GRADUATION RATES AT U.S. COLLEGES AND UNIVERSITIES: A LARGE DATA SET ANALYSIS

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ABSTRACT

This paper compiles data from a half a dozen different sources to examine the relative impact various factors have on graduation rates. Research finds that faculty salaries positively impact rates, public schools have lower graduation rates and liberal arts colleges, research and masters' universities have higher rates than comprehensive. Overall, the existence of learning communities and teaching centers at institutions of higher learning does not improve graduation rates. However, if the type of school is taken into consideration; the existence of learning communities does improve graduation rates at comprehensive universities but does not have any impact on research and masters universities or liberal arts colleges. This research suggests that when implementing programs aimed at improving graduation rates different types of colleges and universities need to be selective in what they choose.

INTRODUCTION

C oncerns about the cost of college, the lack of students entering the science, technology, engineering and mathematics (STEM) fields and growing debt among students appears in the news daily. At, or near, the top of the problems facing higher education is the number of students who do not finish college. Noting that 44 percent of entering students do not graduate from college, Bowen (2009) is one of many who argues that the United States will lose its competitive advantage in the world if this is not addressed. In 2011, the Obama administration set up a system of grants for states to help them improve college graduation rates. The goal is to have the U.S. have the highest college completion rates in the world by 2020 (Lewin, 2011). Entering first year students are more diverse, with a higher number of Hispanic, black, part-time, older, low income and other minorities entering college. Yet, the graduation rate for these populations lags behind more well-to-do white population. (CHE, 2011-12). While improving graduation rates may be a priority for the government and other stakeholders, it has not improved significantly over the past few decades.

There has been an enormous amount of research aimed at explaining and trying to improve graduation rates at U.S. colleges and universities. Some of it has been on developing theories of student retention and how successful particular programs colleges implement are. Other research has focused on specific students such as athletes and how the implementation of a new program may improve graduation rates (*College Student Retention, 2005*). This research adds to the body of literature by examining graduation rates from a broader perspective. Instead of looking at a particular college, small group of students or a certain program, it uses a large data set examining close to 1,000 different schools. It then isolates the impact of variables, such as faculty salaries, learning communities and other factors that influence graduation rates to examine their marginal impact.

On the following pages a review of some of the literature on the subject is covered. Then a description of the data is provided, citing the different sources. The methodology used and the results from the econometrics is discussed. Different variables likely have more or less influence on graduation rates at different types of schools. For example, a learning community may improve graduation rates at larger

research universities than at smaller liberal arts colleges. Thus, this research addresses the interaction of combinations of variables on graduation rates. The conclusion with recommendations for future research completes this paper.

LITERATURE REVIEW

Research pertaining to graduation rates at U.S. colleges and universities covers a broad spectrum of topics. A substantial amount of literature explores programs and policies that schools have implemented or could pursue that increases retention rates. Institutions have developed many orientation programs for first year students attempting to increase engagement and commitment with the ultimate goal of improving graduation rates. In one example of many, Brown (2012) tries to develop a survey at one college for incoming first year students. By administering this test/survey to all incoming students she hopes to identify certain characteristics among the students. Then the data can be analyzed such that different departments in the college can be notified of potential issues that may arise with students to target them with appropriate support to increase their retention.

One area of research inspects the opportunities available at institutions of higher learning, for students who typically struggle, such as the transfer student population or commuter students. Vega and Martinez (2012) look at affordability, access and resources for Latinos in public universities in Texas. They examine a plan put in place by the state government to address the lack of Hispanics graduating from college and then examine public documents. They find that certain areas have higher graduation rates for Hispanic students and that those who stay closer to home are more likely to complete college.

Other research focuses on groups that may be marginalized such as the Lesbian, Gay, Bisexual and Transgender population or have challenges that are not readily apparent like students with some types of learning disabilities. Woosley and Shepler (2011) examine experiences of students who are the first generation in their family to attend college. Based on surveys at one college they find that many of the factors that impact graduation rates of non-first generation college students also impact those of first generation students. The level of academic preparation coming in to college, degree of interpersonal relationships and stress all impact graduation rates; though first generation students are still much less likely to finish college than their counterparts.

Some research looks at the efficacy of privately funded programs aimed towards groups with lower graduation rates. DesJardins and McCall (2006) examine the effectiveness of the Gates Millennium Scholarship Program. They find that the retention of minority students depends in part on their race. However, due to the nature of how students are selected into the program they were not able to better isolate the impact of different variables on retention. Angrist et. al. (2006) studied a small sample of Canadian students, broken into three groups. They found that students using both tutoring services and financial rewards were more likely to return for their second year than students getting only financial or support services. Breaking the group by gender they also determined that the impact was greater on female than on male students.There is also a significant body of research and reports that examines differences in graduation rates at various institutions of higher learning.

The Access and Equity Report in the Chronicle of Higher Education (2011-12, 58:1) is one source. Community Colleges struggle to get many of their students through their programs and on to four year universities. Students attending for-profit colleges finish school at a much lower rate than their non-profit counterparts. Public schools have lower graduation rates than private ones and elite schools have much higher graduation rates than other colleges and universities.The majority of research on the effectiveness of institutions of higher learning uses graduation rates as the main measure of success. However, some researchers have pointed to the limitations of this method. Barefoot (2004) notes that the current method of measuring graduation rates may not accurately reflect the percentage of students who

actually receive degrees. As many as 29 percent of students who have not received their degree from the school in which they first enroll either have graduated from another college or are still in school.

Archibald and Feldman (2008) think that the use of production frontier analysis could also be used to examine the output of universities. They note that a school's graduation rate does not capture all of the value that universities provide such as research activities, service to the local community and the actual value added to students in the classroom. They argue that graduation rates are useful but should be used in the correct context. In part, due to the cuts in funding for higher education, some research examines how Federal or State funding for colleges and universities impacts student retention and completion. Zhang (2009) uses panel data from the Integrated Postsecondary Education Data System (IPEDS) to look at the connection between state increases and decreases for public universities and their six year graduation rates. He finds that the more state funds that are provided to universities do increase graduation rates, but that the impact is small and not necessarily statistically significant over time.

The research in this paper uses a larger data set than any previous research to identify variables that impact graduation rates at colleges and universities across the entire United States. It thus adds to the literature by examining the issue in a macro context as opposed to the micro context of most studies just focusing on one school. It may be useful for broad policy implications.

DATA AND METHODOLOGY

Data on four year colleges and universities were collected from seven different sources. This research does not include two year colleges or for-profit schools. I started with information about graduation rates and a few other variables from the 2009 *U.S. News and World Report*. Since there are many variables that impact graduation rates (such as faculty salary) that are not listed by this source I gathered data from other sources. I also compiled some variables on my own such as the location of the school (urban, suburban or rural) and if it is public or private. In addition, I converted ACT scores to their SAT equivalent in order to include a general standardized test scores in the regressions.

The Carnegie Foundation provided data on the type of school (Liberal Arts, etcetera), the U.S. Department of Education lists whether higher education institutions have learning communities, the American Association of University Professors (AAUP) gives data about faculty salaries. I obtained information if schools participate in the National Survey of Student Engagement (NSSE) from Indiana University and if there is the existence of a teaching and learning center at the college or university from Hofstra University. I compiled the data sources into one large data set. In all cases I gathered data from 2009 so that the variables all coincide. In some situations the data sources were in different formats and in other situations did not have information for all of the colleges and universities. None the less there are close to 1,000 observations available for the regressions estimated. Table 1 gives an overview of the data, describing each variable, listing the source of the data and providing summary statistics.

Inspection of Table 1 provides an interesting overview of higher education institutions in the United States. The average graduation rate for all colleges and universities is just over fifty percent. This corresponds with other studies, though many other researchers tend to just focus on particular categories, such as public only, community colleges or rates in a particular state. Most stakeholders in higher education, including government officials deem this to be too low, hence the research in this paper.

The majority of schools are private, sixty-three percent, and a minority participated in the National Survey of Student Engagement, thirty-three percent. Colleges and universities are located where we would expect, forty-three percent in urban locations, thirty-one percent in suburbia and twenty-six percent in rural areas. Far and away the majority are co-educational, with only three percent all-female and only one school all-male. Over the past decade schools have implemented a variety of programs intended to

increase their graduation rates. Two of the most common and visible are the establishment of teaching centers and learning communities. Teaching (sometimes called teaching and learning) centers are set up to provide professors resources to help them to learn how to be better teachers. When this data was collected there were 256 schools that had a center for teaching.

Students who feel isolated or are homesick are more likely to drop out of college than their counterparts who are not. One recent trend is to have a built in support network for some students. Learning communities group students based on similar interests such as sports, music or other common interests. These are intended to provide a support network for incoming students. As of 2009 there were 243 institutions that implemented some type of learning community for incoming students.   The sections below look at factors impacting graduation rates, with the focus on how teaching centers and learning communities contribute to it.

Table 1: Descriptive Statistics

Variable	Description Of Variables	Data Source	Number of Observations	Minimum	Maximum	Mean	Number Reporting Yes To DV
GradRate	Graduation rate at each school	USNews	1336	0.09	0.98	0.515	
FacultySalary	Average faculty salary, in thousands of dollars, not including instructors	AAUP	935	35.46	130.00	69.40	
StandTests	SAT scores and ACT scores converted to SAT scores	Author	1285	605	1520	1071.5	
TeachCenter	If a school has a teaching center (yes =1)	Hofstra	1347	0	1	0.19	256
LearnComm	If a school has learning communities (yes =1)	USDOE	1347	0	1	0.18	243
NSSE	If school participates in the National Survey of Student Engagement	Indiana Univ	1347	0	1	0.33	445
Public	If the school is public (yes=1)	Author	1347	0	11	0.37	499
Peerassmnt	Peer Assessment of the school	USNews	1347	1	5	2.79	
Rankincat	School's rank in its US News category	USNews	686	1	120	40.68	
FreshReten	Freshmen retention rate	USNews	1313	0.22	0.98	0.748	
PerClsUnder20	Percent of classes with fewer than 20 students	USNews	1271	0.14	1.00	0.5503	
PerClsOver50	Percent of classes with more than 50 students	USNews	1272	0.00	7.00	0.4753	
Studentfacultyratio	Student faculty ratio	USNews	1086	3.00	47.00	14.79	
FacultyFT	Percent of faculty that is full time	USNews	1294	0.08	1.00	0.805	
Freshintop25	Percent of entering students who were in the top 25 percent of their high school class	USNews	1155	0.02	7.00	0.438	
Acceptance rate	Acceptance rate	USNews	1321	0.10	1.00	0.701	
Urban	If the school is in an urban location (yes=1)	Author	1347	0	1	0.43	579
Suburban	If the school is in a suburban location (yes=1)	Author	1347	0	1	0.31	418
Rural	If the school is in a rural location (yes=1)	Author	1347	0	1	0.26	350
Female	All female school (yes=1)	USNews	1347	0	1	0.03	41
Male	All male school (yes=1)	USNews	1347	0	1	0.00	1
Coed	School is coeducational (yes=1)	USNews	1347	0	1	0.97	1305
Diversity	If student population is more than 17 percent white (yes=1)	USNews	1343	0	1	0.47	633
aveACT	Average ACT score of incoming students	USNews	528	14	28	21.94	
aveSAT	Average SAT score of incoming students	USNews	757	705	1520	1085.6	
Research	If the school is a research university (yes=1)	Carnegie	1347	0	1	0.18	242
LiberalArts	If the school is a Liberal Arts College (yes=1)	Carnegie	1347	0	1	0.16	216
Masters	If the school is a Master's University (yes=1)	Carnegie	1347	0	1	0.42	566
Comprehensive	If the school is a Comprehensive University (yes=1)	Carnegie	1347	0	1	0.24	323

This table defines each variable, describes the source of the data and provides general statistics giving an overview of factors that are relevant in explaining colleges and universities graduation rates.

RESULTS

Regressions below examine the impact different variables, such as if a school has a teaching center and if the school uses learning communities, holding other influences constant to determine what influences graduation rates at institutions of higher learning in the US. Thus, the dependent variable, the graduation rate of school i, is a function of independent variables shown below.

Graduation rate$_i$ = β_0 + β_1 X1 + ε_i (1)
Where X1 = vector of variables

Graduation rate$_i$ = β_0 + β_1 FacultySalary + β_2 StandTests + β_3 TeachCenter + β_4 LearnComm + β_5 NSSE + β_6 Public + β_7 PerClsUnder20 + β_8 PerClsOver50 + β_9 Student faculty ratio (2)
+ β_{10} FacultyFT + β_{11} Freshintop25 + β_{12} Acceptance rate + + β_{13} Location + β_{14} Diversity
+ β_{15} Institution type + ε_i

Due to multi-colinearity not all of the variables listed in Table 1 are used in the regressions. For example, freshmen retention and peer assessment are both highly correlated with standardized test scores so are excluded. In the regressions all of the variables are kept in their original form. That is, none of the variables were logged, squared or transformed in other ways. Most of the variables are quantitative so standard interpretations of the coefficients is possible, though I do not include any here.Nominal variables are put into a dummy variable format with a yes equaling one if the characteristic exists and a no for zero if it does not. The coefficient represents the difference between schools with the characteristic and those without it. For dummy variables with more than two outcomes, the excluded category is provided in the tables. The results of regression 1 is in Table 2.[1]

The majority of the control variables has the expected sign and is statistically significant. All else constant, colleges and universities that pay their faculty more have a higher graduation rate than other institutions. Colleges and universities with higher SAT and ACT scores and more students in the top 25 percent of their high school class have higher graduation rates than schools with lower standardized test scores and fewer students in the top of their high school.

All else constant, public schools have ten percent lower graduation rates than their private counterparts. Institutions with smaller class sizes retain and graduate more students than schools with larger classes, though very large class size does not matter compared to medium size classes. Colleges and universities with more minority students and those in an urban area have lower graduation rates than their counterparts. For a one tailed test, at the 10 percent level, schools with a higher student faculty ratio do not graduate as many pupils. Liberal arts colleges, research and comprehensive universities have higher graduation rates than comprehensive universities.

Interestingly, neither the existence of a teaching center or learning community improves graduation rates. Creating a teaching center for professors (and likely graduate assistants) and setting up learning communities for incoming students are both costly and time consuming endeavors. That they do not have the impact expected of them suggests that the resources committed to them might be better used elsewhere.

Table 2: OLS Regression- Dependent Variable: Graduation Rate

Independent Variables	Coefficients	Std. Error	T-Statistic
Intercept	0.056	0.084	0.663
FacultySalary (Ave faculty salary excluding instructors)	0.002	0.000	5.686***
StandTests (SAT and ACT converted to SAT)	0.000	0.000	5.906***
TeachCenter (yes=1 if has teaching center)	-0.003	0.010	-0.263
LearnComm (yes=1 if has learning communities)	-0.004	0.010	-0.377
NSSE (yes=1 if participated in NSSE)	0.006	0.007	0.865
Public (yes=1 if public)	-0.101	0.011	-9.102***
PerClsUnder20 (% of classes with fewer than 20 students)	-0.072	0.034	-2.108**
PerClsOver50 (% of classes with more than 50 students)	-0.002	0.002	-0.858
Student faculty ratio	-0.002	0.002	-1.607*
FacultyFT (Percent of faculty that is full time)	0.047	0.037	1.266*
Freshintop25	0.174	0.031	5.537***
Acceptance rate	-0.023	0.025	-0.927
Urban [a] (yes=1 if in urban location)	-0.017	0.009	-2.009**
Suburban [a] (yes=1 if in suburban location)	0.002	0.009	0.235
Diversity (yes=1 if population > 17% white)	-0.054	0.008	-6.468***
Research [b] (yes=1 if a Research University)	0.125	0.020	6.359***
LiberalArts [b] (yes=1 if a Liberal Arts college)	0.139	0.017	7.978***
Masters [b] (yes=1 if a Master's University)	0.025	0.009	2.690***
Number of observations: 935	R-squared: .802	F statistic: 147	
a: excluded category rural			
b: excluded category-comprehensive			
* statistically significant at the 10% level			
** statistically significant at the 5% level			
*** statistically significant at the 1% level			

This table shows the regression, graduation rates as a function of relevant variables. Graduation rate$_i$ = β_0 + β_1 FacultySalary + β_2 StandTests + β_3 TeachCenter + β_4 LearnComm + β_5 NSSE + β_6 Public + β_7 PerClsUnder20 + β_8 PerClsOver50 + β_9 Student faculty ratio + β_{10} FacultyFT + β_{11} Freshintop25 + β_{12} Acceptance rate + + β_{13} Location + β_{14} Diversity + β_{15} Institution type

While teaching centers and learning communities do not impact graduation rates at schools in general, there may be a marginal gain for certain types of colleges and universities. For example, the effectiveness of one or the other may exist depending on if the institution is public or private. The second regression, shown in Table 2, is the same as the first one except that interaction terms between variables that may impact graduation rates are also included. The focus of the relationships is with teaching centers and learning communities but a few other interaction terms are also included.

$$\text{Graduation rate}_i = \beta_0 + \beta_1 X1 + \beta_2 X2 \; \beta_3 X3 + \beta_4 X4 + \varepsilon_i \tag{3}$$

Where:

X1 = same vector of variables in regression 1
X2= teaching center interaction terms
TCXRES: impact of a teaching center on research universities only
TCXLA: impact of a teaching center on liberal arts colleges only
TCXMA: impact of a teaching center on masters universities only
TCXC: impact of a teaching center on comprehensive universities only
X3= learning communities interaction terms
LRNCOMXRES: impact of learning communities on research universities only
LRNCOMXLA: impact of learning communities on liberal arts colleges only
LRNCOMXM: impact of learning communities on masters universities only
LRNCOMXC: impact of learning communities on comprehensive universities only
X4= other interaction terms
LCXPUBLIC: impact of a learning center on public universities only
LCXTEST: impact of a teaching center with standardized test scores
LCXFACFT: impact of a teaching center with percent of faculty that is full time

$$Graduation\ rate_i = \beta_0 + \beta_1\ FacultySalary + \beta_2\ StandTests + \beta_3\ TeachCenter + \beta_4\ LearnComm + \beta_5$$
$$NSSE + \beta_6\ Public + \beta_7\ PerClsUnder20 + \beta_8\ PerClsOver50 + \beta_9\ Student\ faculty\ ratio$$
$$+ \beta_{10}\ FacultyFT + \beta_{11}\ Freshintop25 + \beta_{12}\ Acceptance\ rate + + \beta_{13}\ Location + \beta_{14}\ Diversity$$
$$+ \beta_{15}\ Institution\ type + \beta_{16}\ LCXRES + \beta_{17}\ LCXLA + \beta_{18}\ LCXMA + \beta_{19}\ LCXC \qquad (4)$$
$$+ \beta_{20}\ LRNCOMXRES + \beta_{21}\ LRNCOMXLA + \beta_{22}\ LRNCOMXM + \beta_{23}\ LRNCOMXC$$
$$+ \beta_{24}\ LCXPUBLIC + \beta_{25}\ LCXTEST + \beta_{26}\ LCXFACFT + \varepsilon_i$$

Compared with regression 1, all of the control variables coefficients have almost the identical size, for example faculty salary is exactly the same and public is almost identical. In addition, the level of statistical significance is the same for all of the variables in both. Ironically, the sign for existence of a teaching center is now negative and statistically significant at the 10% level.

Of particular interest is how centers for teaching and the presence of learning communities impact graduation rates at different types of institutions. It does not increase graduation rates at Liberal Arts colleges and Masters universities and actually decreases graduation rates at comprehensive schools. However, for a one tailed test, at the 10 percent level a teaching center improves graduation rates at research universities. This makes sense, professors at research universities are primarily researchers and they spend a lot less time in the classroom than their counterparts at other schools. It is possible that just getting a little support for their teaching can add a lot to what they do in the classroom. In addition, many classes at research universities are taught by teaching assistants who are graduate students and new at teaching and part-time adjunct professors. A teaching center may add a lot of value to these groups.

Learning communities have no impact on graduation rates at research universities and liberal arts colleges and decrease it for masters schools. For a one tailed test the addition of learning communities is statistically significant at the one percent level in increasing graduation rates at comprehensive universities. Perhaps these institutions have a little less of a sense of camaraderie for incoming students. Grouping students by like interests helps them stay in school where it is not as meaningful at other types of institutions. Comprehensive universities also have lower rates of graduation in general than other schools. Perhaps the marginal impact of learning communities matters more for schools with lower graduation rates compared to those with higher rates.For a one tailed test, at the 5 percent level learning communities improve graduation rates at schools with a higher percentage of faculty who are full time. Full time faculty likely have a greater commitment to their institution than part time teachers. The existence of learning communities may enable professors to engage with like-minded students early in the student's career. For example, students with an interest in music may be grouped together and mentored by a faculty member in this discipline. Faculty may enjoy connecting with students who share an interest in their area and students may be more likely to stay and finish their degree.

CONCLUSION

Colleges and universities in the U.S have implemented a variety of programs aimed at increasing their graduation rates, including establishing teaching centers and grouping like-minded students into learning communities. Actions are sometimes taken without knowledge of their effectiveness. This paper addresses the issue of whether teaching centers and learning communities actually accomplish their goals. Information on faculty salaries, existence of a teaching center, school location, if the college participates in the National Survey of Student Engagement and other information are added to data from the *U.S. News and World Report* data on graduation rates. Regressions were estimated looking at the marginal impact of different variables first without interaction terms, then with them. Not surprisingly, results show that variables like student faculty ratio, the percentage of faculty that are full time and faculty salaries all contribute to higher graduation rates. It is interesting that the existence of student learning communities and if a school has a teaching and learning center for faculty does not improve graduation rates. But this only holds true if institutions are not separated by type and if the marginal impacts are not separated. By

using interaction terms where the influence of different factors can be isolated on the type of institution and other control variables, this research finds that in some situations the existence of teaching centers and learning communities will increase graduation rates.

Table 3: OLS Regression with Interaction Terms- Dependent Variable: Graduation Rate

Independent Variables	Coefficients	Std. Error	T-Statistic
Intercept	0.070	0.087	0.805
FacultySalary (Ave faculty salary excluding instructors)	0.002	0.000	5.980***
StandTests (SAT and ACT converted to SAT)	0.000	0.000	5.673***
TeachCenter (yes=1 if has teaching center)	-0.147	0.110	-1.329*
LearnComm (yes=1 if has learning communities)	-0.002	0.010	-0.220
NSSE (yes=1 if participated in NSSE)	0.006	0.007	0.831
Public (yes=1 if public)	-0.105	0.013	-8.431***
PerClsUnder20 (% of classes with fewer than 20 students)	-0.072	0.035	-2.083**
PerClsOver50 (% of classes with more than 50 students)	-0.002	0.002	-0.799
Student faculty ratio	-0.003	0.002	-1.679*
FacultyFT (Percent of faculty that is full time)	0.020	0.040	0.496
Freshintop25	0.172	0.031	5.481***
Acceptance rate	-0.024	0.025	-0.960
Urban [a] (yes=1 if in urban location)	-0.016	0.009	-1.816**
Suburban [a] (yes=1 if in suburban location)	0.001	0.009	0.092
Diversity (yes=1 if population > 17% white)	-0.054	0.008	-6.466***
Research [b] (yes=1 if a Research University)	0.089	0.025	3.620***
LiberalArts [b] (yes=1 if a Liberal Arts college)	0.134	0.018	7.333***
Masters [b] (yes=1 if a Master's University)	0.024	0.009	2.588***
TCXRES [c] (interaction terms- see below)	0.087	0.054	1.596*
TCXLA [c]	0.065	0.062	1.055
TCXMA [c]	0.042	0.045	0.925
TCXC [c]	-0.066	0.044	-1.490*
LRNCOMXRES [d]	0.011	0.020	0.565
LRNCOMXLA [d]	0.027	0.034	0.790
LRNXM [d]	-0.024	0.018	-1.343*
LRNCOMXC [d]	0.068	0.028	2.427***
TCXPUBLIC [e]	0.010	0.021	0.480
LCXTEST [e]	-0.0000046	0.000	-0.506
LCXFACFT [e]	0.166	0.093	1.775**
Number of observations: 935	R-squared: .807	F statistic: 96	

a: excluded category rural
b: excluded category-comprehensive
c: interaction terms- teaching center multiplied by: research, liberal arts, masters and comprehensive schools
d: interaction terms- learning community multiplied by: research, liberal arts masters and comprehensive schools
e: interaction terms: learning center multiplied by public, teaching center multiplied by standardized test scores and percentage of faculty who are full time respectively
* statistically significant at the 10% level
** statistically significant at the 5% level
*** statistically significant at the 1% level

This table shows the regression, graduation rates as a function of relevant variables plus interaction terms. $Graduation\ rate_i = \beta_0 + \beta_1\ FacultySalary + \beta_2\ StandTests + \beta_3\ TeachCenter + \beta_4\ LearnComm + \beta_5\ NSSE + \beta_6\ Public + \beta_7\ PerClsUnder20 + \beta_8\ PerClsOver50 + \beta_9\ Student\ faculty\ ratio + \beta_{10}\ FacultyFT + \beta_{11}\ Freshintop25 + \beta_{12}\ Acceptance\ rate + + \beta_{13}\ Location + \beta_{14}\ Diversity + \beta_{15}\ Institution\ type + \beta_{16}\ LCXRES + \beta_{17}\ LCXLA + \beta_{18}\ LCXMA + \beta_{19}\ LCXC + \beta_{20}\ LRNCOMXRES + \beta_{21}\ LRNCOMXLA + \beta_{22}\ LRNCOMXM + \beta_{23}\ LRNCOMXC + \beta_{24}\ LCXPUBLIC + \beta_{25}\ LCXTEST + \beta_{26}\ LCXFACFT$

There are both positive and negative aspects of having a large data set to examine marginal impacts of variables on graduation rates. Some limitations are that there could be some micro characteristics impacting graduation that are not picked up by this research or that are not detected due to measuring variables at the college level. In sum, different institutions need to be selective in what type of policy they use when implementing programs aimed at increasing their school's graduation rates. Not surprisingly,

what works at a research university is different from what is useful at a comprehensive university. In addition to the different variables examined in this paper there are likely many others that future research could address.

Notes

[1] A stepwise type regression was also estimated using the stepwise function in SPSS. The highest R squared that was obtained was 0.849, a little higher than the reported R squared in the regression in Table 1. The stepwise regression suggested using rank in category as an independent variable and excluding The Urban category, some of the types of schools and the teaching center variable. Since there are only 686 observations for the rank in category this would lower the degrees of freedom. In addition, this data is ordinal and typically ordinal data is not included with ratio and interval level data that all of my other quantitative variables are. Since the focus of this paper is on if teaching centers matter, the variable needs to be included, whether it is statistically significant or not. Excluding some of the other dummy variables and including others does not make sense. The variables recommended with the stepwise regressions are almost identical to what is in the paper, so I have kept the original regression.

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