How might Governors improve college graduation rates?

Paper presented for the annual meeting of the

American Educational Research Association - April 2011

New Orleans, Louisiana

John G. Asmussen, Ph.D.

Higher Education Policy & Administration

University of Minnesota, Twin Cities

asmus027@umn.edu

Abstract

The National Governors Association joined President Obama and major educational foundations in placing college completion on the governmental agenda. Higher education scholars have established several student and institutional characteristics that affect college graduation. This paper used multivariate analysis of variance and hierarchical linear modeling to extend prior research to include independent factors subject to gubernatorial control, e.g., state-level higher education plans, performance plans, governance structures, and identity of regional accrediting agency. The multivariate analysis of variance revealed that a moderate level of state oversight and governance was related to public universities with the highest levels of graduation rate productivity. Conversely, public universities with limited state oversight showed mediocre productivity. Interestingly, the least productive public universities were subject to the most intense oversight and governance scrutiny from activist state governments. The hierarchical linear model provided added evidence that the public universities with the least productive graduation rates were located in activist states.

Introduction

On July 11, 2010, West Virginia Governor Joe Manchin III announced that, as the incoming chair of the National Governors Association, he would focus on increasing the number of students in the United States who complete college degrees (National Governors Association, 2010). Governors, thus, became the latest, and perhaps the most important, group to call on higher education to produce more graduates. President Barack Obama (2009), in his first remarks to a joint session of Congress, had challenged lawmakers to take steps so that, "by 2020, America will once again have the highest proportion of college graduates in the world." In 2006, Education Secretary Margaret Spellings, representing President George W. Bush, commissioned a national blue-ribbon task force to study the future of higher education. In releasing the final report, Secretary Spellings lamented, "Among high school graduates who do make it on to postsecondary education ... some never complete their degrees at all, at least in part because most colleges and universities don't accept responsibility for making sure that those they admit actually succeed" (U.S. Department of Education, 2006, p. *x*). Private foundations, such as the Lumina Foundation for Education (2008) and the Bill & Melinda Gates Foundation (Gose, 2008) also have begun placing an emphasis on funding research related to college completion.

Among the possible solutions for improving college completion in the U.S. is increasing the graduation rate. In 1989, U.S. Senator Bill Bradley introduced legislation which required U.S. colleges and universities to shed more light on their graduation rates. As a former college basketball star, Senator Bradley was interested primarily in ensuring that potential college athletes would be enlightened about their prospects of earning a college degree. Congress seized upon the opportunity, and broadened Senator Bradley's vision to require colleges and universities to provide information to all students weighing their college options. With passage of the 1990

Student Right to Know and Campus Security Act (Public Law 101-542), the path was charted for a uniform methodology for calculating college graduation rates and publishing them widely.

Because of Senator Bradley's initiative, U.S. college graduation rates, particularly for students seeking baccalaureate degrees, became more transparent. Nonetheless, graduation rates have seemed frozen and immovable. In the preface to its 1990 Student Right to Know and Campus Security Act, Congress found that "just 43 percent of students attending 4-year public colleges and universities ... graduated within 6 years of enrolling" (Public Law 101-542). By 2010, the rates had risen somewhat, but still were less than 50 percent.

Higher education scholars (Astin, 1993; Adelman, 2006; Bowen, Chingos & McPherson, 2009; Chen, 2007; Cope & Hannah, 1975; Kuh, Kinzie, Schuh & Whitt, 2005; and Tinto 1993) have studied the college graduation phenomenon and attributed the differences in graduation rates to many factors. Some factors are related to student characteristics, e.g., the academic preparedness of incoming students, their socio-economic characteristics, and even gender. Other factors are related to institutional differences in resources, size, and possibly location. This complex array of factors makes it difficult to compare graduation rates. Furthermore, some universities or groups of universities have criticized using them as an outcome measure, and rationalized their performances by pointing to their unique attributes, such as the students they serve (Hernandez, 2009).

Rather than comparing reported graduation rates to assess organizational success, a better approach would be to ask whether a university had optimized production from its given inputs, e.g., student and institutional resources. Astin (1993) coined the phrase "talent development" as a means to level the playing field for assessing the effectiveness of universities. Highly selective universities certainly should have much higher reported graduation rates than open-access public

universities. Comparing the effectiveness of two such universities, thus, should focus on which university had forged the greatest increase in the talent for its students during their academic careers. For purposes of this paper, the concept of "productivity" is introduced to measure the relative effectiveness of college graduation rates. After controlling for differences in student characteristics and institutional resources among public universities, the residual effect which remains between actual and predicted graduation rates, provides a measure of how productive a university has been with its given inputs.

Although inputs, like student characteristics, play a strong role in determining graduation rates, the internal environments maintained by public universities also affect such outcomes. Astin's (1993) I-E-O model emphasized that outcomes, like graduation rates, are affected by both inputs and internal environments. Pascarella's (1985) general causal model for differential effects of organizational environments also identified the distinctive role of internal environments on college outcomes, i.e., learning and cognitive development. Measuring the components which create an effective internal environment, though, has proven elusive. Kuh, Kinzie, Schuh, Whitt, and Associates (2005) conducted an extensive qualitative study of highly effective universities and identified 43 recommended practices, but could not define a precise formula for maintaining a productive internal environment. Indeed, Van de Ven & Poole (1995) suggest that the idea of equifinality (multiple routes to the same outcome) may apply to successful organizations.

Various organizational theories suggest that the effectiveness of the internal environment is affected by its external environment. The U.S. Department of Commerce (2008) established the Baldrige National Quality Program for educational institutions which casts the external environment as having an overarching effect on other components of organizational effectiveness. More specifically, punctuated equilibrium theory (Gould, 1989; Sastry, 1997),

proposed that the force of internal inertia would hold organizational performance in a steady state as long as external stakeholders perceived it to be appropriate. The theory hypothesized that an equilibrium existed between an external perception about organizational performance and its actual performance. An imbalance could be remedied either by altering the perception or inducing changes to overcome internal inertia and improve performance. When balance was restored, inertia would reestablish steady performance.

This paper redirects the attention from internal practices which might improve graduation rates to external factors which might prompt colleges to increase the productivity of their graduation rates. It does not examine the "black box" of a university's internal environment to determine which practices may have contributed to improved performance. Rather, it embraces the concept of equifinality, and assumes that a university will find a way that works in their unique circumstances to improve its productivity when pressured by its external environment. In other words, internal productivity will be balanced with external pressures on performance.

Governors may offer the necessary external impetus for colleges to improve their graduation rates. The founders of the U.S. Constitution left responsibility for education to state governments, not the federal government. The federal government exerts indirect influence on improving graduation rates by imposing mandates as a condition for administering federal student financial aid programs, including publishing graduation rates. State governments, though, hold direct authority for their universities. Public universities, in particular, are subject to state control and oversight.

How might the Governors most effectively deploy their powers to improve graduation rates? Over the years, the states have experimented with a myriad of planning commissions, performance programs, coordinating agencies, and board governance structures. Although

government officials often believe that more aggressive interventions will lead to improved educational outcomes, there is scant evidence to support such a supposition. This paper explores the extent that differences in the kinds of external pressures exerted by state governments are associated with differences in the productivity levels of college graduation rates.

Methodology

This paper used an earlier study by Asmussen (2010) which tested a series of hypotheses about possible relationships between external influences and the productivity of the graduation rates of U.S. public universities. Asmussen developed an extensive database of variables affecting the four and six-year graduation rates of U.S. public universities. He used analysis of covariance (ANCOVA) and multivariate analysis of covariance (MANCOVA) models to test a multitude of hypotheses. This paper highlights the work from that study which revealed the most insights for gubernatorial consideration.

This paper then builds on the earlier work of Asmussen (2010) and applies Hierarchical Linear Modeling (HLM) to test some of the same hypotheses. The Asmussen study, though, did not account for the dependencies of universities nested within state. The ANOVA and MANCOVA models used the Ordinary Least Squared (OLS) regression techniques which assumed that observations were independent from each other. To the extent that the graduation rates of universities within states were correlated, the OLS results would be biased. This current study was designed to fill that void. HLM is a statistical methodology that accounts for the within cluster dependencies and facilitates the analysis of nested data structures (Raudenbush & Bryk, 2002). In the Asmussen study, public universities were nested within state governments and it may be advantageous to account for that structure in the data analysis. HLM also will

provide a basis to estimate the proportion of variation in college graduation rates which is attributed to being located in different states.

The methodology for this study was a quasi-experimental design for cross-sectional data, with the six-year graduation rates reported by U.S. public universities in 2007 as the dependent variable. The independent variables of most interest were at the state level (level two for the HLM analysis) of the model and concerned types of higher education plans, performance programs, and role played by state governments.

The quasi-experimental design did not support direct causal inferences because the subjects were not randomly assigned to groups. Nonetheless, it attempted to remove the effects of institutional variables which prior studies have shown to affect college graduation rates, so that the unexplained differences in the residual rates, or productivity of the graduation rates, would be the subject of further analysis. Furthermore, as a two-level model, it facilitated differentiating among affects which are subject to institutional control from those subject to state control.

Population and Sample

This study included 398 of the 576 U.S. public universities which existed in 2001. The universities selected for the study were subject both to state control and a separate, periodic accreditation by a regional accrediting agency (not accredited as a component of a larger entity). Only universities with more than 384 students in their cohort of full-time, first-time students entering in the Fall 2001 term were included in the study (smaller cohort sizes were too sensitive to random year-to-year fluctuations in their rates). In addition, universities that offered primarily sub-baccalaureate degrees were excluded from the study because it focused on completion of baccalaureate degrees. Finally, public universities from Florida, West Virginia, and part of

Colorado were excluded from the study because their governance structures were undergoing substantial changes in 2001.

Data

The data for this study was obtained or derived from the database developed by Asmussen (2010). Although Asmussen examined the possible effects from several external sources which might affect the variation in college graduation rates, e.g., governing boards, accrediting agencies, and state governments. The HLM analysis used only the data associated with state-level factors that Asmussen found to have a statistically significant relationship with graduation rates. In addition, for the HLM analysis a latent variable was constructed as suggested by the Asmussen study regarding the role played by state government relative to its public universities, e.g., activist, off-the-radar, and collegial.

Asmussen (2010) constructed factors related to state governance and oversight from conditions which existed in the unique external environment for each public university in 2001. State-level higher education plans (Education Commission of the States, 2001) were collected, reviewed, and categorized for content. Burke & Minassians (2001) provided data on the types of state performance budgeting programs affecting public universities at the time. It should be noted that Asmussen also tested, but did not find a statistically significant relationship for state performance reporting and funding programs; accordingly, those factors were not included in the HLM analysis for this study.

Asmussen (2010) obtained the data for the dependent variables, four and six-year graduation rates reported in 2007, and the institutional covariates from the series of surveys conducted by the U.S. Department of Education (2008) as part of the Integrated Postsecondary Education Data System. When necessary, imputation methods were used to estimate missing

values and some covariates were transformed to improve the linearity of their relationship with the dependent variables.

For the control variables, Asmussen (2010) conducted a literature review and identified 23 possible predictors of college graduation rates for which public data was available from the U.S. Department of Education. Predictors were organized around a framework proposed by Pascarella (1985) which suggested the existence of student and institutional clusters that accounted for differences in college outcomes. Data was obtained from the series of surveys conducted by the U.S. Department of Education (2008) as part of the Integrated Postsecondary Education Data System. When necessary, imputation methods were used to estimate missing values and some variables were transformed to improve the linearity of their relationship with the dependent variables, four and six-year graduation rates.

Variables

Asmussen (2010) constructed factors related to state governance and oversight from conditions representing the mechanisms which existed in the unique external environment for each public university in 2001. Four categories of independent variables were tested:

- Type of state-level higher education plan: Asmussen (2010) reviewed and classified state-level higher education plans into four levels: (1) no plan, (2) plan without a focus on college completion, (3) plan with an unspecified college completion goal, and (4) plan with targeted goals for college completion. For the HLM analysis, the levels were dummy coded with level #2 as the reference group.
- Type of performance reporting, budgeting, and funding program: Burke & Minassians (2001) classified state performance programs into three levels: (1) no program, (2) voluntary program, and (3) mandatory program (required by state law). For the HLM

analysis, the levels were dummy coded with level #1 as the reference group. In the original study, separate tests were conducted for each of the three types of performance programs: reporting, budgeting, and funding. Only the tests for performance reporting programs showed statistically significant results and are discussed in this paper. Readers interested in the other results are referred to Asmussen (2010).

- The structure of governing boards and responsibilities of state coordinating boards (Education Commission of the States, 2008) were analyzed and categorized. First, a dummy variable was constructed as to whether a local governing board existed for the university (coded 1 if a local board had any duties, even if shared with a larger consolidated governing board and coded 0 if the university was subject to governance only from a consolidated board). Another dummy variable was constructed for whether a university was subject to multiple layers of oversight for academic program approval (usually a coordinating board reviewing the recommendations of a governing board). Other aspects of governance such as the intensity of consolidating governing boards (measured by the number of entities subject to its oversight) and existence of multiple layers of budget review were tested, but not found to have a statistically significant relationship in the model. Readers interested in the other results are referred to Asmussen (2010). This variable was not tested in the HLM analysis because governing board structures varied within states and were not consistently applied to all universities in the same state.
- Finally, the regional accrediting agency (Council on Higher Education Accreditation, 2009) responsible for each public university was coded. This variable also was not tested

in the HLM analysis because the accrediting agency assignments have remained unchanged for many years.

In addition to testing for the main effects of these independent variables, the original study tested for the statistical significance of interaction effects among the state government accountability mechanisms (planning, performance programs, and governance). The most significant effects of these tests were associated with crossing state planning type with type of performance reporting program. That result led to creating an additional independent variable for the HLM analysis:

- Role of state government: Asmussen (2010) found a statistically significant effect associated with crossing state-level higher education plan type with type of performance budgeting program. Rather than introducing 12 additional interaction terms, the current study constructed three latent variable implied by the Asmussen study: (1) "Activist" states which imposed the most aggressive interventions on their public universities, (2) "Off-the-Radar" states which deferred to the universities' governing board(s) regarding planning and performance budgeting, and (3) "Collegial" states which either worked together with their public universities on higher education plans or relied on voluntary performance budgeting programs developed by the universities.

Asmussen (2010) had examined 23 possible covariates in his original study and retained nine covariates in his final models, after eliminating covariates which accounted for redundant or insignificant variation in the dependent variables. The HLM analysis further reduced the number of covariates to four. The HLM model becomes unduly complex when overloaded with covariates or independent variables. Furthermore, for purposes of the current study, the more parsimonious model of four covariates accounted for 97% of the variation accounted for by the 9 covariates from the earlier study. The four covariates retained in the HLM analyis were:

- ACT test scores measured at the 25th percentile for each university. When necessary, SAT test scores were converted to ACT test scores using a formula explained in Asmussen (2010).
- Proportion of undergraduate students who were attending part-time. This variable was converted with a probit transformation to improve the linearity of its relationship with the dependent variable.
- Proportion of residential housing units available to enrolled students.
- Number of students enrolled. This measure of institutional size was converted with a logarithmic transformation to improve the linearity of its relationship with the dependent variable.

Five other covariates were used in the original Asmussen (2010) study, but not retained for the HLM analysis.

- Proportion of white female students.
- Proportion of Black or Hispanic male students. This measure of institutional size was converted with a logarithmic transformation to improve the linearity of its relationship with the dependent variable.
- An index of the cohort's racial/ethnic diversity (Chang, 1999) which indicated the likelihood of two randomly selected students being from different racial/ethnic backgrounds. This measure of institutional size was converted with a logarithmic transformation to improve the linearity of its relationship with the dependent variable.
- Proportion of low-income students measured as a percentage of students receiving federal Pell grants. This measure of institutional size was converted with a logarithmic transformation to improve the linearity of its relationship with the dependent variable.

- Undergraduate students as a proportion of the total student body.

Finally, the dependent variable was graduation rates of full-time, first-time undergraduate students who enrolled in the fall of 2001 and earned a baccalaureate degree within six years (reported as 2007 graduation rates). Although Asmussen (2010) used both four and six-year graduation rates as dependent variables in the earlier study, only six-year graduation rates were used for the HLM analysis. Asmussen applied a logit transformation to improve the normality of four-year graduation rates, complicating the interpretation of the results. It was not necessary, though, to transform six-year graduation rates. Because of the added complexity of the HLM analysis, thus, it was confined to using six-year graduation rates as the dependent variable.

Data Analysis - Original Study

Asmussen (2010) tested hypotheses related to the possible effects associated with state governance and oversight mechanisms on graduation rates using analysis of covariances (ANCOVA) and multivariate analysis of covariance (MANCOVA) statistical techniques. These techniques controlled for differences in student and institutional characteristics, and tested for the effects of independent variables related to state governance and oversight mechanisms on four and six-year graduation rates. By controlling for student and institutional characteristics, the statistical analyses measured the productivity levels of the graduation rates generated by the universities, rather than simply comparing the nominal rates. As a result, it was better able to isolate the effects of the state governance and oversight mechanisms.

Data Analysis - Additional HLM

The data analyses were performed using the software program HLM - student version 6.6 (Raudenbush, Bryck, & Congdon, 2008). First, descriptive analyses were used to describe the patterns in the data, followed by two-level hierarchical modeling (Raudenbush & Bryck, 2002)

with public universities nested within states. To determine whether use of the two-level hierarchical model was justified, the intraclass correlation coefficient (ICC) should be sufficiently large. The ICC describes the proportion of variation in the dependent variable (graduation rates) that is attributable to differences in the Level 2 entities (states, in this study) with the remaining variation attributable to differences in the Level 1 entities (universities, in this study). Because of the added complexity of multilevel modeling, the ICC generally should be at least .05 to justify its use (Harwell, 2010).

To control for the compounding of Type I errors resulting from multiple parameter estimates, an overall family-wise error rate, α, of .10 was distributed among the parameter estimates using a Bonferroni (Abdi, 2007) adjustment of $\alpha \div k$, where k represented the number of parameters tested for a particular hypothesis. The Bonferroni adjusted α-values were not, however, distributed equally to all parameter estimates. Half of the family-wise error rate (.05) was distributed equally among the Level 2 (state) parameter estimates of the main effects, and the remaining .05 of the family-wise error rate was distributed equally among the remaining parameter estimates.

The t-test results reported by the HLM 6.6 software, though, do not account for the dependencies within class (state), and, thus, may underestimated standard errors by an unspecified magnitude. Accordingly, a second test, the deviance test (Harwell, 2010), was performed to test for the statistical significance of the adding independent variables to Level 2 of the model. The change in the "deviance" value between two models was compared to a critical value determined from a χ^2 test with degrees of freedom set at the additional number of parameters estimated in the more complex model and $\alpha = .05$.

Accordingly, for each hypothesis, the deviance test was used first to determine whether the more complex model, including the Level 2 independent variables, was statistically significant, compared to an unconditional Level 2 model. If so, then the t-tests were examined for statistical significance of the Level 2 parameters.

Before testing the hypotheses, the four Level 1 (university) covariates were added to the model, and analyzed to determine whether they should be treated as random or fixed variables. Because the literature offered little guidance on this decision, an empirical analysis was performed which initially treated all four covariates as random variables, and then in a backward stepwise manner converted variables which showed non-significant variance components as fixed variables. Deviance tests were conducted at each step to determine whether converting each covariate from variable to fixed was justified. This process resulted in determining that only the proportion of part-time students covariate justified being treated as a random variable, thus, the other three covariates were treated as fixed variables.

The four covariates were grand-mean centered in the Level 1 model. Grand-mean centering was chosen because group-mean centering would have required adding a contextual variable for each of them at Level 2 and added excessive complexity to the model. Grand-mean centering adds some bias by causing shrinkage to the Level 2 variances, but that trade-off seemed worthwhile to retain a more parsimonious model.

After adding the Level 1 covariates, while leaving Level 2 unconditional produced the following model (γ_{x0} = fixed effects, u_{xj} = Level 2 residuals, and r_{ij} = Level 1 residuals):

$$Y_{ij} = \gamma_{00} + \gamma_{10}(ACT_{ij}-\overline{ACT}) + \gamma_{20}(PT_{ij}-\overline{PT}) + \gamma_{30}(HOUS_{ij}-\overline{HOUS}) + \gamma_{10}(SIZE_{ij}-\overline{SIZE}) + u_{oj} + u_{2j} + r_{ij}$$

The model estimated nine parameters and reasonably satisfied the assumption about multivariate normality, and most other assumptions critical to the reliability of multilevel modeling. The only

assumption which was not reasonably satisfied regarded homogeneity of the Level 1 variances ($p = .008$ on the HLM 6.6 analysis). HLM is quite robust, though, to violations of this assumption, thus, it was accepted.

Hypothesis tests were then conducted by adding the three sets of independent variables to the model individually. Again, deviance tests and, if warranted, t-tests were conducted to determine whether any of the independent variables explained a statistically significant amount of variation among the states.

A final consideration for the data analysis was the power of the model. Power is an indicator of the risk associated with a Type II error (failing to detect a significant effect). Power can be increased by various factors, including increased cluster sizes and samples within cluster. This study, though, was constrained by a set number of U.S. states and public universities within each state. A power analysis, using the Optimal Design software (Liu, Spybrook, Congdon, Martinez, & Raudenbush, 2009), was conducted to assess the strength of the data analysis for detecting significant effects. With $\alpha = .10$, ICC = .10 and .15, clusters (j) = 48, and average cluster size (i) = 8, the software showed that the power for detecting an effect size of .4 was about .8 to .9. In other words, there was an 80-90% probability of detecting a parameter would result in a change of at least .4 standard deviations in the dependent variable. An effect size of .4 is very large, though, and could be difficult to find. Using the same estimates for an effect size of .2 (a more moderate effect size), the power of the model declined to .3 to .4, meaning it had only a 30-40% probability of detecting a significant effect.

Results

Descriptive Analyses

The 398 public universities were distributed unequally among the 48 states included in the sample, ranging from 1 public university in Wyoming to 28 public universities located in California. Overall, the 398 public universities had a six-year graduation rate of 48.8% with a standard deviation of 15.4%. Table 1 shows the descriptive statistics for the Level 1 covariates included in the HLM analysis (readers are referred to Asmussen (2010) for more extensive descriptive statistics from the original study):

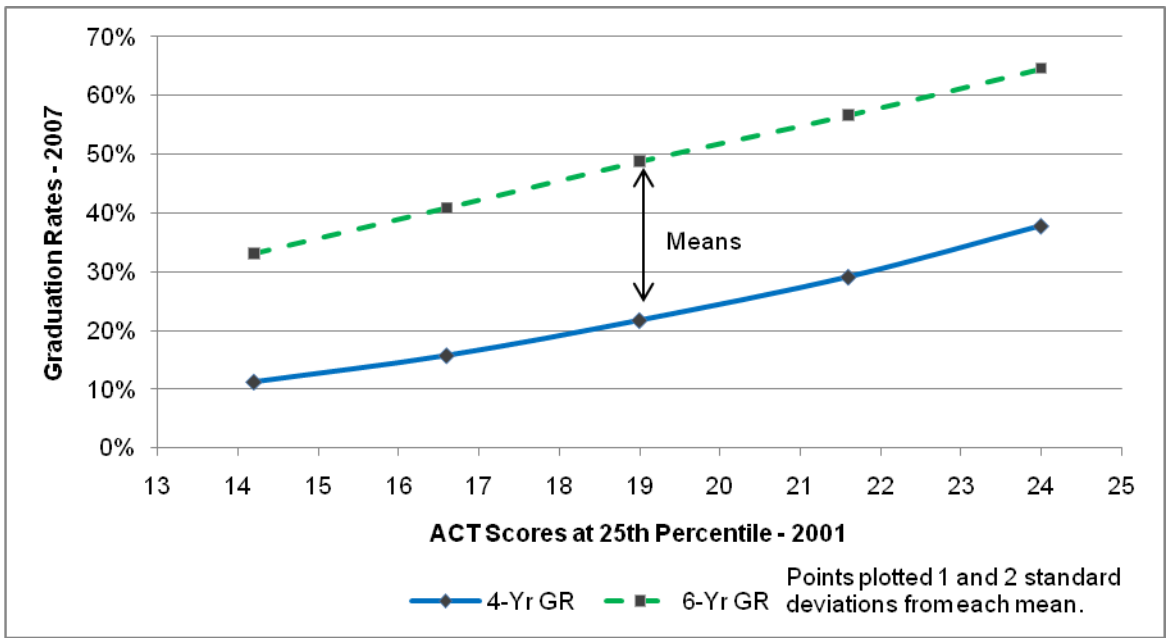
Table 1: Descriptive Statistics for Level 1 (university) covariates

Covariate	Minimum	Maximum	Mean	Std. Dev.
ACT scores at 25th Percentile	13	27	19.10	2.46
Proportion Part-time Enrollment (1)	2.14	5.08	3.94	.48
Student Enrollment (2)	7.24	10.83	9.25	.725
Proportion of Housing Units Available	.00	.74	.24	.15

(1) Part-time Enrollment was converted with a probit transformation to improve the linearity of its relationship with the dependent variable. Translating the values in this table back to proportional values would be minimum = .00, maximum = .53, and mean = .15.
(2) Student Enrollment was converted with a logarithmic transformation to improve the linearity of its relationship with the dependent variable. Translating the values in this table back to proportional values would be minimum = 1,394; maximum = 50,514; and mean = 10,445 students.

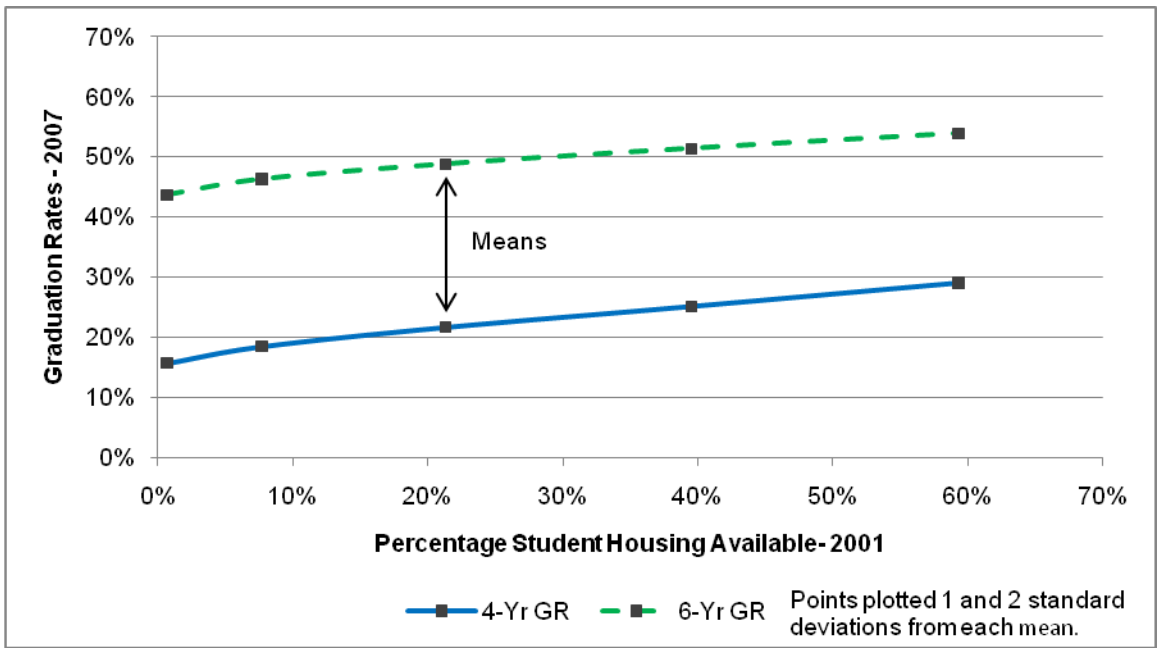
The covariates had strong correlations with the dependent variable: .40 for student enrollment and proportion of housing units available, -.67 for proportion of part-time enrollment, and .83 for ACT scores. Figures 1 - 3 show the relationship between three of the covariates and college graduation rates. It is not surprising that graduation rates rise sharply as student ACT test scores increase, as shown in Figure 1. Figure 2 shows the positive effects of making student housing available. Figure 3 shows that as part-time enrollment increases, and institutional support is stretched to more students, graduation rates decline.

Figure 1: Relationship of ACT Test Scores to Graduation Rates



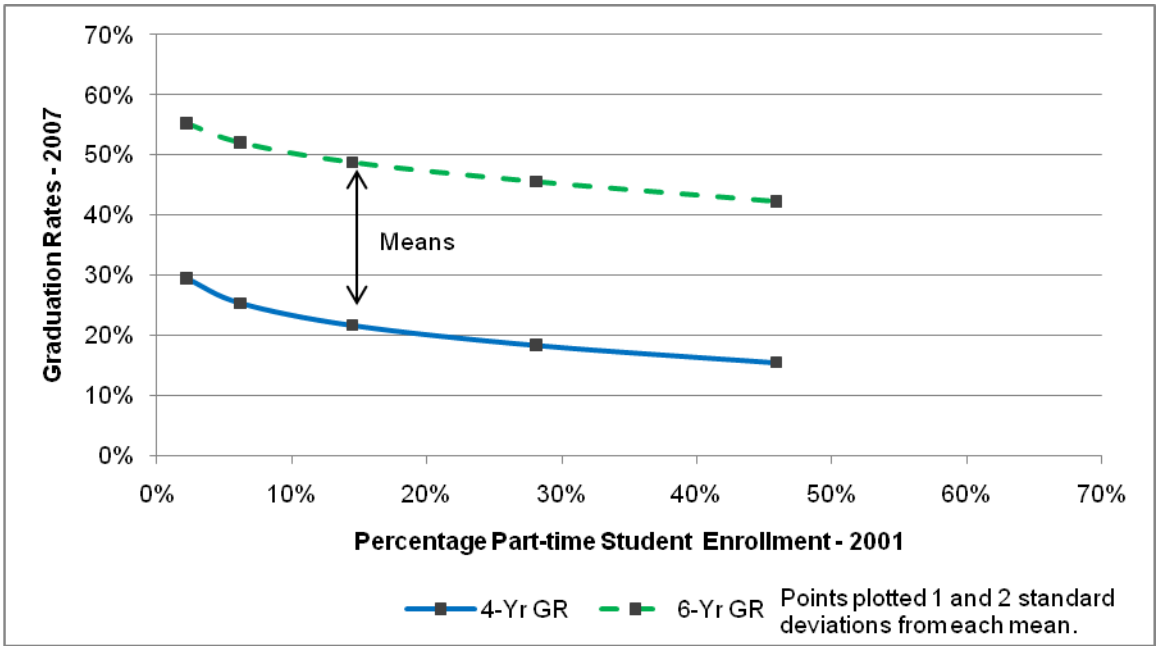
Source: Asmussen (2010).

Figure 2: Relationship of Student Housing Availability to Graduation Rates



Source: Asmussen (2010).

Figure 3: Relationship of Part-time Student Enrollment to Graduation Rates



Source: Asmussen (2010).

Table 2 shows the descriptive statistics for the dependent variable, grouped by the levels of each independent variable.

Table 2: Six-Year Graduation Rates Grouped by State Factors

Variable/Levels	Number of States	Number of Universities	Grad Rate	Std. Dev.
State-level Higher Education Plan				
None	16	112	.480	.146
Plan without completion (1)	18	149	.520	.158
Plan with completion focus, no targets	11	92	.495	.149
Plan with completion targets	3	45	.390	.128
Performance Budgeting				
None	22	159	.492	.144
Voluntary Program (1)	13	131	.517	.165
Mandatory Program	13	108	.447	.147
State Role				
Off-the-Radar	26	174	.483	.144
Collegial (1)	15	150	.533	.158
Activist	7	74	.409	.136

(1) Reference groups for dummy coding purposes.

Perhaps, the most important descriptive statistic for this study is the ICC, because it indicates whether the use of multilevel analysis is justified. Measuring the ICC for the unrestricted model, without covariates at either level, resulted in an ICC of .128, meaning that 12.8% of the variation of the graduation rates among the states was attributable to differences in the characteristics of the states and 87.2% was attributable to differences in the characteristics of the universities. Since the ICC exceeded the threshold of .05, the use of multilevel modeling was justified. An ICC of .128 suggests that the vast majority of variation in graduation rates is controlled by actions of the universities, but it is significant enough that the governors should consider their actions carefully because state actions mattered, too.

Original Study Results

Asmussen (2010) conducted an omnibus MANCOVA test designed to test the significance of the factors, interaction of factors, and the covariates. The multivariate results showed that Wilk's Lambda was significant ($p < .05$) for nine control variables and five independent variables or interactions which included those variables. The univariate results from the MANCOVA test accounted for a highly significant amount of the variation in both four-year rates ($F_{(32,365)} = 46.081$, $p < .001$, and adjusted $R^2 = .784$) and the six-year rates ($F_{(32,365)} = 78.844$, $p < .001$, and adjusted $R^2 = .863$). Accounting for such a high amount of variation suggested that isomorphism may have created substantial commonality among the practices of public universities.

For four-year graduation rates, the main effects for four independent variables were statistically significant in the analysis: identity of regional accrediting agency ($F_{(5,365)} = 8.606$, $p < .001$, and partial $\eta^2 = .105$), the content of state-level higher education plan ($F_{(3,365)} = 5.296$, $p = .001$, and partial $\eta^2 = .042$), type of performance budgeting program ($F_{(2,365)} = 4.907$, $p = .008$,

and partial η^2 = .026), and coordinating oversight for program approval ($F_{(1,365)}$ = 4.738, p = .030, and partial η^2 = .013). Also, two interactions were statistically significant for four-year rates: state-level higher education plan crossed with performance budgeting program ($F_{(5,365)}$ = 4.591, p < .001, and partial η^2 = .059) and state-level higher education plans crossed with the existence of a local governing board ($F_{(3,365)}$ = 3.336, p = .020, and partial η^2 = .027).

For six-year graduation rates, the main effects for three independent variables were statistically significant in the analysis: identity of regional accrediting agency ($F_{(5,365)}$ = 11.490, p < .001, and partial η^2 = .136), type of performance budgeting program ($F_{(2,365)}$ = 4.040, p = .018, and partial η^2 = .022), and coordinating oversight for program approval ($F_{(1,365)}$ = 7.914, p = .005, and partial η^2 = .021). Also, one interaction was statistically significant for six-year rates: state-level higher education plan crossed with performance budgeting program ($F_{(5,365)}$ = 2.750, p = .019, and partial η^2 = .036).

Factors which did not show a statistically significant relationship with the productivity of graduation rates included types of performance reporting or performance funding programs. The lack of effect for performance funding programs was somewhat noteworthy, given the recent interest in linking budget funds to outcome measures, like graduation rates. Few states, though, had performance funding programs in 2001, and further analysis is warranted.

Analyses of the linear contrasts from the statistically significant factors revealed the particular conditions which were associated with the most productive graduation rates. It showed the productivity of graduation rates was higher when state governments had mechanisms which paid attention to its public universities, but did not impose excessively onerous oversight. The results suggest that state governments are advised to tune their oversight and governance mechanisms for higher education. A moderate level of accountability was associated with the

most productive universities; whereas, limited accountability and oversight was associated with mediocre productivity. Interestingly, public universities subject to the most extensive oversight and governance control showed the lowest productivity levels.

HLM Analyses

Table 3 shows the results for the fixed effects from the each model. Neither model 1, state-level higher education plans, nor model 2, performance budgeting programs, showed statistically significant effects. The deviance tests for models 1 and 2 showed *p*-values of .280 (χ^2 = 17.68 at 15 *df*) and .576 (χ^2 = 8.54 at 10 *df*), respectively. The deviance test for model 3, state role, did show it accounted for a statistically significant amount of the variation attributed to the states. The *p*-value for model 3 was .033 (χ^2 = 19.62 at 10 *df*).

The t-tests of the main effects in model 3 showed that states with an "Activist" role, on average, after controlling for the other variables in the study, accounted for a 5.1% point decline in the graduation rate of their public universities. The 95% confidence interval for this significant effect was 1.5% to 8.7% points. This coefficient had an effect size of .34 which is generally considered large. The other level for model 3, "Off-the-Radar" did not show a statistically significant effect (*p* = .199).

Conclusions

The HLM analysis supported the most important finding from Asmussen (2010) that the public universities located in states which had assumed an activist oversight role showed statistically significant lower graduation rates than public universities located in states which had assumed a collegial oversight role. Although Asmussen (2010) also found that the types of higher education plans or performance budgeting programs, alone, accounted for statistically significant differences in the college graduation rates between states, the more rigorous HLM analysis did not. When plan types were combined with performance budgeting type to construct

a latent variable for the role played by state governments, though, the HLM model showed a statistically significant difference between activist and collegial states.

This study suggests that the actions of state government do, in fact, make a difference on the graduation rates of public universities. Differences among states accounted for over 12% of the variation in graduation rates. Governors may wish to exercise some restraint, though, when contemplating ways to increase the graduation rates of their public universities. They are advised to compare actual performance to predicted performance when evaluating a university's graduation rate, rather than comparing its reported rates to other universities. The concept of measuring productivity (Asmussen, 2010) would serve as an effective method for evaluating graduation rates.

Also, Governors should consider inviting university leaders collegially to join them in pursuit of what is becoming a national imperative -- producing more college graduates in the U.S. Taking an alternative activist course, marked by mandates and forced targeted outcomes, may have an effect opposite of what was intended, and depress graduation rates. In many respects, the findings support the recommendations offered by MacTaggart & Associates (1996). That study recommended that state governments assign primary governance duties locally to universities, and retain statewide oversight as necessary to coordinate planning and academic programming to meet state needs.

Finally, the covariates used in the study reiterate some important lessons about college graduation rates:

- Improving the academic preparedness of entering students increases their odds of graduating.
- Increasing the availability of student housing increases the odds of students graduating.

- Serving larger numbers of part-time students, diminishes the odds of full-time students graduating (likely by diluting the availability of student support).

With those trends in mind, Governors could promote public policies that would lead to higher graduation rates.

In closing, it should be cautioned that the study design would not support strong causal inferences that link the actions of state governments directly to college graduation rates. Because it was not possible to construct an experimental design for this phenomenon, though, the study offers the best available evidence. Clearly, this phenomenon deserves additional research. More data, such as surveys of state and higher education leaders, could help sharpen the definition and differentiation of state roles played in overseeing public universities. It also is noteworthy that even after accounting for the differences in state roles, as defined by this study, the HLM analysis revealed a variance component for between state differences which remained statistically significant ($p < .001$), indicating that there are additional unexplained differences among state governments that are affecting the variation in college graduation rates. Some areas from the earlier Asmussen (2010) also deserve further study, such as differences in graduation rate productivity based on identity of regional accrediting agency and existence and duties of local governing boards. Hopefully future studies will continue to yield evidence which helps guide Governors and other policymakers in making sound decisions about the governance and oversight of public universities.

Table 3: Results for HLM Models Accounting for Variation in Graduation Rates

Results	Coefficients for Each Model #					
	0	1	2	3	4	5
	Unconditional	Level 1 All Fixed	Level 1 PT Random	Level 2 Planning	Level 2 Perform Budget	Level 2 State Role
Level 2 Fixed Effects: State Governments						
Intercept (Grand Mean)	.485*	.484*	.486*	.496*	.484*	.502*
Types of State-Level Plans						
None	-	-	-	-.007	-	-
Completion Goals, No Targets	-	-	-	-.014	-	-
Completion Targets	-	-	-	.063*	-	-
Types of Performance Budgets						
Voluntary	-	-	-	-	.010	-
Mandatory	-	-	-	-	-.005	-
State Role						
Activist	-	-	-	-	-	-.051*
Off-the-Radar	-	-	-	-	-	-.017
Level 1 Fixed Effects (Std.): Public Universities						
ACT Scores - 25th Percentile	-	.575*	575*	.575*	.559*	.591*
% Part-time (Probits)	-	-.196*	-.228*	-.165*	-.137	-.190*
% Housing Available	-	.215*	.210*	.224*	.276*	.134
Student Enrollment (Log)	-	.250*	.250*	.259*	.268*	.202*
Variance Components						
Between States (τ_{00})	.00300*	.00139*	.00151*	.00129*	.00161*	.00119*
Between Part-time Slopes (τ_{20})	-	-	.00157*	.00142*	.00118*	.00087*
Between Universities	.02050	.00293	.00263	.00253	.00261	.00258
Model Deviance	-383.02	-1122.48	-1141.95	-1159.63	-1150.49	-1161.57
Parameters Estimated	3	7	9	24	19	19
Deviance Test (*p*-values)	n/a	<.001	<.001	.280	.576	.033

* = Significant based on Bonferroni-adjusted critical values (.05 distributed among independent variables in each model and .05 distributed among remaining variables).

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