The Effect of In-State Tuition on International Student Enrollment: Evidence from the Heartland

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In 2008, the Minnesota State Colleges and Universities (MSCU) system modified residency criteria for tuition determinations and allowed institutions to charge international students in-state tuition. We use IPEDS data and a difference-in-differences design to determine the impact of the policy change on new international student enrollment in MSCU public four-year colleges relative to those in neighboring states, the Heartland, and all other states. We also derive a synthetic control group and compare the results. The findings indicate the MSCU policy allowing international students to pay in-state tuition drew 385 new international students to the state in the policy's first year. Domestic student enrollment did not change, so we infer the policy resulted in an increase in net revenues. We discuss the benefits of expanding in-state tuition to international students, including how it can attract international students to less selective and regional college and universities, increase the cultural diversity of campus and local communities, and expand access to higher education to a more socioeconomically diverse population of students seeking to study in the United States.

Keywords**:** *higher education policy, international students, tuition, difference-in-differences*

Recruiting international students to U.S. higher education institutions is thought to be a means of generating revenue that helps to address fluctuations in state appropriations and student enrollments. Typically, international students are willing to cover tuition and fees and pay for many other goods and services while they study in the United States. However, because costs are a significant factor in their decisions about study abroad location and destination institution (Tan, 2015; Wilkins et al., 2012), providing more attractive tuition and fee packages (e.g., resident tuition and fees, or 150% of resident tuition and fees rather than non-resident tuition fees) may be a draw for international students.

In 2008, the Minnesota State Colleges and Universities system (MSCU) began to allow its 37 public colleges and universities (seven four-year colleges and 30 two-year colleges) to offer international students in-state tuition rates, with the goal of increasing the number of international students and tuition revenue. Specifically, MSCU's *Board Policy 2.2. State Residency* revised how residents and nonresidents were classified, which had implications for eligibility for receiving in-state tuition benefits. The policy afforded MSCU institutions the opportunity to set their own criteria for determining the residency of students, including making international students eligible for in-state tuition rates.

We examine how in-state tuition for international students (ISTIS), which reduces the sticker price for international students, changed new international student enrollment across four-year MSCU campuses. We do so by using data from Integrated Postsecondary Education Data System (IPEDS) and the Institute of International Education (IIE), which tracks the number of international students enrolled at each U.S. institution. We use a difference-in-differences design to determine international student enrollment changes following the introduction of the ISTIS policy. We compare public four-year institutions in Minnesota to control institutions in neighboring states, to institutions in other states in the Heartland (specifically, states in the Midwestern Higher Education Compact), and to institutions across the U.S. We also derive a synthetic control group using synthetic difference-in-differences methods (Abadie et al., 2010).

Results suggest that the ISTIS policy significantly increased international student enrollment in the state. In the first year of the policy, 385 new international students enrolled in MSCU four-year institutions, and 314 did so in the second year. Domestic student enrollment did not change. The findings of the study suggest in-state tuition for international students may be a promising policy for increasing international student enrollment and, subsequently, tuition revenues. The study offers important evidence in a context of declining domestic support for U.S. higher education and declining international student enrollment due to the COVID-19 pandemic.

Literature Review

The U.S. has typically been a top destination for students seeking opportunities for higher education abroad. It holds 18% of the global education market share and is the top destination within the Organisation for Economic Cooperation and Development (OECD) nations (OECD, 2020). Roughly 1.1 million international students enrolled in U.S. colleges and universities each academic year from 2016-2017 to 2019-2020, comprising 5.5% of the U.S. higher education population (IIE, 2020). Enrollments declined by 15% to 914,000 (4.6% of all college students) in 2020-2021 as the COVID-19 global pandemic led to travel and visa restrictions, but reports indicate a slight positive rebound in enrollment in Fall 2021 (Martel, 2021). Just over half of international students in the U.S. originate from China or India, and California and New York are the top two destination states (IIE, 2020).

U.S. colleges and universities welcome and seek to attract international students for a variety of reasons. In addition to expanding intellectual vitality and talent, international students contribute to the local economy and workforce (Hegarty, 2014). They also bring cultural diversity to campuses and local communities, which is especially important in regional institutions serving more rural areas (Orphan & McClure, 2019).

For these reasons much attention has been to paid to the "internationalization" efforts campuses have engaged in with the goal of increasing international student enrollment and better serving international students (Altbach & Knight, 2007; George Mwangi & Yao, 2020). Since more than 50% of international students prefer to attend R1 doctoral and ranked universities (IIE, 2019), internationalization and recruitment efforts are particularly important at less selective regional colleges and universities, who may find it more of a challenge to bring a large number of international students to their campus. For example, Akiba (2021) documented the positive benefits of a program designed to recruit Japanese students to a regional institution. Institutions have also relied on third-party recruitment agent networks to bolster their international student recruitment (Farakish et al., 2020; Redden, 2018).

Declining Funding Across U.S. Public Higher Education

One reason internationalization has been a campus priority is because international students typically provide important sources of revenue to destination institutions. Since the early 2000s, state and local governments have lost a large amount of revenue from resources such as income taxes, property taxes, and sales taxes (Hegarty, 2014; Jackson & Saenz, 2021; Johnson et al., 2011; Nehls et al., 2017), and at least 43 states cut higher education funding. In response, U.S. public higher education institutions in these states have had to raise tuition and fees, reduce student services, and lay off their staff and faculty to offset state funding cuts (Jackson & Saenz, 2021; Johnson et al., 2011).

Although there were slight rebounds in public funding for higher education, the onset of the COVID-19 pandemic again led to decreases in state and local tax revenues and caused many states

to cut their higher education funding (American Council on Education, 2020; Cheche et al., 2021; Jackson & Saenz, 2021). For example, 37 states had to reduce per-student spending (Jackson & Saenz, 2021). Estimates suggest U.S. colleges and universities would need at least $120 billion to offset lost funding, to offer students financial assistantships, and to operate quality and safe in-person and remote classes (American Council on Education, 2020). Remarkably, U.S. Congress agreed to pass the Coronavirus Aid, Relief, and Economic Security (CARES) Act in March 2020, providing much-needed support for U.S. colleges and universities who were struggling to offset revenue losses and support student aid (Jackson & Saenz, 2021).

In response to declining public investment in higher education and funding volatility, research, master's, and baccalaureate institutions alike have used several strategies to recoup the deficit of state appropriations (Hurlburt & Kirshstein, 2012; Jaquette & Curs, 2015). Some of these efforts include increasing research activities to procure additional grant and contract revenues from research (Slaughter & Rhoades, 2004). Others ramp up fundraising efforts to find more donors and investors who are willing to set up private gifts (Cheslock & Gianneschi, 2008). Yet still, researchers posit that the funds generated by research activities and voluntary support (e.g., donation, gifts, and grants) at public higher education institutions could not be greater than the funds generated by tuition revenue (Jaquette & Curs, 2015).

Recruiting International Students to U.S. Higher Education

Increasing in-state tuition can be a complicated legislative and public relations challenge (Zinth & Smith, 2012), leading some institutions to recruit more non-resident students to offset the decline in state appropriations (Jaquette & Curs, 2015). In particular, recruiting international students to U.S. higher education institutions is expected to be a strategy that generates revenue and helps to address fluctuations in state appropriations and student enrollments (Choudaha, 2017; Cantwell, 2015). An analysis of the effects of declining state appropriations over time showed that a 10 percent reduction in state appropriations led to an increase in foreign enrollment of 16 percent at public research universities (Bound et al., 2020). These efforts also appear to pay off. In the academic year 2018-2019, about $45 billion was contributed by the entire population of international students who were enrolled in U.S. colleges and universities (IIE, 2019). Increasing international student enrollment also appears to generate revenue that subsidizes and increases domestic student enrollment (Shih, 2017), though not all institutions are able to increase revenues through this strategy (Cantwell, 2015).

International student enrollment dramatically declined at the onset of the COVID-19 pandemic. Estimates suggest that more than 40,000 international students deferred enrollment to a future semester (American Council on Education, 2020; IIE, 2020). As international students provide a much-needed source of revenue, it is important to examine policies and practices that may attract international students and increase enrollment.

International Students' College Choice Processes – Push and Pull Factor Theory

We draw from push-pull theory to examine how a reduction in tuition costs, one of the key factors in international students' decision-making processes, may change their enrollment choices. The origin of push-pull theory was developed to study the factors that impact people moving from one place to another (Lee, 1966), such as moving from one apartment or country to another. In framing and analyzing these acts of migration, Lee (1966) explored the factors at departure and destination countries, such as the set of obstacles (e.g., economic conditions and political and cultural tensions) and the series of personal factors (e.g., motivation, career improvement, and gender issues) that influence migration choices (Lee, 1966). Migrants make the final decision to move to a new host

country when they find negative factors in their home countries and positive factors in host countries (Lee, 1966).

Higher education researchers have used push-pull theory to analyze why international students decide to study abroad and how they select a host country and host institution (Chen, 2008; Gesing & Glass, 2018; Mazzarol & Soutar, 2002; Wilkins et al., 2012). For example, Mazzarol and Soutar (2002) used push-pull theory to investigate how international students, who are currently enrolled in Australian higher education institutions, made decisions regarding study abroad destinations. Similarly, Chen (2008) used push-pull theory to describe how international graduate students who studied in two Canadian higher education institutions were considered push and pull factors at each of the three stages of the decision-making process, including the decision to study abroad, the choice of a country, and the choice of an institution.

Based on these and other researchers' findings, push factors include the lack of qualified higher education institutions and good job opportunities; economic, political, and social issues; limited enrollment in specific programs; and strict immigration policies (Chen, 2008; Gesing & Glass, 2018; Mazzarol & Soutar, 2002; Wilkins et al., 2012). Pull factors that attract international students to the destination include the availability of high-quality programs; the prestige, rankings, and reputation of the institution; the availability of financial aid and scholarships; the standard of living in the area; an abundance of high paying job opportunities; the flexibility of immigration policies; and a safe environment (Chen, 2008). Additional factors other researchers describe include the national political climate and context of receptivity of the destination state and institution (Hacker & Bellmore, 2019).

The Importance of Cost of Education for International Students

The cost of education is consistently reported as one of the most significant factors when domestic (e.g., resident and out-of-state) and international students make their college choices (Chen, 2008; Jaquette & Curs, 2015; IIE, 2015; Mazzarol & Soutar, 2002; Onsman, 2013; Tan, 2015; Wilkins et al., 2012). In the academic year 2020-2021, IIE found that more than 80% of international undergraduate students and 53% of international graduate students used their personal and family funding to pay for their studies (IIE, 2021). Typically, international students spend two to three times more than the resident tuition rate, and they are willing to cover tuition and fees and contribute many educational expenses in the United States (National Center for Education Statistics, n.d.).

Research has shown that costs do influence international students' choices of destination and institution. Chen (2008) observed that Chinese students selected higher education institutions in Australia because of the low tuition, fees, and living expenses. Mazzarol and Soutar (2002) observed more Canadian and Mexican students were willing to study in U.S. institutions because they could easily come back to their home countries and save a significant amount of travel-related expenses. Furthermore, Wilkins et al. (2012) reported that international students considered attending international branch campuses because of attractive tuition and fees compared to institutions located in the U.S. and U.K. The salience of cost as a pull factor also varies by family income and the economic development of the home country (e.g., low income, middle income, and high income) (Lee, 2014; Gesing & Glass, 2018). For example, Lee (2014) found that international students from Southeast Asian countries were very concerned about the cost of tuition, fees, and living expenses, and subsequently were very responsive to the number of scholarships, grants, and stipends they are awarded when they decide to study abroad. Indeed, in a survey that included nearly 16,000 valid international students' responses, nearly 10,000 international students felt higher education institutions in the U.S. were so expensive that it would be challenging to pay for all educational

expenses while attending. The survey reported that more than 6,000 international students would be willing to make a final decision about study abroad destination and school quickly if institutions offered them scholarships, grants, and stipends. Given these trends, we explore a policy that lowered the cost of college for international students to assess the gravity of cost as a pull factor.

Setting

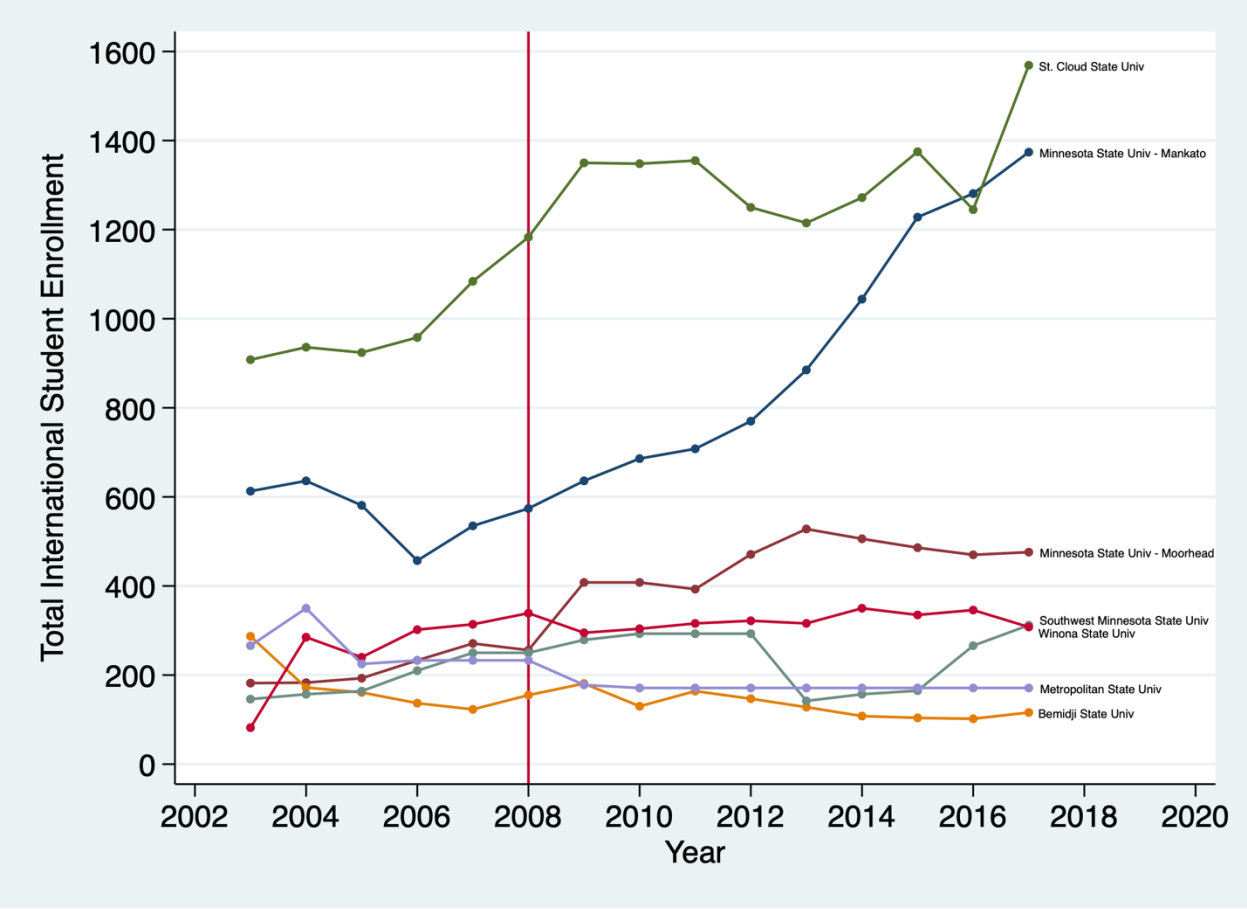
We focus on the state of Minnesota, which is neither a top 10 international student destination state nor has a top 10 international student-receiving institution since at least the year 2000 (IIE, 2020). However, efforts to attract international students appear to have increased in Minnesota over time. This began in 1995, when the Board of Trustees of the Minnesota State system developed *Board Policy 2.2. State Residency*. The policy was implemented throughout the Minnesota State Colleges and Universities system (MSCU), which includes 37 state colleges and universities, in 1997. The purpose of this policy was to offer MSCU a standard procedure to determine the appropriate tuition charges based on students' status, either State Residents or Non-Resident Students. The policy has been revised six times since 1995.

The key policy change examined in this study is MSCU's revision of Part 4 in 2008 (Minnesota State, 2008). MSCU added the specific classification of residents and non-residents and the criteria for receiving in-state tuition. In general, only domestic students who meet residency requirements set by U.S. public higher institutions qualify for in-state resident tuition. However, Part 4 of Board Policy 2.2 State Residency, "Non-Resident Students Allowed to Pay the Resident Tuition Rate," states that non-resident students are allowed to receive the resident tuition rate if they meet the specific requirements listed under Part 4. Specifically, the language states "Colleges and universities may charge resident tuition to nonimmigrant international students classified under 8, U.S.C. 1101 (a) (15) (B), (F), (H), (J), and (M)" (Minnesota State, 2008). In other words, individual MSCU institutions are allowed to offer out-of-state domestic and international students, most of whom have F-1 or J-1 visas, the in-state tuition rate.

To better understand which MSCU institutions chose to implement the policy, we conducted a scan of college websites. For example, Minnesota State University – Moorhead has implemented the "In-State Scholarship Policy for International Students," initiated by the Office of International Programs. St. Cloud State University and Minnesota State University – Mankato created the "Academic and Cultural Sharing Scholarship" and the "In-State Tuition Scholarship," respectively. As expected, data from the IIE shows that these policy changes appear to have affected international student enrollment in MSCU public four-year campuses. Figure 1 shows total international student enrollment at each public four-year MSCU institution. The increase is largest in a subset of these institutions, suggesting new freshman student enrollments in these institutions. Our interest is examining the causal impact of this policy in the state of Minnesota, doing so using the data and methods outlined below.

Figure 1

Total international student enrollment at each public four-year institution in the Minnesota State Colleges and Universities system



Data

We used institution-level data from the Integrated Postsecondary Education Data System (IPEDS) obtained from the Urban Institute's Education Data Portal (IPEDS, via Education Data Portal v. 0.14.0, Urban Institute, under ODC Attribution License). The primary variable of interest is in the enrollment file and captures freshman fall enrollment by state of residence as of October 15 or the institution's official fall reporting date. The variable contains information on the number of first-time freshmen by state of residence and includes one category for "foreign." The data are mandatorily reported in even-numbered years and optionally reported in odd-numbered years.

We constructed a panel with institution-level data for each four-year public institution in the U.S. In Minnesota, this included seven institutions in the MSCU system (Bemidji State University, Metropolitan State University, Minnesota State University – Mankato, Minnesota State University – Moorhead, Southwest Minnesota State University, St. Cloud State University, Winona State University), and four in the University of Minnesota (UMN) system (Crookston, Duluth, Morris, and Twin Cities). A fifth campus, the University of Minnesota Rochester, was formally established in 2006 and was therefore not included in this analysis. Although the 2008 ISTIS policy only applied to

the MSCU institutions, we decided to keep the UMN institutions in the analysis because there were no clear criteria for removing public four-year institutions from the control groups.

We also gathered data on two key proxy variables for prestige/rankings that were noted in the literature as being a pull factor for international students. These variables included the six-year graduation rate and the average salary for a professor at the institution. We selected these two variables because they were factors in the *U.S. News & World Report* (*USN&WR*) rankings methodology that were most likely unrelated to the total cost of attendance. Furthermore, these variables had information before 2009; other variables such as endowment value and student-faculty ratio did not have these data available.

Methods

Given Minnesota initiated the residency policy change while surrounding states did not, we use a difference-in-differences (DiD) design to estimate policy impacts. In this approach, Minnesota's public four-year institutions are "treated" by the MSCU policy change, while public four-year institutions in other states serve as controls. Although two-year institutions in the MSCU system would have also been eligible to take advantage of the ISTIS policy, we focus on public four-year institutions because these institutions would have resulted in the largest discount if they adopted ISTIS. The DiD model is:

$$Y_{ist} = \alpha_0 + \beta_1 Treat_s + \beta_2 Post_t + \beta_3 (Treat * Post)_{st} + \mu_i + \delta_s + \theta_t + \varepsilon_{ist} \quad (1)$$

Y_{ist} is the outcome international student enrollment for institution (*i*) in state (*s*) at time (*t*). *Treat* is a dichotomous indicator that equals 1 when the institution is in Minnesota, and 0 when the institution is in a control state (e.g., neighboring states; Midwestern Compact states; all states). *Post* equals 1 in 2008 and 2009, and 0 from 2003-2007. The interaction of *Treat* and *Post* is the DiD estimate of interest.

In addition to this baseline model, we estimate model 2 with controls for institutional prestige. This model includes proxies for prestige, which is a noted pull factor for international students. These proxies are variables from IPEDS that capture average professor salary and six-year completion rate, two of the factors used in the calculation of the *USN&WR* college rankings.

$$Y_{ist} = \alpha_0 + \beta_1 Treat_s + \beta_2 Post_t + \beta_3 (Treat * Post)_{st} + \beta_4 Salaries_{ist} + \beta_5 Completion_{ist} + \mu_i + \delta_s + \theta_t + \varepsilon_{ist} \quad (2)$$

These DiD models could be estimated with institution, state, and year fixed effects. However, the fixed effects approach means time-invariant variables (e.g., *Treat*) would be dropped as they are collinear with the institution and state fixed effects. We therefore explored the possibility of using a random effects approach. The random effects estimator is a more efficient estimator than the fixed effects estimator, but relies on the assumption that unobserved institutional variation is uncorrelated with the independent variables. While this is a strong assumption to make, Hausman tests we conducted failed to reject the null hypothesis that a random effects approach was appropriate for both equation 1 (*Prob>chi2* = 0.4512) and equation 2 (*Prob>chi2* = 0.1382). The main results presented below are obtained using the random effects estimator, and we provide fixed effects estimates in the Appendix.

The DiD estimates are intent-to-treat (ITT) estimates because the interaction *Treat x Post* captures the effect of being in a treated state (Minnesota) in the treated period (post-2008), and is

not limited to institutions that appear to have implemented the policy (as depicted in Figure 1). The estimate can be interpreted as the average change in international student enrollment for each public four-year institution in Minnesota.

Validity

Control group. The validity of the DiD estimate hinges in part on the suitability of the control group (i.e., counterfactual) and the assumption it is unaffected by the policy. We assessed sensitivity to control group composition by constructing different control groups. We first compared Minnesota to neighboring states (South Dakota, Iowa, and Wisconsin). We then compared Minnesota to other states in the Heartland, specifically those in the Midwestern Higher Education Compact (South Dakota, Iowa, Wisconsin, Missouri, Illinois, Indiana, Kansas, Nebraska, Ohio, and Michigan). The Midwestern Higher Education Compact (hereafter, Midwestern Compact) is an interstate effort to strengthen and promote higher education in the Midwestern U.S. through shared policy and research, including tuition agreements (www.mhec.org). Finally, we compared Minnesota's 11 public four-year institutions to those in all other states in the U.S. These different control groups include 23 public four-year institutions in the neighbor states, 117 institutions in the Midwestern Compact states, and 587 institutions in all other states besides Minnesota.

We excluded North Dakota from each of these analyses because the North Dakota University System also developed a policy to reduce the cost of tuition for international students by offering tuition discount waivers. Internal reports from North Dakota State University (NDSU) indicate that waivers can reduce the out-of-state/international tuition rate by upwards of 50%, bringing the final cost to 133% of the in-state rate (NDSU Budget Study Work Group, 2016). Over half of international students at NDSU received these waivers in 2008.

Parallel Trends. A standard assumption of the DiD design is that the control and treatment groups have similar pre-treatment trends. We assessed this through visual inspection (see Figure 4 below) and by regressing international student enrollment on an indicator of treatment group status, year dummies, and interactions between treatment group status and year. These results are provided in the Appendix and show no evidence of significantly different trends between Minnesota and those chosen comparison groups in the years leading up to the MSCU policy change.

Synthetic Difference-in-differences

Although we assessed sensitivity of the analysis to the composition of the control group by comparing Minnesota to neighboring states, Midwestern Compact states in the Heartland, and all other states, it is possible that these combinations do not necessarily result in the best control group. We therefore aggregated the foreign student enrollment data to the state level and engaged in a state-level comparison using a synthetic DiD approach (Abadie et al., 2010). The synthetic control approach is data-driven and weights observations in the full dataset of states based on pre-treatment trends to construct a "Synthetic Minnesota." In this case, Synthetic Minnesota is constructed so that it has equivalent trends in foreign student enrollment as Minnesota before the MSCU policy. It therefore serves as a valid counterfactual in the DiD design. Any divergence between Minnesota and Synthetic Minnesota after the policy's introduction would be evidence of a policy impact.

Results

Figure 2 shows total international freshman student fall enrollment in Minnesota four-year institutions (i.e., state of residence: "foreign"). There is a spike in 2008 and the level remains high

but dips slightly in 2009. After a drop in 2010, the numbers increase again as the economy recovers from the Great Recession.

Figure 2

New freshman international student enrollment in public four-year institutions in Minnesota

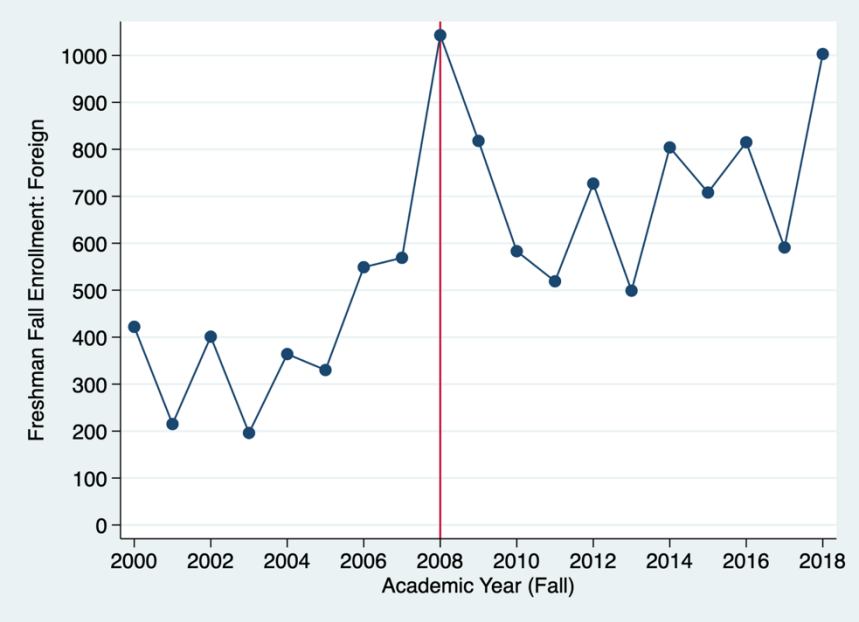


Figure 3

New out-of-state domestic student enrollment (U.S. total) and in-state enrollment (Minnesota) in public four-year institutions in Minnesota

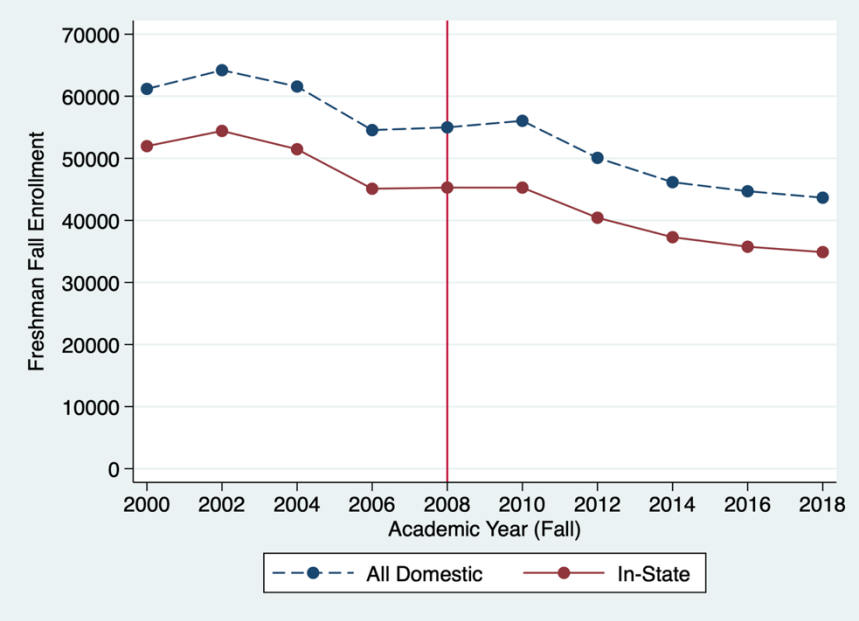
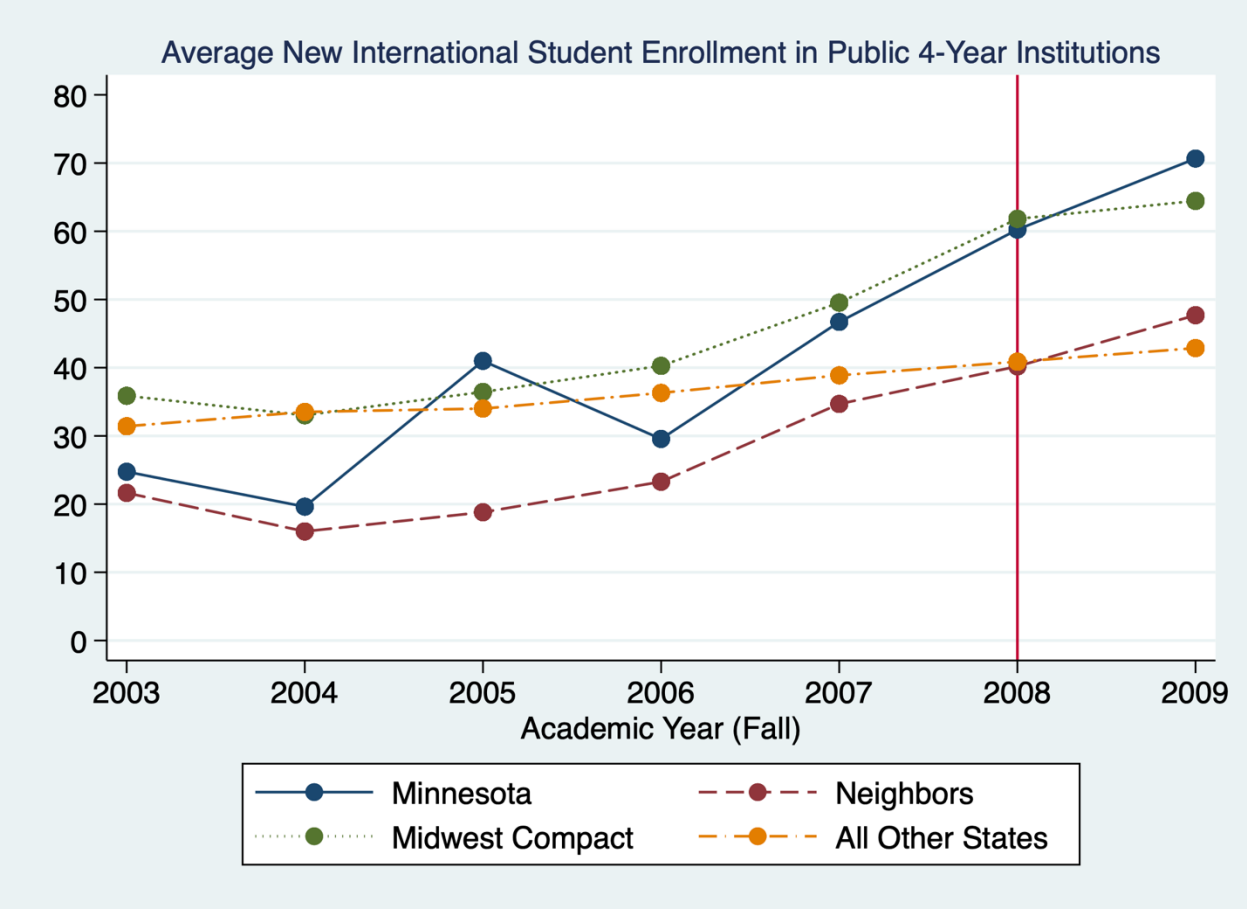


Figure 3 shows the same variable but for the total of domestic students (U.S. total) and in-state students (Minnesota only). These two visualizations suggest there was an enrollment shift in response to ISTIS in 2008. New international students appeared to increase in numbers around this time, while both in-state and out-of-state domestic student enrollment declined.

To motivate our DiD design, Figure 4 shows the average new international student enrollment in each public four-year college in Minnesota, juxtaposed with this same information for institutions in three sets of states – neighboring states, states in the Midwestern Compact, and all other states. North Dakota is excluded from each of these control groups. This figure shows similar trends prior to 2008 (corroborating the findings of the pre-treatment trends analysis in the Appendix), but a steady increase in average international student enrollment in Minnesota and the Midwestern Compact states beginning in 2008. Minnesota's institutional average surpasses all other averages after 2008.

Figure 4

Average new international student enrollment in each public four-year institution in Minnesota, neighboring states, Midwestern Compact states, and all other states



We empirically examined this using DiD estimation. Given the patterns observed in Figures 1 and 2, we decided to limit the analytical window to 2003-2009, in other words, just prior to when the effects of the recession on higher education enrollment began to be substantial (Brown &

Hoxby, 2014). This approach helped to better identify the effect of ISTIS, though the estimates presented below are likely an under-estimate of the true effect (in part because of recession effects and in part because we did not remove UMN institutions from the analysis).

The results are shown in Table 1. Three controls groups are specified and two models are shown for each control group specification. The first is a baseline random effects model (fixed effects estimates are provided in the Appendix). The second adds control variables for average professor salary and six-year completion rate. Significance stars are for a two-tailed test, but we also show the *p*-values so that a one-tail test can also be conducted by halving the *p*-value. A one-tail test may be appropriate in this case because it is expected that a reduction in cost would lead to a positive increase in enrollment.

Table 1

Impact of in-state tuition for international students on freshman international student enrollment (random effects model), even years only 2003-2009

	Control Group: Neighbors		**Control Group: Midwestern Compact**		**Control Group: All U.S. States**	
	(1)	(2)	(1)	(2)	(1)	(2)
Treat x Post	17.000*	13.15	11.385*	8.841	29.833***	29.960***
SE	(7.810)	(7.016)	(5.493)	(5.105)	(3.218)	(3.292)
p	0.030	0.061	0.038	0.083	0.000	0.000
Treat	4.131	-3.786	-10.087	-10.64	-9.468	-10.488
SE	(5.342)	(7.396)	(7.113)	(6.284)	(5.598)	(6.380)
p	0.439	0.609	0.156	0.090	0.091	0.100
Post	20.031*	2.199	25.765***	-0.585	7.030*	-6.357
SE	(7.810)	(6.315)	(5.493)	(7.437)	(3.218)	(3.942)
p	0.010	0.728	0.000	0.937	0.029	0.107
Avg. Professor Salary (in 000s)		2.074***		2.888***		1.387***
SE		(0.407)		(0.828)		(0.240)
p		0.000		0.000		0.000
6-Year Completion Rate (pp)		1.059*		1.063***		0.237
SE		(0.539)		(0.224)		(0.177)
p		0.049		0.000		0.180
Constant	18.937***	-190.072***	33.038***	-248.560***	32.704***	-88.493***
SE	(5.342)	(46.096)	(7.113)	(58.029)	(5.598)	(16.884)
p	0.000	0.000	0.000	0.000	0.000	0.000
N	87	87	287	287	1405	1377

Notes: Standard errors are clustered at the state level. Freshman enrollment by residence is mandatorily reported in even years of IPEDS data collection. Source: Urban Institute Education Data Portal.
**p<.05; **p<.01, ***p<.001 (two-tail test)*

On average, public four-year institutions in Minnesota saw an increase of about 17 international students when compared to institutions in neighboring states. The estimate dropped to about 13.15 students in model 2, and would be significant with a one-tail test. When compared to other states in the Midwestern Compact, Minnesota institutions saw an increase of about 11 students on average, dropping to about 9 students when controls were added in model 2. These estimated coefficients were also significant with a one-tailed test. When compared to all other four-

year public institutions, the change in Minnesota after 2008 is significant and positive. On average, four-year public institutions in Minnesota saw an increase of about 30 students per campus. The results are similar to when we used the fixed effects estimator (see Appendix).

Synthetic Control

We then aggregated the number of freshman international students in four-year public colleges to the state level. In addition to providing an estimate of the effect of a statewide policy, the sensitivity of the results to control group composition make a synthetic control method attractive for the evaluation. The approach constructs a "Synthetic Minnesota" by applying weights to select states in the full sample that together make the best control for Minnesota based on pre-treatment trends in foreign student enrollment. The synthetic control in this case weighted data from Colorado (.596), Idaho (.050), Indiana (.343), and Maryland (.011).

Figure 5 presents a visualization of the synthetic control method. Freshman international student enrollment in Synthetic Minnesota tracks along with the real Minnesota, but beginning in 2008 and continuing in 2009, Minnesota's enrollment is higher than that of Synthetic Minnesota. After 2010, freshman international student enrollment in Minnesota drops below that of Synthetic Minnesota.

Figure 5

New freshman international student enrollment in public four-year institutions in Minnesota, compared to Synthetic Minnesota

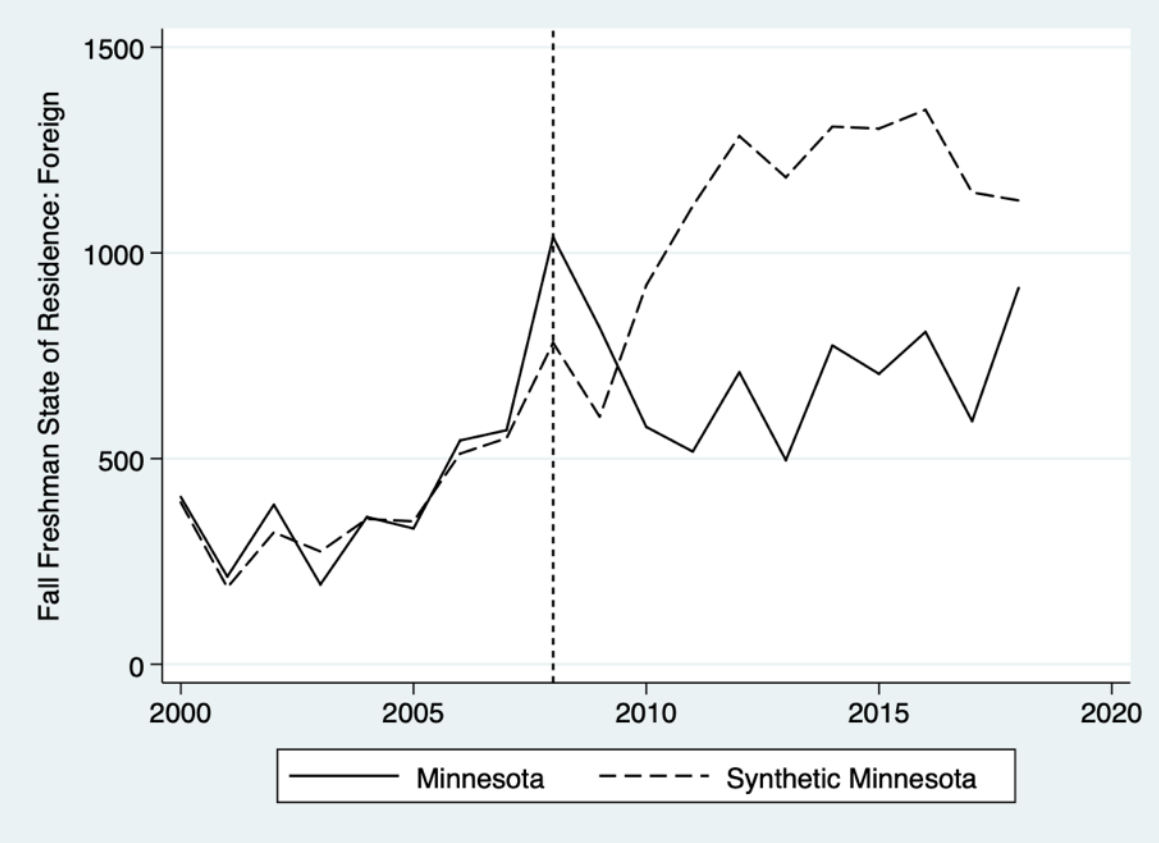


Table 2

Impact of ISTIS policy in Minnesota on freshman international and domestic student enrollment, compared to Synthetic Minnesota

	International Student Enrollment			Domestic Student Enrollment		
	Estimates	***p*-value**	**Sig.**	**Estimates**	***p*-value**	**Sig.**
2008	384.7	0.000	***	831.4	1.000	
2009	313.6	0.000	***	-4427.9	0.531	
2010	-179.0	0.429		1971.4	0.857	
2011	-110.4	0.755		-9319.0	0.163	
2012	-278.6	0.429		-690.1	1.000	
2013	-207.9	0.388		-7583.9	0.184	
2014	-328.3	0.429		-1350.4	0.959	
2015	-178.5	0.571		-6669.3	0.245	
2016	-332.8	0.347		-1661.5	0.918	
2017	-225.3	0.551		-7639.7	0.265	
2018	-172.3	0.714		-2859.4	0.878	
States (weights) used in construction of Synthetic Minnesota	Colorado (.596) Idaho (.050) Indiana (.343) Maryland (.011)			Hawaii (.474) Indiana (.526)		

*Notes: Estimated using synth_runner in Stata 15.0. The synthetic control constructed for the analysis of international student enrollment draws upon data from Colorado (.596), Idaho (.050), Indiana (.343), and Maryland (.011). The synthetic control in the analysis of domestic student enrollment draws upon data from Hawaii (.474) and Indiana (.526). *p<.05; **p<.01, ***p<.001 (two-tail test)*

The estimation results in Table 2, which we obtained using the synth and synth_runner commands in Stata 15.0, show the magnitude and significance of these differences. There is a significant difference of 384.7 international students (p<.001) in the first year of implementation (2008), and a significant difference of 313.5 in 2009 (p<.001). That is, after ISTIS was implemented, Minnesota saw an increase of about 385 freshman international students relative to a synthetic control Minnesota. This difference was still significant in 2009, but narrowed to about 314 students. With 11 public four-year Minnesota institutions in the analysis, this synthetic DiD estimate is of similar magnitude to the standard DiD estimates, which reported an increase of about 30 students per institution. Although Figure 5 shows that international student enrollments dropped below those of Synthetic Minnesota after 2010, the results in Table 3 indicate these post-2010 differences are not significant.

Since it is possible that the recruitment of new international students comes at the cost of in-state or domestic student enrollment, we also conducted the same analysis using domestic student enrollment as the outcome. This synthetic DiD analysis weighted the data from Hawaii (.474) and Indiana (.526). There do not appear to be any significant differences in domestic student enrollment between Minnesota and Synthethic Minnesota after the MSCU policy was implemented, suggesting that the new international students did not result in decreased domestic student enrollment.

Discussion

International student enrollment in U.S. higher education is increasingly a point of interest given that these students can generate significant revenues for host institutions. In the face of public disinvestment in higher education, declining state appropriations, and enrollment declines due to the COVID-19 pandemic, institutions of higher education may be considering policies that can promote international student enrollment. Just a handful of studies have leveraged policy changes to better understand the forces at play in international student's college enrollment choices, such as visa availability (Chen & Hagedorn, 2019; Shih, 2016), and the return to in-person instruction during the COVID-19 pandemic (Whatley & Castiello-Gutiérrez, 2021). There has been less research on how tuition costs affect student enrollment, one of the key pull factors that shape international students' choices.

Our study contributes to this evidence by focusing on a legislative provision that allowed colleges and universities in Minnesota to charge international students in-state tuition. The findings indicate that the policy increased freshman international student enrollment in the state by about 385 students in 2008. This positive significant effect remained in 2009, but eventually dissipated as the economic fallout of the Great Recession began to take root in higher education and beyond (Brown & Hoxby, 2014). Nonetheless, the small window of time in which the policy was enacted appears to have drawn more international students to Minnesota who would otherwise not have enrolled in a Minnesota public four-year institution. There was no concurrent decline in domestic student enrollment, suggesting a net increase in revenues. Given the average annual full-time undergraduate resident tuition and fees in 2008 was reported to be $6,373, this corresponds to about $2.5 million in new tuition revenue for that academic year alone, not including additional revenues captured by room, board, and other expenses associated with the full cost of attendance. Overall, the results show that the offer of in-state tuition did serve to "pull" students to the state and offer empirical support that the cost of tuition is a pull factor salient in international students' decision-making about study abroad. Importantly, we demonstrate that in-state tuition pulled international students even after controlling for two proxies for institutional prestige – professor salary and completion rate.

Implications for Practice

States and institutions interested in generating additional revenues can explore the possibility of enacting similar legislation or policy change that revises residency requirements or grants waivers to certain groups (e.g., international students; undocumented students) for in-state tuition benefits. However, getting this type of legislation passed may be difficult if there is not public support for using tax dollars to offset the cost of higher education provision for international students. Although the findings here indicate that there was likely a net increase in revenue to the state, increased revenues are just one benefit to ISTIS policies. Particularly in institutions like those in the MSCU system, regional comprehensive institutions that often serve more rural and remote areas, an increase in international students also increases the cultural diversity and intellectual vitality of the campus and community (Orphan & McClure, 2019). It would be important to promote both narratives in galvanizing support for ISTIS policies.

It is important to note that these effects appear to be driven by three MSCU institutions that implemented the policy with intention. These institutions (St. Cloud State University, Minnesota State University Mankato, and Minnesota State University Moorhead) experienced substantial increases in total international student enrollment. Future research should examine how ISTIS policies are implemented by campus, including the recruitment efforts and institutional contexts that

may facilitate the adoption and implementation of ISTIS policies. Support can be given to those institutions seeking to implement ISTIS, including providing training for staff in admissions, financial aid, and international student offices in how to navigate the policy with international students. It is also possible that the tuition discount was complemented with increased recruitment strategies, such as outsourcing recruitment to third parties (Farakish et al., 2020). The role of these entities can be further scrutinized.

Importantly, substantially lowering the cost of college for international students, who typically pay significantly higher out-of-state and international student rates, could be a means of increasing access to and affordability of U.S. higher education for a more diverse body of international students (Choudaha, 2020). Research in this area should also examine which types of international students benefit from in-state tuition to better understand the equity implications of these types of policies. Institutions who have implemented these policies can also review their programs and practices to ensure that they are meeting the needs of a more diverse set of international students.

Conclusion

The findings presented here show that a significant tuition reduction for international students to the in-state rate drew new international students to Minnesota. This generated new revenues, presumably expanded the diversity of the international student cohort, and brought cultural diversity to the regions served by these institutions and to the state writ large. As such, policies like in-state tuition for international students may be a promising and even necessary policy response in light of stagnant and declining international student enrollments, declining support for U.S. public higher education, and the looming enrollment challenges facing higher education.

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Appendix

Table A1

Differences in pre-treatment trends in international student enrollment

	Control Group: Neighbors		Control Group: Midwestern Compact		Control Group: All U.S. States	
	(1)	(2)	(1)	(2)	(1)	(2)
Treat	3.186	-3.151	-8.182	-13.941	-7.903	-11.321
SE	(17.850)	(13.890)	(24.710)	(20.079)	(29.783)	(28.960)
p	0.858	0.821	0.741	0.487	0.791	0.696
2004	-2.096	-4.522	-0.577	-5.509	1.637	-1.605
SE	(5.364)	(5.220)	(3.603)	(3.533)	(2.934)	(3.023)
p	0.696	0.386	0.873	0.119	0.577	0.595
2005	1.105	-4.02	3.186	-7.813*	2.329	-3.123
SE	(5.332)	(5.255)	(3.600)	(3.680)	(2.995)	(3.139)
p	0.836	0.444	0.376	0.034	0.437	0.320
2006	5.581	-3.83	7.978*	-9.665*	5.096	-4.584
SE	(5.332)	(5.423)	(3.577)	(3.994)	(2.911)	(3.228)
p	0.295	0.480	0.026	0.016	0.080	0.156
2007	15.864**	2.764	17.738***	-7.156	7.072*	-7.113
SE	(5.458)	(5.816)	(3.603)	(4.518)	(3.065)	(3.638)
p	0.004	0.635	0.000	0.113	0.021	0.051
2004 x Treat	-1.518	0.144	-3.014	0.965	-5.398	-3.712
SE	(11.704)	(11.362)	(14.680)	(14.137)	(27.191)	(27.477)
p	0.897	0.99	0.837	0.946	0.843	0.893
2005 x Treat	13.399	12.611	11.291	11.88	12.342	12.647
SE	(13.658)	(13.364)	(17.564)	(16.942)	(32.926)	(33.307)
p	0.327	0.345	0.520	0.483	0.708	0.704
2006 x Treat	3.649	3.188	1.413	5.551	3.281	5.961
SE	(11.666)	(11.296)	(14.647)	(14.102)	(27.025)	(27.289)
p	0.754	0.778	0.923	0.694	0.903	0.827
2007 x Treat	7.078	9.405	5.22	15.012	15.775	21.88
SE	(12.168)	(11.791)	(15.314)	(14.787)	(28.359)	(28.649)
p	0.561	0.425	0.733	0.310	0.578	0.445
Avg. Professor Salary (in 000s)		1.596***		2.514***		1.182***
SE		(0.380)		(0.314)		(0.170)
p		0.000		0.000		0.000
Six Year Completion Rate (pp)		0.858*		0.763**		0.245
SE		(0.406)		(0.282)		(0.166)
p		0.035		0.007		0.140
Constant	17.139	-139.856***	28.347***	-195.824***	29.082***	-69.281***
SE	(9.020)	(26.582)	(6.613)	(22.507)	(3.266)	(11.129)
p	0.057	0	0	0	0	0
N	130	130	447	446	2168	2120

Note: Regression of international student enrollment on year indicators, treatment group status, and interaction of year indicators and treatment group status. Source: Urban Institute Education Data Portal.
**p<.05; **p<.01, ***p<.001 (two-tail test)*