Final Paper

"How has influx of post-secondary international students affect economic growth (GDP) across provinces in Canada since 1992-2016"

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Introduction to my question and answer, why it is important/interesting

As an international student myself, I always imagine why it was appealing for many people to study abroad, especially with such high tuition rates. With more knowledge about being able to study aboard, I learned that Canada is one of the top countries that international students chose to study in because of its high-ranking education, easy transition towards permanent residency and has an abundance of competitive packages that allow international students to be eligible to work part-time in order to subsidize their expenses and gain experience in their chosen field. International students have contributed more than $15 billion to the Canadian economy, which supports over 170,000 Canadian jobs in the market (El-Assal, 2018). In turn, it encourages international students to spend more and substantially contribute to Canada's GDP. In 2015, there were around 355,000 international students in Canada, a growth rate of 8.1% from 2014 (Gera, 2015). I hope that this research will also lead to other points of view that we should be taking into consideration, for example, whether or not Canada should or should not be taking in more international students in the future.

I was intrigued by this topic because I wanted to observe and study the number of incoming international students in each province and how that impacts the fluctuation in provincial GDP at basic price. I am going to research both the short-term & long-term impacts on the influx of international students coming into Canada. This would allow me to study both the economic benefit and downfalls that international students coming to Canada have on the Canadian economy. These can have effects on those international students who obtain work permits which allow them to work and encourages more economic spending to increase GDP. I

would be observing the patterns and trends that the influx on international students have to the contribution to provincial GDP at basic price. A huge effect that international students would have on the economy is dependent on whether or not they are able to obtain high-level jobs after graduation which would lead to a high level of productivity contributed to the economy. In order to obtain these results, I will be regressing the number of international students on the employment rate of immigrants in each province.

Summary of ideas and evidence that I will use to support my argument.

In terms of geographic and temporal scope of my paper, I have 10 provinces and 25 years of data, therefore I have 250 observations. In regard to tuition rates, I have 10 provinces and 11 years of data, therefore I have 110 observations. This data is based on the yearly provincial level. To make my dataset even richer, I will be using the regression method of lagging my data. By lagging my dataset on the number of international students and its effect on provincial GDP we would see what happens to provincial GDP at basic price years after international students come in to study in Canada and how long these effects persist. I would use the annual growth rate and changes in GDP at basic price as my dependent variable and use other variables such as the number of international students multiplied by the annual tuition fees as my independent variable to show the total annual tuition revenue for that province and lagging the data again in the same process.

		GDP at Basic Price			
# of International Students	**1**	**2**	**3**	**4**	
P-Value	0.011	0.013	0.024	0	# of Observations = 275
Province fixed effects	YES	NO	YES	NO	Adjusted R^2= 0.9790
Year fixed effects	YES	YES	No	NO	

The first result that I wanted to see if there would be a correlation between the number of international students in each province on a yearly basis and lag my data for all the province's GDP at basic price for 2, 4, 6, and 8 years in order to see what happened to provincial GDP at basic price after those international students have come into Canada and how long these effects persist. For example, I am testing specifically Ontario, I have data for 25 years from 1992-2016 and stated the number of post-secondary international students that came to study in the province of Ontario on a yearly basis. In addition, I have matched the provincial GDP at basic price in Ontario with its respective years. I then took the number of international students and lagged it for 2, 4, 6, and 8 years respectively, to show how the effect of the number on international students that came in 2, 4, 6, and 8 years ago has on GDP for that year and how long these effects and changes would persist. I have done this for 10 provinces in Canada except for Northwest Territories, Yukon, and Nunavut because there is not enough sufficient data due to the lack of post-secondary education offered and low quantity of international students who choose to study in those provinces.

The results that my dataset show that the number of international students does have an impact on provincial GDP at basic price. My result contained a p-value of 0.01 which is statistically significant at the 1% level regressed with both province and year fixed effect in order to mitigate for omitted variable bias. As I lagged the data for 2, 4, 6 and 8 years, it resulted in having a less significant impact on provincial GDP at basic price. In addition, the more lagged my dataset, the more observations I lost which can be a limitation to my finding with very little observations in my dataset.

The u term represents all other variables and factors other than international students in the labor force that may have an effect on provincial GDP at basic price. The coefficient bo is the intercept parameter which is the value of provincial GDP at basic price when the number of international students and the error term is zero. Holding all else equal, the coefficient b1 represents the slope parameter against the regression line. It is the effect on real GDP with the change in the number of international students coming into study in each province.

My methodology intends to analyze this dataset utilizing multiple regression model. Variables included within this regression would assist me in identifying the amount of contribution that each province international student's total tuition has on provincial GDP. In addition, my regression would include lagged years for 2, 4, 6 and 8 years in order to see how long these effects persist. Based on my output, we can see that the number of international students coming into Canada does have a positive effect on provincial real GDP up until 8 years. I did not go past 8 years because I would have lost too many observations in my dataset.

Regression line

$$GDPpy = bo + b1Immigrant\ Employment\ Rate_{py} + u_{py} + \alpha_p + \Delta_y$$

		Employment Rate			
# of international student	1	2	3	4	
P-Value	0.027	0	0.034	0	# of Observations = 110
Province fixed effects	YES	YES	NO	NO	Adjusted R^2= 0.7741
Year fixed effects	YES	NO	YES	NO	

Another dataset that I will be regressing is the employment rate percentage of immigrants coming into each province as my y (dependant) variable regressed on the number of international students in each province as my x (independent) variable. This regression would allow me to

conclude if the number of international students coming into a province translates into higher employment rate for immigrants in that specific province. If it were to yield a positive effect, this would lead to justifying one of the reasons why this has a positive effect on provincial GDP in the sense that the number of international students who are coming into a province are obtaining jobs within the Canadian economy. In addition, if the employment rate is increasing on a yearly basis, we can assume that international students coming into each province who enter the labor force are acquiring skills. In turn, we can see that Canada is investing in human capital which would result in higher contribution towards the Canadian economy.

I have used panel data because I am regressing the same province appearing across multiple years. Panel data include two different fixed effects which are province fixed effects, and year fixed effects in order to mitigate for omitted variable bias problems. I would report this simple regression with the same fixed effects and see how the outcomes are changing. The year fixed effects to control for year-specific shocks that would equally affect all the provinces. I also need to control for province fixed effects so that my main regression does not get disrupted.

I would need controls to mitigate endogeneity in order to have international student's tuition rates directly relate to economic GDP growth. I need to control for these variables because there could be other factors that can lead to economic growth such as an increase in tax revenue, meaning more money to invest which attracts more international students. I am going to isolate for the relationship between yearly tuition rate in correlation to provincial GDP contribution. The first limitation of my study is that my data only consists of 10 provinces and not 13 due to the lack of data available from the provinces of Northwest Territories, Yukon, and

Nunavut. Therefore, there is a bias shown in my research meaning that we should not take the information correctly straight away. The second limitation that my study has is the state of each Canadian province. Fluctuations such as recessions occur over multiple time periods that are being observed. They can have a negative impact on the economy and discourage international students who have just recently graduated and are about to enter the workforce, which directly impacts the employment of international students.

The third limitation is the number of international students who enroll in Canadian institutions and after graduation leave the country to work elsewhere or migrate back to the country they originated from. This would cause a change in the amount of contribution that international student has on provincial GDP at basic price. Therefore, I have controlled for this by lagging my data set by 2, 4, 6 and 8 years in order to see how long these effects persist and if there are changes in provincial GDP once international students have enrolled into Canadian institutions. Lastly, there are limitations to consider in the process of my data collection for the control variables which could omit vital data or large groups that may create shortcomings in my research.

I have found information on the employment rate of immigrants coming into each Canadian province for 10 years. Therefore, I utilized this information by regressing it on the number of international students coming into each province to see if the number of international students transitions into the Canadian labor force and contribute to the economy. If we were to see a strong p-value, we could infer that Canada is investing in their human capital and that international students gains skills once they enter the workforce.

Since the p-value is associated with the f-value, the p-value helps to interpret if the independent variable reliably predicts the dependent variable. Based on the results of my regression, I found that the provincial immigrant employment rate reliably predicts the number of international students coming into each province, but only a small amount. With a p-value of 0.027, which is significant at the 5% level, the number of international students in each province does have a small impact on the provincial immigrant employment rate. Therefore, we can conclude that the number of international students coming into each province is entering the workforce which contributes to provincial GDP and that Canada is investing in human capital.

One of the reasons why international students choose to study in Canada is to transition towards permanent residency (V.I. Chirkov et al., 2008). Even though a key factor that explains the decision of international students to study in a foreign university is based on the quality of education, having the possibility of applying for permanent residence after graduation is also an attractive reason. Once international students obtain permanent residency and enter the labor market, they are contributing to the country's productivity. International students play a crucial role in the contribution towards the Canadian economy which has an impact on Canada's labor market and economic growth. In addition, international students make a significant contribution that brings in innovation, skill, and knowledge development (Freeman, 2018).

Available Data:

Statistics Canada (2019)

- Sex: Both male and female

- Demographic: International students coming in to study in each province of Canada (25 years)
- Real provincial GDP at basic price (25 years)
- Immigrant employment rate in each province
- Difference in annual provincial real GDP at basic price
- International student's tuition fees (11years)
- Level of education – Post-secondary education, bachelor's degree and further education above a bachelor's degree (Ph.D., Masters).

Control variables that will be included in the multiple regression model:

- Annual number of international students coming into each Canadian province to study
- Annual employment rate of immigrant coming into each Canadian province

The data that would solidify my research has been derived from multiple credible sources. Due to the nature of my research and the focus on Canadian provinces, our data will consist mainly of Canadian individual census. Data banks will include Stats Canada, Bank of Canada, Government of Canada, Odesi, EconLit, and Google Scholar. From Odesi, I will be extracting data from full-time post-secondary student enrollment and capturing the change in enrollment and tuition rates. Utilizing this data set, I will be able to analyze the number of incoming international students in regard to their tuition fees over multiple years. In the long run, I will be utilizing SLID and CIS to analyze international student's income growth as well as their spending habits and compare that to each provincial GDP. From the Government of Canada, I will be extracting data achieved on economic impact of international education in Canada

website to analyze the change in provincial GDP over multiple years. Google Scholar will give me peer-reviewed articles regarding input that other authors have on this topic and what it would imply in the future for international students that choose to study in Canada.

Regression Equation:

$$GDPpy = bo + b1\ Total\ Tuition\ py + u_{py} + b2\ Total\ Tuition\ p,y-2 + b2\ Total\ Tuition\ p,y-4 + b2\ Total\ Tuition\ p,y-6 + b2\ Total\ Tuition\ p,y-8 + \alpha_p + \Delta y$$

		GDP at Basic Price			
International Student's Tuition Fees	1	2	3	4	
P-Value	0.301	0.292	0.241	0.483	# of Observations = 100
Province fixed effects	YES	NO	NO	NO	Adjusted R^2= 0.8370
Year fixed effects	YES	YES	YES	NO	

I wanted to see the relationship between provincial post-secondary international student's tuition fees and provincial GDP at basic price. Therefore, in the same process, I have lagged provincial post-secondary international tuition fees of 11 years on provincial GDP at basic price for 2, 4, 6, and 8 years to see the changes in yearly tuition fees in relation to provincial GDP at basic price, and how long these effects persist. Lastly, I wanted to see the long term effects of international students that enter the Canadian labor force and the effect it has on provincial GDP.

Human capital accumulation: As Canada takes in more qualified international students into Canada, this becomes a key factor in international competitiveness as the wealth of a nation is invested within its people. Because Canada is suffering from a low fertility rate, human capital accumulation needs to be attained through immigration of skilled and qualified international students to increase productivity through investing in education, skill, creativity, social and personal attributes in order to perform labor to produce economic value (Calder et al. 2016).

Endogenous Growth Theory Model: The endogenous growth theory model is a theory which states that improvements in productivity can be directly related to faster innovation and more investment in human capital. This theory, where I will focus on the human capital aspect to examine the role that international students studying in Canada play in contributing to productivity. A few of the main drivers of the endogenous growth theory model is the increasing returns to scale derived from capital investment especially in infrastructure, investment in education, human capital, innovation, government policies encouraging entrepreneurship as a means of creating new jobs, and private sector investment in research and development (Keton, 2018). Canada taking in more international students plays a critical role in contributing to the factors of this model. In turn, this would result in an increase in economic growth and productivity generated from within the system as a direct result of internal policies implemented. An example of this which I obtained from a reviewed article states that international students come to study in Canada in hopes of obtaining a degree and entering the workforce after graduation. Canadas' government need to play a vital role to ensure that they invest towards infrastructure, education systems, and human capital in order to foster growth and productivity in the future in order to maximize potential economic growth (Skinkle & Embleton, 2014).

Economies of scale in education: A reason why Canada might be taking in more international students is because the infrastructure is available, with the amount of seats available for use, it would not cost Canada a substantial amount to bring in these students in terms of infrastructure investment. Canada would gain a lot from taking in more international students because it contributes to the pool of skilled workers and as tuition fees are vastly increasing on a

yearly basis. Canada needs to take in more international students to prevent institutions from cutting programs or even shutting down due to the lack of demand and high supply of infrastructure. In Ontario, more than 100,000 students space disappeared from public education system between 1998-2016 (Crawley, 2017).

Transfer of knowledge and innovation (technology): As more and more student chose to study internationally, this expands to a higher mass of education spread worldwide. With such a diverse background, this would develop into innovation from various diverse inputs across individuals. In the long run, this would generate benefits and advances around the world and would foster economic growth.

Background section outlining existing literature and how it fits into my paper

One of the related literature articles stated how they measure the economic impact of university research and development. They either used the static approach, which is based on simulation through an input, output model, and regional multiplier or the dynamic approach, which corresponding to the share of university research in the real increase of GDP (Martin, 1998). This is a different method from my data because I utilize lagged growth and regression that regresses the dependent variable on the independent variable.

Another existing literature that fits well into my paper is called "The Economic Impact of Post-Secondary Education in Canada" written by The Conference Board of Canada. This literature talks about the economic impact of Canada's post-secondary education institution

through its operation. Similar to my paper, this literature talks about the development of human capital and university research that influences the Canadian economy through intellectual capital creation. The issue this article is attempting to solve is the causal link between post-secondary institution's activities and value added in the broader Canadian economy. This literature takes on a comprehensive approach to understanding the economic contribution that Canada's post-secondary education institutions bring. This literature uses the same variable that I have used in my research, but I used the number of international students as my dependent variable. The literature shows variables of 333 recognized post-secondary education institution, comprised of just under 100 public universities and colleges, and 133 public colleges and institutions.

I have also faced similar issues when collecting my data to ensure that is no endogeneity issues in relation to my variables because Canada is an economy that is highly complex, and many other factors make it difficult to determine the value that post-secondary education institution brings to the Canadian economy. This literature's strategy to accurately compute the value that post-secondary education brings to GDP focuses on how large post-secondary education sector should be, how it should be developed, operating models to be used, and how its effectiveness can be assessed. This literature states that provincial governments have tended to limit operating grant funding increases to the rate of inflation. Meanwhile, most collective bargaining agreements have built-in actual cost increases well above inflation. For instance, the Ontario government has noted that operating grant funding would increase by 1.1 in the near future, while institution' consists were also set to increase by 5-8% per annum (TCBOC, 2014). Operating grant funds are unlikely to increase much in the short and medium term. Therefore,

post-secondary education institutions has responded to demographic change and operating grants limits by accepting more enrollment for international students (TCBOC, 2014).

This literature also talks about economies of scale in education. It states that enrolment has risen in ways that are relatively easy to expand in a low-cost way, such as lecture course based in the humanities, business, public administration and arts. Thus, if there is infrastructure available to be utilized, adding additional students would add relatively nothing to the cost of the lecture and would only increase by a small amount to access learning. This could also raise concerns regarding the quality of education and learning experience that students obtain. Refer to Figure #1 (Statistics Canada, 2018)

Another literature that is closely related to my paper talks about how more international students that come into any country brings in more technological innovation, expansion of mass higher education and more direct human capital acceleration to speed up the process of adopting the best of practices around the world **(**El-Assal, 2018). All of these variables bring benefit and value advances to an economy and plant future steps for economic productivity. As an extra analysis, I found out there is a positive correlation between the number of international students coming into Canada to study and tuition fees. I found this by looking at the international student's tuition fee per student and the number of international student per province, based on my data, we can see that there is an increase in international student's tuition fees as more and more international students come into Canada to study. In order to back up my statistics, this existing literature also states that when the governments for that specific province is allowed to

dictate tuition rates, post-secondary education institution typically charges 2-5 times the domestic tuition rates to international students (preview chart 2).

In conclusion, the number on international students' enrolment into Canadian post-secondary education institutions is expected to increase over the next decade (CMEC, 2012), and international education will be a one of the main economic driver in both the short and long-term growth for the Canadian economy (Advisory Panel, 2012). Based on my findings, we can see that the number of international students enrolling in post-secondary education institutions are increasing at a drastic rate. Thus, this will result in more pressure on the Canadian economy to expand both personal as well as financial services for these students in order for them to fully integrate themselves into the system and maximize their contribution to economic growth through productivity and the skills they have learned after graduation from Canadian education institutions.

Appendix:

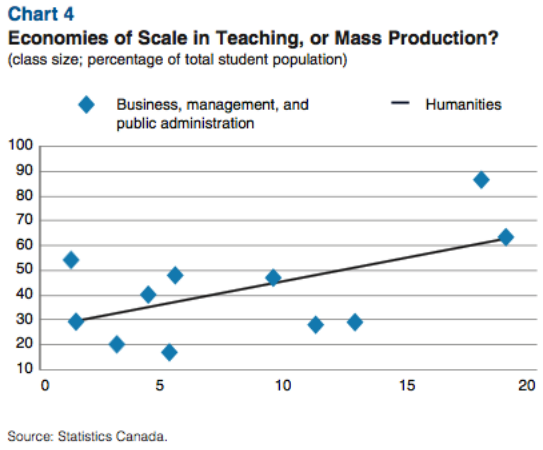

Figure #1 (Statistics Canada, 2018)

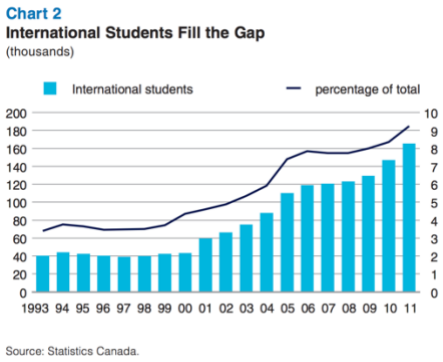

Figure #2 (Stats Canada, 2011)

(Figure #3) Regression on employment rate on the number of international students x with province and year fixed effects

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.
. xi: regress employmentrate_n nintstudents_n i.province i.year
i.province        _Iprovince_1-11     (_Iprovince_1 for pro~e==ALBERTA  omitted)
i.year            _Iyear_1-12         (_Iyear_1 for year==2006 / 2007 omitted)
note: _Iprovince_9 omitted because of collinearity
note: _Iyear_12 omitted because of collinearity
```

Source	SS	df	MS		
				Number of obs	= 110
				F(20, 89)	= 19.67
Model	2259.96168	20	112.998084	Prob > F	= 0.0000
Residual	511.227869	89	5.74413336	R-squared	= 0.8155
				Adj R-squared	= 0.7741
Total	2771.18955	109	25.4237573	Root MSE	= 2.3967

employmentra~n	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
nintstudents_n	-.0000876	.000039	-2.25	0.027	-.0001651	-.0000101
_Iprovince_2	-8.364252	1.264524	-6.61	0.000	-10.87683	-5.851669
_Iprovince_3	-1.654915	1.072109	-1.54	0.126	-3.785173	.4753422
_Iprovince_4	-9.588274	1.091533	-8.78	0.000	-11.75713	-7.419421
_Iprovince_5	-11.27432	1.115075	-10.11	0.000	-13.48995	-9.058693
_Iprovince_6	-11.56607	1.060819	-10.90	0.000	-13.6739	-9.45825
_Iprovince_7	-3.803628	2.364454	-1.61	0.111	-8.501747	.8944916
_Iprovince_8	-12.94312	1.13113	-11.44	0.000	-15.19065	-10.69559
_Iprovince_9	0	(omitted)				
_Iprovince_10	-7.170212	1.28717	-5.57	0.000	-9.727792	-4.612632
_Iprovince_11	-1.63969	1.091044	-1.50	0.136	-3.807572	.5281909
_Iyear_2	.1304655	1.072069	0.12	0.903	-1.999713	2.260644
_Iyear_3	.466107	1.073546	0.43	0.665	-1.667006	2.59922
_Iyear_4	.7047795	1.078301	0.65	0.515	-1.437783	2.847342
_Iyear_5	.3224168	1.08141	0.30	0.766	-1.826322	2.471156
_Iyear_6	1.401834	1.091392	1.28	0.202	-.7667393	3.570407
_Iyear_7	2.189937	1.104638	1.98	0.051	-.0049546	4.384829
_Iyear_8	2.719723	1.125325	2.42	0.018	.483727	4.955719
_Iyear_9	3.014886	1.154777	2.61	0.011	.7203686	5.309403
_Iyear_10	3.238478	1.163871	2.78	0.007	.9258913	5.551064
_Iyear_11	4.241399	1.204003	3.52	0.001	1.849071	6.633728
_Iyear_12	0	(omitted)				
_cons	64.46225	1.058337	60.91	0.000	62.35936	66.56515

Legend

Province 1: British Columbia
Province 2: Saskatchewan
Province 3: Manitoba
Province 4: New Brunswick
Province 5: Newfoundland
Province 6: Nova Scotia
Province 7: Ontario
Province 8: PEI
Province 9: Alberta
Province 10: Quebec

Year 1: 2007/2008
Year 2: 2008/2009
Year 3: 2009/2010
Year 4: 2010/2011
Year 5: 2011/2012
Year 6: 2012/2013
Year 7: 2013/2014
Year 8: 2014/2015
Year 9: 2015/2016
Year 10: 206/2017

(Figure #4) Lagged Excel Dataset:

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