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Are International Students Getting a Bang for their Buck? The Relationship between Expenditures and International Student Graduation Rates

Anthony Schmidt
University of Tennessee, Knoxville, USA

ABSTRACT

Do increased expenditures lead to improvements in international students' outcomes? As state subsidies for public higher education institutions remain low, the reliance on out-of-state tuition from international students underscores their importance. Because international students often pay such higher tuition fees, it is worth studying how such fees impact their education. This study investigated to what extent institutional expenditures affect undergraduate international student graduation rates. Using ordinary least squares regression with robust standard errors, the results indicated that academic support expenditures are significantly related to international student graduation rates, but may only have small effects in other areas. Out-of-state tuition was also found to be significant, suggesting tuition affects international students in ways not captured by expenditure data.

Keywords: expenditures, graduate rates, international students, Integrated Postsecondary Education Data System, student engagement

INTRODUCTION

Since the 1950s, international student growth in the U.S. has increased rapidly. According to the Institute of International Education's (2018a) *Open Doors* data, the number of international students surpassed one million in 2015, a trend that continued in 2016 and 2017. The *Open Doors* data on enrollment shows that the top five leading places of origin for international students from 2012–2013 to 2017–2018 were China, India, Saudi Arabia, South Korea, and Canada. International students from China

have alone accounted for an average of 31% of the total international student population. However, there are signs that these trends might be changing. New international student enrollment in undergraduate programs fell by 6.3% while new enrollment in graduate programs fell 5.5% for the 2017–2018 academic year. For this same year, Chinese and Indian student enrollment had slight increases, but enrollment from South Korea and Saudi Arabia sharply declined. Despite showing some signs of decline (Baer, 2018), international student growth still continues around the country and the United States remains a major destination for globally mobile students.

Bound et al. (2016) pointed out four reasons that can account for increased student mobility, especially to the United States. They argued that the ability to pay for the cost of U.S. higher education has increased. This is likely due to the rise in middle-class families, especially in countries such as China and India that are major exporters of international students (Kharas, 2017). Bound et al. (2016) also pointed out that increased secondary education has led to the birth of more and more college-seekers. The repercussions of this have precipitated a number of related push factors. When population growth outpaces higher education growth, intense competition for seats is created. Compounding this are the strict university entry requirements that remain a major hindrance to university acceptance, further increasing this competition (Bodycott & Lai, 2012; Chen, 2017). Finding their home education opportunities lacking in availability and quality (a third factor cited by Bound et al., 2016), this growing population is forced to seek higher education globally. Bound et al. (2016) also argued that employment opportunities in the United States are also an important draw for international students. One example of this is the optional practical training program, which allows international graduate students to stay and work 3 years or more after graduating, including shifting their visa from F-1 (student visa) to H-1B (a foreign work visa), which can further extend their stay for up to 6 years (U.S. Citizenship and Immigration Services, 2019). This program has grown in recent years and is a big draw for those seeking both higher education and related employment opportunities (Redden, 2018).

The growth in international student enrollment is certainly not one of passive activity on the part of U.S. institutions. A major reason for international student growth in the United States is their active recruitment (Choudaha, 2017; Wilkins & Huisman, 2011). International students are seen as an important part of higher education internalization strategies. They are seen as important sources of cultural diversity, and some research suggests a positive benefit for domestic students who interact with internationals (e.g., Luo & Jamieson-Drake, 2013).

These intangible benefits are certainly a reason for international student recruitment, but they rank low on the prevailing motivations underlying such efforts. The overwhelming discourse on international students is related to economics (Karram, 2013). Indeed, their economic impact cannot be denied. According to NAFSA (2018), international students contributed $39 billion dollars to the U.S. economy and supported more than 455,000 jobs in 2017–2018. While some of this amount comes from living expenses, a large proportion of it is generated from tuition revenue (NAFSA, 2019). In fact, in describing recent international student mobility trends, Choudaha (2017) cited the search for higher tuition revenues as a major factor

for international student recruitment, especially during the financial recession in the late 2000s.

The desire for revenue generated from international students is particularly important for public universities where there are large tuition differentials between the domestic in-state rates and the out-of-state rates international students must pay. For example, an analysis of tuition data from the Integrated Postsecondary Education Data System (IPEDS) indicates average out-of-state tuition rates for public doctoral universities is about 49% higher than in-state tuition.[1] Concurrent with increased international student recruitment has been a nationwide decrease in state subsidies for public universities. In fact, many argue this decline is an important factor in increased recruitment (e.g., Adkisson & Peach, 2008; Bound et al., 2016)

With international students spending so much on education, it is critical to understand what is spent on them through expenditures and if this spending is working to their benefit. Although there has been much research on the effect of expenditures, there has been no research that looks specifically at the relationship between expenditures and international student outcomes. As a student population that is actively recruited by U.S. institutions and bring both tangible and intangible benefits, it is critical to ensure fiscal accountability for these students' learning and experiences. The purpose of this study, therefore, was to investigate the relationship between expenditures and graduation rates for international students at public doctoral and master's universities.

LITERATURE REVIEW

State subsidies for public universities have played an important role in their organization and functioning. However, over the last 30 years, there has been a dramatic decline in state funding. The State Higher Education Executive Officers Association (2017) reported that a majority of public higher education institutions relied more on tuition dollars than government funding. Despite more recent increases in subsidies, they still remain at pre-recession levels.

This has led to a number of broad outcomes, two of which are directly concerned with this research study. First, as discussed above, it has created a sweeping trend of international student recruitment and enrollment as a means to offset state subsidy deficits. Second, it has precipitated greater demands for effectiveness, efficiency, and accountability with the funds universities already have (Pike et al., 2006; Terenzini & Pascarella, 1998). In other words, there has been much greater attention paid to how money is spent in higher education.

The question of whether money matters in terms of educational outcomes has long been contentious. Much of the research on expenditures had been heavily concentrated in K–12 contexts, with mixed findings (see Pike et al., 2006, for an overview). Recently, however, more attention has been paid to higher education.

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[1] Calculated from in-state (living on campus) and out-of-state (living on campus) tuition categories, 2007–2017.

Toutkoushian and Smart (2001) used student-level data on self-reported student growth combined with institution-level data from the Higher Education Research Institute. They found that institutional expenditures had a significant positive effect on student gains, specifically on learning and interpersonal skills. Looking at specific categories of expenditures revealed a positive relationship between institutional support and knowledge, while expenditures on academic support showed a negative relationship. While certain institutional characteristics such as selectivity and student characteristics such as race or gender certainly play a role, the authors argued that "the level of spending can have a direct impact on student gains in interpersonal skills and learning" (p. 55). Unfortunately, no satisfying explanation was given that explains how these gains were related to spending. Additionally, while their research provides some insight into the effects of expenditures, they only looked at gains, not ultimate outcomes such as graduation.

Later research focused more on offering conceptual models to explain effects of expenditures. A number of conceptual models for students in general draw on prior works by Astin (1993) and Tinto (1987) to explain student participation and engagement as a mediator between expenditures and variables of interest. Pike et al. (2006) specifically tied expenditure data from IPEDS to results from several National Survey of Student Engagement benchmarks: level of academic challenge, active and collaborative learning, student interaction with faculty, enriching educational experiences, and supportive campus environment. They used separate regression models to test the effects of institutional characteristics (especially expenditures) on each benchmark, measured at the first year and senior year, for both private and public universities. What they found was an overall complex relationship. For public universities, academic support and instructional support expenditures had a significant positive relationship with level of academic challenge, active and collaborative learning, student interaction with faculty, and enriching educational experiences during students' first year and only level of academic challenge during their senior year. During this same academic time period, research expenditures had a significant positive relationship with enriching educational experiences. For private universities during students' first year, instruction expenditures had a relationship with enriching educational experiences, research with level of academic challenge, and student services with student interaction with faculty. Results during the senior year were even more mixed. These varied results led the authors to conclude that, for students in general, "the relationships among expenditures, engagement, and outcomes...are likely to be indirect and contingent. The results of the present research suggest that a conceptual model of the relationships among expenditures, engagement and outcomes is not readily attainable" (Pike et al., 2006, p. 867).

That a conceptual model of expenditures must be indirect has been acknowledged by other researchers. Gansemer-Topf and Schuh (2003) looked at persistence and graduation rates among public and private doctoral and master's universities using IPEDS data. Their conceptual model was firmly rooted in Tinto's (1987) theory of institutional departure. The authors rationalized that expenditures can indirectly lead to students becoming more academically and socially involved, which may lead to increased persistence and graduation. Like the previous studies,

they found that instruction and academic support expenditures lead to higher first-year retention and higher graduation rates.

Work by Ryan (2004) echoed those findings: graduation rates at public and private baccalaureate colleges had significant positive relationships with both academic and instructional support. Like previous studies, Ryan used expenditure and graduation data from IPEDS. However, unlike the findings of Toutkoushian and Smart (2001), there was no significant relationship between graduation rates and institutional support. Furthermore, student services expenditures also did not have significant relationships with the outcomes Ryan measured. This is surprising because most conceptual models link student services that work to improve student participation and well-being to positive outcomes. Ryan argued that possible lack of student service expertise in combination with this funding also earmarked for admissions and financial aid services "may overshadow the effects of expenditures of other services that may affect students more directly and more often" (p. 109).

Contrary to Ryan's findings, later research has consistently found student services to be a significant predictor of higher education outcome measures in addition to other expenditure categories. Using IPEDS, Webber and Ehrenberg (2010) examined first-year persistence and graduation rates among 1,160 institutions, using linear regression with panel data to first determine the relationships between expenditures and outcomes, followed by an econometric method called unconditional quantile regression to test the effects of reallocating money to different expenditure categories. Both instruction and student service expenditures were found to be significant. Focusing mainly on student services, their first findings suggested student service expenditures have a significant positive relationship, especially at institutions with lower entrance test scores or a larger number of Pell Grant dollars. As the authors cleverly explained it: Student services expenditures "matter more for schools that have lower graduation and persistence rates than they do for schools that have higher graduation and persistence rates" (Webber & Ehrenberg, 2010, p. 956). Their use of unconditional quantile regression examined reallocation effects not on the entire sample of institutions but rather on subsamples of institutions categorized by SAT percentiles. They found that a reallocation of $500 could enhance rates of graduation by 2% for schools at or under the 50th percentile. For schools at or above the 70th percentile, the increase is only 0.5%. Webber and Ehrenberg (2010) demonstrated that student services clearly play an important role in persistence and graduation; however, other characteristics may serve to interact with this role.

Building on this analysis, Webber (2012) took a finer grained approach by looking at restricted-access student-level data at 4-year public institutions in Ohio in an attempt to match students to the level of expenditures they were exposed to. Prior research has mostly used a 6-year moving average of expenditures, assuming students are exposed to all 6 years and then graduate. However, the averages do not, in fact, reflect the reality; students enroll in institutions at different times and therefore experience varying levels of expenditures. Findings from this research supported Webber and Ehrenberg (2010), with student services remaining a significant factor in graduation for students with lower test scores. Referring back to the conceptual explanation for the effect of expenditures, Webber (2012) argued that "this may be indicative of relationship [sic] between student engagement and graduation" (p. 617).

Interestingly, Webber (2012) also found instructional expenditures are significant factors for students with higher test scores. In fact, these instructional expenditures are especially significant for STEM majors. Webber (2012) made the assertion that "high-achieving students have always been academically engaged, and the quality of instruction is dominant factor [sic] in their academic success" (p. 617).

More recent work by Powell et al. (2012) has provided a more empirical linkage between expenditures and outcome measures. Using structural equation modeling (SEM), the authors attempted to model the relationship between institutional characteristics (such as size, Carnegie classification, and grant aid) and expenditures to determine benchmarks of efficiency and effectiveness. Faculty workload data from the National Study of Postsecondary Faculty was used to determine efficiency, measured as the number of credit-bearing courses taught per semester, weekly teaching hours, faculty-to-student ratio, class size, faculty satisfaction, and administration staff-to-faculty ratio. Institution-level data from IPEDS was used to collect institutional characteristics from public and not-for-profit 4-year institutions in the United States. As measures of effectiveness, this data included part-time and full-time retention rates as well as 4- and 6-year graduation rates. Prior to running the SEM, multiple regression was used to remove nonsignificant predictors. In terms of expenditures, instructional, research, academic support, and student services expenses were kept.

The authors hypothesized that institutional characteristics and expenditures would interact to affect efficiency and effectiveness. However, results from the SEM found that they are in fact separate predictors. The results also confirm previous research, finding that instructional, academic, and student services expenditures are the strongest predictors. Different expenditures levels were also found to predict whether institutions could be classified as ineffective, effective, or highly effective, each defined by which tercile an institution falls into for retention rates and 4- and 6-year graduation rates. For example, the authors found that an institution that spends between $6,019.97–$6,410.46 on instruction is likely to be an effective institution in terms of retention (71%–81%), 4-year graduation (20%–41%), and 6-year graduation (42%–58%). These patterns of outcomes were also found to be similar for academic support and student services. Whereas expenditures held a positive relationship with effectiveness, both increasing in tandem, efficiency was opposite, with greater expenditures related to diminished efficiency at varying rates. The authors then sought to find optimum levels of both in order to reach equilibrium, the details of which are beyond the scope of this paper. It is sufficient to say that this research reinforces previous findings regarding the effect of institutional expenditures on outcome measures.

Over two decades of research has been dedicated to answering the question of whether money matters, with the answer being mostly affirmative. However, most of this research looks at expenditures and outcome measures of the total student body. Scant research has looked at the effects on different racial or cultural groups. In a nonrefereed report by the Center for American Progress, a nonpartisan policy institute, Garcia (2018) argued that up to $1,000 less is spent on Black and Latinx students, suggesting that expenditures per student are not equally distributed. While the mathematical approach that arrived at these figures has not been subjected to

careful scrutiny, it does beg the question of whether different groups experience the effects of expenditures similarly. No prior research has examined the effects of expenditures on international students. Nevertheless, with this group paying disproportionately higher tuition rates, such investigation is warranted in order to understand whether international students are getting a bang for their buck. The purpose of this research is to answer this question. Specifically, the aim of this paper is to answer the following research question: What institutional expenditures, if any, have a measurable effect on international student graduation rates at public doctoral and master's universities?

Conceptual Model

The current research project is informed by several conceptual models that can explain the steps along the path from international student recruitment to graduation. One model is resource dependency theory. Resource dependency theory ties institutional behavior to external resources (Fowles, 2014). In the context of higher education, this theory explains how institutions react as state subsidies (external resources) diminish. Cantwell (2015) argued that such decreases force institutions to seek increased revenue through out-of-state tuition, which may cause dependence on international student recruitment and enrollment.

Resource dependency theory also offers an explanation for how tuition revenue is related to expenditures. Fowles (2014) argued that sources of resource inputs have a tacit effect on outputs: "In the case of increased tuition reliance, institutions focus more on educational activities" (p. 283). In other words, increased revenue from tuition commits, in theory, universities to spend more on activities that will lead to favorable education outcomes, namely graduation.

As Pike et al. (2006) pointed out, expenditures serve as an indirect catalyst for graduation rates, mediating outcomes by various forms of student social and academic engagement (Kuh et al., 2006). Thus, student engagement serves as the conceptual bridge between spending and graduation. The explanatory power of each expenditure category lies in how it may or may not affect student engagement (see Table A1 for definitions). The current conceptual model for this research project is illustrated in Figure 1.
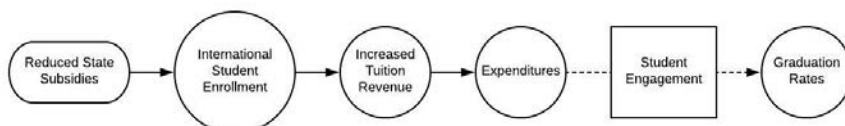

Figure 1: Conceptual Framework for Current Study

Data

The data for this research comes from IPEDS (National Center for Education Statistics, 2019), which contains comprehensive institutional-level data covering

almost all U.S. postsecondary institutions. Data is collected on a yearly basis via a number of surveys completed to capture information about institutional characteristics, enrollment, finances, retention measures, and a number of other factors. IPEDS data is publicly accessible and contains nonidentifying information. Therefore, Institutional Review Board approval was not required. Using IPEDS's "Compare Institutions" tool, datasets were separately downloaded for the included variables before combining and cleaning the data. The original and compiled datasets, as well as the SPSS syntax for processing the data and running the analyses below can be downloaded from https://osf.io/fbx3y/.

Because of the role state subsidies play in resource allocation, only public universities within the United States were included in the sample. Among these public institutions, only doctoral and master's institutions were chosen, as these two types of institutions account for 85% of international student enrollment (IIE, 2018a). The initial sample size for this research includes a total of 469 institutions. Institutions not reporting international student enrollment, international student graduation rates, or expenditure data were removed from the sample. Table 1 provides descriptive statistics for the final sample of 431. It describes doctoral and master's institutions separately. However, the analysis itself combines both groups and includes a separate classification dummy variable control for any institution-based differences.

Table 1: Descriptive Statistics for Included and Reference Variables[a]

Variable	Doctoral (N = 187)			Master's (N = 244)		
	M	Median[b]	*SD*	*M*	Median	*SD*
6-year (150%) graduation rate (2015–2017)						
Undergraduate international enrollment (2009–2017)	62.94		13.51	49.49		18.61
Percent undergraduate international	4.06		2.81	2.65		2.82
Expenditures per full-time enrollment (2009–2017)[b]						
Instructional	$10,956	$9,916	$4,632	$7,597	$7,282	$1,835
Research	$5,723	$4,129	$5,452	$788	$152	$3,653
Public service	$2,053	$1,132	$2,671	$609	$377	$684
Academic support	$3,186	$2,640	$2,006	$1,847	$1,757	$681
Student services	$1,659	$1,441	$731	$1,832	$1,814	$718
Institutional support	$2,740	$2,435	$1,323	$2,362	$2,194	$1,018
Tuition and fees (2009–2017)						
Out-of-state	$22,607	$21,154	$6,340	$16,197	$16,063	$4,013

Note. [a]Figures for most data included in the table are rounded to the nearest whole number. [b]Median values are included for financial data only.

The dependent variable is the mean international student ("nonresident alien") 6-year graduation rate for years 2015, 2016, and 2017. The graduation rates consist of undergraduate, full-time, and first-time adjusted cohort (adjusted by IPEDS to remove any exclusions) data for students who enrolled during Fall 2009, 2010, and 2011, respectively. The graduation rate is determined based on the number of students from each adjusted cohort who graduate within 150% (6 years) of normal time by August 31. Four-year graduation rates that are disaggregated by race/ethnicity are not available in IPEDS. Thus, the 6-year rate was used.

Using the mean of the graduate rates produces a smoothing effect that accounts for any major spikes or dips in the data. Visual inspection of histogram data for this graduation rate indicates the rate is approximately normally distributed. Scores for skewness (−.481) and kurtosis (.440) are close to zero, further verifying the graduation rate is approximately normal (Kim, 2013). For the years included, the undergraduate international student graduation rate was 62.9% for doctoral institutions and 49.5% for master's institutions (see Table 1).

The independent variables of interest are expenditures per full-time enrolled student for the categories of institutional support, academic support, instruction, student services, and research (see Table A1 for category definitions). Mean expenditures per full-time student from academic years 2009 to 2017 were used to determine expenditure amounts. Since the included graduation rates consist of cohorts enrolled in 2009, 2010, and 2011 respectively, the chosen time span takes into consideration all expenditures during that time. It is important to include the entire time range because expenditures may affect students from the time they enroll until they graduate. Additionally, as it is possible for expenditures to vary over time, the mean is used to account for this variation. Because data for each expenditure category were positively skewed, these variables were rescaled (divided by 100). While this did not improve normality, it does make interpretation of regression coefficients easier, with one unit of change corresponding to each $100 unit of change. Table 1 describes both the mean and median values for each expenditure category.

Control variables were chosen based on prior research, selecting ones that were especially relevant to international students. These included Carnegie classification (master's = 1, doctoral = 0) and dummy-coded institutional size variables based on IPEDS categories (see Table 2). For those institutions that changed size categories, their most frequent category size was used. Also included were the mean percent of undergraduate international students enrolled (from 2009–2017) and the mean out-of-state tuition and fees for full-time undergraduates (from 2009–2017, rescaled by 1,000).

Table 2: Frequency of Institutions by Size and Type

Number of students	Doctoral ($N = 187$)	Master's ($N = 244$)
1,000–4,999	2	49

Number of students	Doctoral ($N = 187$)	Master's ($N = 244$)
5,000–9,999	15	103
10,000–19,999	56	73
20,000 and above	114	19

Note. No institutions under 1,000 were reported.

METHOD

To determine the relationship between expenditures and graduation rates, multiple regression is used. Multiple regression is often used to examine the relationship between a dependent variable and a set of independent variables, which includes covariates for increased statistical control (Darlington & Hayes, 2017). There are a number of forms of regression analysis. Given that the current study's dependent variable is continuous, ordinary least squares (OLS) regression was chosen as the appropriate statistical test. This test is also suitable for variables that violate assumptions of normality (i.e., the expenditure variables) so long as normality of residuals during post hoc regression analysis is not violated. Analyses were performed in SPSS version 25 (IBM Corp, 2017).

Prior to running multiple regression, both correlation, linearity, and multicollinearity assumptions were assessed. Nearly all variables are significantly moderately correlated with the dependent variable (international student graduation rate). Both the independent variable for student services expenditures and the control variable for institutions having between 10,000–19,999 students have low, nonsignificant correlations. However, these variables are retained to ensure the model is correctly theoretically specified. Analysis of bivariate scatterplots indicated all variables had linear relationships with graduation rates. Variance inflation scores were around one for most variables and none were greater than 3.26, suggesting no strong presence of multicollinearity.

RESULTS

The initial results of the multiple regression model (Model 1) indicate a significant model, $F(12, 418) = 12.06$, $p < .001$, which accounts for 26% of the variance in undergraduate international student graduation rates. Specifically, only research expenditures ($b = .055$, $p = .010$) and out-of-state tuition ($b = .603$, $p = .001$) were significantly associated with the graduation rate. Before interpreting results, regression diagnostics were performed to inspect for multivariate outliers. Cases with Mahalanobis critical values less than .001 and leverage values greater than 2k/n (.097) were profiled, as were cases that appeared as outlying on standardized DFBETA index plots. Those institutions that appeared in two or more outlier diagnostics were excluded from the final analyses. When these cases were profiled, it was revealed that they had extreme expenditures, often in more than one category. Some expenditures ranged well beyond 7 *SD*s above the mean. Because these values could skew the results and bias estimates, they warranted removal. In total, 17 (.04%) cases were removed, leaving 414 institutions in the analyses.

OLS regression was repeated and model diagnostics continued (Model 2). The results indicate a significant model, $F(12, 401) = 11.52$, $p < .001$, which accounts for 26% of the variance in undergraduate international student graduation rates. Out-of-state tuition ($b = .565$, $p = .003$) remained significant. The t test for research did not reach significance; however, academic support did ($b = .217$, $p = .032$). Visual inspection of histograms of residuals indicated a normal distribution. However, some measure of heteroscedasticity was observed in scatterplots of residuals plotted against predicted values. This was confirmed through the Breusch-Pagan test, $\chi^2(1) = 22.74$, $p < .001$. To address this violation of the assumption of homoscedasticity, OLS was repeated using robust standard errors (Darlington & Hayes, 2017).

Table 3 summarizes the final multiple regression model (Model 2, with robust standard errors). The results indicate a significant model, $F(12, 414) = 11.52$, $p < .001$, which accounts for 26% of the variance in undergraduate international student graduation rates. Final results of the estimates with robust standard errors indicate both academic support ($b = .217$, $p = .046$) and out-of-state tuition ($b = .565$, $p = .006$) are significantly associated with the graduation rates. In terms of academic expenditures, the analysis found that a $100 increase in instructional expenditures is associated with a .22 percentage point increase in graduation rate. Similarly, a $1,000 increase in tuition is associated with a .57 percentage point increase in graduation rate. All other predictors were nonsignificant.

Table 3: Regression Results for Predictors of Undergraduate International Student Graduation Rates

Variable	Model 1[A]					Model 2[B]				
	b	*β*	*SE*	*T*	*P*	*b*	*β*	*SE*[C]	*T*	*P*
Instructional	.052	.109	.036	1.434	.152	.078	.163	.048	1.642	.101
Research	.055	.160	.021	2.587	.010	.000	.000	.037	−.004	.997
Public service	−.057	−.062	.045	−1.248	.213	−.100	−.110	.076	−1.305	.193
Academic support	.022	.020	.074	.303	.762	.217	.190	.108	2.002	.046
Student services	−.056	−.023	.114	−.496	.620	.002	.001	.130	.016	.988
Institutional support	−.009	−.006	.083	−.109	.913	−.042	−.028	.110	−.385	.701
Carnegie classification	−3.309	−.092	2.224	−1.488	.137	−3.480	−.097	2.098	−1.659	.098
Size: under 4,999	−5.677	−.103	3.266	−1.738	.083	−6.247	−.113	3.395	−1.840	.066
Size: 5,000-9,999	−3.010	−.075	2.584	−1.165	.245	−3.990	−.100	2.343	−1.703	.089
Size: 10,000-19,999	−2.169	−.056	2.218	−.978	.329	−2.776	−.071	1.671	−1.661	.097

| | Model 1[A] | | | | | Model 2[B] | | | | |
Variable	*b*	*β*	*SE*	*T*	*P*	*b*	*β*	*SE*[C]	*T*	*P*
Percent international	.092	.015	.282	.328	.743	.067	.011	.328	.204	.839
Out-of-state tuition	.603	.204	.175	3.438	.001	.565	.191	.205	2.761	.006

Note. [a]Model 1: R^2 = .257; [b]Model 2: R^2 = .321; [c] Robust standard errors were computed using HC3 method.

DISCUSSION

The purpose of the present research was to determine which expenditure categories are significantly associated with international student graduation rates among public masters and doctoral institutions in the United States. The results indicated both academic support and tuition are significantly associated with those graduation rates. As either increases, so do graduation rates. To be more specific, a $100 increase in academic support expenditures is associated with a .22 percentage point increase in graduation rate. Likewise, a $1,000 increase in out-of-state tuition is associated with a .57 percentage point increase.

Academic support expenditures support academic-related activities such as the library, academic computing, professional development, and course and curriculum development (see Table A1). Though not explicitly connected to teaching, academic support influences the academic environment in which students learn, promoting "academic integration." Tinto's (1987) theory of college student departure explains that "[a]cademic integration reflects a student's experience with the academic systems and academic communities of a college or university. Such experiences find expression in a student's sense of normative congruence and affiliation with these academic systems and communities" (Braxton et al., 2000, p. 571). An enriched (i.e., well-funded) academic environment may promote greater academic and social involvement, which may in turn lead to higher rates of graduation. Gansemer-Topf and Schuh (2003) argued that "[i]f one assumes that as institutions allocate increasing resources to instruction and academic support, they are supporting the ability of students to be connected with their college or university in an academic sense," confirming Tinto's theory (1987, pp. 139–140).

These findings partially echo previous research on expenditures for undergraduate graduation rates of all students (rather than only international students). Gansemer-Topf and Schuh (2003), Powell et al. (2016), and Ryan (2004) all found academic support expenditures to be positive, significant predictors. Where the present study differs is that these studies found academic support significant *in addition to* other expenditures, such as instructional or student services support. This difference suggests that expenditures might not affect all students in the same manner.

For example, one interesting finding was that student services expenditures, which are related to physical and mental health, as well as sociocultural development activities, were not found to be significant. This contradicts previous studies (Powell et al., 2016; Webber, 2012; Webber & Ehrenberg, 2010) that have found student services expenditures to be significantly related to graduation rates. Regarding

physical and mental well-being, it seems intuitive that these services would play an important role for students who may have to contend with the stresses of living in a new culture, coupled with loneliness and homesickness. However, it is also likely that certain populations of international students do not take advantage of emotional or mental health services, negating this expenditure's potential impact (Mori, 2000). In terms of sociocultural development activities, these may include the funding of activities meant to promote social integration and cultural sharing between domestic and international students. It is probable that, while these types of activities could have a positive effect on international students, the impact on graduation rates is marginal. Another way of thinking about it is that, although they may offer increased social engagement, they do not promote student engagement, the "engagement in educationally purposeful activities," which have been found to be critical for positive educational outcomes (Pike et al., 2006, p. 848).

It must be recognized that although academic support was found to be a statistically significant variable, the *practical* significance based on its parameter estimate (.217) indicates that this variable has only a small effect on graduation rates. For example, it would take a $500 increase in academic support expenditures to improve graduation rates by just one percentage point. The current model establishes that academic support is indeed important, but only to a limited degree.

Out-of-state tuition was also a significant variable. Though initially a control variable, it is worth considering the effect of tuition on international student graduation rates because of this result. The regression results indicated that graduation rates increase as tuition increases. Tuition no doubt funds institutional expenditures. However, only one expenditure (academic support) was significant, and, thus, expenditures clearly do not capture how tuition is being spent in a way that influences graduation. One possible reason for tuition's effect is that institutions that charge higher tuition rates are either more selective, ensuring highly qualified students, or have in other ways excellent undergraduate programs. Indeed, most of the institutions with the highest out-of-state tuitions in the sample are also top-ranked public universities (US News & World Report, 2019).

The final, significant results of Model 2 are the primary findings for this study. However, the original findings from Model 1 should not be discounted. In Model 1, research was a significant predictor of international student graduation rates. This finding suggests that for some institutions, research expenditures might have an influence on students. No other previous studies have found this same result, so it begs the question of why it might be significant for international students. A possible explanation is that higher research expenditures serve as a proxy for strong programs that attract highly qualified students, especially in the STEM fields. The *Open Doors* report (IIE, 2018b) indicates engineering is the most common field of study for international students, followed by business and management, and math and computer science. All of these fields are research-intensive. In addition, these fields might be considered a path towards optional practical training, a pull factor for international students (Redden, 2018). Another explanation for is simply that these expenditures are different representations of out-of-state tuition, and are therefore proxies for rankings, selectivity, quality and similar measures, as discussed above.

Limitations

There are several limitations to the present study. First and most importantly, while expenditures explain the general area in which money is spent, they do not represent actual spending on services and programs, which can vary widely. As they only serve as a somewhat ambiguous measure of spending, casual relationships should not be hastily made, and any policy implications must be conceived with caution. In addition, more research is needed to determine which specific services are useful for international students. This could more easily be accomplished at the level of a singular institution, or a region of institutions, where access to more comprehensive information may be available.

Second, some of the variables chosen present limitations. The present research only considers public universities. These universities were chosen because many of them have relied on out-of-state tuition from international students to offset declining state subsidies. However, public universities may not be representative of international student destinations in the United States. According to IIE (2018c), six out of the top-10 leading institutions for international students in 2017–2018 represent private institutions. It is very possible that expenditures and their effects could be different at private universities. Another limitation is the focus on first-time, full-time students at these institutions, which excludes transfer students from other universities. However, data on transfer student graduation rates is not available via IPEDS. A further limitation is the focus on graduation rates for the years 2015 to 2017. This could certainly be expanded to take into account more fluctuation in state subsidies (as well as enrollment), The inclusion of 2015–2017 was meant to take into consideration only the most recent data and to avoid including data that was collected under different definitions of nonresident alien status (IPEDS has changed race/ethnicity classifications several times in the past).

Neither this research nor the IPEDS database can take into account the national and cultural diversity of international students. That is, whether students are from Canada or China cannot be differentiated. Students from various world regions may have different needs in relation to student services, academic support, and the like. Therefore, using a blanket category of "international student" may blur important distinctions among different populations of students.

However, given that the most common places of origin for international students are countries where English is not the "native," official, or de facto language, the role language proficiency plays in outcome measures should not be ignored. A number of studies on the relationship between proficiency tests such as the TOEFL or IELTS exams and grade point average have found significant moderate associations (e.g., Cho & Bridgeman, 2012; Hill et al., 1999; Wait & Gressel, 2009). However, IPEDS does not include average proficiency scores, nor minimum language proficiency requirements (i.e., cutoff scores). Having these values may serve as important statistical control variables inasmuch as language proficiency is related to retention and graduation.

Finally, another limitation is the model itself, which accounts for only about 26% of variance in international graduation rates. Model specification assumes all relevant variables are included in the model (Cohen et al., 2003). Though carefully chosen

based on prior research and a theoretically sound conceptual model, it is clear that the IPEDS variables do not fully capture nor explain what influences international graduation rates. In other words, IPEDS may not contain enough information to fully model the relationship. It would be prudent for future researchers to consider combining IPEDS with College Board, National Survey of Student Engagement, or large other national datasets in order to capture a more holistic picture of this complicated phenomena.

IMPLICATIONS AND CONCLUSION

This research has been the first to look at the effect of expenditures on graduation for a specific population of students. Like previous research, this study highlights the importance of academic expenditures. In terms of policy implications, the effects of instruction-related expenditures, especially academic support, is supported by the present study and previous research. Increased spending in these areas, focusing on further development of faculty, courses, and curricula, is likely to improve international student graduation rates. Moreover, while out-of-state tuition is a significant predictor of graduation, this research study in no way supports increasing tuition. Rather, as explained above, this model suggests tuition already affects graduation, but not solely through expenditures.

While this research sheds light on the effects of expenditures on international undergraduates' graduation rates and adds to the literature on the role of expenditures in higher education, more research is needed. The current model cannot account for the actual spending of institutions. Thus, institution-specific research that can precisely track spending may be able to get a more nuanced picture of the relationship between expenditures and graduation rates. Furthermore, the present study suggests not all expenditures affect students in the same way. Therefore, research comparing how expenditures affect different student populations will enhance the literature of expenditure-based student outcomes research.

In conclusion, this research set out to answer the question of whether international students, who pay high tuition rates, are getting a bang for their buck in terms of their graduation rates. The short answer is "somewhat." Using institutional expenditures, it was found that academic support expenditures and out-of-state tuition were significant predictors of international student graduation, although both have small effects. This research primarily suggests academic support may serve as an indirect catalyst that promotes academic engagement, leading to more favorable student outcomes.

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ANTHONY SCHMIDT, MSEd, is currently a doctoral student in evaluation, statistics, and measurement at the University of Tennessee, Knoxville. He was an English language instructor for international students for over 10 years. Email: aschmi11@utk.edu