI) = \beta_0 + \beta_1 \ln(CADUSD) + \varepsilon \quad (4)$$

The long run results, as shown in Table 7, suggest that a one percent increase in the spot exchange rate will increase enrollment of international students by 1.07%. In the short run (Table 8) cycle, a one percent increase in the spot exchange rate will increase enrollment of international students by 0.51%.

The fourth model examines the impact of macroeconomic factors on student enrollment based on major instructional programs: social sciences, business, physical sciences, humanities, and health and related fields. In the empirical model we represent the long-run relationship between total enrollment of students and its major determinants in a linear logarithmic form for each type of program as follows:

$$\ln(SOCIAL) = \beta_0 + \beta_1 \ln(GDP) + \beta_2 \ln(UNEMA) + \varepsilon \quad (5)$$

$$\ln(BUSINESS) = \beta_0 + \beta_1 \ln(GDP) + \beta_2 \ln(UNEMA) + \varepsilon \quad (6)$$

$$\ln(SCIENCE) = \beta_0 + \beta_1 \ln(GDP) + \beta_2 \ln(UNEMA) + \varepsilon \quad (7)$$

$$\ln(HUMANITIES) = \beta_0 + \beta_1 \ln(GDP) + \beta_2 \ln(UNEMA) + \varepsilon \quad (8)$$

$$\ln(HEALTH) = \beta_0 + \beta_1 \ln(GDP) + \beta_2 \ln(UNEMA) + \varepsilon \quad (9)$$

This model uses the following variables: total enrollment in the program (*SOCIAL, BUSINESS, SCIENCE, HUMANITIES, HEALTH respectively*) as the dependent variable and GDP growth per capita (*GDP*) and the seasonally adjusted unemployment rate for each province (*UNEMA*) as independent variables.

Using this data set for the social sciences, the model shows that in the long run (Table 9), a one percent increase in GDP per capita will increase enrollment in this type of program by 1.75%, and a one percent increase in the unemployment rate would increase enrollment by 0.62%. In the short run (Table 10), both GDP growth and the unemployment rate have no impact on enrollment in social programs.

Using this data set for business programs, the model shows that in the long run (Table 11), a one percent increase in GDP per capita will increase enrollment by 0.89% while the unemployment rate has no effect. In the short run (Table 12), both GDP growth and the unemployment rate have no impact on enrollment in business programs.

Using this data set for physical science programs, the model shows that in the long run (Table 13), a one percent increase in GDP per capita will increase enrollment in this type

of program by 1.21% while a one percent increase in the unemployment rate would increase enrollment by 0.60%. In the short run (Table 14), both GDP growth and the unemployment rate have no impact on enrollment in physical science programs.

Using this data set for humanities programs, the model shows that in the long run (Table 15), a one percent increase in GDP per capita will increase enrollment in this type of program by 1.78% while the unemployment rate has no effect. In the short run (Table 16), both GDP growth and the unemployment rate have no impact on enrollment in humanities programs.

Using this data set for health-related programs, the model shows that in the long run (Table 17), a one percent increase in GDP per capita will increase enrollment in this type of program by 1.915% while the unemployment rate has no effect. In the short run (Table 18), GDP growth has no impact on the enrollment in health-related programs, however, the unemployment rate has a positive impact.

Overall, we can see that in the long run increase in GDP would increase enrollment in all educational programs, whereas an increase in unemployment would affect enrollment in the social and physical sciences. In the short run, an increase in unemployment would stimulate enrollment only in health-related programs. There is no evidence that fluctuations in GDP affect enrollment to any type of program in a short run.

The fifth model separately examines the impact of macroeconomic factors on part-time and full-time enrollments. In the empirical model, we represent the long-run relationship between total enrollment of part-time students (Eq. 10) and full-time students (Eq. 11), and its major determinants in a linear logarithmic form as follows:

$$\ln(ENRFT) = \beta_0 + \beta_1 \ln(GDP) + \beta_2 \ln(UNEMA) + \varepsilon \quad (10)$$

$$\ln(ENRPT) = \beta_0 + \beta_1 \ln(GDP) + \beta_2 \ln(UNEMA) + \varepsilon \quad (11)$$

This model uses the following variables: total enrollment in the full-time program (*ENRFT*) or part-time program (*ENRPT*) as dependent variables and GDP growth per capita (*GDP*) and the seasonally adjusted unemployment rate for each province (*UNEMA*) as independent variables.

Using this data set for full-time enrollment, the model shows that in the long run (Table 19), a one percent increase in GDP per capita will increase enrollment in the full-time program by 1.49%, and a one percent increase in the unemployment rate would increase enrollment by 0.56%. In the short run (Table 20), both GDP growth and the unemployment rate have no impact on the enrollment of full-time students.

Using this data set for part-time enrollment, the model shows that in the long run (Table 21), a one percent increase in GDP per capita would increase part-time enrollment by 1.80%, while the unemployment rate has no impact. In the short run (Table 22), both GDP growth and unemployment rate have no impact on the enrollment of part-time students.

Overall, we can see that in the long run, an increase in GDP would increase enrollment in both full-time and part-time students, whereas an increase in unemployment would affect only the enrollment of full-time students. There is no evidence that fluctuations in the GDP and the unemployment rate affect enrollment of either full-time or part-time students in the short run.

Conclusion

Using data from Statistics Canada (1992-2013), this study examined the impact of macroeconomic factors such as unemployment rate, GDP growth, and the exchange rate on student enrollment in Canadian post-secondary institutions. In order to estimate regressions, this study used the Autoregressive Distributed Lag (ARDL) method.

The results from the overall model show that both GDP growth and unemployment have a positive impact on enrollment in the long run. However only the unemployment rate has a positive effect on total enrollment during a short term. The study divided a sample on the basis of gender, and the results show that the unemployment rate has a positive effect on male enrollment while GDP growth has a positive impact on female enrollment. The study also examined the impact of the exchange rate on the enrollment of international students. The results show that a depreciation of the Canadian dollar leads to an increase in enrollment.

The results of this study are consistent with findings from similar studies that examined the relationship between economic cycles and the level of college enrollment in the United States from Bastola, Sapkota (2014) and Windolf, Haas (1993). Overall, the GDP growth per capita is a good predictor of enrollment, which follows the procyclical pattern.

This research has elements that could lead to further studies. This study does not incorporate the factor of tuition fees due to a limited availability of data. Economic conditions in host countries could also have an impact on the enrollment of international students, whereas this research uses only the aggregated data.

The policy makers could use macroeconomic factors discussed in this study to measure student enrollment and forecast future enrollment scenarios.

Appendix 1. Tables

Table 1. Impact of macroeconomic factors on the total enrollment in the long run.
Long-run coefficient estimates

Variable	Coefficient
	1.480625* (t-statistic 29.51481)
	0.209962* (t-statistic 5.136768)

*Denotes significance at the 1% levels.

Table 2. Impact of macroeconomic factors on the total enrollment in the short run.
Short-run coefficient estimates

Variable	Coefficient
	-0.042755 (t-statistic -0,186036)
	0.121786* (t-statistic 3.588192)
	-0.272995* (t-statistic -3.128938)

*Denotes significance at the 1% levels.

Table 3. Impact of macroeconomic factors on the total enrollment of males in the long run.
Long-run coefficient estimates

Variable	Coefficient
	1.118623* (t-statistic 47.70547)
	0.349726* (t-statistic 18.75626)

*Denotes significance at the 1% levels.

Table 4 Impact of macroeconomic factors on the total enrollment of males in the short run.
Short-run coefficient estimates

Variable	Coefficient
	-0.330872 (t-statistic -1.195442)
	0.064796 (t-statistic 1.107299)
	-0.444161* (t-statistic -2.974208)

*Denotes significance at the 1% levels.

Table 5. Impact of macroeconomic factors on the total enrollment of females in the long run.
Long-run coefficient estimates

Variable	Coefficient
	1.152323* (t-statistic 34.60705)
	0.252343* (t-statistic 10.02882)

*Denotes significance at the 1% levels.

Table 6. Impact of macroeconomic factors on the total enrollment of females in the short run.

Short-run coefficient estimates

Variable	Coefficient
	-0.069306 (t-statistic -0.188900)
	0.078327 (t-statistic 1.493043)
	-0.360033* (t-statistic -4.078127)

*Denotes significance at the 1% levels.

Table 7. Impact of the exchange rate on the enrollment of international students in the long run.

Long-run coefficient estimates

Variable	Coefficient
	1.074075* (t-statistic 5.016683)

*Denotes significance at the 1% levels.

Table 8. Impact of the exchange rate on the enrollment of international students in the short run.

Short-run coefficient estimates

Variable	Coefficient
	0.51966* (t-statistic 2.354073)
	-0.451371* (t-statistic -2.794333)

*Denotes significance at the 1% levels.

Table 9. Enrollment in social sciences programs in the long run.

Long-run coefficient estimates

Variable	Coefficient
	1.752042* (t-statistic 15.05717)
	0.629424* (t-statistic 7.077645)

*Denotes significance at the 1% levels.

Table 10. Enrollment in social sciences programs in the short run.

Short-run coefficient estimates

Variable	Coefficient
	-0.04629 (t-statistic -0.11949)
	-0.04444 (t-statistic -0.72899)
	-0.18755* (t-statistic -5.40001)

*Denotes significance at the 1% levels.

Table 11. Enrollment in business programs in the long run.

Long-run coefficient estimates

Variable	Coefficient
	0.894561* (t-statistic 12.35859)
	-0.05954 (t-statistic -0.9858)

*Denotes significance at the 1% levels.

Table 12. Enrollment in business programs in the short run.

Short-run coefficient estimates

Variable	Coefficient
	-0.21378 (t-statistic -0.72881)
	-0.120818 (t-statistic 1.408514)
	-0.27603* (t-statistic -3.3623)

*Denotes significance at the 1% levels.

Table 13. Enrollment in physical science programs in the long run.

Long-run coefficient estimates

Variable	Coefficient
	1.216623* (t-statistic 17.16562)
	0.603062* (t-statistic 13.49088)

*Denotes significance at the 1% levels.

Table 14. Enrollment in physical science programs in the short run.

Short-run coefficient estimates

Variable	Coefficient
	-0.51458* (t-statistic -1.50644)
	-0.10286 (t-statistic -1.25337)
	-0.34058* (t-statistic -2.46689)

*Denotes significance at the 1% levels.

Table 15. Enrollment in humanities programs in the long run.

Long-run coefficient estimates

Variable	Coefficient
	1.786105* (t-statistic 1.897964)
	-1.44499* (t-statistic -1.78419)

*Denotes significance at the 1% levels.

Table 16. Enrollment in humanities programs in the short run.

Short-run coefficient estimates

Variable	Coefficient
	0.242628 (t-statistic 0.480016)
	0.28008 (t-statistic 1.507398)
	-0.07407* (t-statistic -1.72492)

*Denotes significance at the 1% levels.

Table 17. Enrollment in health-related programs in the long run.

Long-run coefficient estimates

Variable	Coefficient
	1.918031* (t-statistic 14.80118)
	0.016789 (t-statistic 0.162539)

*Denotes significance at the 1% levels.

Table 18. Enrollment in health-related programs in the short run.
Short-run coefficient estimates

Variable	Coefficient
	-0.27027 (t-statistic -0.91862)
	0.090032* (t-statistic 2.179799)
	-0.35192* (t-statistic -6.0427)

*Denotes significance at the 1% levels.

Table 19. Enrollment in full-time programs in the long run.
Long-run coefficient estimates

Variable	Coefficient
	1.492202* (t-statistic 27.39023)
	0.565323* (t-statistic 12.82756)

*Denotes significance at the 1% levels.

Table 20. Enrollment in full-time programs in the short run.
Short-run coefficient estimates

Variable	Coefficient
	-0.08305 (t-statistic -0.21026)
	0.059665 (t-statistic 0.892256)
	-0.22659* (t-statistic -3.73786)

*Denotes significance at the 1% levels.

Table 21. Enrollment in part-time programs in the long run.
Long-run coefficient estimates

Variable	Coefficient
	1.809821* (t-statistic 8.292648)
	0.071989 (t-statistic 0.302474)

*Denotes significance at the 1% levels.

Table 22. Enrollment in part-time programs in the short run.
Short-run coefficient estimates

Variable	Coefficient
	-0.221 (t-statistic -0.51449)
	0.121987 (t-statistic 1.621134)
	-0.27656* (t-statistic -5.22286)

*Denotes significance at the 1% levels.

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