International Student Mobility in a Competitive World: Determinants and US Policy Before and After Post 9/11

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Abstract

Following 9/11, the United States issued a declining number of foreign student visas in 2002 through 2004 which startled many observers. We analyze visa issuances for a large sample of nations from 2000 to 2004 using an OLS fixed-effect model. We replicate Rosenzweig's finding that source country capacity (enrollment ratios) increases student migration, but at a decreasing rate when interacted with per capita GDP. This implies that the student flows from poorer countries with lower per capita GDP or enrollment ratios respond more positively to increases in their income or educational capacity. Lagged visa rejections rates reduce visa issuances, but the effect is small and no greater than exchange rate weighted tuition costs which also reduce student visas. We also find that international enrollments in other English speaking countries reduce visas issued by the US, but that effect zeros out with the introduction of a post-2001 dummy. These results indicate that relative per capita income is the greatest driver of the demand for student visas and that educational capacity in poorer nations actually increases visa demand. Critics are correct in pointing out that US visa policy deters students (increased rejections of applicants), but the effect is rather small. All of which implies that the greatest deterrent to demand post 9/11 was neither policy nor even sharp increases in US tuition, but perhaps the same fears, etc., that depressed tourism. And demand for US student visas is likely to remain strong or even increase as other nations (both sources and destinations) gear up their "competitive" educational capacity. Looking forward US educational costs and capacity should be, perhaps, more of a concern than the strength of visa demand.

1. Introduction.

In the recent years, the economics literature has shown much interest in exploring the determinants of the flow of international students into the US. While immigration –as the flow of workers in search of better skill prices – has been studied much since the influential work by Borjas (1987), a very little research has been done to understand the mobility of students across international borders. Provided below is a brief review of some works that deal with foreign students.

Bratsberg (1995) examines the determinants of the return rates of foreign students using immigration model by Borjas (1987). Borjas (2002) discusses facts and issues related to the US system of admitting students. These studies, however, do not offer much insights into the determinants of the foreign student inflows into a country. The following two studies by Rosenweig (2007) and DeVoretz (2005) considers factors affecting the inflow of foreign students.

Rosenzweig (2007) examines two competing explanations for the international student flow into the US. Do they come to acquire skills that they could not otherwise acquire at home ? Or do they come because high-skill employment is under-rewarded at home? The first explanation considers the shortages of higher educational institutions (or of quality institutions) as a driving force. The basis of the second explanation is the wage differentials across nations. The author's econometric model rejects the first explanation, i.e. the schooling shortage explanation. Instead he finds that students from low-wage countries seek schooling in high-wage countries as a means of augmenting their chances of obtaining a high-wage job in those countries.

In a different approach, using the lagged demand function, DeVoretz (2005) estimates the demand for enrollment in Canadian higher institution. He regresses current demand on one period lagged enrollment, source country income level and exchange rate weighted tuition fee in Canada. As expected, he finds that positive signs on the estimated coefficients on lagged enrollment and source country income level and negative on

Canadian tuition fees. He estimates that, a ten percent rise in Canada's domestic education price (induced via either currency appreciation or a tuition increase or both) leads to a 8.4 per cent decline in Canadian enrollment. He also finds that relative tuition costs matter. According to his estimates, a one percent rise in Canadian tuition relative to United States tuition reduces Canadian demand nearly one percent.

Additionally, some recent studies [Roberts (2006); B. Lindsay Lowell, Micah Bump, and Susan Martin Roberts (2007)] have commented on decrease in foreign student flows in the US in the recent years. Roberts (2006), for example, notes that between 2001/2002- 2004, undergraduate and graduate enrollments fell by 8% and 4% respectively.

These studies have suggested that the US losing some of its share in the English Language Market (UK, Canada, Australia, NZ) is one of the reasons for this decline. They attribute this decline to factors such as rising US tuition costs, tightened US visa rules and rise in unfavorable opinion of the US post 911. At the same time, other destination countries have been able to be attract more foreign students through improvements in the education qualities, expansion of their programs and relatively friendlier rules for staying in the host country post graduation.

As noted above, the foreign student flow literature is very young. The literature offers very little insight into whether, much less how much, the international student flow in a country can be affected by the host country's visa regulatory practices. In a competitive market place, visa regulations can affect both the size and the quality of the foreign student applicant pools. The immigration literature and as well as a recent finding show that this is an important consideration.

Cobb-Clark and Connolly (1997) finds that the demand for skilled immigration visas to Australia is related to the number of immigrants accepted by the United States and Canada. Similarly Mayda show that immigration policies affect flow rates of

immigrants into the OECD countries. She further finds a result consistent with the idea of immigrants considering multiple countries for emigration. Further, DeVoretz's finding that Canadian tuition cost relative to that of the US matters, is a strong evidence showing that the international student migration is competitive in nature. The relative tuition costs could in turn be affected by fluctuations is exchange rates or tuition costs or both. Both of above studies note that visa regulations and targets change from time to time. Hence, it is important to control for government visa policy variables and tuition costs of competing countries.

There are mainly two goals in this paper. First, we want to explore whether the government policies and regulatory practices matters. In particular, we ask the question: Is the flow of students affected by visa rejection rates? Second, we want to test the proposition that international student migration can be seen as an outcome determined in competitive market place where the migrants choose between different countries that may not be strongly differentiated on economic grounds, but rather by the policies that attract students.

The contribution of this paper to the literature, thus, will be an analysis of the effects of visa regulation and the international competition on the foreign student flow into the US. Our empirical strategy is to draw on findings of the immigration literature and on student flow models by Rosenweig (2007) and DeVoretz (2005) and to add variables related with government visa regulations and international competition.

Until now, the immigration literature has provided the backdrop for analyzing the international student flows. Massey et al (2003) and [?] provide wide surveys of important theories of international migration. We use the empirical literature on immigration [See Hatton and Willamson, Mayda, Cobb-Clark and Connolly, Rosenweig] for conceptual basis for both modeling and estimation of the foreign student flows. In the next few paragraphs, we review some of the variables used in the literature and suggest some additional variables in line with the market competition we have in mind.

The dependent variable of interest has mostly been either flow rates or simply the flow of immigrants. The difference in wage rates or gdp per capital is considered to be the most important variables driving the process of immigration. The travel cost, often approximated by distance between the source and the destination countries, is consistently found to be significant in regression analysis. Researchers often use income level in the source country (gdp per capita) to control for the income constraint induced self selection of relatively richer migrant workers. Dummy variables for common language, common border or colonial ties shared by countries have been used to control for non-economic factor that can affect the immigration flows.

Similarly, some measures of young population, total population and schooling characteristics of the young population have been found relevant. They control for size and quality of the pool of potential immigrants. In addition, some studies, for example Mayda and Cobb-Clark and Connolly, use immigration policy variables in the empirical analysis.

Most of these variables are as relevant in determining the flow of foreign students as they are in the context of the immigrants. Studies [Rosenweig, DeVoretz] suggest that there are additional variables we could consider when it comes to the international student flow. Rosenzweig controls for the number of universities, the number students per teacher, international ranking of universities in the source countries. DeVoretz uses domestic tuition cost (Canada) relative to that in the competing country (USA) as well as domestic tuition cost.

2. Model and Data.

To motivate an empirical model to test along the lines discussed above, consider a potential applicants decision making in the face of multiple choices for a destination country. In principle, getting student visa is easy for a student if he/she can demonstrate the ability to complete the education abroad, both financially and academically. For concreteness, let us suppose that the US is the most preferred destination for student applicants.

For a student with reasonably good academic records and financial capability, the visa may be almost guaranteed. Hence, such students may not be affected so much by visa regulations. However, relatively weaker applicants would be adversely and severely affected by tightening of visa rules. In any case, some hints of tightening visa rules would reduce the expected benefit of applying to the US. The result is that, more students could be applying to other destinations for reasons such as: diversifying the risk and maximizing the expected benefit. In some cases, when rejected by the US consulate, students might simply apply to other destinations. In essence, all else equal, higher refusal rates should lower the demand for the student visas into the US. At the same time, there might be increase in the demand for the student visas in the other competing countries. We can anticipate similar outcome when tuition cost rises sharply in the US overtime. Now let us turn to the econometric model to be tested in this paper.

This paper is interested in regression results using panel data, allowing for country fixed effects. The empirical analysis presented in this paper use county data from 1999 through 2004 years from various sources. However, data for only 5 years, instead of 6 years, were used for a country as most of the variables are lagged by 1 year. The regressions use data on a total of 130 countries.

The dependent variable is log of student visa issuances *FV* (includes both F1 & F2 visa categories). The set of independent variables used in the regression analysis include : log of population *POP*, log of gdp per capita (in purchasing power parity terms, 2000 constant dollars) *GDPPC* , log of enrollment ratio in the sending country *ER*, log of four-

year tuition cost (real exchange rate adjusted, 2000 US dollars) at public college/universities *TC*; log of non-immigrant visa rejection rates *RR*; log of student enrollment from a sending country in the other English-speaking countries , Australia, Canada, the UK and New Zealand, denoted as *ACUN* ; log of student enrollment from a sending country to non-English-speaking countries, France, Germany and Japan, denoted by *FGJ* ; and finally post-911 dummy *post911* takes on 1 for year 2002-2004 and 0 otherwise.

The number of student visas *FV* issued and refusal rates *RR* come from the State Department. The figures for *GDPPC* and *POP* are obtained from the World Development Indicators 2007 database. The enrollment ratio ER and foreign student enrollment data in ACUN and FGJ are obtained from the UNESCO database. The enrollment data for Canada is missing for 2001 and 2003 and for 2003 in the case of Australia. The missing values of for foreign student enrollment in in the competing countries were linearly interpolated or extrapolated. The data on 4 year public college tuition *TC* comes from …… Table 1 provides the summary statistics.

Consider the following country fixed effect model of the student flow.

$$\begin{aligned} logFV_{j,t} = \alpha_j &+ \alpha_1 logGPPPC_{j,t-1} + \alpha_2 logER_{j,t-1} + \alpha_3 logGDPPC_{j,t-1} * logER_{j,t-1} \\ &+ \alpha_4 lnPOP_{j,t} + \alpha_5 lnRR_{j,t-1} + \alpha_6 lnTC_{j,t-1} + \alpha_7 lnACUN_{j,t-1} \\ &+ \alpha_8 lnFGJ_{j,t-1} + \alpha_9 post911 + \varepsilon_{j,t} \end{aligned}$$

In the above specification, j and t denotes the sending country and year respectively. The parameters to be estimated are α_1 through α_9 . The destination country is the US. Note that all the right hand side variables except *lnPOP* and *post911* are lagged by one

period to avoid contemporaneous effects. The subscripts are dropped for convenience from here on.

In the above specification, *logGDPPC* is expected to pick up the effects of both the ability of the prospective foreign student to pay for the study abroad and the incentive of the applicant to obtain the US visa to get access to the US labor market where the skill prices are higher. In Rosenweig (2007), these effects are separately identified.

Similarly, *logER* is intended to control for the educational atmosphere in the sending country. Lower *ER* in the sending country would imply inadequate supply of tertiary schools and/or, to some extend, lower premium for tertiary education. *ER* would also be an indicator for the quality of the student visa applicant pool.

The data shows that the correlation between *logGDPPC* and *logER* is 0.74. This suggests that applicants from relatively poorer countries, for which both *GDPPC* and *ER* are lower, have greater incentives to get the student visas. For these applicants, the skill price premiums as well as the value of access to better education can be expected to be stronger than other applicants from relatively richer countries. The interaction between *logGDPPC* and *logER* is intended to capture this difference in the incentive levels among applicants.

Other regressors *logRR*, *logTC*, *logACUN*, *logFGJ*, *post911* and are added to the regression to control for the impact of visa regulations, tuition costs, foreign student enrollment patterns in the 'competing' countries, and mobility of students before and after 911. Based on the earlier discussion in this paper, we expect the estimated coefficients on these regressors to be non-positive.

3. Results.

The result of the fixed effect panel regression for various alternative specifications are presented in Table 2. The t-statistics given in parenthesis are based on the robust standard errors. Result 1 is based on the specification with a basic set of controls: *logGDPPC, logER, logPOP, logRR, logTC, logACUN, logFGJ*. Specification 2 adds *post911* to the first specification; specification 3 adds the interaction term *logGDPPC*logER*; and the last specification has both the interaction term and the post-911 dummy. The signs on the estimated coefficients are consistent across the specifications. However, magnitudes change dramatically when the interaction and/or the post-911 dummy is/are added.

The main findings are as follows. *GDPPC* and *ER* are positively related with the student flow. They are not significant even at 0.10 level, without the interaction term in the regression. When the interaction term is added, *GDPPC*, *ER* and their interaction term are significantly correlated with the student flow at 0.01 level. The interaction term has a negative estimated coefficient.

Based on Result 4, the elasticity of the student flow with respect to per capita income, computed at the sample mean, is 0.49 [=1.28+(-2.81)*(2.81)]. Similarly, the student flow elasticity vis-à-vis enrollment ratio is 0.10 [=2.48+(-2.81)*(8.48)]. These estimates suggest that, on average, the student flow increases by 5% when the per-capita income goes up by 10%. However, the flow only increases 1% when the domestic enrollment ratio increases by 10%.

When the above elasticities were computed for countries like India and the UK (or Japan), there are significant differences. For India, per-capita income and enrollment_ratio elasticities are 0.61 and 0.29. The corresponding figures are 0.13 and -0.38 for the UK. The elasticities for Japan are similar to those for the UK . Together, the results are consistent with the earlier discussion about applicants from poorer countries having higher incentives to obtain the student visas. The student flows from poorer countries with lower *GDPPC* or *ER* respond more positively to income increases or improvement in enrollment ratio in the sending country. The incentives to study abroad in poor countries are high both on account of high skill prices and choices of quality educational institutions in the US. These incentives are much lower for more affluent countries. The interaction term takes into account the apparently varying degrees of incentives among applicants from countries that range widely on income scale.

These results are consistent with the findings by Rosenweig (2007). For a country, 1% rise in incomes is more likely be associated with higher percentage increase in the student flow, lower the enrollment-ratio. Similar, a percentage rise in the enrollment ratio is ,on average, associated with higher percentage increase in the student flow, lower the per-capita income.

The negative association between *logFV* and *logRR* is significant at 0.01 level in all regressions. According to Result 4, 10% rise in rejection rates is associated with a decrease in the student inflow by 1.5%. Similarly, 10% rise in tuition cost is associated with 1.9% decrease in the student inflow. The estimated coefficient on *logTC* is significant at 0.01 level. The regression table show that the statistical significance of the

the estimated coefficient on *logTC* is sensitive presence of *post911* dummy in the regression. For example, when the regression contains no interaction term but controls for post-911 effect [Result 2], the coefficient is not significant loses significance at 0.10 or 0.05 level.

The regression results show that, the flow of students into the other major competiting countries *ACUN* and *FGJ* are negatively related with the flow into the US. The results are significant at 0.10 to 0.05 when *post911* is not the regression [Results 1 & 3]. However, the coefficients on *logACUN* and *logFGJ* are not significant and have small magnitudes when *post911* is in the regressions [Results 2 & 4]. Hence, the results do not show sizable or strong association between enrollment in the competiting countries and the student flow into the US. The variable *post911* has a negative sign as expected. According to Result 4, compared to period 2000-2001, there was 0.18 percent decrease in the student flow in the period 2002-2004 . Finally, the *logPOP* coefficient has negative signs and is mostly insignificant.

4. Conclusion.

To summarize, the results of this study show that the major determinants of the student flow into the US are per-capita income, rejection rates and the tuition costs and domestic enrollments. Student flow is more responsive to increases in per-capita income or enrollment-ratio when their levels low like in poor countries. Higher rejection rates and tuition costs adversely affect the flow.

References.

Borjas, George J. (1987) "Self-Selection and the Earnings of Immigrants," *American Economic Review*, Vol. 77, pp. 531-553.

Borjas, George J. (2002) "An Evaluation of the Foreign Student Program," Backgrounder, Center for Immigration Studies, June 2002.

Bratsberg, B. (1995) "The Incidence of No-return Among Foreign Students in the United States," *Economics of Education Review*, Vol. 14, No. 4, pp. 373-384.

Cobb-Clark, D. A. and Connolly, M. D. (1997), "The Worldwide Market for Skilled Migrants: Can Australia Compete?" *International Migration Review*, Vol. 31, No. 3, pp. 670-693.

Hattam, T.J and William, J. G. (2002). " What Fundamentals Drive World Migration*" NBER Working Papers 9159*, National Bureau of Economic Research, Inc.

Massey, D. S, Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A. and Edwqard J. (1993), "Theories of International Migration: A Review and Appraisa**l,"** *Population and Development Review,* Vol. 19, No. 3, pp. 431-466.

Rosenweig, M. (2006) ."Global Wage Differences and International Student Flows," Brookings Trade Forum *Global Labor Markets*? May 11-12, 2006.

DeVoretz.

Mayda.

Roberts.

Lowell et al.

[?] A review of dominant theories of international migration.
http://fds.oup.com/www.oup.co.uk/pdf/0-19-829391-7.pdf

http://stats.uis.unesco.org/ReportFolders/reportFolders.aspx

Table 1. Summary Statistics of Variables for the period 1999-2004.

Variables	#Obs.	Mean	Std. Dev.
$logFV_{j,t-1}$	968	5.97	1.60
$logGDPPC_{j,t-1}$	911	8.48	1.16
$logPOP_{j,t}$	579	16.0	1.65
$logER_{j,t-1}$	553	2.81	1.25
$logRR_{j,t-1}$	897	-1.34	0.69
$logTC_{j,t-1}$	952	8.17	0.32
$logACUN_{j,t-1}$	765	6.21	1.84
$logFGJ_{j,t-1}$	764	6.24	2.03

Table 2. Fixed Effects Regression Results

The dependent Variable is *logFV*

	1		2		3		4	
Regressors:								
logGDPPC$_{j,,t-1}$	0.055	(0.18)	0.469	(1.61)	1.206	(2.86)	1.278	(3.13)
logER $_{j,t-1}$	0.011	(0.06)	0.156	(0.88)	3.060	(3.77)	2.475	(3.07)
logGDPPC $_{j,t-1}$**logER_1* $_{j,t-1}$		--		--	-0.365	(-4.14)	-0.281	(-3.16)
logPOP $_{j,t-1}$	-1.731	(-1.51)	-0.805	(-0.71)	-2.567	(-2.40)	-1.622	(-1.48)
logRR $_{j,t-1}$	-0.239	(-4.94)	-0.176	(-3.72)	-0.185	(-3.81)	-0.147	(-3.02)
logTC $_{j,t-1}$	-0.287	(-2.19)	-0.150	(-1.35)	-0.299	(-2.62)	-.0.185	(-1.83)
logACUN $_{j,t-1}$	-0.130	(-1.79)	-0.051	(-0.69)	-0.141	(-1.99)	-0.074	(-1.03)
logFGJ $_{j,t-1}$	-0.068	(-1.30)	-0.062	(-1.23)	-0.030	(-0.59)	-0.034	(-0.67)
post911		--	-0.227	(-5.90)		--	-0.184	(-4.83)
constant	18.70	(1.97)	16.54	(0.89)	41.02	(2.48)	23.54	(1.39)
#Obs.	506		506		506		506	
R-sq: within	0.28		0.34		0.33		0.38	
Overall	0.45		0.19		0.40		0.28	