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International Student Enrollment Trends In the United States: Economic Perspectives

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INTERTNATIONAL STUDENT ENROLLMENT TRENDS IN THE UNITED STATES: ECONOMIC PERSPECTIVES

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APPROVAL FOR SUCCESSFUL DEFENSE

Olga Komissarova has successfully defended and made the required modifications to the text of the doctoral dissertation for the Ph.D. during this **Spring Semester 2020**.

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Abstract

My dissertation covered issues relevant to the impact of international student enrollment on the finances of U.S. public universities and examines the increasing numbers of international students at those institutions between 2003 and 2018. All three studies utilized fixed-effects panel regression technique that is a perfect fit for an examination of questions around student enrollments. I used data from IPEDS, U.S. News and World report, 2009 Barron's Competitiveness Index U.S. Census, Bureau of Labor Statistics, National Conference of State Legislatures. In the first chapter, I explored how first-time international undergraduate enrollment contributes to the growth of net-tuition revenue at public research universities. The results showed that the magnitude of the relationship was small, suggesting that prestige-seeking and not financial rationale has been the major reason to recruit students from abroad. In the second chapter, I looked at the extent to which state support explains first-time international undergraduate enrollment patterns at public research universities. My analysis confirmed that international enrollment is an important channel through which selective public research universities buffer declines in state funding. In the third chapter, I looked at whether international student enrollment can affect access for domestic minority students in full-time MBA programs at public universities. This study showed that international enrollments do not reduce access for domestic minority students.

Keywords: international students, enrollment, resource dependence, fixed-effects regression, tuition revenue, state appropriation, domestic enrollment, minority enrollment, undergraduate enrollment, MBA

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In Dedication

This is dedicated to the many people who either directly or indirectly helped me to accomplish my doctoral journey.

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Chapter 1: International Undergraduate Enrollment and Net Tuition Revenue:

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Selectivity

The global market for internationally mobile students has been surging. In 2017, more than five million students were enrolled in universities outside their home countries. This figure represents nearly a fourfold increase from 1.3 million internationally mobile students in the 1990's (United Nations Educational, Scientific and Cultural Organization, 2020). It is projected that there will be eight million internationally mobile students by 2025 (Organization for Economic Co-operation and Development, 2018).

The United States hosts the largest number of international students. In the 2018-19 academic year, there were approximately one million international students enrolled in U.S. colleges and universities, representing a 1.5 percent increase from the prior academic year. For the fourth consecutive year, international students have a share of approximately five percent of the total enrollment in U.S. tertiary education (Institute of International Education, 2019). The percentage is up from around 3.5 percent in earlier years. The increase is explained by the growing numbers of international students and small declines in the number of American students enrolled in U.S. higher education.

Revenue generation has become an important rationale for universities in the United States to grow international enrollments (Deschamps & Lee, 2015; Lee, Maldonado-Maldonado, & Rhoades, 2006). Several studies demonstrated how some universities have been able to generate revenue by enrolling additional international students (Cantwell, 2015; Komissarova, 2019). The revenue stream from international students has been used to counteract diminishing state support for public higher education (Bound, Braga, Khanna, & Turner, 2016; Shen, 2017).

The U.S. universities' dependence on international students for revenue has been at the forefront of debate in recent years as the growth in the numbers of international students has recently stalled in the face of restrictive immigration policies and competition from other countries (Altbach, 2018). In 2018, the number of first-time international students at U.S. universities declined four percent from the previous year (National Science Board, 2018). Further declines are also expected due to the global economic downturn caused by the coronavirus pandemic (Startz, 2020).

Future declines in international enrollments can be particularly impactful for the financial stability of public research university sector, as this sector has experienced the highest international enrollment increase in recent years. Between 2003 and 2018, public research universities experienced a 180 percent increase in international enrollments at the undergraduate level (author's calculations using IPEDS data). Two recent studies demonstrated that public research universities generated additional tuition revenue from recruiting more international students (Cantwell, 2015; Komissarova, 2019). However, these studies did not account for state-level factors that can impact the relationship between international enrollment and net tuition revenue, although it has been demonstrated that state-level demographic, economic, and political factors can affect enrollment patterns at public institutions (Jaquette & Curs, 2015; Kelchen, 2019).

By adding important control variables that have not previously been tested and using most recent data available, this study presents a more current and more comprehensive exploration of the economic value of international students for public research university sector. This paper also explores and tests heterogeneity of the magnitude of net tuition revenue gains from enrolling additional international undergraduate students for public research institutions of

different selectivity. It recognizes that more selective institutions charge higher tuition and attract more international students (Shen, 2017). Therefore, I conduct separate analyses for more selective and less selective public research institutions to explore the heterogeneity.

The Research Aim

The goal of this study is to further explore how international undergraduate enrollment contributes to the growth of net-tuition revenue among public research universities in the United States. The research questions are the following:

1) What are the gains in net tuition revenue associated with enrolling additional international undergraduate students?

2) How does the relationship differ by institutional selectivity?

Looking at the relationship between first-time international undergraduate enrollment and net tuition revenue will provide some insights into the impact of the internalization on public higher education finance. Findings from this study may have implications for developing financial and enrollment strategies.

Theoretical Framework and Literature Review

The theoretical framework for this study is Bowen's rule. According to the rule, universities raise all of the money possible to spend it on pursuing excellence, influence, and prestige (Bowen, 1980). Universities develop strategies to either enhance or maintain their perceptions in the public eye, as well as their rankings position. The prestige-boosting activities may include research, athletics, academic program offerings, admission, and enrollment practices (Brewer, Gates, & Goldman, 2002; O'Meara, 2007).

Prestige-boosting behavior becomes increasingly relevant in light of future demographic changes. As the pool of college-aged students will decline in the upcoming years, many colleges will face stagnant and falling enrollments in the upcoming years (Grawe, 2018). Institutions will need to focus on maintaining a strong brand to compete for students with better academic profiles. More selective universities will be less affected by declining enrollment from traditional-age students but will still experience declines in the supply of local high school graduates and will need to attract more out-of-state and international students.

Resource dependence theory (RDT) supplements Bowen's rule by explaining how institutions raise money. This theory posits that revenue-generating behavior is affected by the resource environment. Organizations adjust their activities to fit the changing environment (Pfeffer & Salancik, 1978). Following RDT, universities tend to diversify their revenue sources to gain some independence from external pressures by reducing their dependence on a single source.

Diversification of revenue sources has always been a topical issue for private higher education institutions, but now has become increasingly important for public universities. Over the last decades, state funding for public higher education has been growing, but it has not kept up with the growing enrollment and maintenance costs. There has been a substantial shift from state support toward tuition revenue. The 2017-18 academic year was the first year when more than half of all states relied more heavily on tuition than on state appropriations (State Higher Education Executive Officers, 2018).

Although public research universities do not rely on state funding as much as public non-research institutions (American Academy of Arts and Sciences, 2015), their global reputation allows them to attract globally mobile students. Following RDT, it is likely that these institutions

become more dependent upon tuition revenue from international undergraduate students and less dependent on state funding or in-state tuition revenue. Unlike international undergraduates at private universities who face same tuition rates as domestic students, international students at public institutions pay tuition that is 2-3 times higher than tuition for domestic students. In the 2017-18 school year, the average published tuition and fee price at four-year public institutions for in-state students was $9,970, while the average price for out-of-state students (this includes international students) was $25,620 (College Board, 2017). Additionally, public colleges and universities often face tuition caps for in-state students (Armstrong, Carlson, & Laderman, 2017).

The Matthew Effect demonstrates that student and revenue distributions in higher education happen in ways that lead to cumulating advantages for more selective institutions (Cheslock & Gianneschi 2008; Slaughter & Leslie 1997) and thus highlights the importance of prestige. It was found that an institution's global reputation influences international student choice of a university (Bastedo & Bowman, 2011). More prestigious universities with greater international enrollments can attract more international students (Bound et al., 2016; Shen, 2017). Therefore, more selective public research universities with their global reputation will rely more on international enrollments to fulfill their financial needs.

Existing research has shown that public research universities have been able to generate substantial additional revenue from international students. Cantwell (2015) found a positive statistically significant relationship between international student enrollment and net tuition revenue at public research and doctoral universities. He used IPEDS panel data from 2000 to 2009. The analysis showed that a one percent increase in newly enrolled foreign undergraduate students at public research universities predicts 0.04 percent growth in net tuition revenue

(β=0.369, p<0.01). Komissarova (2019) used more recent IPEDS data from 2003 to 2017 and also found a positive statistically significant relationship where a one percent increase in newly enrolled international undergraduate students predicts 0.01 percent growth in net tuition revenue (β=0.101, p<0.01). None of the previous studies explored how state-level characteristics might affect the relationship between international enrollment and net tuition revenue at public research universities. It is important to examine how state economic conditions might affect the relationship because studies have shown that state economic health is associated with changing enrollment patterns (Jaquette, Curs & Posselt, 2016).

Additionally, it is worth examining whether political party control of the state legislature might affect the relationship. Public institutions in more liberal states tend to have lower in-state tuition prices (Doyle, 2012). Lower in-state tuition prices might push institutions to focus more on generating revenue from out-of-states and international students.

Methodology

This study examines the relationship between first-time international student enrollment and net tuition revenue at public research universities in the United States. The following section provides details on the data, sample and method.

Sample

The sample represents all public universities classified as doctoral universities based on the 2018 Carnegie Classification system and eligible for Title IV funding. I excluded two doctoral universities in the state of Nebraska due to the state's nonpartisan legislature. I also excluded six public research institutions in Colorado because since 2006 this state does not

allocate funding directly to its public institutions (Hillman, Tandberg, & Gross, 2014). A total of 156 public research universities in 48 states make up a final sample for this study (85 percent of the population). To answer the second research question about differences by selectivity, I divided institutions into two groups based on selectivity measured by 2009 Barron's Admissions Competitiveness Index. Barron's determines institutional competitiveness based on the following factors: grade point average (GPA), ACT and SAT scores, high school rank and admission rate. There are seven categories of school competitiveness: "most competitive", "highly competitive", "very competitive", "competitive," "less competitive," "non-competitive," and "special" (Weis, Cipollone, & Jenkins, 2014). I classified 63 universities under "very competitive" or above Barron's categories as being more selective and the other 93 universities in the sample were classified as less selective.

Data

I draw data from the Integrated Postsecondary Education Data System (IPEDS) available to the public through the National Center for Education Statistics (NCES). The data cover the period from 2003 to 2018, resulting in 15 time points total. The 2017-2018 academic year is the last year for which IPEDS data was available. Since 2000 NCES has been collected annual data on international student enrollment at all higher education institutions in the U.S. It is mandatory for higher education institutions to report this information in even-numbered years. Reporting students' residence in odd-numbered years is optional. Around 15 percent of public research universities did not report students' residence in odd-numbered years. I interpolated enrollment numbers in even-numbered years by averaging together data from the preceding and following years. Then I excluded around one percent of first-time full-time undergraduate students with

unknown residency status. Even after interpolation, first-time full-time undergraduate enrollment variables had the largest percentage of missing data. These variables had approximately seven percent of missing data.

Listwise deletion method was used to handle missing data for all other variables. Per-student endowments had about seven percent of data missing. Institutional aid had approximately six percent of missing data. All other variables had around one to four percent of data missing. Missing IPEDS data reduced the analysis sample and the potential number of institution-year observations to 2,340 (156 institutions multiplied by 15 years). Four hundred eleven of these 2,340 institution-year observations contained missing data. Therefore, my analysis sample was an unbalanced panel of 156 institutions and 1,929 institution-year observations.

Several variables in the dataset required computation or transformations before they could be used in the analysis. I held all financial variables in constant 2017 U.S. dollars. I computed per full-time equivalent FTE state appropriations, institutional grants, endowment assets. Further, I addressed the skewness in the data through log transformation for all financial and enrollment variables.

Analysis Method

I used a panel regression technique with logged net tuition revenue as the dependent variable and logged international undergraduate student enrollment as the key independent variable of interest. This study focuses on variations within institutions so fixed effects estimates will be used since they provide control for unobserved institutional characteristics (Zhang, 2010). I also include control variables that can capture institution- and state- level factors that vary over

time and affect international student enrollment for a given institution. The fixed-effects model (1) of interest is:

$$logY_{it} = \beta_1 \, logX_{it-1} + \beta_2 W_{it-1} + \alpha_i + \delta_t + \varepsilon_{it} \qquad (1)$$

In this model: Y is the outcome variable at school *i* in year *t*; the independent variable of interest, X, is the number of full-time international undergraduate students; β_1 is the coefficient of interest that measures the effect of enrolling an additional international student on net tuition revenue within a particular university; W_{it-1} is a vector of institution- and state-level time-varying covariates lagged one year relative to net tuition revenue; α_i represents a vector of institution fixed effects; δ_t represents a vector of fixed effects and ε_{ist} is the error term.

Control Variables

Tables 1, 2 and 3 provide information on institution- and state-level characteristics that were used as control variables in my regression analysis. Enrollment behavior is closely aligned with tuition revenue objectives. I controled for the number of full-time first-time in-state and out-of-state domestic undergraduate students. Graduate enrollments also affect institutional budgets, since some graduate students also pay tuition. I controlled for the total count of graduate students.

I also included several institutional-level financial characteristics. Tuition price might affect international enrollment demand (Bound et al., 2016; Shen, 2016). I included logged tuition and fees for full-time nonresident students as a control variable since tuition price can affect international enrollment demand. I controlled for the share of tuition revenue in total revenue as it represents institution's reliance on tuition dollars. Since institutional grant aid is often used to fulfill enrollment management objectives (Lord, 2018), I included logged per-student institutional aid per full-time equivalent (FTE) as a control variable. Institutional aid

includes both funded and unfunded institutional grants to students for universities that follow the Financial Accounting Standards Board (FASB) reporting standards and institutional grants from restricted and unrestricted resources for institutions that use the Governmental Accounting Standards Board (GASB) standards. I controlled for state appropriations per FTE student since it has been found that public institutions increase international enrollment in response to declines in state funding (Bound et al., 2016; Shen, 2016). Finally, I controlled for endowment assets per FTE since some public universities offset state funding cuts through endowment fundraising (Webber, 2017).

International demand for higher education may be affected by state-level factors. Better economic conditions of the state might be an indicator of better internship/job prospects. Since international students might be interested in internships and job opportunities after graduation (Shen, 2016), I included two state-level indicators of economic health: median household income (from the U.S. Census Bureau) and state unemployment rate (from the Bureau of Labor Statistics). Additionally, universities may be more inclined to enroll more international students if the supply of potential in-state students is limited. I included state-by-state estimates of the college-aged population (from the U.S. Census Bureau) to control for changes in the supply of in-state applicants. Since it was shown that public universities in states with more liberal legislators tend to have lower in-state tuition prices (Doyle, 2012) and thus may be more prone to attract more international students that pay higher tuition, I also controlled for whether Democratic party holds both legislative chambers and the state governorship.

Descriptive statistics

Summary statistics for the years 2003-04 and 2017-18 can be found in Tables 1-3. The descriptive statistics indicated considerable growth of tuition revenue over the period of 2003-04 to 2017-18. During this period, median tuition revenue grew 269 percent from $54 to $199 million. The public research universities included in this study have also become more tuition reliant. The median percent of total revenue from tuition grew from 35 to 51 percent.

More selective institutions received substantially more resources in the form of tuition revenue, compared to less selective school schools. In 2017-18, median net tuition revenue for more selective schools was $345 million, while median net tuition revenue for less selective universities was $141 million. At the same time, less selective universities have been more tuition reliant. In the 2017-18 academic year, the share of tuition revenue in total revenue at less selective public research universities was 53 percent, while more selective institutions received 44 percent of their revenue from tuition. Such difference can be explained by the fact that less competitive universities have limited access to alternative sources of revenue.

Despite all universities in the study being classified as research universities, some more selective schools were clearly richer than others in terms of financial resources. In addition to generating more tuition revenue, more selective research universities received substantially more resources in the form of state appropriations. In 2017-18, the median state funding per FTE at less selective schools was $7,307, while the median state funding at less selective schools was $6197. More selective institutions also had more endowments per FTE. In the 2017-18 academic year, the median endowment assets per FTE at more selective schools was $18,011.

 The summary statistics show that between 2003-04 and 2017-18 universities in the sample started to enroll significantly more undergraduate students. Median total first-time

undergraduate enrollment grew 33 percent from 2,439 to 3,254 students. However, the share of first time in-state undergraduate dropped from 87 to 82 percent.

First-time international undergraduate enrollment in the sampled public research universities has increased considerably over the time period examined in the study. Between 2003-04 and 2017-18, the median first-time international undergraduate enrollment grew 112 percent 112 from 26 to 55 students. During this period, the coefficient of variation (the ratio of the standard deviation to the mean) of first-time international undergraduate enrollment grew from 1.4 to 1.6. This suggests that differences in the numbers of first-time international undergraduate students have grown over the period.

Compared to less selective doctoral universities, more selective institutions enroll greater numbers of first-time international undergraduate students. In the 2017-18 academic year, more selective universities enrolled the median of 156 new international undergraduate students, a 300 percent increase from the median of 39 first-time full-time international undergraduate students in 2003-04. The median first-time international enrollment at the sampled less selective public research universities grew 52 percent, from 23 to 34 international students.

There were also big differences in other enrollment figures based on selectivity. Between 2003-04 and 2017-18, more selective and less selective public research universities saw about 31 percent increase in first-time domestic enrollment. Although nonresident first-time domestic out-of-state undergraduate enrollment at more selective public universities was significantly higher, the median first-time domestic out-of-state undergraduate enrollment at less selective public universities had a larger percentage increase of 72 percent from 203 to 350 students.

The median first-time domestic out-of-state undergraduate enrollment at less selective public universities grew 31 percent from 681 to 880 students. More selective public research

universities also had larger 12-month graduate enrollment. During the 2017-18 academic year, more selective schools enrolled 4,913 graduate students, while 12-month graduate enrollment at the sampled less selective universities was 2,384 students. The figures suggest significant differences in enrollment patterns at public research universities based on selectivity.

The descriptive statistics also confirm the substantial growth of nonresident tuition rates between 2003-04 and 2017-18. The median nonresident tuition price grew 157 percent, from $8,629 to $22,194. There were substantial differences in nonresident tuition price based on selectivity. In 2017-18, the median nonresident tuition at more selective public research universities was $9,500 higher.

The median state funding per FTE grew 22 percent, from $5,026 to $6,468. The median for the control variables of institutional grant aid per FTE, endowment assets per FTE, the percentage of students admitted in 2017-18 academic year were $2,062, $10,982 and 64 percent respectively. More selective universities had higher institutional grant aid per FTE and endowment assets per FTE. More selective institutions also had lower acceptance rates.

The descriptive statistics for the state-level controls indicate that the household income has increased while the unemployment rate has slightly declined. They also reflect the change in the political landscape of the United States. This study's sample shows how the prevalence of Democratic control of state legislatures has dropped from 31 to 23 percent.

Table 1: Summary Statistics of the Institutions in the Dataset (n=156)

Variable	FY 2003-04			FY 2017-18		
	Mean	Median	SD	Mean	Median	SD
Enrollment Characteristics						
Count of first-time international undergraduate students	56	26	81	160	55	257
Count of first-time in-state domestic undergraduate students	2,287	2,119	1,227	2,805	2,697	1,570
Count of first-time out-of-state domestic undergraduate students	480	294	525	801	502	844
Count of graduate students	3,274	2,707	2,402	3,746	2,799	2,823
Financial Characteristics						
Nonresident tuition price ($)	8,783	8,629	2,700	23,556	22,194	7,885
Net tuition revenue ($M)	70	54	57	269	199	223
Percent of revenue from tuition	0.35	0.35	0.14	0.48	0.51	0.16
Per-student state funding ($)	5,421	5,026	1,846	6,957	6,468	2,467
Per-student institutional grants ($)	672	520	514	2412	2062	1583
Per-student endowments ($)	5,974	2,216	9,918	23,294	10,982	34,589
Institutional Selectivity						
Admission rate	0.65	0.67	0.16	0.68	0.71	0.17
Barron score – more selective institutions (share)	0.40	-		0.40	-	-
State-Level Characteristics						
Median household income ($K)	57	57	8	60	59	8
State unemployment rate (pct)	5.86	5.9	0.94	4.3	4.4	0.64
College-aged population (K)	1,057	721	919	1,157	822	1,030
Democratic control of state legislature (pct)	0.31	-	0.46	0.23	-	0.43

Sources: Integrated Postsecondary Data System (IPEDS); 2009 Barron's Competitiveness rating; Census Bureau; National Conference of State Legislatures (NCSL); Bureau of Labor Statistics

Note: (1) Selectivity is defined based on Barron's competitiveness rating. Universities listed as "very competitive" or above were coded as more selective institutions and all others were coded as "less selective".

Table 2: Summary Statistics for More Selective Public Research Universities (n=63)

Variable	FY 2003-04			FY 2017-18		
	Mean	Median	SD	Mean	Median	SD
Enrollment Characteristics						
Count of first-time international undergraduate students	82	39	105	303	157	347
Count of first-time in-state domestic undergraduate students	2,621	2,364	1504	3,421	3,107	1,819
Count of first-time out-of-state domestic undergraduate students	732	681	573	1,107	880	888
Count of graduate students	4,180	4,529	2,940	5,395	4,913	3,560
Financial Characteristics						
Nonresident tuition price ($)	10,424	10,306	2,698	28,858	28,822	7,974
Net tuition revenue ($M)	103	87	69	402	345	238
Percent of revenue from tuition	0.30	0.31	0.13	0.41	0.44	0.16
Per-student state funding ($)	6,157	5,963	2,099	7,267	7,307	2,343
Per-student institutional grants ($)	1,016	1,078	596	3,109	3,119	1,804
Per-student endowments ($)	11,024	6,344	13,974	40,751	25,991	48,194
Per-student endowments ($)						
Admission rate (pct)	0.75	0.77	0.15	0.74	0.75	0.14
Barron score – more selective institutions (share)	1	-	0	1	-	0
State-Level Characteristics						
Median household income ($K)	59	58	8	62	60	8
State unemployment rate (pct)	5.7	5.7	0.96	4.2	4.3	0.62
College-aged population (K)	1,098	721	1,012	1,189	822	1,044
Democratic control of state legislature (pct)	0.28	-	0.44	0.28	-	0.45

Sources: Integrated Postsecondary Data System (IPEDS); Census Bureau; National Conference of State Legislatures (NCSL); Bureau of Labor Statistics

Table 3: Summary Statistics for Less Selective Public Research Universities (n=93)

Variable	FY 2003-04			FY 2017-18		
	Mean	Median	SD	Mean	Median	SD
Enrollment Characteristics						
Count of first-time international undergraduate students	38	23	55	64	34	85
Count of first-time in-state domestic undergraduate students	2,067	1,947	956	2,513	2,485	1,273
Count of first-time out-of-state domestic undergraduate students	317	203	421	603	350	756
Count of graduate students	2,428	2,183	1,451	2,685	2,384	1,612
Financial Characteristics						
Nonresident tuition price ($)	7,676	7,602	2,107	20,148	19,311	5,650
Net tuition revenue ($M)	49	43	34	182	141	161
Percent of revenue from tuition	0.37	0.38	0.13	0.52	0.53	0.15
Per-student state funding ($)	4,912	4,746	1,453	6,749	6,197	2,553
Per-student institutional grants ($)	484	398	345	1,945	1,689	1,220
Per-student endowments ($)	3,139	1,422	4,817	11,595	7,980	10,663
Institutional Selectivity						
Admission rate	0.65	0.67	0.16	0.61	0.64	0.19
Barron score – more selective institutions (share)	0	-	0	0	-	0
State-Level Characteristics						
Median household income ($K)	56	55	7	57	59	8
State unemployment rate (pct)	4.2	4.3	0.6	4.4	4.45	0.64
College-aged population (K)	1,031	721	858	1,189	823	1,109
Democratic control of state legislature (share)	0.30	-	0.47	0.30	-	0.47

Sources: Integrated Postsecondary Data System (IPEDS); Census Bureau; National Conference of State Legislatures (NCSL); Bureau of Labor Statistics

Limitations

       Two limitations of the study are attributed to current limitations of IPEDS. One is that IPEDS does not differentiate the amount of tuition revenue received separately from domestic versus international students or undergraduate versus graduate students. Breaking tuition revenue data by source can substantially improve the analysis. Running analysis with net tuition revenue that comes specifically from international undergraduate students as a dependent variable will provide a much better estimate of revenue gains from enrolling international undergraduate students.

       Another limitation that there is no reliable data source on the numbers of the international transfer students. In this study, I only looked at first-time international undergraduate student enrollment (meaning enrollment of entering undergraduate who has never attended any institution of higher education) and did not account for international transfer undergraduate students. International transfer undergraduate students could also bring substantial revenue to universities.

Results

       The purpose of this study was to explore the relationship between international enrollment and net tuition revenue at public research universities. Additionally, I sought to examine whether there are differences in the magnitude of the relationship based on selectivity. Table 4 demonstrates results for fixed effects panel regressions for the total sample of public research universities (Column 1), the sample of more selective institutions (Column 2) and the sample of less selective schools (Column 3). The calculated R^2 of 0.59 demonstrates that the model explains 59 percent of the overall variance in net tuition revenue for the total sample of

pubic research universities. This suggests that a significant share of the variation in net tuition revenue among public research universities in the sample is explained by the predictor variables in the present model.

Table 4 shows that first-time international enrollment is a significant predictor of net tuition revenue (B=0.05, p<0.001). For the sample that represents all public research universities, for each one percent increase in first-time international undergraduate enrollment, there was a 0.04 percent increase in net tuition revenue. This suggests that public doctoral institutions indeed generated additional net tuition revenue from enrolling greater numbers of international students. However, the magnitude of the relationship is relatively small. The magnitude of the relationship is similarly small and significant for the subsamples of more selective (B=0.05 p<0.01) and less selective institutions (B=0.04, p<0.05).

The analysis showed that other factors had a greater association with net tuition revenue for public research universities. Share of net tuition revenue in total revenue had the largest standardized beta coefficient (B = 0.86, p<0.001). With each percentage point increase in the proportion of tuition revenue in total revenue, institutions saw 1.36 percent increase in net tuition revenue. The magnitude of this relationship was even stronger for more selective public research universities (B=1.03, p<0.01).

Nonresident tuition price (B=0.59, p<0.001) was also significantly associated with the increases of net tuition revenue. Universities that charge higher tuition prices yield greater net tuition revenue, which would be expected according to basic economic principles. The magnitude of this relationship was also higher for the sample of more selective public research universities (B=0.70, p<0.001).

Beta coefficients for first-time in-state and out-of-state undergraduate enrollment (B=0.18 and B=0.16 respectively, p<0.001) were higher than beta coefficient for international undergraduate enrollment. This can be explained by the fact that domestic undergraduate student enrollments make up greater proportions of the incoming classes at public research universities. A one percent increase in domestic enrollment is substantially greater than a one percent increase in international enrollment. Graduate enrollment also has a positive association with net tuition revenue (B=0.25, p < 0.001) than does first-time undergraduate enrollment. A one percent increase in graduate enrollment predicts 0.25 percent increase of net-tuition revenue.

Institutional aid per FTE was also positively related to net tuition revenue (B=0.08, p<0.001). A one percent increase in per student grant aid predicted 0.08 percent increase in net tuition revenue. This is consistent with Hillman's (2012) study that focuses on tuition discounting for revenue management at public universities. My findings confirm that public research universities have been actively using institutional grants to raise additional revenue. The magnitude was greater for the sample of more selective universities (B=0.10; p<0.05), suggesting that more selective public research universities are more actively using tuition discounting to generate revenue, compared to their less selective counterparts.

Surprisingly, the relationship between admission rate and net tuition revenue was not significant. This suggests that universities do not leverage their selectivity statuses to influence net tuition revenue generation. This contradicts Hillman's findings (2012) that showed that selectivity is a significant predictor of net tuition revenue for public four-year universities.

This study adds to the body of literature by adding state-level control variables. The relationship remained statistically significant once state-level characteristics were also included. Indicators of state economic health were found to be significant predictors of net tuition revenue.

The median household income (B=0.01, p<0.05) was a very weak but significant predictor of net tuition revenue for the total sample. This suggests that public research universities in states with higher median household income generate more net tuition revenue. However, median household income did not predict net tuition revenue for the samples of more and less selective public research universities. State level unemployment rate (B= -0.02, p<0.05) was found to be negatively related to net tuition revenue in the sample of more selective public research universities. More selective universities in states with higher unemployment rates generated more net tuition revenue.

State college-aged population is a significant predictors of net tuition revenue for public research universities (B=0.73; p<0.001). The results show that a one percent increase in state's college aged population predicted a 0.73 percent increase in net-tuition revenue. Democratic control of the state legislature was not significantly related to net tuition revenue.

Table 4: Panel Regression Results with Fixed Effects Between First-Time International Undergraduate Enrollment and Net Tuition Revenue

	Full Sample		More Selective Universities		Less Selective Universities	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Log count of first–time international undergraduate students	0.05***	0.01	0.05**	0.02	0.04*	0.01
Log count of first-time in-state domestic undergraduate students	0.18**	0.06	0.14	0.10	0.21***	0.06
Log count of first-time out-of-state domestic undergraduate students	0.16***	0.03	0.14**	0.05	0.13***	0.03
Log count of graduate students	0.13**	0.04	0.11	0.07	0.18***	0.05

Log nonresident tuition price	0.59***	0.04	0.70***	0.08	0.55***	0.05
Admission rate	- 0.12	0.08	-0.06	0.15	-0.08	0.09
Percent of revenue from tuition	0.86***	0.08	1.08**	0.33	0.88***	0.19
Log state appropriations per FTE	-0.05	0.04	-0.05	0.07	-0.02	0.05
Log institutional grants per FTE	0.08***	0.02	0.10*	0.04	0.07***	0.02
Log endowment assets per FTE	0.02	0.01	-0.01	0.02	0.04**	0.01
Median household income	0.01*	0.00	0.00	0.00	0.01	0.00
State unemployment rate	- 0.01	0.00	-0.02*	0.01	0.00	0.01
Log college-aged population	0.73***	0.14	1.13*	0.45	0.73***	0.14
Democratic control of state legislature	-0.01	0.03	0.01	0.05	0.01	0.03
Observations Number of Institutions R-Squared Adj R-Squared	1975 156 0.59159 0.55335		835 63 0.64707 0.61168		1139 93 0.63527 0.59781	

Note. Robust standard errors in parentheses.
***$p<0.001$, **$p<0.01$, *$p<0.05$

Robustness checks

I conducted robustness checks in two ways (Table 5). First, I ran the analysis on the

sample of universities that were classified as doctoral institutions based on the 2010 Carnegie

Classification (Model 1). A considerable number of public universities obtained research

university status in 2018, which means that some institutions in the sample may be less

prestigious and less capable of attracting students from abroad. I applied the 2010 Carnegie

Classification to my full sample of public research universities and it reduced the sample size to 120 public research universities. My second robustness check accounted for state nonresident enrollment caps (Model 2). States and institutions may implement policies pertaining to enrollments as a way to protect access for residents. Such caps can affect international enrollment growth. I performed online search to find states where the caps were implemented. The search results indicated that two states (California and North Carolina) had nonresident enrollment caps in place during the period of my analysis. I excluded 11 public research universities that were located in California and 5 institutions in North Carolina from the total sample. For both robustness check analyses procedures, the regression coefficients showed a similar pattern of results. These results point to the fact that first-time international enrollment is a significant predictor of tuition revenue and not determined by the above-mentioned changes to the total study sample.

Table 5: Robustness Check - Panel Regression Results

	Model 1		Model 2	
	Coeff.	SE	Coeff.	SE
Log count of first–time international undergraduate students	0.05***	0.01	0.04***	0.01
Log count of first-time in-state domestic undergraduate students	0.15*	0.06	0.16**	0.06
Log count of first-time out-of-state domestic undergraduate students	0.17***	0.03	0.15***	0.03
Log count of graduate students	0.13**	0.04	0.13**	0.04
Log nonresident tuition price	0.54***	0.04	0.55***	0.04
Admission Rate	-0.06	0.09	-0.14	0.09
Percent of revenue from tuition	1.01***	0.18	1.24***	0.18

Log state appropriations per FTE	-0.05	0.04	-0.04	0.05
Log institutional grants per FTE	0.13***	0.02	0.10***	0.02
Log endowment assets per FTE	0.01	0.01	0.02	0.01
Median household income	0.01**	0.00	0.01*	0.00
State unemployment rate	-0.01	0.00	-0.01	0.00
Log college-aged population	0.70***	0.14	0.74***	0.14
Democratic control of state legislature	0.01	0.03	0.01	0.03
Observations Number of Institutions R-Squared Adj R-Squared	1483 120 0.60734 0.57018		1775 140 0.58603 0.5464	
Note. Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05				

Discussion

In this study, I examined the relationship of first-time international undergraduate enrollment to net tuition revenue at public research universities, and how this relationship varies by institutional selectivity. Consistently with previous work, I illustrated that between 2003 and 2018, public research institutions were actively enrolling international undergraduate students. The most profound international enrollment growth was at more selective public research institutions compared to less selective ones.

I found evidence that first-time international undergraduate enrollment did impact net tuition revenue; however, the effect size was low. This is likely because international undergraduate student enrollment has a small share of total enrollment. Although international students have been making substantial economic contributions to the U.S. economy, their impact on tuition revenue for public research universities is modest. The findings are consistent with the results of the previous studies (Cantwell, 2015; Komissarova, 2019).

I believe this study is the first to explore how the magnitude of the relationship between first-time international undergraduate enrollment and net tuition revenue varies by selectivity. A surprising finding is that even though more selective public research universities attract more international students and charge higher tuition (Shen, 2017), the magnitude of the relationship between international enrollment and tuition revenue for the sample of more selective public research institutions was not different from the magnitude in the sample of less selective public research universities. At the same time, more selective universities may still experience larger tuition revenue gains if they start to enroll more international students. The capacity of more selective public research universities to attract larger numbers of international students may exacerbate differences in tuition revenue generating potential among public universities of different selectivity.

The findings of this study also suggest that tuition revenue potential is not the primary reason for these institutions to enroll students from abroad. International enrollment growth should be viewed as an element of prestige seeking, rather than a way to generate additional revenue. This is important to consider, particularly as the higher education sector has been experiencing declines in international enrollments in recent years.

In this study, gains in tuition revenue associated with enrolling international undergraduate students were estimated when holding constant the numbers of domestic students enrolled. This suggests that public research universities seek additional tuition revenue and prestige not just by enrolling more students, but also by changing the composition of the student body and making it more international.

This study adds to the research literature on the economic effects of internationalization as well as revenue generation and enrollment management at public research universities in the

United States. In the current context of diminished resources to public higher education, it is important to continue asking questions about initiatives that public universities are engaging in to balance budgets during difficult fiscal periods. Enrollment management decisions help optimize tuition revenue gains. In particular, a focus on international enrollments might be needed in light of recent warnings about the future shrinkage of the college-age population in the United States. However, this might be difficult due to current concerns about international student mobility and a global economic recession (Startz, 2020).

Recommendations for Further Research

This study shows that international undergraduate students at public research universities can only modestly contribute to enrollment-driven revenue gains. It also suggests that enrolling more international students is the mechanism through which public research universities attempt to increase prestige. Due to the limited research on enrollment management for enhancing prestige, this study gives initial insight on this topic and provides a foundation for future work. One possibility is to explore whether institutions attempt to demonstrate their prestige by advertising their international student share or the number of countries students come from. This may provide evidence of international recruitment for boosting prestige. There is also a need to assess to what extent international enrollment can influence institutional reputation. Although prestige in higher education is abstract in nature, a variety of indicators should be used to measure prestige among U.S. universities.

Further research should explore how striving for prestige through international enrollments may impact different aspects of institutional functioning. It can follow Zerquera's (2019) line of research that looked at how striving for prestige at urban-serving universities

affects minority student enrollments. This quantitative study found that several elements of prestige-seeking significantly affect minority enrollments. However, this study did not include international enrollment as a prestige-seeking variable. Additional research can explore whether international students may cross-subsidize or crowd-out vulnerable populations of domestic students. This will show how international enrollment growth may relate to changes in access for underrepresented groups of domestic students.

Given increased attention to constrained budgets of public universities across the country, scholars can examine the association of international enrollment with key elements of institutional budgets. Similar to Kelchen's (2019) study that looked at how increases in the share of nonresident undergraduate enrollments affect per-FTE expenditure patterns at four-year public universities, future studies can focus on examining the relationship between international enrollments and different expenditure categories (e.g. instruction expenditures, research expenditures, public service expenditures). It is also important to understand how this relationship might vary by sector, selectivity, or other institutional characteristics.

A closer look at the impact of the growth of international enrollments will provide insight into how this growth can help U.S. universities remain competitive and meet their educational missions. There is a great opportunity for future qualitative studies to explore the nuances of the benefits and consequences of the growth of international enrollments. For example, interviews with university administrators and faculty could help to gain a further perspective into the effects of enrolling more students from abroad.

Additionally, as the scope and restrictiveness of U.S. immigration policies have grown substantially in the last few years (Pierce, Bolter, & Selee, 2018), there is a need for research that captures the interweaving of both the immigration policy and international student enrollment

patterns. Such studies can help to develop institutional policies that keep pace with immigration policies and their impact on international enrollments. As mentioned in the limitation section, it would also be helpful to replicate this study and cover the time period of drops in first-time international enrollments.

Finally, it is important to note that the study covered a period when universities were actively recruiting international undergraduates as a source of revenue. Current international enrollment declines suggest that in the future it will become harder for U.S. institutions to recruit international students and thus generate revenue from enrolling additional international undergraduate students. Therefore, the present study could be replicated in the future for an expanded analysis that captures international enrollment slowdown.

Chapter 2: Exploring the Relationship between State Appropriations and International Student Enrollment at Public Research Universities

Many higher education institutions in the United States are motivated towards enrolling more international students. Among the main benefits associated with internationalization of the student body are the increase in student diversity, improved institutional profile, reputation, and research as well as knowledge production (Carini, Kuh & Zhao, 2005; Ergron-Polak & Hudson, 2010). However, the financial rationale is often considered a predominant reason for international recruitment (Cantwell, 2015; Komissarova, 2019; Lee, Maldonado-Maldonado, & Rhoades, 2006). The economic impact of international students on schools and communities is considerable. During the 2018-19 academic year, international students contributed $41 billion to the U.S. economy through spending on tuition, room and board and living expenses (NAFSA: Association of International Educators, 2019).

The economic impact of international enrollment has been different across different types of higher education institutions. The tuition revenue growth associated with international enrollment was found to be the greatest at the public research university sector (Bound, Braga, Khanna, & Turner, 2016; Cantwell, 2015; Komissarova, 2019). International undergraduate student enrollment in this sector has grown faster than in other higher education sectors. Between 2003-04 and 2017-18, public research universities experienced a 180 percent increase in international enrollments at the undergraduate level (author's calculations using IPEDS data).

Studies showed that international enrollment helped public research institutions raise additional revenue to make up for declines in state funding (Bound et al., 2016; Cantwell, 2015; Komissarova, 2019; Rizzo & Ehrenberg, 2008). In 2018, per-student state funding remained below the levels reported ten years earlier (in dollars adjusted for inflation) (SHEEO, 2019). Cuts

in state support have prompted public universities to alter their enrollment strategies (Bound et al., 2018; Curs & Posselt, 2016; Jaquette, Curs, & Posselt, 2016; Shen, 2017). Institutions started to enroll more nonresident students (domestic out-of-state and international) who are willing to pay full tuition. Median nonresident freshman enrollment at public four-year universities increased from 118 in Fall 2003 to 155 in Fall 2017 (a 31 percent increase), compared to an increase of 1091 to 1115 (a two percent increase) for resident freshman (author's calculations using IPEDS).

Research on changing enrollment trends and finances at the public university sector primarily looked at a changing share of undergraduate nonresident students (Jaquette & Curs, 2015; Jaquette, Curs & Posselt, 2016; Kelchen, 2019). Much less attention has been paid to the international undergraduate student enrollment alone. The major rationale for looking at international enrollment separately is the growing global supply of potential students from abroad who are financially and academically ready to attend U.S. universities. British Council projected a steady growth of international student mobility over the next twenty years (British Council, 2018). Additionally, the United States faces a shrinking college-age population, and therefore, the supply of domestic students is expected to decline (Selingo, 2017). Another reason to focus specifically on international undergraduates is the fact that domestic nonresident students are often allowed to claim in-state residency after one year in school through regional exchange programs (FinAid, 2018). This results in universities losing extra out-of-state tuition revenue from domestic students.

Previous research has pointed to a negative relationship between state funding and international enrollment at public research universities (Bound et al., 2016). However, more work is needed to examine this relationship more extensively. Since state-level characteristics

are correlated with state appropriations and might affect international enrollments (Jaquette & Curs, 2015; Kelchen, 2019), this study contributes to the existing literature by taking into account several state-level factors that have not been previously examined. The inclusion of macroeconomic and political measures is important for having a robust understanding of the association between state support and international enrollment because public institutions of higher education are subject to external influences.

Additionally, this study will examine the heterogeneity of the relationship by institutional selectivity. The rationale for the separate analyses is that more selective institutions charge higher tuition and receive higher per-student state appropriations than less selective institutions. Higher selectivity also shows that many students desire to enroll at that institution. Thus, more selective public research universities have larger pools of prospective international and can respond to state funding declines with larger international enrollment increases.

I analyzed the time period that provides more up-to-date estimates, covering the period spanning the 2003-04 through 2017-18 academic years, while Bound et al. (2016) study covered period that ended in 2012. Knowing which state- and institution-level variables have influenced the relationship between state appropriations and international undergraduate enrollment, as well as the significance of the relationship between the two, may be useful to state policymakers as they make decisions about funding for public higher education.

Research Questions

The goal of this study is to investigate to what extent does state support explain international undergraduate enrollment patterns at public research universities in the United States. My research questions are the following:

1. To what extent does international enrollment at public research universities change as a response to declines in state appropriations?

2. Does the relationship between state appropriations and international enrollment at public research universities vary by institutional selectivity? If so, how?

Literature and Theoretical Framework

A great deal of attention has been paid to the issue of cuts in state support to public higher education institutions, as well as to the implications of such cuts (Barringer, 2016; Baum & Johnson, 2015; Geiger, 2015; Li, 2017). Cuts in state funding for higher education are greater than cuts for other budget areas of state governments (Delaney & Doyle, 2011). State funding for higher education is often viewed as the "balance wheel" of state budgets to the extent that state legislators determine higher education appropriations budget by checking what is left after other spending priorities (Medicaid, K-12, corrections, and other social services) (Kane, Orszag & Apostolov, 2005; Labaree, 2017). Researchers assert that state policymakers justify prioritizing funding for other state obligations because of public colleges' and universities' ability to acquire revenues from alternative sources (Cheslock & Gianneschi, 2008; Hovey, 1999).

Public colleges and universities respond to state appropriation declines by reducing spending. Researchers showed that declining state support for public higher education institutions leads to lower faculty salaries, as well as cuts in institutional financial aid (Bound et al., 2019; Lowry, 2001; Lyall & Sell, 2006). It was demonstrated that cuts in state funding lead to the growth of a share of part-time faculty (Goodman & Henriques, 2015; Zhao, 2017). There is also a negative impact of funding cuts on the institution's public service expenditures, as well as plant operations and maintenance expenditures (Lowry, 2001). State funding cuts lead to

declines in spending on instruction and academic support. Several studies also demonstrated significant negative effects of appropriations declines on enrollments and degree completion (Bound et al., 2019; Deming & Walters, 2018).

To address the declines in appropriations, public universities try to get revenue from other sources. In accordance with resource dependence theory (RDT), effective revenue diversification is crucial to the financial well-being of an organization (Pfeffer & Salanik, 1978). The theory posits that organizations are always working towards ensuring a stable flow of resources from the external environment. Organizations will adopt strategies to overcome reliance on a declining source (Davis & Cobb, 2009).

For public research universities, alternative sources of revenue to state funding include tuition, private gifts, and funds for research. The latter two sources are limited for many institutions. Substantial research revenue can only be generated by schools that engage in extensive research activity. Most, but not all public research universities receive substantial federal research support (Bound et al., 2016).

Endowments and investment returns on institutional cash balances are seen as a promising source of revenue. In 2018, endowment revenues at public universities in Texas, Virginia, and Kansas reached record values (McDonald & Lorin, 2018). However, there are funding restrictions for many endowments as they tend to be given for special purposes. Plus, the revenues from the endowments on a per-student basis are pretty small compared to other revenue sources. In the 2015–16 academic year, the median endowment spending per FTE (full-time equivalent) student in public research university sector was $900 (Urban Institute, 2017).

The most common source for public institutions to rely on in their efforts to offset declining state support is tuition revenue. Universities boost net tuition revenue by raising their

tuition rates and attracting students who can afford to pay full tuition. Such revenue boosting behavior led to changing the structure of institutional revenues. Between 2004-05 and 2014-15, tuition revenue per FTE student increased by 42 percent at public four-year institutions. At the same time, revenue from state and local appropriations declined by 19 percent (Ma, Baum, Pender, & Welch, 2017). In 2018, more than half of the states (32) relied primarily on tuition revenue to finance higher education (SHEEO, 2019). This growth in the share of states that rely on tuition as a primary revenue source for their public higher education institutions is remarkable, considering that per-student funding has been slowly increasing over the last couple of years.

Zhao (2018) analyzed panel data that span from 1987 to 2012. After controlling for revenues from all other sources, Zhao revealed that in response to each dollar decline in state funding, there is a 0.17 dollar increase of tuition price. Zhao's findings are consistent with Webber's (2018) results. Webber analyzed the period of 1987 through 2014 and found that a dollar decline in per-student funding leads to a 0.26 dollars increase in students' costs. Webber also found that state funding cuts have a greater effect on tuition rates at public research universities, compared to non-research public universities. This suggests that public research universities have more market power to regulate pricing, compared to non-research institutions.

As a response to tuition increases, many states have placed caps on tuition to improve college affordability for in-state students (Jaquette & Curs, 2015; Parker, 2017; Zinth & Smith 2012). For example, all public four-year institutions in Wisconsin had frozen undergraduate resident tuition since 2012 (Armstrong, Carlson, & Laderman, 2017). However, it was found that tuition caps are not effective in improving college affordability for in-state students. Institutions that are subject to tuition caps tend to raise fees at higher rates than other colleges (Kim & Ko,

2014).

State-mandated tuition caps lead to budget shrinkages and encourage universities to
increase out-of-state and international student enrollment. Nonresident students, domestic out-of-
state and international, are an attractive revenue source as they pay tuition that is two-three times
higher than what residents pay. In the 2017-18 school year, the average tuition and fee price at
four-year public institutions for in-state students was $9,970, while the average price for out-of-
state students was $25,620 (College Board, 2017). Jaquette and Curs (2015) showed that there is
a strong negative relationship between state funding and nonresident enrollment. The study
found that a one percent increase in state appropriations is associated with a 0.34 percent decline
in the number of freshmen paying nonresident tuition. Several studies examined the effects of
enrolling a higher proportion of nonresident students at public institutions. Jaquette, Curs, and
Posselt (2016) found that out-of-state enrollment at public universities (including international
students) crowds out low-income in-state students. Moreover, Kelchen (2016) showed that
additional tuition revenue from out-of-state students is not associated with a reduction in sticker
and net prices for low-income resident students. These findings suggest that new enrollment
patterns have serious implications for public higher education in the United States.

In 2017-18, the percentage of first-time out-of-state domestic undergraduate students at
four-year public universities was 17 percent, while the share of first-time international
undergraduate students was three percent (author's calculations using data from IPEDS).
Although the share of international students in the undergraduate population is smaller than the
share of out-of-state residents, international enrollments are often viewed as a promising way to
raise tuition revenue (Cantwell, 2015; Shen, 2015). International student enrollment is a
promising way to generate revenue, considering that the pool of prospective students from

abroad has been growing in recent decades (British Council, 2018). However, empirical studies demonstrated that only public research institutions can rely on students from abroad as significant financial contributors (Bound et al., 2018; Cantwell, 2015; Komissarova, 2019).

Bound et al. (2016) found that declines in state appropriations are associated with the growth of international enrollment at public research institutions. It was found that a ten percent decline in state funding corresponds to a twelve percent growth of the proportion of international students in the total undergraduate enrollment. This study also provided evidence of the Matthew Effect of cumulative advantage. The Matthew Effect shows how more resource-intensive universities will accumulate additional advantages in student and revenue distributions. These additional advantages widen the inequalities between them and less advantaged universities (Cheslock & Gianneschi 2008; Slaughter & Leslie 1997). Bound et al. (2016) showed that the association between declines in state support and the growth in the proportion of international students was more profound at resource-intensive research universities where a ten percent decrease in state appropriations was associated with a 17 percent increase in the share of international students. These results show that more resourceful and hence more selective universities with their global reputation will rely more on international enrollments to fulfill their financial needs.

Research Method

This study examined the relationship between state appropriations and first-time international undergraduate student enrollment at public research universities in the United States. In order to answer the second research question, I ran a separate analysis for two

subsamples of more and less selective public research universities (based on Barron's competitiveness rating).

Sample

My population of interest is all Title IV participating public research universities in the United States (N=212). I defined public research institutions using the following categories of the 2018 Carnegie Classification: doctoral universities: very high research activity; doctoral universities: high research activity; doctoral/professional universities. As with prior studies on state funding for higher education, I omitted two public doctoral universities in Nebraska due to that state's unicameral legislature. I also excluded six public research institutions in the state of Colorado because in 2006 the state government of Colorado implemented a voucher model for funding its public higher education institutions. Under this model, state appropriations are allocated to students, rather than universities (Hillman, Tandberg, & Gross, 2014). I removed CUNY Graduate School from the sample because of its primary focus on graduate education. Further, I excluded a small number of universities that report IPEDS finance data in the aggregate on behalf of branch campuses that are part of the same state higher education system. Then I dropped 21 universities with values of state appropriations per FTE 150 percent greater than the median value or 60 percent less than the median value for all years of the analysis. A total of 156 public research universities in 48 states make up a final sample for this study (73 percent of the population).

Because universities of different selectivity may respond to state finding declines differently, I divided the sample into two subsamples based on 2009 Barron's competitiveness index. The Barron's index calculation includes four criteria: high school class rank, high school grades, standardized test scores, and an institution's admission rate (Hess, 2013). Institutions

classified by Barron's as "very competitive" or above were assigned to the "more selective universities" subsample (n=63) and all others were in the "less selective universities" subsample (n=93).

Data

Institutional-level panel dataset for this study incorporated Integrated Postsecondary Data System (IPEDS) survey data for 156 public research universities as defined by the 2018 Carnegie Classification for the period between 2003-04 and 2017-18. Data for some years were missing for some of the sampled institutions. Consequently, the analytical sample was composed of 1961 observations. The dataset was supplemented with state-level data from several sources: Bureau of Economic Analysis; Bureau of Labor Statistics; U.S. Census; National Conference of State Legislatures.

Several variables obtained from IPEDS required computation or transformations before they could be used in the analysis. All financial variables were adjusted for inflation and held in constant 2017 U.S. dollars. I computed per full-time equivalent FTE tuition revenue, institutional grants, endowment assets, federal operating grants and contracts. Further, I addressed the skewness in the enrollment and financial variables through log transformation.

The outcome variable, the number of first-time international undergraduate students, was obtained from the Residence and Migration sub-component of the IPEDS Fall Enrollment survey. Before the 2000-01 academic year, the IPEDS Resident and Migration survey was collected only in even-numbered years. Starting from 2001-02, institutions could voluntarily submit the survey in odd-numbered (e.g., the 2010–2011 academic year) academic years. Approximately 15 percent of public research universities did not report students' residence in

odd-numbered years. I interpolated missing enrollment numbers for odd-numbered years by finding the average of data from the preceding and following years. I also excluded approximately one percent of first-time full-time undergraduate students whose residence status was unknown. Prior to that I excluded year-observations for several universities with abnormally high proportion of students with missing residence status (first-time undergraduate enrollment with unknown residency status of 4 percent or higher).

Control Variables

Fixed effects regression models remove the effect of unobserved variables that do not vary over time. Thus, I only control for time varying factors. I included institutional- and state-level covariates that have an effect on international enrollment as well as a systematic relationship with lagged state appropriations. I controlled for institutional level factors that can affect both institutional demand for international students and the supply of students from abroad. It was found that international students tend to choose university abroad based on reputation for academic quality (Lee, 2008). I used percent of applicants admitted to control for institutional selectivity

I included counts of all new in-state and domestic out-of-state undergraduate students. There is no multicollinearity issue here since the Pearson correlation coefficient for these two control variables is low (for 2003-04 it was 0.29 and 0.15 for 2016-17). Since some graduate students also pay tuition, I will also include the share of graduate and professional enrollment in the total enrollment as a control.

I also included several institutional-level financial characteristics as controls. Tuition price might affect international enrollment demand (Bound et al., 2018; Shen, 2016). I included

tuition and fees for full-time nonresident students as a control variable. I also controlled for the share of tuition revenue in total revenue. Since institutional grant aid is often used to fulfill enrollment management objectives (Lord, 2018), I included institutional grants per FTE as a control variable. Institutional grants include both funded and unfunded institutional grants to students. Finally, I controlled for endowment assets per FTE since some public universities offset state funding cuts through endowment fundraising (Webber, 2017). I also included federal operating grants and contracts per FTE as this is another alternative source of revenue (Bound et al., 2019).

International demand, as well as state's ability to fund public higher education, may be affected by state economic health. State economic conditions might affect the number of international students who choose to go to a particular state since international students might be interested in internships and job opportunities after graduation (Shen, 2016). Economic indicators also capture state's ability to fund public higher education (Jaquette, Curs, & Posselt, 2016). I included two state-level indicators of economic health: median household income (from the U.S. Census Bureau) and state unemployment rate (from Bureau of Labor Statistics).

State-level demographic characteristics affect resident student enrollment at public universities and may be correlated with the share of nonresident enrollment (Jaquette, Curs, & Posselt, 2016). I included state-by-state estimates of the college-aged population (18- to 24-year-old state residents) from the U.S. Census Bureau to control for changes in the supply of in-state applicants.

Several studies have contributed empirical evidence that political affiliation plays a role in allotting state funding to higher education. It was found that universities in states with Democratic legislators receive higher levels of state funding than universities in states with

Republican legislators (Archibald & Feldman, 2006; Dar & Lee, 2016). I included a dummy variable that indicates whether Democratic party had control of the state House and Senate. This data come from the National Conference of State Legislatures website.

Descriptive Statistics

Table 1 presents descriptive statistics for the total sample and covers first and last year of the analysis. Between 2003-04 and 2017-18, the median international freshman enrollment increased 112 percent, from 26 to 55 students. The median state resident freshman undergraduate enrollment grew 27 percent, from 2,119 to 2,697 students. And the median freshman out-of-state domestic enrollment increased 71 percent, from 294 to 502 students. The share of full-time graduate student enrollment in total university enrollment has not change much over the period and remained at around 15 percent. Although the first-time international undergraduate student enrollment had been growing at higher rates, its proportion in the total first-time undergraduate enrollment still remains low. In the 2017-18 academic year, the proportion of first-time international undergraduate enrollment in the overall first-time international undergraduate enrollment at public research universities was four percent, while the proportion of out-of-state domestic students was 21 percent.

Tables 2 and 3 present summary statistics for the subsamples of more and less selective universities. Table 2 shows that more selective public doctoral universities increased international undergraduate enrollment by 300 percent from the median of 39 students in 2003-04 to 157 students in 2017-18. As shown in Table 3, less selective public research universities enrolled less first-time international undergraduate student, compared to more selective institutions. The big differences in international enrollment patterns within public research

university sector have been observed in previous studies that looked at international enrollment trends (Bound et al, 2016; Cantwell, 2015; Shen, 2017) and were explained by the fact that some universities have greater capacity to attract students from abroad.

Tables 1-3 also demonstrate substantial shifts in revenue sources. The share of tuition revenue in the total operating revenue increased from 35 to 51 percent. It corresponded with increases in median tuition revenue per FTE from $3,307 in 2003-04 to $10,306 in 2017-18. Compared to more selective public research universities, less selective public research universities had larger share of net tuition revenue in total revenue. This can be explained by the fact that more selective institutions have more access to alternative revenue streams. More selective public research universities on average have more endowments per FTE and receive more federal operating grants and contracts per FTE.

State appropriations for public research universities had grown during the period of the analysis. For the total sample, between 2003-04 and 2017-18, the median state appropriations grew 54 percent, from $83,738 to $128,690. There were substantial differences in the level of state funding between more selective and less selective institutions. In the 2017-18 academic year, more selective institutions received two times more in state funding compared to less selective public research institutions.

Over the 15-year period, the median nonresident tuition price at public research universities increased by $13,565, or 157 percent. More selective institutions charged substantially higher nonresident tuition prices. In 2017-18, the median nonresident tuition price at more selective public research institutions was $8911 higher.

Public research institutions made gains in per-student net tuition revenue with increases of $6,999 or 212 percent. At the same time per-student tuition revenue at more selective public

research universities increased by $8,725, or 214 percent. Less selective schools had a $5,353 (or 184 percent) increase in tuition revenue per FTE.

The sampled institutions also substantially increased their institutional aid on a per student basis. Between 2003-04 and 2017-18, per-student institutional grant aid grew 297 percent, from $520 to $2,062. More selective public research universities provide students with more financial aid.

During the period of the study, public research universities have considerably grown their endowment assets. The median per-student endowment assets grew from $2,216 to $10,982. There was a big difference in the per-student endowment asset growth by selectivity. Between 2003-04 and 2017-18, per student endowment assets increased by $19,647 (310 percent) at more selective public research universities and by $6,558 (461 percent) at less selective institutions.

Per-student federal operating grants and contracts grew from $2,251 in 2003-04 to $2,791 in 2017-18 for the total. More selective public research institutions had been receiving more in federal operating grants in contracts. The median per-student federal operating grants in contracts at more selective schools grew from $3,230 to $4,605, while the median per-student federal operating grants and contracts at less selective institutions slightly declined from $1,631 to $1,595.

The descriptive statistics for the state-level characteristics demonstrate that household income has increased while the state unemployment rate has slightly declined. There also was a change in the political landscape, where the prevalence of Democratic control of state legislatures dropped from 31 to 23 percent.

Table 1: Summary Statistics of the Institutions in the Dataset (n=156)

Variable	FY 2003-04			FY 2017-18		
	Mean	Median	SD	Mean	Median	SD
Enrollment Characteristics						
Count of first-time international undergraduate students	56	26	81	160	55	257
Count of first-time in-state domestic undergraduate students	2,287	2,119	1,227	2,805	2,697	1,570
Count of first-time out-of-state domestic undergraduate students	480	294	525	801	502	844
Share of full-time graduate enrollment in total enrollment	0.16	0.16	0.06	0.15	0.14	0.06
Financial Characteristics						
Nonresident tuition price ($)	8,783	8,629	2,700	23,556	22,194	7,885
State appropriations ($M)	110	84	84	165	129	114
Revenue from tuition (pct)	0.35	0.35	0.14	0.48	0.51	0.16
Per-student net tuition revenue ($)	3,518	3,307	1,436	10,690	10,306	4,196
Per-student institutional grants ($)	672	520	514	2,412	2,062	1,583
Per-student endowment assets ($)	5,974	2,216	9,918	23,294	10,982	34,589
Per-student federal operating grants and contracts ($)	3,020	2,251	2,539	3,833	2,791	4,050
Institutional Selectivity						
Admission rate (pct)	0.65	0.67	0.16	0.61	0.64	0.18
Barron score – more selective institutions (pct)	0.40	-		0.40	-	-
State-Level Characteristics						
Median household income ($)	57	57	8	60	59	8
Unemployment rate (pct)	5.86	5.9	0.94	4.3	4.4	0.64
College-aged population (K)	1,058	722	919	1,157	823	1,030
Democratic control of state legislature (pct)	0.31	-	0.46	0.23	-	0.43

Sources: Integrated Postsecondary Data System (IPEDS); 2009 Barron's Competitiveness rating; Bureau of Labor Statistics Census Bureau; National Conference of State Legislatures (NCSL)

Note: (1) Selectivity is defined based on Barron's competitiveness rating. Institutions listed as "very competitive" or above were coded as "more selective public research universities" and all others as "less selective"

Table 2: Summary Statistics for More Selective Public Research Universities (n=75)

Variable	FY 2003-04			FY 2017-18		
	Mean	Median	SD	Mean	Median	SD
Enrollment Characteristics						
Count of first-time international undergraduate students	82	39	105	303	157	347
Count of first-time in-state domestic undergraduate students	2,621	2,364	1,504	3,421	3,107	1,819
Count of first-time out-of-state domestic undergraduate students	732	681	573	1,107	880	888
Share of full-time graduate enrollment in total enrollment	0.18	0.16	0.07	0.17	0.16	0.07
Financial Characteristics						
Nonresident tuition price ($)	10,424	10,306	26	28,858	28,822	7,974
State appropriations ($M)	159	141	104	227	212	138
Percent of revenue from tuition (%)	0.30	0.31	0.13	0.41	0.44	0.16
Per-student net tuition revenue ($)	4,237	4,076	1,645	13,221	12,801	4,231
Per-student institutional grants ($)	1,016	1,078	596	3,109	3,119	1,804
Per-student endowment assets ($)	11,024	6,344	13,974	40,751	25,991	48,194
Per-student federal operating grants and contracts ($)	4,184	3,230	3,113	6,014	4,605	5,073
Institutional Selectivity						
Admission rate (pct)	0.75	0.77	0.15	0.74	0.75	0.14
State-Level Characteristics						
Median household income ($K)	59	58	8	62	60	8
Unemployment rate (pct)	5.70	5.7	0.96	4.2	4.3	0.62
College-aged population (K)	1,099	722	1,012	1,189	822	1,044
Democratic control of state legislature (pct)	0.28	-	0.44	0.28	-	0.45

Sources: Integrated Postsecondary Data System (IPEDS); Bureau of Labor Statistics; Census Bureau; National Conference of State Legislatures (NCSL)

Table 3: Summary Statistics for Less Selective Public Research Universities (n=104)

Variable	FY 2003-04			FY 2017-18		
	Mean	Median	SD	Mean	Median	SD
Enrollment Characteristics						
Count of first-time international undergraduate students	38	23	55	64	34	85
Count of first-time in-state domestic undergraduate students	2,067	1,947	956	2,513	2,485	1,273
Count of first-time out-of-state domestic undergraduate students	317	203	421	603	350	756
Share of full-time graduate enrollment in total enrollment	0.15	0.15	0.06	0.14	0.14	0.05
Financial Characteristics						
Nonresident tuition price ($)	7,676	7,602	2,107	20,148	19,311	5,650
State appropriations ($M)	75	64	42	124	108	70
Percent of revenue from tuition	0.37	0.38	0.13	0.52	0.53	0.15
Per-student net tuition revenue ($)	3,039	2,913	1,037	9,021	8,266	3,244
Per-student institutional grants ($)	484	398	345	1,945	1,689	1,220
Per-student endowment assets ($)	3,139	1,422	4,817	11,595	7,980	10,663
Per-student federal operating grants and contracts ($)	2,196	1,631	1,606	2,356	1,595	2,198
Institutional Selectivity						
Admission rate (pct)	0.65	0.67	0.16	0.61	0.64	0.19
State-Level Characteristics						
Median household income ($K)	56	55	7	57	59	8
Unemployment rate (pct)	4.2	4.3	0.6	4.4	4.45	0.64
College-aged population (K)	1,031	721	858	1,189	823	1,109
Democratic control of state legislature (pct)	0.30	-	0.47	0.30	-	0.47

Sources: Integrated Postsecondary Data System (IPEDS); Bureau of Labor Statistics; Census Bureau; National Conference of State Legislatures (NCSL)

Methodology

To answer my research questions, I utilized the following fixed effects institutional-level linear panel model:

$$log(Intl_{it}) = \beta_0 + \beta_1 \log(Approp_{it-1}) + W_{it-1}\beta_2 + \varphi_{st-1}\beta_3 + \delta_t + \alpha_i + \varepsilon_{ist} \qquad (1)$$

In the model, subscript *i* represents institution, *s* represents state and subscript *t* represents year. The outcome variable is the number of first-time international undergraduate students. The independent variable of interest is state appropriations lagged one year. β is the coefficient of interest that represents the effect of state appropriations on international enrollment. W_{it-1} is a vector of institution- and time-varying covariates lagged one year relative to international enrollment; φ_{st-1} represents state level time-varying covariates lagged one year, where subscript s represent the state which institution i is located. δ_t is time-varying institution-invariant effects. α_i represents time-invariant characteristics of institutions and ε_{it} is the error term.

The model specified a one-year lag between state appropriations and first-time international undergraduate enrollment. A one-year lag was appropriate because enrollment decisions are likely to be affected by prior-year financial indicators. Drawing from resource dependence theory, I argue that declines in state appropriations caused universities to desire more international students in the following year. It also seems possible that some institutions may not be able to ramp up international recruitment in one year. In the robustness check part of the results section I added an alternative specification with a two-year lag.

Limitations

The study has several limitations that can influence the development of my conclusions and findings. First, the sample was limited to public research universities. Therefore, the results are not generalizable to the whole public higher education sector. At the same time, the strength of this is that most international students go to public research universities. It has been found that non-research public institutions have been unable to generate substantial revenue from international students (Cantwell, 2015; Komissarova, 2019) and did not enroll more students from abroad as a response to state funding cuts (Bound et al., 2016)

Another limitation of this study is that I could not locate systematic time-varying data on formal or informal nonresident enrollment caps for each state. Such caps may limit international enrollment growth. I explained how I partially address this limitation in the Robustness Check portion of the Results section.

This study also did not account for states' tuition reciprocity agreements. Such agreements allow nonresident domestic students from certain states to pay in-state tuition or reduced tuition. According to the National Association of Student Financial Aid Administrators (NASFAA) website, in 2019, 39 states were participating in one or more tuition reciprocity programs (NASFAA, 2019). Under resource dependence theory, public universities in states where reciprocity agreements are implemented would be more prone to enroll international students in order to maximize tuition revenue. However, since the number of participating states did not change much during the period covered in this study, and since I used the fixed-effects method, I was able to account for the differences.

Finally, the study was limited to a 15-year period, and all years outside the scope of the analysis were ignored. It is important to remember that in-state, out-of-state, and international

enrollment for a university are determined by the supply of applicants. The supply of

international students to U.S. universities is not likely to remain constant in future decades. If the

supply of international students declines, public research universities might not be able to

respond to state appropriation cuts through generating extra revenue from enrolling international

students.

Results

Table 4 presents the results of the estimation of the association between state funding and

first-time international undergraduate enrollment. For the full sample of public research

universities (Column 1), I found that a one percent increase in state appropriations is associated

with a 0.22 percent decrease in first-time international undergraduate enrollment ($p < 0.001$). The

magnitude of the relationship was slightly larger at more selective public research institutions

(Column 2), where a one percent increase in state appropriations leads to 0.25 percent decrease

in first-time international undergraduate enrollment ($p < 0.001$). The magnitude of the

relationship was smaller (B=-0.16, p<0.01), but also significant for the sample of less selective

public research universities (Column 3).

Several factors were found to contribute to growth or declines of international student

enrollment. First-time nonresident domestic undergraduate enrollment was the strongest

predictor of first-time international undergraduate enrollment (B=0.43, p < 0.001). When

universities see nonresident enrollment as a potential means of revenue generation, they focus on

enrolling more nonresident students that pay higher tuition both domestically and from abroad.

The magnitude of the relationship was higher for the subsample of more selective public research

universities (B=0.66, p<0.001).

There was negative significant relationship between first-time in-state and first-time international undergraduate enrollment for the total sample (B=-0.35, p<0.001) and for the subsample of more selective schools (B= -1.010). This finding contradicts finding aligns with the results from the study by Bound et al. (2016) that provided evidence of negative association between changes in international and in-state enrollment at the research-intensive universities. These findings raise concerns about international students crowd out in-state students.

Nonresident tuition price also predicted first-time international undergraduate enrollment (B=0.40, p < 0.001). A one percent increase in nonresident tuition price predicted a 0.40 percent increase in first-time international enrollment. This points to the inelasticity of demand for U.S. undergraduate education from international students. The beta coefficient also follows RDT logic, where institutions that aggressively increase nonresident tuition price will attempt to capitalize on the international student market to generate more tuition revenue. The relationship between nonresident tuition and international enrollment was even stronger for the subsample of more selective public research universities (B=0.781, p < 0.001). The relationship between nonresident tuition and first-time international undergraduate enrollment was not significant for the sample of less selective institutions, suggesting that less selective institutions have less market power.

Interestingly, Democratic control of state legislature predicted international enrollment growth (B=0.16, p < 0.01) for the total sample and for the subsample of more selective public doctoral universities (B=0.32, p < 0.01). This suggests that public research institutions in states with liberal government are more likely to enroll international students. It may also be the case that international students are more prone to going to Democratic states. Another consideration might be the institution's geographic location since the majority of coastal states are liberal.

Another interesting finding is that state median household income is associated with international enrollment for the subsample of less selective research universities (B= -0.02, p < 0.05). When a state's median household income goes up, international enrollment at less selective public research universities decreases. One possible explanation is that when states experience household income declines, the residents are unable to afford going to less selective public research universities, leading those institutions to focus more on international recruitment. This may also imply that demand for education from more selective public research universities is more elastic.

Another interesting finding is that state median household income is associated with international enrollment for the subsample of less selective research universities (B= -0.02, p < 0.05). When a state's median household income goes up, international enrollment at less selective public research universities decreases. One possible explanation is that less selective public universities in states with weaker economies tend to attract more international students.

Table 4: Panel Regression Results with Fixed Effects Between State Appropriations and First-Time International Undergraduate Enrollment

	All Public Research Universities		More Selective Research Universities		Less Selective Research Universities	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Log state appropriations	-0.21***	0.05	-0.25***	0.09	-0.16**	0.06
Log count of first-time in-state domestic undergraduate students	-0.35**	0.12	-1.01***	0.22	0.06	0.15
Log count of first-time out-of-state domestic undergraduate students	0.43***	0.06	0.66***	0.10	0.29***	0.07
Admission rate	-0.00	0.18	0.00	0.33	0.03	0.21

Share of full-time graduate enrollment in total enrollment	0.01	0.01	-0.02	0.03	0.09	0.02
Percent of revenue from tuition	0.64	0.42	-0.92	0.78	1.27*	0.48
Log nonresident tuition price	0.40***	0.09	0.78***	0.18	0.13	0.11
Log institutional grants per FTE	0.05	0.04	0.14	0.10	0.03	0.04
Log endowment assets per FTE	0.04	0.02	-0.01	0.04	0.09**	0.03
Log federal operating grants and contracts per FTE	0.10	0.04	0.10	0.12	0.07	0.05
State median household Income	-0.01	0.01	0.00	0.01	-0.02*	0.01
State unemployment rate	0.01	0.01	0.01	0.02	-0.01	0.01
Log state college-aged population	0.25	0.30	-1.42	1.02	0.60	0.31
Democratic control of state legislature	0.14*	0.06	0.32**	0.10	0.01	0.07
Observations	1,961		836		1,125	
Number of Institutions	156		63		93	
R-Squared	0.24689		0.34463		0.21092	
Adj R-Squared	0.17583		0.27901		0.12945	
Note. Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05						

Robustness Checks

I performed four robustness tests to assesses whether the estimated effects remain statistically significant across different specifications. My first robustness test (Model A) involved dropping from the analysis states that had nonresident enrollment caps. I performed an online search and dropped institutions from the states that have adopted nonresident enrollment caps at any point during the period covered by the analysis in this study. The search revealed that two states (California and North Carolina) had implemented nonresident enrollment caps during

the analysis period. Removing public universities from California and North Carolina reduced my sample size to 140 institutions.

My second robustness test (Model B) involved looking at how the beta coefficients might change when I analyze a sample of universities that are classified as research universities based on the 2010 Carnegie Classification. Many public universities obtained research university status in 2018. Applying the 2010 Carnegie Classification reduced the total sample size to 120 institutions.

The third robustness test (Model C) addressed concern of whether the results of my analysis might be driven by data from the period of the Great Recession in which states, universities, and students may have behaved differently than in other periods of time. I dropped the academic years 2008-09 and 2009-10, that correspond to the Great Recession.

The fourth robustness check (Model D) involved implementing a two-year lag between state appropriations and first-time international undergraduate enrollment. This test was conducted to test the assumption that universities might need more time to adjust to state funding cuts.

The estimates for all four robustness tests show that state funding is a significant predictor of international enrollment. The relationship between these two variables is negative and the magnitudes of the relationship in all three tests are not higher than the magnitude in the initial model. However, robustness check results also reveal additional factors associated with first-time international enrollment. Interestingly, there was no significant relationship between domestic in-state undergraduate enrollment and international enrollment in Model A. This suggests that enrollment caps do not help to prevent the crowd out effect. Another interesting finding in Model A is that increase in admission rate predicted increase in international enrollments (B=0.35, p < 0.01) that excludes universities from states with nonresident enrollment

caps. Results in this model suggest that becoming less selective increased international student

enrollment.

Model B is also the only one to demonstrate a significant relationship between

institutional grants per FTE and institutional enrollment (B=0.15, p<0.01). A one percent

increase in institutional grants per FTE predicted 0.26 percent increase in first-time international

undergraduate enrollment. There is a possibility that as universities without nonresident caps

become more generous with institutional grants, they will attempt to attract more international

students to raise additional revenue.

Table 5: Robustness Check - Panel Regression Results

	Model A		Model B		Model C		Model D	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Log state appropriations	- 0.19**	0.00	-0.24**	0.05	-0.24***	0.05	-0.08*	0.03
Log count of first-time in-state domestic undergraduate students	- 0.10	0.43	-0.37**	0.13	-0.39*	0.13	-0.30*	0.12
Log count of first-time out-of-state domestic undergraduate students	0.25***	0.00	0.54***	0.06	0.41***	0.06	0.45***	0.06
Admission rate	0.35**	0.18	-0.01	0.18	-0.04	0.20	-0.05	0.18
Share of full-time graduate enrollment in total enrollment	-0.00	0.53	0.76	0.54	0.02	0.02	0.02	0.01
Percent of revenue from tuition	0.90*	0.42	0.39	0.44	0.24	0.40	0.88*	0.41
Log nonresident tuition price	0.26**	0.09	0.29**	0.10	0.46***	0.09	0.48***	0.09

Log institutional grants per FTE	0.06	0.04	0.15**	0.05	0.03	0.04	0.06	0.04
Log endowment assets per FTE	0.05*	0.02	0.02	0.02	0.04	0.02	0.05	0.02
Log federal operating grants and contracts per FTE	0.35	0.06	0.05	0.06	0.07	0.05	0.11	0.04
State median household income	-0.01	0.00	-0.01	0.01	-0.01	0.01	-0.01	0.01
State unemployment rate	0.01	0.01	-0.00	0.01	0.01	0.01	0.01	0.01
Log state college-aged population	0.42	0.29	0.45	0.30	-0.15	0.33	0.33	0.30
Democratic control of state legislature	0.038	0.06	0.20***	0.06	0.15*	0.06	0.14*	0.06
Observations	1,766		1,513		1,701		1,957	
Number of Institutions	140		120		156		156	
R-Squared	0.19908		0.2845		0.25947		0.24138	
Adj R-Squared	0.12197		0.21658		0.1788		0.16964	
Note. Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05								

Discussion and Implications

Increases in international enrollment over the last decade have been much larger in the public university sector than in other sectors of U.S. higher education. International undergraduate enrollment growth at public research universities coincided with institutional adjustments to changes in state funding. In this paper, I examined whether public research universities increased international undergraduate freshman enrollment in response to declines in state appropriations using an analysis period from 2003–04 to 2017–18. My analysis

demonstrated a negative relationship between state appropriations and international undergraduate enrollment. I found that a one percent decline in state appropriations (lagged one year) was associated with a 0.22 percent increase in international undergraduate freshman enrollment for the sample of all public research universities. I also found that this relationship was stronger for more selective research universities, where a one percent decline in state appropriations was associated with a 0.4 percent increase in first-time international undergraduate enrollment. These results are consistent with findings from previous studies and confirm that international enrollment is an important channel through which selective public research universities have buffered changes in state funding.

This study shows that more selective schools are in a better position to attract foreign undergraduate students and, therefore, to counter the impact of state budget cuts through increasing international enrollment. The descriptive statistics show that more selective research universities are capable of generating substantially larger nonresident enrollment compared to less selective institutions. Further, the regression results show that the relationship between state funding and international undergraduate enrollment was not significant for the subsample of less selective institutions. This gives another evidence of the Matthew Effect in revenue seeking behavior of higher education institutions.

Over the last few decades, state funding has become a smaller proportion of institutional revenues, while the share of tuition revenue in total revenue has grown. This study shows a strong positive association between international enrollment and out-of-state tuition price. It means that public research universities attempt to improve their overall financial health through increasing tuition revenue by simultaneously increasing tuition prices and enrolling more students who pay higher tuition. At the same time, there was no relationship between the share of

tuition revenue in total revenue and international enrollment for the full sample and the sample of more selective public universities.

This study provides important implications for leaders of public research universities and state policymakers concerned about access. Increasing understanding of enrollment patterns at public research universities that were hurt by diminished state support will help in developing sound enrollment strategies that can potentially promote equity and social mobility for state residents. The results show that increased international undergraduate enrollment leads to declines in in-state undergraduate enrollment. At the same time, the robustness test results show that policies limiting nonresident enrollment do not help increase access for resident students. These findings deserve further exploration.

Recommendations for Further Research

Future research should continue to explore the effects of state appropriations on enrollment patterns. For example, future studies can account for differences in patterns of state funding across public research universities. It was found that research universities located in state capitals receive higher levels of state funding per FTE than similar institutions in other locations (McLendon, Mokher, & Doyle, 2009). Therefore, one can explore differences in the relationship between state funding and international or nonresident enrollment based on whether a university is located in a state capital. Another direction for further research is to explore differences in the relationship between state funding and international enrollment based on political characteristics of the states since it was shown that political factors do affect public university revenues (McLendon, Hearn, & Mokher, 2009; Tandberg, 2010).

Future studies can consider Weerts and Ronca's (2012) recommendation of using percentage change in state appropriations support for higher education as a dependent variable. The percent change in state support can provide more informative results as compared to logged dollars in explaining differences in international enrollments.

Further research should continue exploring costs and benefits of international enrollment growth. My study showed that international students do not squeeze out in-state students, however, there is also empirical evidence that increases in nonresident enrollment crowd out low-income and underrepresented minority in-state students (Jaquette, Curs, & Posselt, 2016). Thus, there is a need to examine the relationship between international enrollment and enrollment of underrepresented groups of students. This will help to understand whether international students deprive low-income and underrepresented minority students of educational opportunities.

My findings offer a distinctively new perspective on the factors associated with international enrollment at public research universities. The association between Democratic control of state legislature and international enrollment point out the need for further exploration of political factors. Future studies must consider additional state-level covariates such as citizen and government political ideology or political affiliation of the state governor.

Chapter 3: Exploring the Relationship between International and Minority Enrollment in MBA programs at Public Universities in the United States

The United States has been one of the most popular destinations for international students. Between 2000 and 2018, international enrollment grew by 113 percent, from 514,723 to 1,094,972 international students (Institute of International Education, 2018). The dramatic growth in the number of international students has provoked public concerns from both scholars and the popular media. Critics argue that international students crowd-out domestic students (Anderson, 2016; Bound, Braga, Khanna, & Turner, 2016; Pratt, 2014). On the other hand, proponents of internationalization point at the economic value of international students and emphasize international students' potential to subsidize domestic students (National Foundation for American Policy, 2017).

Recent criticism has arisen as a reaction to the influx of international students at the undergraduate level. However, international students have long maintained a high presence in graduate education. Between 2000 and 2018, graduate international enrollment grew from 238,497 to 382,953 students (Institute of International Education, 2018). The share of international enrollment in total enrollment in graduate programs in 2018 was 13 percent, which is higher than the total share of international students in the whole U.S. higher education sector (five percent) (author's calculations using IPEDS). Although many graduate schools in the U.S. have been reporting declines in first-time enrollments among international graduate students since 2018 (Okahana & Zhou, 2019), it is still important to understand the impact of international enrollments on domestic enrollments in graduate sector.

The growth in the number of international students can be particularly impactful on access for historically disadvantaged groups of domestic students (e.g. low-income students and

minority students). While students from disadvantaged groups are entering higher education at higher rates, graduate and professional programs still fail to enroll a critical mass of students from vulnerable groups (Baum & Steele, 2017; Posselt & Grodsky, 2017). With increased attention to diversity on campuses, more work is needed to understand how universities might systematically preclude access. One possible avenue for research is investigating whether international enrollment has indeed impacted minority enrollment in graduate and professional education.

While other studies have examined the relationship between international student enrollment and domestic minority enrollment for undergraduates (Shen, 2017) and for various PhD programs (Borjas, 2004; Regets, 2007; Shih 2017; Zhang, 2009), this is the first paper to explore the relationship in full-time MBA programs. I chose to focus on business major because business administration is the field in which the largest number of master's degrees have been conferred (National Center for Education Statistics, 2019). Additionally, business is one of the most popular fields of study for international students. According to an Open Doors report, in 2018, twenty percent of all international students in the United States were enrolled in business major academic programs (Institute for International Education, 2019).

My decision to look specifically at graduate business schools affiliated with public universities comes from the notion that public institutions are expected to embrace the mission of accessible and affordable quality education for domestic student population. Similar to all other programs at public institutions, business schools affiliated with public universities charge international students tuition rates that are two to three times higher (based on tuition data for MBA programs from U.S. News and World Report). Such pricing can subsidize the cost of enrolling more students from historically underrepresented groups of domestic students. This

"cross-subsidization" may occur when business schools are committed to the access and equity mission. Alternatively, if a business school is oriented towards revenue generation, and/or if international applicants to MBA programs have better academic profiles, there is a chance that prospective minority MBA students may be crowded out by their peers from abroad. Changes in student body composition are an important indicator of changing institutional priorities. Therefore, findings of this study provide insights about the changing character of public universities and have implications for the campus climate experienced by minority students.

Share of minority enrollment in total enrollment varies across business schools of different selectivity. According to data from U.S. News and World Report (USNWR), in 2017, minority students represented 30 percent of all students in the least selective full-time MBA programs (selectivity based on GMAT score). The share of minority students in the most selective MBA programs is about 20 percent. This calls for examination of how the relationship between international and minority enrollment varies across business schools of different selectivity.

Research Questions

The goal of this study is to identify whether there is an effect of international enrollment on domestic minority enrollment in traditional full-time MBA programs at business schools affiliated with public universities and accredited by the Association to Advance Collegiate Schools of Business (AACSB). It will be guided by the following research questions:

(1) Is the growth in the numbers of international students associated with declines or increases in the numbers of minority students in MBA programs at public universities?

(2) Does the relationship between international enrollment and minority enrollment differ by program selectivity?

Theoretical Framework

This research is grounded in the concept of Iron Triangle of Enrollment Management (ITEM). Institutions and academic programs want to pursue access, academic profile, and revenue simultaneously and focus on enrollment goals that are deemed most important (Cheslock & Kroc, 2012). One important feature of the Triangle is that gains in any one dimension will lead to decreases in at least one dimensions (Kelly & Rodriguez, 2014). For example, increase in access can result in can result in a decrease in academic profile, a decrease in tuition revenue, or both. The interaction among these three enrollment goals characterize the dilemma facing higher education institutions in the United States.

The Iron Triangle helps identify business school's preferences for domestic minority and international students. Some of the same institutional priorities that international students embody—cultural and geographic diversity—are also enhanced through the admission of domestic minority students. In addition to diversity, minority enrollment contributes to the business school's access and equity mission. Focus on access and equity is more common for business schools affiliated with public institutions that are grounded on institutional mission to provide access to higher education to state's residents. The majority of full-time MBA programs in the U.S. that have the most minority students in their classes are affiliated with public universities (U.S. News and World Report, 2019).

International enrollment targets two interrelated enrollment goals outlined in the Iron Triangle of Enrollment Management. Graduate business schools' reasons for pursuing

international enrollment are: tuition revenue gains and boosting academic profile through

increasing prestige and creating multicultural learning environment. International students, who

often pay higher tuition as well as additional fees, are crucial for generating significant revenues.

Enrolling more international students also helps to enhance business schools' prestige.

International students expand alumni networks globally, increasing a university's visibility and

strengthening its brand (Lee, 2010). Additionally, many business school's rankings (e.g.

Financial Times, CNN ranking, The Economist) are rewarding business schools for higher

number of international students in the programs (de Vega, 2016).

Enrollment management priorities vary based on the selectivity of an academic unit.

More selective programs primarily focus on attracting more high-caliber students, while less

selective ones are more concerned with filling the classes with any students that meet minimum

admission criteria. Given that underrepresented minority students tend to be less academically

qualified (Bowman & Bastedo, 2018), they will more likely apply and get accepted to a less

selective business program.

Literature Review

As outlined in the theoretical framework, enrollment management is a complex process

with various factors influencing institutional enrollment behavior. In this section, I will discuss

major factors that can affect enrollments of domestic minority and international MBA students.

Further, I will present findings from existing studies on the relationship between international

students and domestic enrollment in graduate education.

Factors Affecting MBA Enrollments

Graduate business schools need to improve and enhance the competitive market position to increase the capacity to achieve strategic goals. One way to achieve this is by strengthening the academic profile. In the case of graduate business education, there are several factors that are considered by admissions committees. The first six factors: GPA, GMAT, coursework, letters of recommendation, personal statement, and resume are the standard and the most important factors, whereas professional experience or internships, leadership in student organizations, and honors/awards are additional factors that may help prospective MBA students stand out among other candidates (Hammond, Cook-Wallace, Moser, & Harrigan, 2015).

Graduate business school enrollments are also greatly affected by institutional financial needs. Compared to other graduate programs, business programs are more actively engaged in profit-seeking behavior as they tend to be seen as "cash cows" for their host universities. It is more cost effective for institutions to expand graduate business enrollment compared to other academic as MBA students have lower demands on facilities (they do not need dormitories, dining halls and other facilities and may attend classes in evenings or on weekends). Graduate business schools offer an important revenue stream and sometimes share their positive cash flow with less-funded academic programs (Friga, Bettis, & Sullivan, 2003).

The entrepreneurial nature of business schools may have an impact on admissions and enrollment practices. It imposes a great deal of pressure on business school admission officers to meet financial goals and rarely leads to practices that improve socioeconomic and racial diversity. Graduate business programs have incentives to generate additional revenue. They enroll more high-income out-of-state (if affiliated with a public university) and international students who pay significantly higher tuition prices. Additionally, unlike students in other

graduate programs, business students are rarely offered financial aid and expected to pay full tuition and associated expenses out of pocket (Baum & Steele, 2018).

Another factor that might affect enrollment trends is whether business school admissions emphasize access and equity. Business schools have been asserting that a diverse student body is an important element in educating business leaders to meet the needs of a diverse society (Howard, 2019). However, it is still unclear whether expressing a desire to increase diversity of their student body will translate into practical implications.

The three above mentioned priorities that affect MBA enrollments of international and domestic minority students are subject to organizational constraints. If the MBA enrollment supply was inelastic, then international enrollment growth would necessarily crowd-out domestic minority enrollment. However, unlike other majors, educating business professionals does not require special facilities or equipment. Therefore, it is relatively easy for business schools to expand enrollment capacities. Additionally, business schools are under no pressure from education rankings organizations that reward educational programs that have resources to maintain low class sizes. For example, U.S. News business school's ranking methodology does not include the class size (Morse & Hines, 2018). It is important to note that when enrollment demand grows more rapidly than institutional capacity, institutions use admission standards to ensure that capacity and enrollments grow at similar rates (Hoenack & Weiler, 1979).

Multiple external factors can determine international and domestic minority enrollment patterns at a business school. Business school enrollment trends are affected by economic conditions. When the economy slows down, domestic demand for MBA programs will go up (Geiger, 2015). This happens because people go to graduate school when it becomes harder to keep or find a job or get a promotion.

Competition from MBA programs in other countries can also play a role in shaping international enrollments in MBA programs. Business schools in Canada, the UK, and other Western European countries also attract many foreigners. A majority of MBA schools in Western Europe and Canada have seen significant growth in international enrollment for the 2017-18 academic year (Graduate Management Admission Council, 2018).

Federal and state policies might also shape MBA international and domestic minority enrollment trends. Research has shown that minority students take on more student debt (Goldrick-Rab, Kelchen, & Houle, 2014). Therefore, domestic minority enrollment in MBA programs might be affected by changes to federal lending for graduate and professional education. Increases of federal student loan limits for graduate education may increase minority enrollment in MBA programs. Increased enrollment of minority students can lead to crowding out international students from selective MBA programs.

National immigration policies are affecting international enrollments at business schools. Recent changes to the political climate and anti-immigration rhetoric in America have made it more difficult for business schools to recruit international students. Proposed changes to H-1B visa policies, as well as travel bans, are keeping international students away (Leiber, 2017; Tausche & Dhue, 2017; Lewington, 2018). A GMAC Application Trends survey taken in 2018 showed that only 32 percent of American business schools reported growth in international applications for traditional MBA programs, compared to 49 percent in 2016 (Graduate Management Admission Council, 2018).

How International Enrolment Affects Domestic Enrollment

Several quantitative studies looked at how international students impact domestic enrollment in graduate education. Despite some methodological similarities, the studies produced

quite conflicting findings. Borjas (2004) used data from the Integrated Postsecondary Education Data System (IPEDS) and looked at enrollments in all graduate programs at a given institution except law, medicine, and dentistry programs. The analysis of cross-sectional data spanning 1978 through 1998 revealed that enrolling ten additional international students reduce enrollment of domestic White male students by four. The crowd out effect was found to be the strongest for the subsample of elite private universities. However, Borjas also found that ten additional international students would raise enrollment of domestic female students, Asians, and Hispanics by roughly two. Shih (2017) also used graduate enrollment data from IPEDS on both public and private not-for-profit universities and covered a more current period (1995 through 2005). He found that an in-flux of ten international students leads to 8 additional domestic students. Shih showed that cross-subsidization is more pronounced in the public higher education sector. Regets (2007) used department-level data from the National Science Foundation's Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS) for the period from 1982 to 1995 year. Regets found that an increase in enrollment of one international student is associated with an enrollment increase of 0.33 for white domestic students, an increase of 0.02 for underrepresented minority students. Regret's analysis also showed a decrease of 0.07 for Asian students. Zhang (2009) used more current data from the National Science Foundation's Survey of Graduate Students and Post-doctorates in Science and Engineering (GSS) and found that one additional international Ph.D. recipient leads to one extra domestic Ph.D. recipient. However, the analysis of non-STEM fields revealed a crowd-out effect.

The conflicting results in the existing studies on the impact of international enrollment on domestic enrollment suggest the need for more research on international graduate enrollment. For example, none of the previous studies on the impact of international graduate-level

enrollment has focused specifically on business education. It also becomes important to analyze more up-to-date data to account for recent changes in international enrollment trends.

Methodology

This study examines the relationship between international and domestic minority enrollment counts in full-time MBA programs at public universities in the United States. It uses data from the 2003-04 through 2016-17 academic year. This time period is of significance for this study, as it captures time before, during, and after the Great Recession. The following section provides details on the data, sample, method and control variables.

Sample

The sample consists of 200 business schools affiliated with public universities accredited by the Association to Advance Collegiate Schools of Business (AACSB) and provided information for the U.S. News guidebook. To answer my second question, I divided my sample into more selective and less selective programs based on the average GMAT score of the admitted students. I used average GMAT scores either for the 2003-04 academic year or the year when a business program first reported to U.S. News and World Report. The subsample of more selective programs consisted of business schools with a GMAT score higher or equal to 540, and the subsample of less selective schools consisted of schools with a GMAT score below 570). I chose the average GMAT score of 540 as my cut off score because this was the median score for my subsample of business schools.

Data

The main source of data is the directory portion of the U.S. News & World Report's guidebooks for graduate and professional education. The graduate program directory portion of the guidebooks contains self-reported information about MBA programs. The U.S. News and World report categorizes Asian-American, African American, Hispanic, or American Indian as minority students. This categorization is the same as the one of the U.S. Department of Education. The data from the 2003 through 2017 guidebooks was hand-entered.

Data from the Integrated Postsecondary Data System (IPEDS) was used on several institution-level controls. Prior to 2003-04, institutions used different standards to report financial data to IPEDS. Consequently, the 2003-04 academic year was chosen as a starting point of the analysis. The final year was determined based on U.S. News data availability. State-level covariates were gathered from several governmental data system and described in the Control Variables section.

Missing data were not imputed given the limited power of imputing data for panel data analysis (Young & Johnson, 2015). Additionally, my regression method does not eliminate the entire unit of analysis if data are missing for a specific time point. However, I removed 39 programs that had less than three program-year observations.

Missing data reduced the analysis sample and the potential number of program-year observations. Around 54 percent of program-year observations had complete data for analysis. My final regression analysis sample was an unbalanced panel of 200 business programs and 1531 program-year observations. The largest percentage of cases with missing data was for the 2004-05 academic year. The largest percentage of missing data overall were enrollment counts (minority and international) and selectivity metrics (GMAT and GPA). Each variable had around 25 percent missing data.

Several variables in the dataset required computation or transformations before they could be used in the analysis. A small number of business schools reported tuition prices for the entire degree program (which are typically two years in length), so I divided the reported price by two to get an annual price. Several MBA programs reported per credit tuition. I multiplied per-credit tuition by 18 (9 per semester) to get a typical full-time credit load for the year). All enrollment and financial variables were log-transformed to reduce heteroscedasticity. The financial variables were held in constant 2017 U.S. dollars by adjusting for inflation using the CPI index.

Control Variables

Time-varying covariates for the study were grouped into three categories: program-level, institution-level, and state-level controls. I included factors related to institutional demand for both minority and international students. The first group of controls focused on program-level characteristics and came from the U.S. News guidebooks. I controlled for the share of full-time enrollment in overall program enrollment. Admissions policies and selectivity shape enrollment. I controlled for the median GMAT scores, average GPAs of newly admitted full-time MBA students and acceptance rate. I also control for out-of-state tuition price for full-time MBA programs.

The second group of control variables focused on institution-level factors and came from the Integrated Postsecondary Education Data System (IPEDS). I used graduate and professional enrollment as a percentage of overall enrollment to account for the university's relative focus on undergraduate versus graduate education. I also controlled for two major revenue sources for public universities: state appropriations and tuition revenue. There is a negative relationship

between state appropriations and international undergraduate student enrollment (Bound et al., 2016). I used tuition revenue as a percentage of overall revenue to control for an institution's reliance on tuition revenue.

The third group of control variables is state-level factors. State economic conditions have an impact on university enrollment. Studies showed that declines in state funding lead to increases in nonresident enrollment at public universities (Bound et al., 2016; Jaquette & Curs, 2015). I controlled for median household income (from the U.S. Census Bureau) and state unemployment rate (from the Bureau of Labor Statistics). I also controlled for the state-level share of minority population in total population as it could be correlated with minority enrollments (from the U.S. Census Bureau).

Summary Statistics

Summary statistics for the total sample and the two subsamples for the 2003-04 and 2016-17 academic years are presented in Tables 1-3. Between 2003-04 and 2016-17, the median minority enrollment in full-time business programs increased 66 percent, from 9 to 15 students. The median international enrollment grew 50 percent, from 18 to 27 students during the same period. Full-time students made up proportionally less of incoming MBA classes at public universities in 2017 than they had 14 years prior.

There were some differences in the enrollment figures based on program selectivity. In the 2016-17 academic year, more selective programs enrolled median of 17 minority students, and the median minority enrollment at less selective schools was 11 students. More selective programs were also able to attract more international students. Between 2003-04 and 2016-17, median international enrollment at more selective business schools grew 20 percent from the

median of 30 to the median 36 students. At less selective programs it grew 77 percent from 9 to 16 students during the same period.

There were some changes to the selectivity measures for the period of the study. The median GMAT score slightly increased from 554 to 561 points. The median average GPA grew from 3.30 to 3.35. The median GMAT score grew by 9 points for more selective programs, from 603 to 612 points. The median GMAT score slightly went down from 500 to 498 points for less selective programs. The median average GPA of newly admitted students increased for both more and less selective programs. In the 2016-17 academic year, the median average GPA was 3.35 for more selective programs and 3.32 for less selective programs.

Out-of-state tuition prices grew substantially from the median of $13,733 to the median of $20,782. In the 2016-17 academic year, at more selective business programs charged higher out-of-state tuition of $30,000, while less selective programs charged $16,000.

The descriptive results of the institution level characteristics show that the share of graduate enrollment remained stagnant at approximately 15 percent. There were changes in the share of tuition revenue in total revenue for public universities in the sample. It grew from 38 to 53 percent for the total sample of business programs. The median state appropriations per FTE grew from $5,017 to $6,082.

The summary statistics for the state-level characteristics demonstrate that household income has increased from $57,167 to $58,319. The state unemployment rate has slightly declined. The proportion of minority residents in the total population slightly went up from 19 to 21 percent.

Table 1: Summary Statistics of the Total Sample (n=200)

	FY 2003-04			FY 2016-17		
Variable	Mean	Median	SD	Mean	Median	SD
Program-Level Characteristics						
Count of international students	37	18	28	42	27	45
Count of minority students	26	9	54	22	15	30
Share of full-time students	0.41	0.37	0.23	0.39	0.34	0.23
Median GMAT score	561	554	65	570	561	79
Average GPA	3.30	3.30	0.14	3.34	3.35	0.15
Out of state tuition ($)	15,321	13,733	7,458	25,471	20,782	13,515
Institution-Level Characteristics						
Share of graduate enrollment in total enrollment (pct)	0.16	0.15	0.07	0.15	0.14	0.07
Share of tuition revenue in total revenue (pct)	0.38	0.38	0.13	0.50	0.53	0.16
State appropriations per FTE ($)	5,483	5,017	2,145	6,901	6,082	3,708
State-Level Characteristics						
Median household income ($)	57,709	57,167	7,876	58,998	58,319	8,057
Unemployment rate (pct)	5.95	6	0.89	4.85	5	0.71
Share of minority population	0.19	0.19	0.09	0.23	0.21	0.09

Sources: U.S News and World report guidebooks, Integrated Postsecondary Data System (IPEDS); Census Bureau; Bureau of Labor Statistics

Table 2: Summary Statistics of the Subsample of More Selective Programs (n=105)

	FY 2003-04			FY 2016-17		
Variable	Mean	Median	SD	Mean	Median	SD
Program-Level Characteristics						
Count of international students	46	30	48	50	36	50
Count of minority students	28	12	34	25	17	39
Share of full-time students	0.41	0.35	0.25	0.37	0.32	0.20
Median GMAT score	605	603	43	612	622	62
Average GPA	3.3	3.3	0.13	3.37	3.35	0.14
Out of state tuition ($)	17,721	15,572	7,994	31,940	30,210	13,858
Institution-Level Characteristics						
Share of graduate enrollment in total enrollment (pct)	0.18	0.16	0.07	0.16	0.15	0.07

Variable	Mean	Median	SD	Mean	Median	SD
Share of tuition revenue in total revenue (pct)	0.35	0.34	0.14	0.46	0.47	0.17
State appropriations per FTE ($)	6,029	5,948	2,261	7,319	6,780	3,764
State-Level Characteristics						
Median household income ($)	58,248	57,361	7,711	60,195	59,396	7,857
State unemployment rate (pct)	5.95	5.9	0.93	4.86	5	0.72
Share of minority population	0.18	0.19	0.09	0.22	0.21	0.09

Sources: U.S News and World report guidebooks, Integrated Postsecondary Data System (IPEDS); Census Bureau; Bureau of Labor Statistics

Table 3: Summary Statistics of the Subsample of Less Selective Programs (n=95)

	FY 2003-04			FY 2016-17		
Variable	Mean	Median	SD	Mean	Median	SD
Program-Level Characteristics						
Count of international students	25	9	35	28	16	41
Count of minority students	10	8	22	22	11	74
Share of full-time students	0.41	0.39	0.19	0.42	0.36	0.25
Median GMAT score	499	500	35	495	498	41
Average GPA	3.23	3.21	0.12	3.31	3.32	0.17
Out of state tuition ($)	11,450	10,952	4,234	16,376	16,129	5,332
Institution-Level Characteristics						
Share of graduate enrollment in total enrollment (pct)	0.14	0.13	0.07	0.14	0.12	0.07
Share of tuition revenue in total revenue (pct)	0.43	0.44	0.12	0.56	0.58	0.13
State appropriations per FTE ($)	4,748	4,443	1,712	6,419	5,683	3,601
State-Level Characteristics						
Median household income ($)	56,920	56,691	8,139	57,628	57,780	8,104
State unemployment rate (pct)	5.93	6.2	0.85	4.82	4.84	0.70
Share of minority population	0.20	0.19	0.08	0.24	0.21	0.09

Sources: U.S News and World report guidebooks, Integrated Postsecondary Data System (IPEDS); Census Bureau; Bureau of Labor Statistics

Analysis Method

I employ a time-series panel regression. The number of full-time minority students in full-time MBA programs is the dependent variable and the number international enrollment is

the key independent variable. I also include control variables that can capture program-,

institution- and state-level factors that vary over time and affect international and minority

enrollment for a given business program. The fixed-effects model (1) of interest is:

$$Y_{it} = \beta_1 X_{it} + \beta_2 W_{it-1} + \alpha_i + \delta_t + \varepsilon_{it} \tag{1}$$

In this model: Y is the outcome variable at program i in year t; the independent variable of

interest, X, is the number of international students in the full-time MBA class for a given

business school for a given year; β_1 is the coefficient of interest that measures the effect of

international enrollment on minority enrollment; W_{it-1} is a vector of program-, institution- and

state-level time-varying covariates lagged one year relative enrollment figures of interest; α_i

represents the vector of fixed effects; δ_t represent time fixed effects and ε_{it} is the error term.

Limitations

The first major limitation of the study is that because of data availability, the sample was

limited to AACSB accredited business schools in the United States. The study did not attempt to

generalize results beyond AACSB accredited MBA programs and focused on more prestigious

full-time MBA programs. Accreditation by internationally respected agencies, such as the

AACSB, is an important selling point of programs at reputable schools. AACSB has the most

stringent accreditation standards (Guo, 2018). AACSB-accredited business schools typically

belong to research-oriented higher education institutions (Kelchen, 2018). There are 820

business schools in 53 countries that have earned AACSB Accreditation. These schools represent

less than five percent of schools granting business degrees (AACSB, 2018). Thus, the sample is

not representative of the population of MBA providers since there are other accreditors. Besides,

business schools in the U.S. don't have to be accredited to operate. AACSB accreditation

standards emphasize a need to internationalize student experiences (Gordon, Heischmidt, & Greenwood, 2000). This is a strong stimulus to recruit more international students. Additionally, several studies indicated that AACSB accreditation is important to students selecting an institution of higher education for their studies (Hunt, 2015).

Another limitation of the study is that beta coefficients for the relationship between international enrollment and minority enrollment do not directly suggest cross-subsidization or crowd-out effect. To interpret the relationship coefficient as cross-subsidization, it is necessarily to look at the institutional and program budget and see how much tuition revenue was generated from international MBA students and how much institutional aid was given to minority students in full-time MBA programs.

Results

Table 4 presents fixed-effects estimates of the association between international enrollment and minority enrollment in full-time MBA programs in business schools affiliated with public universities. They indicate that a one percent increase in international enrollments is associated with a 0.20 percent growth in minority enrollment ($p < 0.001$). The magnitude of this relationship between international enrollment and minority enrollment is similarly small and positive for the subsamples of more and less selective MBA programs. These results demonstrate that as MBA programs increase international enrollment, they do not restrict access for minority students. This may also suggest that international students subsidize minority students, however, as mentioned in the limitation section, this study estimated correlational relationship rather than causal one.

There were several other predictors of minority enrollment in full-time MBA programs. The share of tuition revenue in total revenue at the university level is the strongest predictor of full-time MBA minority enrollment (B=1.13, p< 0.001). A one percent increase in the share of tuition revenue in total revenue leads to a 1.13 percent increase in minority student enrollment. One potential explanation is that public universities use additional tuition revenue to subsidize minority students in graduate business programs. Another possibility is that universities actively grow enrollment to increase tuition revenue.

Full-time minority enrollment is also associated with the proportion of full-time MBA enrollment in total enrollment (B=1.02, p< 0.001). A one percent in the share of full-time MBA enrollment leads to 1.02 increase in full-time minority enrollment. One possible explanation of this relationship is that as business schools try to expand enrollment in their full-time programs, they start to enroll more minority students. At the same time, this relationship is not significant for the subsample of less selective business programs.

There is a negative statistically significant relationship between the median GMAT score and minority enrollment. For the full sample (B=-0.00, p<0.05) and for the subsample of more selective programs (B=-0.00, p<0.05) the relationship is negative, meaning that as GMAT score goes down minority enrollment goes up. Meanwhile, the relationship between median GMAT score and minority enrollment is statistically significant and positive for the subsample of less selective programs (B=0.08, p<0.001), suggesting that the growth of the median GMAT score leads to minority enrollment increases.

The state unemployment rate is also a significant predictor of minority enrollment in full-time MBA programs for the full sample of programs as well as for the subsamples of more and less selective business programs. As unemployment rate goes up, full-time minority enrollment

in full-time MBA programs increases. The increased minority enrollment could be attributed to the declining opportunity cost of education during times of economic decline.

Table 4: Results for Fixed Effects Models (dependent variable - full-time MBA international enrollment)

	Full Sample		More Selective MBA Programs		Less Selective MBA Programs	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Log count of international students	0.20***	0.03	0.29***	0.04	0.10*	0.05
Log out-of-state tuition price	0.14*	0.07	0.30***	0.08	-0.15	0.13
Share of full-time enrollment in total enrollment	1.02***	0.13	0.86***	0.18	1.08***	0.20
Median GMAT score	-0.00*	0.00	-0.00*	0.00	-0.00	0.00
Average GPA	0.14	0.14	0.24	0.20	-0.00	0.00
Pct of enrollment as grad students	-0.97	0.62	0.22	0.76	0.44	0.48
Pct of revenue from tuition	1.13***	0.33	1.74***	0.49	0.09	0.20
Log state appropriations per FTE	-0.04	0.09	0.03	0.15	-0.68	0.07
Median household income	0.00	0.00	0.00	0.01	0.00	0.00
State unemployment rate	0.03**	0.00	0.02*	0.01	0.04*	0.02
Pct minority population	0.02	0.17	0.07*	0.03	0.01**	0.04
Observations	1,531		926		605	
Number of programs	200		107		93	
R-Squared	0.15339		0.1949		0.15786	
Adj R-Squared	0.018698		0.078321		0.015279	
Note. Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05						

Robustness Checks

Table 5 presents results of two robustness tests. The first robustness check (Model A) was conducted to eliminate concerns of whether the results of the analysis are driven by data from the period of the Great Recession. In a U.S. Census report "Postsecondary Enrollment Before, During, and Since the Great Recession", Schmidt (2018) showed that postsecondary enrollment patterns were affected by the crisis and there were substantial differences in enrollment by race. In 2009-11, Black and Hispanic students were enrolling in graduate and professional education at higher rates compared to White students. I excluded the academic years 2008-09 and 2009-10, that correspond to the period of the Great Recession.

My second robustness check (Model B1 & B2) looked at whether grouping schools by selectivity based on average undergraduate GPA of students in full-time MBA programs would produce similar regression estimates as with using average GMAT score to divide schools into less selective and more selective groups. The subsample of more selective MBA programs consisted of business schools with an average undergraduate GPA higher or equal to 3.29, and the subsample of less selective schools consisted of schools with an average GPA score below 3.29. The average undergraduate GPA of 3.29 was used as the cut off because it was the median undergraduate GPA for my subsample of business schools.

The estimates for both tests were robust to an alternative time frame and selectivity measure. One major difference in the estimates was that the proportion of underrepresented minority residents in the total state population was not a significant predictor of full-time minority enrollment for the subsamples of more selective and less selective business schools.

Table 5: Robustness Check - Panel Regression Results

	Model A		Model B1 More Selective MBA Programs		Model B2 Less Selective MBA Programs	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Log count of international students	0.23***	0.03	0.26***	0.04	0.15***	0.04
Log out-of-state tuition price	0.16*	0.08	0.32***	0.09	-0.05	0.10

Share of full-time enrollment in total enrollment	1.02***	0.15	0.91***	0.18	1.09***	0.20
Median GMAT score	-0.00*	0.00	-0.00*	0.00	-0.00	0.00
Average GPA	0.13	0.15	0.33	0.19	-0.08	0.20
Pct of enrollment as grad students	-0.51	0.71	0.48	0.82	-0.22	0.93
Pct of revenue from tuition	0.80*	0.37	0.96	0.50	1.35	0.46
Log state appropriations per FTE	-0.08	0.11	-1.08	0.28	0.09	0.14
Median household income	0.00	0.00	0.00	0.00	0.00	0.00
State unemployment rate	0.03**	0.01	0.02*	0.01	0.03*	0.01
Pct minority population	0.26	0.38	0.44	0.93	0.81	0.34
Observations Number of programs R-Squared Adj R-Squared	1,291 200 0.16137 0.0020013		800 97 0.1838 0.057598		731 103 0.15418 0.047275	
Note. Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05						

Discussion

Although racial disparities in overall graduate education have been narrowing, various

stakeholders from both within and outside academia have had debates about equity across MBA

recruitment and admission practices (Graduate Management Admission Council, 2018; Ethier,

2019; Howard, 2019). Master of business administration is an important and often necessary

credential for a career in business. It is crucial to understand institutional efforts for addressing

racial inequality in MBA admissions because it mirrors the whole educational sector's attempts

to reduce inequality in society.

In this study, I looked at fluctuations in minority enrollments in full-time MBA programs at public universities caused by international MBA enrollments. This paper adds to what we know about equity in graduate business education. I focused specifically on business schools affiliated with public universities because public institutions are famous for their commitment to equity and inclusive excellence for the domestic student population. That commitment can be compromised, however, because public institutions recruit out-of-state and international students that pay higher tuition and fees to increase their tuition revenue (Cantwell, 2015; Jaquette, Curs, & Posselt, 2016). My findings, nevertheless, concluded that increases in international enrollments do not reduce access for minority students and there may be small increase in minority enrollment as a result. Additionally, this study showed a strong positive statistically significant relationship between the share of tuition revenue in total university revenue and minority enrollment. This may either suggest that public universities use additional tuition revenue to subsidize full-time minority students in MBA programs or that business schools enroll more minority students to generate more revenue.

The study also showed that minority enrollment in full-time MBA programs at public research universities follows a counter-cyclical pattern. This finding aligns with Becker's (1993) Human Capital Theory model. The model theorizes that weak economy, and consequently, fewer employment opportunities and lower salaries lead to lower opportunity costs for receiving a higher education.

The findings have implications for practice and policy that aim to facilitate more diverse and inclusive graduate business education. By demonstrating a positive significant relationship between minority and international student enrollment, this study suggests that enrollment

managers of MBA programs affiliated with public universities do not have difficulties shaping a class that meets the institution's needs and goals.

Recommendations for Further Research

Quantitative studies might fail to explain the complexity of decision-making in MBA admissions. I therefore suggest further qualitative exploration of the concept of the Iron Triangle of Enrollment Management in the context of graduate business education. Qualitative studies can help understand views of business school enrollment management personnel and institutional leaders on how to best balance three enrollment goals. This will help to identify factors that promote as well as limit the advancement of minority students in MBA programs.

More research is needed to confirm subsidization. One interesting and worthwhile study would be a replication of this quantitative study to look at enrollment trends in MBA programs affiliated with private nonprofit universities to see if there would be a crowd out effect in that context. I expect to see results similar to the results in Borjas's study (2003). Borjas showed that international students crowd out domestic students in the subsample of graduate programs at elite private universities. Although my results indicated that there is no crowd out in MBA programs at public universities, the picture can be different in the context of more selective private schools. According to rankings like U.S. News and World and QS Quacquarelli Symonds, the majority of the most prestigious MBA schools are affiliated with elite private not-for-profit universities. Business schools at private elite universities charge significantly higher tuition, establish tougher admission standards and limit their class sizes which can potentially lead to a crowd out effect.

The relationship between the business cycle and graduate business school enrollment is another compelling area for future research. Long (2014) showed that enrollment growth spurred

by the Great Recession was strongest for part-time students and students of color. Scholars can explore and compare the impact of different economic indicators, such as employment growth, GDP growth, personal income growth on MBA enrollment patterns.

References

AACSB. (2020). *About*. Retrieved from AACSB: https://www.aacsb.edu/about

Alexander, E. R., & Frey, D. E. (1984). An Econometric Estimate of Demand for MBA
Enrollment. *Economics of Education Review, 3*(2), 97-103.

Altbach, P. G. (1998). *Comparative higher education: Knowledge, the university and
development.* Greenwich, CT: Ablex.

American Academy of Arts and Sciences. (2015). *Public Research Universities: Changes in
State Funding.* Retrieved from The Lincoln Project: Excellence and Access in Public
Higher Education:
https://www.amacad.org/sites/default/files/academy/multimedia/pdfs/publications/researc
hpapersmonographs/PublicResearchUniv_ChangesInStateFunding.pdf

Anderson, N. (2016, December 21). *Surge in foreign students may be crowding Americans out of
elite colleges*. Retrieved from The Washington Post:
https://www.washingtonpost.com/local/education/surge-in-foreign-students-might-be-
crowding-americans-out-of-elite-colleges/2016/12/21/78d4b65c-b59d-11e6-a677-
b608fbb3aaf6_story.html

Armstrong, J., Carlson, A., & Laderman, S. (2017). *The State Imperative: Aligning Tuition
Policies with Strategies for Affordability.* Retrieved November 2018, from State Higher
Education Executive Officers:
http://www.sheeo.org/sites/default/files/State_Tuition_Fees_Financial_Assistance_2017.
pdf

Archibald, R. B., & Feldman, D. H. (2008, May-June). Explaining Increases in Higher Education
Cost. *The Journal of Higher Education, 79*(3), 268-295.

Barringer, S. N. (2016). The Changing Finances of Public Higher Education Organizations:

   Diversity, Change, and Discontinuity. *Research in the Sociology of Organizations, 46*,

   223-263.

Bastedo, M. N., & Bowman, N. A. (2011). College rankings as an interorganizational

   dependency: Establishing the foundation for strategic and institutional accounts.

   Research in Higher Education, 52(1), 1-21.

Baum, S., & Johnson, M. (2015, November). *Financing Public Higher Education. The*

   Evolution of State Funding. Retrieved January 25, 2018, from Urban Institute :

   https://www.urban.org/sites/default/files/publication/72576/2000500-financing-public-

   higher-education-the-evolution-of-state-funding.pdf

Baum, S., & Steele, P. (2017). *Who Goes to Graduate School and Who Succeeds?* Retrieved

   from Urban Institute:

   https://vtechworks.lib.vt.edu/bitstream/handle/10919/84058/GradSchoolWhoSucceeds.pd

   f?sequence=1&isAllowed=y

Baum, S., & Steele, P. (2018, January). *Financing Graduate and Professional Education How*

   Students Pay. Retrieved from Urban Institute:

   https://vtechworks.lib.vt.edu/bitstream/handle/10919/87005/FinancingGraduate.pdf?sequ

   ence=1&isAllowed=y

Becker, G. S. (1994). Human Capital: A Theoretical and Empirical Analysis with Special

   Reference to Education, Third Edition. *National Bureau of Economic Research* .

Borjas, G. J. (2004). *Do foreign students crowd out native students from graduate programs?*

   (No. w10349). National Bureau of Economic Research. National Bureau of Economic

   Research.

Bound, J., Braga, B., Khanna, G., & Turner, S. (2016, December). A Passage to America: University Funding and International Students . *NBER Working paper series*. National Bureau of Economic Research .

Bowen, H. (1980). *The costs of higher education: How much colleges and universities spend per student and how much should they spend?* San Francisco: Jossey-Bass.

Bowman, N., & Bastedo, M. (2018). What Role May Admissions Office Diversity and Practices Play in Equitable Decisions? *Research in Higher Education, 59*(4), 430-447.

Bramhall, R. (2014). Turning Back the Tide on Contingency. *Academe, 100*(5), 27-29.

Brewer, D. J., Gates, S. M., & Goldman, C. A. (2002). *In pursuit of prestige: Strategy and competition in U.S. higher education. New Brunswick, NJ: Transaction Publishers.* New Brunswick, NJ: Transaction Publishers.

British Council. (2018, February 01). *International student mobility to grow more slowly to 2027.* Retrieved from British Council: https://www.britishcouncil.org/organisation/press/international-student-mobility-grow-more-slowly-2027

Cameron, C. A., & & Trivedi, P. K. (2005). *Microeconometrics: Methods and applications.* New York, NY: ambridge University Press.

Cantwell, B. (2015). Are International Students Cash Cows? Examining the Relationship Between New International Undergraduate Enrollments and Institutional Revenue at Public Colleges and Universities in the US . *Journal of International Students , 5*(4), 512-525.

Carini, R., Kuh, G., & Zhao. (2005). A comparison of international student and American student engagement in effective educational practices. *76*(2), 209-231.

Cheslock, J. J., & Gianneschi, M. (. (2008). Replacing state appropriations with alternative

    revenue sources: The case of voluntary support. Journal of Higher Education, 79(2), 208–

    229. *Journal of Higher Education*, 208–229.

College Board. (2017). *Trends in Higher Education Series.* Retrieved from Trends in College

    Pricing 2017: https://research.collegeboard.org/pdf/trends-college-pricing-2017-full-

    report.pdf

Cooper, P. (2017, June). *Pennies on the Dollar: The Surprisingly Weak Relationship between*

    State Subsidies and College Tuition. Retrieved February 2019, from American Enterprise

    Institute: http://www.aei.org/wp-content/uploads/2017/06/Pennies-on-the-Dollar.pdf

Curs, B. R., & Jaquette, O. (2017). Crowded Out? The Effect of Nonresident Enrollment on

    Resident Access to Public Research Universities. *Educational Evaluation and Policy*

    Analysis.

Dar, L., & Lee, D. W. (2014). Partisanship, Political Polarization, and State Higher Education

    Budget Outcomes. *The Journal of Higher Education, 84*(4), 469-498.

Davis, G. F., & Cobb, J. A. (2009). Resource dependence theory: Past and future. *Research in*

    the Sociology of Organizations, 28, 21–42.

de Vega, G. A. (2016). *How Variances in Business School Rankings Affect Enrollment Trends*

    and Practices. Retrieved from Seton Hall University Dissertations and Theses (ETDs):

    http://scholarship.shu.edu/dissertations/2137

Delisle, J. D., & Cooper, P. (2018, August 06). *What more funding for state universities buys*

    students. Retrieved from The American Enterprise Institute :

    https://www.aei.org/publication/what-more-funding-for-state-universities-buys-students/

Deschamps, E., & Lee, J. (2015). Internationalization as Mergers and Acquisitions: Senior

International Officers' Entrepreneurial Strategies and Activities in Public Universities.

Journal of Studies in International Education, 19(2), 122-139.

Desrochers, D. M., & Hurlburt, S. (2016, January). Trends in College Spending: 2003–2013.

American Institutes for Research.

Doyle, W. R. (2012). The politics of public college tuition and state financial aid. *The Journal of

Higher Education, 83*(5), 617-647.

Egron-Polak, E., & Hudson, R. (2010). *Internationalization of Higher Education: Global Trends,

Regional Perspectives. IAU 3rd Global Survey Report.* Parris: International Association

of Universities.

Ethier, M. (2019, September 04). *Focus On Diversity Pays Off In Latest Berkeley Haas Class.*

Retrieved from Poets & Quants: https://poetsandquants.com/2019/09/04/berkeley-haas-

school-of-business-berkeley-mba-program-class-profile/

FinAid. (2018). *In-State Tuition and State Residency Requirements*. Retrieved from

http://www.finaid.org/otheraid/stateresidency.phtml

Friga, P. N., Bettis, R. A., & Sullivan, R. S. (2003, August). Changes in Graduate Management

Education and New Business School Strategies for the 21st Century. *Academy of

Management Learning and Education, 2*(3).

Geiger, R. L. (2015). Impact of the Financial Crisis on Higher Education in the United States .

International Higher Education, 59.

Goldrick-Rab, S., Kelchen, R., & Houle, J. (2014, September 2). *The color of education debt:

Implications of federal loan program reforms for Black students and Historically Black

Colleges and Universities.* Retrieved from University of Wisconsin-Madison, Wisconsin

HOPE Lab: https://news.education.wisc.edu/docs/WebDispenser/news-connections-pdf/thecolorofstudentdebt-draft.pdf?sfvrsn=4

Goodman, S., & Henriques, A. 2. (2015). Attendance Spillovers between Public and For-Profit Colleges: Evidence from Statewide Changes in Appropriations for Higher Education. *Finance and Economics Discussion Series*, 25

Gordon, P., Heischmidt, K., & Greenwood, R. (2000, Fall). How to Internationalize the Business Curriculum: Some Ideas That work Based on Experience. *Proceedings of the Western Decision Science Institute*, 308-310.

Graduate Management Admission Council. (2018). *Understanding Underrepresented Populations in the Business School Pipeline.* Retrieved from Graduate Management Admission Council: https://www.gmac.com/~/media/Files/gmac/Research/research-report-series/rr-16-02-underrepresented-populations-v2.pdf

Grawe, N. D. (2018). *Demographics and the demand for higher education.* Baltimore, Maryland : Johns Hopkins University Press.

Grow, N. (2020, March 2020). *H-1B Petition Pitfalls — And How International Students Can Avoid Them*. Retrieved from Poets & Quants: https://poetsandquants.com/2020/03/04/h-1b-petition-pitfalls-and-how-international-students-can-avoid-them/

Hammond, K. L., Cook-Wallace, M. K., Moser, E. R., & Harrigan, R. L. (2015). Traditional MBA Admissions Criteria and Graduate School Success: The Importnce of GMAT Scores and Undergraduate GPA as Predictors of Graduate Business School Performnce. *Academy of Educational Leadership Journal, 19*(2), 67-75.

Hemelt, S. W., & Marcotte, D. E. (2011). The impact of tuition increases on enrollment at public col- leges and universities. *Educational Evaluation and Policy Analysis, 33*, 435–457.

Herbst, M. (2007). *Financing Public Universities: The Case of Performance Funding.* Zurich, Switzerland: Springer.

Hillman, N. (2012). Tuition discounting for revenue management. *Research in Higher Education, 53*(3), 263-281.

Hillman, N. W., Tandberg, D. A., & Gross, J. (2014). Market-Based Higher Education: Does Colorado's Voucher Model Improve Higher Education Access and Efficiency? *Research in Higher Education, 55*(6), 601-625.

Hoenack, S. A., & Weiler, W. C. (1979, January). The Demand for Higher Education and Institutional Enrollment Forecasting. *Economic Inquiry, 17*, 89-113.

Hovey, H. A. (1999). *State spending for higher education in the next decade: The battle to sustain current support.*

Howard, B. (2019, March 26). *What to Consider About Business School Diversity.* Retrieved from U.S.News and World Report: https://www.usnews.com/education/best-graduate-schools/top-business-schools/articles/2019-03-26/what-to-consider-about-business-school-diversity-before-applying

Hunt, S. (2015). Research On The Value Of AACSB Business Accreditation In Selected Areas: A Review And Synthesis. *American Journal Of Business Education, 8*(1), 23-30.

Institute of International Education. (2019). *Open Doors 2019 .* Retrieved November 2018, from Institute of International Education: https://www.iie.org/en/Research-and-Insights/Open-Doors/Data

Jaquette, O., & Curs, B. R. (2015 , January 23). Creating the Out-of-State University: Do Public Universities Increase Nonresident Freshman Enrollment in Response to Declining State Appropriations? *Research in Higher Education, 56*(5), 535–565 .

Jaquette, O., Curs, B. R., & Posselt, J. R. (2016). Tuition rich, mission poor: Nonresident

    enrollment growth and the socioeconomic and racial composition of public research

    universities. *The Journal of Higher Education, 87*, 635–673.

Jaquette, O., Kramer, D. A., & Curs, B. R. (2018). Growing the Pie? The Effect of

    Responsibility Center Management on Tuition Revenue. *The Journal of Higher

    Education, 89*(5), 637-676.

Johnstone, D. B., & Marcucci, P. N. (2010). *Financing Higher Education Worldwide: Who

    Pays? Who Should Pay?* Baltimore, MD: The Johns Hopkins University Press.

Jordan, M. (2015, March 24). *International Students Stream Into U.S. Colleges.* Retrieved April

    09, 2018, from The Wall Street Journal : https://www.wsj.com/articles/international-

    students-stream-into-u-s-colleges-1427248801

Kane, T. J., Orszag, P. R., Apostolov, E., Inman, R. P., & Reschovsky, A. (2005). Higher

    education appropriations and public universities: Role of Medicaid and the business

    cycle. *Brookings-Wharton papers on urban affairs*, 99-146.

Kelchen, R. (2018, January). *Does the Bennett Hypothesis Hold in Professional Education? An

    Empirical Analysis*. Retrieved from Association for Institutional Research :

    https://www.airweb.org/GrantsAndScholarships/Documents/Grants2016/KelchenScholarl

    yPaper2.pdf

Kelchen, R. (2019, November). Do Nonresident Students Affect Prices for In-State Students at

    Public Colleges. *Teachers College Record Volume, 121*(2).

Kelly, A., & Rodriguez, A. (2014). *Access, affordability, and success: How do America's

    colleges fare and what could it mean for the President's ratings plan?* Washington DC:

    American Enterprise Institute.

Kiley, K. (2012, October 8). *The Cost of Values.* Retrieved from Inside Higher Ed: https://www.insidehighered.com/news/2012/10/08/changes-funding-sources-shifting-public-university-admissions

Kim, M. M., & Ko, J. (2015). The Impacts of State Control Policies on College Tuition Increase. *Educational Policy, 29*(5), 815–838.

Komissarova, O. (2019). Exploring the Relationship between International Undergraduate Enrollment and Net Tuition Revenue at U.S. Colleges and Universities. *NAFSA Research Symposium Series, 3*.

Labaree, D. F. (2017). *A Perfect Mess: The Unlikely Ascendancy of American Higher Education.* Chicago: University of Chicago Press.

Lee, J. J. (2008). Beyond Borders: International Student Pathways to the United States. *Journal of Studies in International Education, 12*(3), 308-327.

Lee, J. J. (2010). International students' experiences and attitudes at a us host institution: Self-reports and future recommendations. *Journal of Research in International Education, 9*(66), 66-84.

Lee, J. J., Maldonado-Maldonado, A., & Rhoades, G. (2006). The political economy of international student flows: Patterns, ideas, and propositions. *Higher Education: Handbook of Theory and Practice, 21*, 545-590.

Li, A. Y. (2017). Dramatic Declines in Higher Education Appropriations: State Conditions for Budget Punctuations. *Research in Higher Education, 58*, 395–429.

Long, B. T. (2014). The financial crisis and college enrollment: how have students and their families responded? In *How the financial crisis and Great Recession affected higher education* (pp. 209-233).

Lord, W. P. (2018). Institutional Aid and Net Tuition Revenue: Understanding the Relationship

  Across Private Institutions of Different Carnegie Classifications. S*eton Hall University*

  Dissertations and Theses (ETDs).

Lowry, R. (2001). The effects of state political interests and campus outputs on public university

  revenues. *Economics of Education Review, 20*, 105-119.

Lyall, K. C., & Sell, K. R. (2006). The de facto privatization of American public higher

  education. *Change: The Magazine of Higher Learning, 38*(1), 6-13.

Ma, J., Baum, S., Pender, M., & Welch, M. (2017). *Trends in College Pricing 2017.* New York:

  College Board.

Martin, R., & Gillen, A. (2009). Breaking the Cost Spiral. *Inside Higher Ed* .

McDonald, M., & Lorin, J. (2018, September 2018). *Texas, Virginia Universities Post Double-*

  Digit Endowment Gains. Retrieved from Bloomberg:

  https://www.bloomberg.com/news/articles/2018-09-18/texas-virginia-universities-post-

  double-digit-endowment-gains

McLendon, M. K., Hearn, J. C., & Mokher, G. C. (2009). Partisans, professionals, and power:

  The role of political factors in state higher education funding. *The Journal of Higher*

  Education, 80(6), 686-713.

McLendon, M., Mokher, C., & Doyle, W. (2009). 'Privileging' Public Research Universities: An

  Empirical Analysis of the Distribution of State Appropriations Across Research and Non-

  Research Universities. *Journal of Education Finance, 34*(4), 372-401.

Mitchell, M., Leachman, M., & Masterson, K. (2017, August 23). *A Lost Decade in Higher*

  Education Funding: State Cuts Have Driven Up Tuition and Reduced Quality. Retrieved

from Center on Budget and Policy Priorities: https://www.cbpp.org/research/state-budget-and-tax/a-lost-decade-in-higher-education-funding

Morse, R., Castonguay, A., Vega-Rodriguez, J., & Brooks, E. (2020, March 16). *Methodology: 2021 Best Business Schools Rankings.* Retrieved from U.S. News and World Report: https://www.usnews.com/education/best-graduate-schools/articles/business-schools-methodology

NAFSA: Association of International Educators. (2018). *Financial Aid for Undergraduate International Students.* Retrieved from NAFSA: https://www.nafsa.org/About_Us/About_International_Education/For_Students/Financial _Aid_for_Undergraduate_International_Students/

NASFAA. (2020). *State and Regional College Tuition Discounts.* Retrieved from https://www.nasfaa.org/State_Regional_Tuition_Exchanges

National Center for Education Statistics. (2018, May). *Undergraduate Enrollment* . Retrieved from National Center of Education Statistics.

National Center for Education Statistics. (2019, April). *The Condition of Education. Graduate Degree Fields*. Retrieved from https://nces.ed.gov/programs/coe/indicator_ctb.asp

National Foundation for American Policy. (2018). *Declining International Student Enrollment at U.S. Universities and Its Potential Impact* . Retrieved from https://nfap.com/wp-content/uploads/2018/02/Decline-in-International-Student-Enrollment.NFAP-Policy-Brief.February-2018-2.pdf

National Science Board. (2018). *International students enrolled in U.S. higher education institutions, by broad field and academic level: 2012–17.* Retrieved November 2018,

from National Science Foundation:

https://www.nsf.gov/statistics/2018/nsb20181/assets/561/tables/tt02-10.pdf

OECD. (2018). *Foreign / international students enrolled*. Retrieved November 2018, from

OECD.Stats: https://stats.oecd.org/Index.aspx?DataSetCode=RFOREIGN

Okahana, H., & Zhou, E. (2019). *Graduate Enrollment and Degrees: 2008 to 2018.* Retrieved

from The CGS/GRE Survey of Graduate Enrollment:

https://cgsnet.org/ckfinder/userfiles/files/CGS_GED18_Report_web.pdf

Oliff, P., Palacios, V., Johnson, I., & Leachman, M. (2013, March 19). *Recent Deep State Higher*

Education Cuts May Harm Students and the Economy for Years to Come. Retrieved

January 20, 2018, from Center on Budget and Policy Priorities:

https://www.cbpp.org/sites/default/files/atoms/files/3-19-13sfp.pdf

O'Meara, K. A. (2007). Striving for what? Exploring the pursuit of prestige Springer. In S. J. D.,

Higher education: Handbook of theory and research (Vol. 21, pp. 121–179). New York,

NY: Springer.

Parker, E. (2017, May 18). *Coupling Incentives to Tuition Caps: A new path toward*

affordability? Retrieved January 27, 2018, from Education Commission of the States:

https://www.ecs.org/coupling-incentives-to-tuition-caps-a-new-path-toward-affordability/

Perna, L. W., Steele, P., Woda, S., & Hibbert, T. (2005). State public policies and the

racial/ethnic stratification of college access and choice in the state of Maryland. *Review*

of Higher Education, 28, 245–272.

Posselt, J. P., & Grodsky, E. (2017). Graduate Education and Social Stratification. *Annual*

Review of Sociology, 353-378.

Pratt, T. (2014, June 13). *Residents are crowded out of college by out-of-state and foreign students*. Retrieved from The Hechinger Report: https://hechingerreport.org/residents-crowded-college-state-foreign-students/

Pfeffer, J., & Salancik, G. R. (1978). *The External Control of Organizations: A Resource Dependence Perspective.* New York: Harper & Row.

Pierce, S., Bolter, J., & Selee, A. (2018). *Trump's first year on immigration policy: Rhetoric vs. Reality.* Washington, DC: Migration Policy Institute.

Regets, M. C. (2007). *Research issues in the international migration of highly skilled workers: a perspective with data from the United States.* Arlington, VA USA: National Center for Science and Engineering Statistics at the National Science Foundation.

Schmidt, E. (2018, April). *Postsecondary Enrollment Before, During, and Since the Great Recession.* Retrieved from U.S. Census Bureau: https://www.census.gov/content/dam/Census/library/publications/2018/demo/P20-580.pdf

Selingo, J. (2017, June 26). *The Future of Enrollment: Where Colleges Will Find Their Next Students.* The Chronicle of Higher Education. Retrieved from Huffington Post: https://www.huffingtonpost.com/entry/us-colleges-are-facing-a-demographic-and-existential_us_59511619e4b0326c0a8d09e9

SHEEO. (2016). *State Higher Education Finance FY 2016.* Retrieved January 2018, from SHEEO: http://www.sheeo.org/sites/default/files/project-files/SHEEO_SHEF_2016_Report.pdf

Shen, Y. (2017). The Impacts of the Influx of New Foreign Undergraduate Students on U.S. Higher Education. *Working Paper*.

Shih, K. (2017, October). Do International Students Crowd-Out or Cross-Subsidize Americans in higher education. *Journal of Public Economics* .

Shulman, S. (2017). Contingency in Higher Education: Evidence and Explanation. *Academic Labor: Research and Artistry, 1*(Article 3).

Sigritz, B. (2016). *State Expenditure Report: Examining Fiscal 2014-2016 State Spending.* Washington, DC: NASBO.

Slaughter, S., & Leslie, L. L. (1997). *Academic capitalism: politics, policies, and the entrepreneurial university.* Baltimore: Johns Hopkins University Press.

Startz, D. (2020, March 17). *Coronavirus will harm America's international students - and the universities they attend.* Retrieved from Brookings: https://www.brookings.edu/blog/brown-center-chalkboard/2020/03/17/coronavirus-will-harm-americas-international-students-and-the-universities-they-attend/

State Higher Education Executive Officers Association. (2017). *State Higher Education Executive Officers Association.* Retrieved from State Higher Education Executive Officers Association: https://sheeoorg.wpengine.com/wp-content/uploads/2019/03/SHEF_FY16.pdf

Tandberg, D. (2010). Politics, interest groups and state funding of public higher education. *Research in Higher Education, 51*(5), 416-450.

Tausche, K., & Dhue, S. (2017, September 19). *U.S. Business Schools are Struggling to Recruit International Candidates*. Retrieved from https://www.cnbc.com/2017/09/19/us-business-schools-are-struggling-to-recruit-international-candidates.html

The College Board. (N/A). *Trends in Higher Education.* Retrieved January 25, 2018, from The
College Board: https://trends.collegeboard.org/college-pricing/figures-tables/total-and-
student-state-and-local-funding-and-public-enrollment-over-time

Thomason, A. (2013, October 15). Diversity Aside, International Students Bring a Financial
Incentive. *The Chronicle of Higher Education*.

Toutkoushian, R. K. (2001). Trends in revenues and expenditures for public and private higher
education. In M. B. Paulsen, *The finance of higher education: Theory, research, policy,
and practice* (pp. 11-38).

Toutkoushian, R. K., & Hillman, N. W. (2012). The impact of state appropriations and grants on
access to higher education and outmigration. *Review of Higher Education, 36*(1), 51–90.

United Nations Educational, Scientific and Cultural Organization. (2020). *Outbound
internationally mobile students by host region.* Retrieved from UNESCO Institute for
Statistics: http://data.uis.unesco.org/Index.aspx?queryid=172

Urban Institute. (2017). *Endowments.* Retrieved from Understanding College Affordability:
http://collegeaffordability.urban.org/cost-of-
educating/endowments/#/income_from_endowments

Webber, D. A. (2017). State divestment and tuition at public institutions. *Economics of
Education Review, 60*, 1-4.

Weerts, D. J., & Ronca, J. M. (2012, March/April). Understanding Differences in State Support
for Higher Education across States, Sectors, and Institutions: A Longitudinal Study. *The
Journal of Higher Education, 83*(2), 155-185.

Weis, L., Cipollone, K., & Jenkins, H. (2014). *Class Warfare: Class, Race, and College
Admissions in Top-Tier Secondary Schools.* University of Chicago Press.

Young, R., & Johnson, D. R. (2015). Handling missing values in longitudinal panel data with multiple imputation. *Journal of Marriage and Family, 77*(1), 277-294.

Zerquera, D. D. (2019). The Problem with the Prestige Pursuit: The Effects of Striving on Access for Black and Latino Students at Urban-Serving Research Universities. *The Review of Higher Education, 42*, 393-424.

Zhang, L. (2010). The use of panel data models in higher education policy studies. *Higher Education: Handbook of Theory and Research, 25*, 307-349.

Zhang, L. A., & Ness, E. C. (2010). Does state merit-based aid stem brain drain? . *Educational Evaluation and Policy Analysis, 32*(2), 143-165.

Zhao, B. (2018). Disinvesting in the Future? A Comprehensive Examination of the Effects of State Appropriations for Public Higher Education. *Working Papers.* Federal Reserve Bank Boston.

Zinth, K., & Smith, M. (2012, October). *Tuition-setting authority for public colleges and universities. Education Commission of the States.* Retrieved February 2018, from Education Comission of the States: http://www.ecs.org/clearinghouse/01/04/71/10471.pdf