Why does the graduation rate productivity of U.S. public universities vary? Looking outside their boundaries for answers.

A DISSERTATION
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA
BY

John G. Asmussen

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Dr. Darwin D. Hendel
Advisor

September 2010

Acknowledgements

I am grateful to the many people who have helped make this dissertation possible. Leading the list is my advisor and friend, Dr. Darwin Hendel. Even as he assumed the role of department Chair, in addition to his teaching and research duties, he always found time to offer me timely advice and feedback. He assisted me with assembling an outstanding dissertation committee which included Dr. Melissa Anderson, Dr. Robert Poch, and Dr. Robert delMas. Their blend of expertise, perspectives, and suggestions helped me strengthen this dissertation immensely.

This journey also was made possible and usually enjoyable because of the cohort of students who started in the program with me in the Summer of 2005. We offered each other mutual support and encouragement. I learned a great deal because of their willingness to share their professional experiences and opinions. It was comforting and reassuring to have company while I maneuvered the many mysterious steps of completing a doctorate.

In addition, I benefited from wonderful support from my colleagues at the Minnesota State Colleges and Universities. Working full-time while pursuing a doctorate introduced additional challenges. My good colleagues offered continual support. Chancellor James McCormick was a staunch supporter, as was his Chief of Staff Janice Fitzgerald. Dr. Whitney Harris, General Counsel Gail Olson, Board Secretary Inge Chapin, and other members of the Cabinet and Leadership Council offered me ongoing encouragement. Members of my staff at the Office of Internal Auditing, particularly Deputy Director Beth Buse, were always sympathetic of the demands on my time. While they knew that I was not willing to sacrifice time or quality at work, I appreciated their understanding and support as I completed this program.

For the past 12 years, I have had the privilege of reporting directly to the Minnesota State Colleges and Universities Board of Trustees. It has allowed me to work with the members of a lay governing board and closely observe the challenges of their role. My experience with the board helped inspire this dissertation topic. Moreover, it has afforded me the opportunity to work with outstanding individuals. In earlier years, Michael Vekich and Nancy Braatas were most supportive. In recent years, Scott Thiss, David Olson, and Jim Van Houten have supported me and encouraged me as I completed my doctoral studies. I am grateful to them and the many other trustees with whom I have worked with over the years.

Finally, I wish to acknowledge the wonderful system of higher education that exists in the state of Minnesota. I have benefited by earning degrees from three distinct sectors: a baccalaureate degree from a private college, Saint John's University; a masters degree from a state university, Metropolitan State University; and now a doctoral degree from the state's flagship, the University of Minnesota - Twin Cities. I have experienced firsthand the virtues of living with a diverse higher education system. It has instilled in me a commitment to use my knowledge to ensure higher educational opportunities remain available to future generations.

Dedication

This dissertation is dedicated to my beautiful and loving wife, Beth. She encouraged me to enroll in this program when she recognized that I had a restlessness to advance my knowledge and develop my research skills. She offered me unconditional support to pursue a doctoral degree. When the weeks and evenings grew long because of my studies, she developed new hobbies. When I babbled about a new theory or statistical technique which I had discovered, she patiently listened and gently redirected my enthusiasm to topics with which she was conversant. When we needed another person to join us on a tour of European universities, she volunteered to come along (okay, she really signed on early and was not about to miss a trip to Europe). When I struggled to find the energy to finish this dissertation, she urged me on.

Beth, thank you for your love and support!

Abstract

The importance of college completion has risen high on the U.S. policy agenda in recent years. An obvious strategy for increasing college completion is improving graduation rates, which for public universities have hovered around 50% for decades. Higher education scholars previously have revealed many student and institutional characteristics which help explain differences in graduation rates. This study treated the variation which could not be explained by student and institutional differences as an indicator of the level of productivity associated with an institution's graduation rate. It used punctuated equilibrium theory, which suggested that productivity would be aligned with expectations from the external environment, as a conceptual framework.

Using multivariate analysis of covariance statistical techniques, the study identified several elements from the external environments of 398 public universities which had statistically significant relationships with differences in the productivity levels of their graduation rates. Statistically significant environmental elements included the type of state-level higher education plan in place, use of performance budgeting programs, existence of local governing boards, and choice of regional accrediting agency. The study found no evidence of a statistically significant effect associated with other environmental elements, notably the use of performance reporting or performance funding programs.

The results suggest that public universities which have collegial relationships with their external environments have the most productive graduation rates. Public universities on the governmental agenda in their states had more productive graduation rates than

universities which were absent from the governmental agenda. Productivity, though, was not further enhanced for universities subject to the most aggressive accountability mechanisms. The public universities subject to the most aggressive accountability levels, e.g., state-level plans with targeted completion rates combined with performance budgeting programs, showed the lowest productivity levels. Perhaps the inertia of low productivity was resistant to external accountability efforts. Ironically, the public universities which enjoyed the most autonomy only showed mediocre productivity in their graduation rates.

State policymakers and higher education officials could use the study results as they reconsider the nature of their relationships and the design of accountability mechanisms in pursuit of improved college graduation rates.

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Chapter One: Introduction

Statement of the Problem

Why is there such great variability in graduation rates among public universities in the United States? For example, why, in 2007, did one public university have a six-year graduation rate of 32.6% while another similar university had a six-year graduation rate of 65.2%? Were the students better prepared academically at the second university? Did the productivity of their internal environments differ? Was the second university held more accountable for its graduation rates than the first university? Are graduation rates a valid indicator of organizational effectiveness? This study explored those questions.

Most people now need a college degree as a passport to a successful future. Trow (1970) foresaw this phenomenon forty years ago, when he predicted that a college education would change from a privilege available only to the elite few into a universal right of the masses. Today in 2010, global competition has amplified the pressure for the U.S. to produce more college graduates. Federal and state policymakers have worked for the past few decades to increase access to U.S. higher education institutions, and such efforts have been largely successful. Now more students are participating in higher education than ever before. In Fall 2008, 19.1 million students were enrolled in U.S. colleges and universities, and 9.4 million of those students were pursuing baccalaureate degrees at four-year universities (U.S. Department of Education, 2010). These numbers represent about a 36% increase in students seeking baccalaureate degrees from a decade earlier. In the Fall 1998, 14.5 million students were enrolled in U.S. colleges and universities, and 6.9 million of those students were pursuing baccalaureate degrees. Although some access challenges remain, particularly for people from low-income households, first-generation college students, and members of certain racial/ethnic minority groups, another fundamental concern exists – low college graduation rates (Carey, 2004).

In 2008, 1.6 million students graduated from U.S. colleges and universities with a baccalaureate degree, a 32% increase from a decade earlier, when 1.2 million students earned a baccalaureate degree (U.S. Department of Education, 2010). This increase in the production of baccalaureate degrees, though, essentially is explained by the increase in the volume of students pursuing these degrees (the 36% increase mentioned earlier). The official six-year graduation rate for full-time, first-time students pursuing a baccalaureate degree was only 57.2% during the 2007-08 academic year at U.S. universities ("Almanac Issue", 2010). As discussed later, that six-year college graduation rate has remained remarkably steady over time. The completion prospects for students enrolled in two-year colleges appeared even more dismal. A national survey (U.S. Department of Education, 2003) showed that only 38% of students who initially enrolled in a two-year college in 1995 earned any kind of college credential by 2001. If a college degree has become the minimum standard for a successful future, then U.S. universities must improve their productivity. More students who attend college must graduate. Institutional graduation rates, hence, cannot be ignored or rationalized as unimportant.

Improved college graduation rates will benefit students, institutions, taxpayers, and society in general. It is shameful for students to attempt college, temporarily forego earning wages and accumulate debt, but depart with no academic credentials. Not receiving a credential wastes the resources of students, their families, taxpayers, and higher education institutions. Although some students reenroll in other institutions and eventually earn an academic degree, many students drop-out permanently or engage in an aimless, nomadic journey that Adelman (2006) refers to as "swirling" until they finally abandon higher education without a degree.

The pressure to hold universities accountable for student educational attainments has been escalating in recent years. In 2003, congressional concerns prompted a national study of college completion rates (U.S. General Accounting Office, 2003). The study confirmed congressional suspicions that college completion rates needed improvement, particularly for students from lower socio-economic backgrounds. In 2006, a blue-ribbon commission convened by the U.S. Secretary of Education observed, "Among high school graduates who do make it on to postsecondary education, a troubling number waste time – and taxpayer dollars – mastering English and math skills that they should have learned in high school. And [*sic*] 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*).

Newly-elect president Barack Obama quickly cited college completion as a priority for his administration by proposing the creation of a five-year $2.5 billion fund to assist states with improving college enrollment and graduation (U.S. Office of Management and Budget, 2009). Several state governments also have begun to reconsider linking their higher education appropriations to graduation rates (Marklein, 2009; Moltz, 2009a).

College graduation rates are becoming established as an implicit goal for measuring the effectiveness of U.S. colleges and universities. Bess and Dee (2008) indicated that goal attainment was the most common model of organizational effectiveness. In this era of accountability for higher education, graduation rates increasingly have become standard performance indicators (Burke, 2005). New tools and information sources have sprung up to analyze college graduation rates. For example, The Education Trust (2008) created an interactive Web site for comparing graduation rates of four-year universities that share similar student demographics. The American Association of State Colleges and Universities and the National Association of State Universities and Land Grand Colleges (2008) adopted a voluntary system of accountability that features graduation rates as one of its key measures.

Governing boards have felt the pressure to improve student outcomes, and have begun to redirect that pressure to college and university administrators. In Minnesota, for example, both public higher education governing boards have taken action to establish institutional goals for student success, as defined by retention and graduation rates. In June 2006, the Minnesota State Colleges and Universities Board of Trustees approved a strategic plan that included targets for improving the first-year retention rates for students at each of its institutions. In October 2006, the University of Minnesota Board of Regents accepted aggressive new targets for improving graduation and retention rates at four of its five campuses. Measures such as graduation and retention rates, thus, have become a primary indicator of organizational effectiveness for colleges and universities. It should be noted, though, that similar targets were less common for those students who began as transfer students.

Graduation Rates by Institutional Type

The U.S. higher education system includes a rich array of institutional options, ranging from public two-year community colleges to private ivy-league universities. Graduation rates, though, may not be a particularly valid performance indicator for community colleges. There is too much uncertainty about the educational intentions of community colleges students and a high percentage of them attend part time. The graduation rate methodology does not fit well when student bodies possess those characteristics.

The focus of this study, thus, was on four-year universities, specifically public institutions. As shown in Table 1, graduation rates for the 2000-01 entering freshman cohort varied considerably among different types of four-year universities. Generally, graduation rates were higher at private institutions; most categories of public universities had graduation rates below 50%. The importance of public universities is accentuated because they enrolled 64% of the undergraduate students attending four-year institutions in the Fall 2007 term (Knapp, Kelly-Reid, & Ginder, 2009). If the U.S. is to produce more citizens with baccalaureate degrees, public universities simply must improve their graduation rates.

The analysis in Table 1 shows that private institutions had graduation rates 10 percentage points higher than public institutions. Pascarella and Terenzini (2005), though, found that the differences in the likelihood of completing a bachelor's degree for

Table 1

6-Year Graduation Rates of 2000-01 Freshmen at 4-Year Institutions

Carnegie Classification of Institution	Type of Control: Public	Private Nonprofit	All
Very High Research	69.6%	88.2%	72.8%
High Research	52.4%	73.4%	56.3%
Doctoral/Research	47.5%	62.0%	51.3%
Masters – Large Programs	46.2%	59.5%	49.0%
Masters – Medium Programs	43.5%	56.4%	48.3%
Masters – Smaller Programs	42.6%	53.2%	48.7%
Baccalaureate – Arts & Sciences	47.2%	71.1%	66.8%
Baccalaureate – Diverse Fields	40.7%	48.3%	45.5%
Totals – All Classifications	53.3%	63.8%	56.4%

Note: Data obtained from "*Almanac Issue*" (2008).

students attending public and private institutions are more muted after controlling for the differences in the student demographics between those two institution types. They concluded that “Net of differences in the students enrolled, the advantage of attending a private institution is probably indirect, mediated by such other institutional characteristics as size, selectivity, emphasis on undergraduate education, and faculty and peer relations” (p. 437). Comparing public and private institutions, thus, is complicated because of the substantial differences in institutional characteristics. Private universities tend to enroll smaller numbers of students, be more selective, and have greater financial resources per student than public universities.

Graduation Rates as a Performance Indicator

This study asserts that the college graduation rate, as measured by the official federal methodology (U.S. Department of Education, 2008), is a useful indicator of the organizational effectiveness of four-year universities, after accounting for differences in entering student cohorts and institutional characteristics. With passage of the 1990 Student Right to Know and Campus Security Act (Public Law 101-542), the U.S. Department of Education began requiring colleges and universities to report graduation rates annually. After years of effort, the Department was able to collect and disseminate annual data on graduation rates and other important institutional factors from nearly all U.S. colleges and universities.

Admittedly, there are limitations associated with using graduation rate as a measure of organizational effectiveness. The official U.S. Department of Education methodology includes only full-time, first-time students. Part-time students and transfer students are excluded from the calculation for a good reason. It is misleading to mix the graduation rates of part-time and full-time students. As Chen (2007) noted, part-time students earn college degrees at considerably lower rates than full-time students. Also, the official methodology measures whether a student graduated within six years of entering college, an insufficient period of time for many part-time students to complete a baccalaureate degree.

The official graduation rate methodology also does not count students as graduates if they transfer and earn a degree elsewhere. Certainly this fact limits the usefulness of graduation rates for some institutions, particularly community colleges, which admit significant numbers of students who may be intent on transferring to a four-year institution. For most four-year universities, though, newly admitted students are intent on earning a college degree from that university. Astin (2004) found that 97% of the students entering a four-year university were intent on earning a degree from that university.

Simple comparisons of unadjusted graduation rates, though, may be misleading because individual colleges and universities often serve very different groups of students. Harvard should and does produce a graduation rate of 97%, but it should not be the standard for assessing the effectiveness of less selective universities. Using statistical techniques to control for variation caused by factors such as student background characteristics, especially their scholastic aptitude, allows for more robust and useful analyses. Astin (2004) has shown institutional selectivity and student background demographics account for about two-thirds of the variation in graduation rates among U.S. universities. This study sought to understand the remaining variation which existed among the graduation rates of U.S. public universities.

Some scholars (Archibald & Feldman, 2008; Zheng & Stewart, 2000) have advocated even more aggressive statistical methods. Rather than using regression techniques based on the statistical means, these scholars suggested statistical techniques that benchmark against the best performing universities. Caution should be exercised, though, to temper overly ambitious goals for graduation rates. Higher education is not ready for a "No-Child-Left-Behind" mentality. Too many high school graduates remain under prepared for the academic challenges of completing a baccalaureate degree. The U.S. higher education system, in contrast to systems in other countries, allows any high school graduate a chance to earn a college degree. Under-prepared students may need to take remedial coursework and exert extra effort to succeed, but they are allowed that chance in the U.S. higher education system. If this level of access is to continue, the current U.S. system of higher education must tolerate less than ideal graduation rates. Bess and Dee (2008) recommended that goal attainment models consider constraints on individual organizations. Similarly, predictive models, as proposed by Astin (2004), take into account factors that serve as constraints on performance, such as student background characteristics, in order to establish graduation rate goals that are reasonable for each university.

Predictive models do have limitations. Porter (1999) argued against using multiple regression analysis for a graduation-rate prediction model because it produced such a large standard error of estimate and greatly diminished the confidence in predictions for individual universities. Porter examined the model used by *U.S. News & World Report* to predict graduation rates in 1999. The *U.S. News & World Report* rankings emerged as a popular choice among consumers in the 1980s for comparing universities (Burke, 2005). Porter found that the model had an adjusted R^2 of 72%, meaning that it accounted for 72% of the variation in graduation rates among the universities. The standard estimate of error for the model, though, was 9.8, meaning that the 95% confidence interval for predicted graduation rates of an individual university would be plus or minus 19 percentage points, an untenable range for evaluating organizational performance.

Porter, though, mistakenly assumed that the standard estimate of error for the predicted graduation rates was, in fact, attributed to random error among the institutions. By definition, when using multiple regression models for prediction, any variation not accounted for by factors included in the model is attributed to error. That error could have been reduced if other factors had been included in the model. If his assumption had been correct, then the actual graduation rates of individual institutions should vary considerably from year-to-year due to random effects. The actual graduation rate data contradicts Porter’s assumption. Institutional graduation rates are very stable from year to year, usually changing by no more than a few percentage points at an individual institution. Table 2 illustrates this point by showing the year-to-year change in the six-year graduation rates for Minnesota public universities. Except for the smallest university, University of Minnesota - Crookston, which had fewer than 200 students in the cohorts used to measure its graduation rates, the 2005 and 2006 graduation rates changed only slightly at each institution. It certainly seems more plausible, then, that much of the residuals from Porter’s prediction model could be attributable to differences in institutional environments and practices, rather than random error.

Porter (1999) did offer some useful recommendations for improving graduation rate prediction models. He recommended care in defining samples and using sound theoretical models to identify independent variables. This study adopted those recommendations in its research design.

Finally, there are some risks associated with placing too much emphasis on an institution’s graduation rate. Elton (2004) cited the potentially deleterious effects of Goodhart’s Law in Economics, which suggested that the reliability of a measure may diminish when it is used as a target. Using a measurement to evaluate performance introduces a higher risk that it will be distorted or gamed to produce an artificially inflated result. Perhaps more concerning, though, is that the pursuit of improved graduation rates could cause diminished educational quality or reduced emphasis on other important aspects of student development. Chickering and Reisser (1993) identified seven vectors of human development aided by colleges and universities. The risk of ill effects should not discourage the use of graduation rates as a performance indicator, but do warrant careful monitoring to protect against harmful and unintended consequences.

The Internal Environment and Graduation Rates

Astin (1993a) introduced the I-E-O model, which suggested that the institutional environment (E) explained why institutions with the same inputs (I), such as similar student demographics, produced differing outputs (O), such as graduation rates. The effect of the internal environment on graduation rates, thus, could be isolated by using a statistical model that controlled for the differential effects of inputs. Astin observed, though, that “Environmental assessment presents by far the most difficult and complex challenge in the field of assessment. It is also the most neglected” (p. 81). Astin's model defined inputs rather narrowly and was confined to student characteristics. As a result, his notion of environment broadly encompassed factors that this study treated as inputs, such as structural features and financial resources possessed by universities.

Pascarella (1985) developed a general causal model for assessing the differential

Table 2

Comparative 6-Year Graduation Rates for Minnesota Public Universities

University	2006 Undergraduate Enrollment	6-Year Graduation Rates 2005	2006	Change
Bemidji State University	3,121	47.3%	45.5%	-1.8%
Metropolitan State University	3,327	24.4%	20.9%	-3.5%
Minnesota State University-Mankato	11,785	48.9%	47.8%	-1.1%
Minnesota State University-Moorhead	6,546	42.3%	42.1%	-0.2%
Saint Cloud State University	12,523	46.4%	46.0%	-0.4%
Southwest Minnesota State University	3,491	37.6%	40.2%	+2.6%
University of Minnesota-Crookston	1,355	35.7%	25.7%	-10.0%
University of Minnesota-Duluth	8,885	47.7%	51.2%	+3.5%
University of Minnesota-Morris	1,581	54.5%	57.2%	+2.7%
University of Minnesota-Twin Cities	28,910	60.7%	60.7%	0.0%
Winona State University	7,012	51.9%	54.3%	+2.4%
Means Weighted by Enrollment		50.5%	50.6%	+0.1%

Note: Data obtained from The Education Trust (2008).

effects of institutional environments on student learning and cognitive development. Pascarella and Terenzini (2005) suggested that this model also may be used for other student outcomes, such as educational attainment. The Pascarella model provided an alternative framework for organizing clusters of variables that affect graduation rates. It defined the concept of environment more narrowly than the Astin (1993a) model.

Pascarella segregated institutional characteristics from the internal environment. He conceived that the institutional environment exerted both a direct effect and an indirect effect, mediated through faculty and peers, onto a student's quality of effort. The model, though, left institutional environment as a "black box" and did not identify its components.

Gilmore (1990) chronicled several attempts that scholars made to develop instruments to measure the characteristics of college environments in the 1960s. Those efforts, though, did not produce a standard method for measuring environmental effects. In recent years, student survey instruments have become more widely administered. The National Survey of Student Engagement (NSSE, 2008b) emerged as the most popular student survey administered by public universities. The survey instrument solicited student perceptions on certain aspects of the institutional environment. Initially, most universities chose not to publish their survey results. Recently, almost 400 universities began voluntarily disclosing their survey scores for five benchmark areas through *USA Today* ("Searching for Signs",2008). These published results, though, did not provide responses to the detailed questions from which the benchmarks were calculated. For example, a benchmark for "supportive campus environment" was derived from answers to six detailed questions (NSSE, 2008a). Three of the detailed questions asked about the quality of relationships with other students, faculty members, and administrative personnel, respectively. Without data on the detailed questions, the effects of these respective relationships, if any, on the campus environment remained uncertain.

In their meta-analysis of higher education research, Pascarella and Terenzini

(2005) found limited empirical evidence to explain the between-college differences in students' educational attainment and persistence. They cited compelling evidence that a student's odds of earning a baccalaureate degree are reduced by starting at a two-year community college rather than a four-year university. For the most part, though, studies that explained educational attainment differences among four-year universities focused on student or structural characteristics, e.g., size, percent residential, and selectivity, rather than environmental factors, e.g., institutional policies regarding academic and student support, faculty and staff attitudes about student success, and opportunities for student participation in institutional decision-making. Of the student and structural characteristics, Pascarella and Terenzini found the strongest evidence for using institutional selectivity as a factor for predicting graduation rates.

Higher education internal environments are complex and subject to many influences. Administrators may not exercise strong control over the internal environments that exist on their campuses. Governance is shared with faculty members. Subunits also have significant autonomy from the central administration, thus, some scholars have labeled universities as loosely coupled organizations (Cohen & March, 1974; Weick, 1976; Birnbaum, 1991). Environments within institutions may have multiple levels, particularly at large universities, such as research extensive universities, which may have layers of colleges, departments, and academic programs. Students at larger campuses may have different educational experiences, depending on their major field of study, choice of residence, participation in particular support programs, and other factors. Pascarella and Terenzi (2005) found considerable evidence that within-college effects had a significant impact on educational attainment and persistence.

Kuh, Kinzie, Schuh, Whitt, and Associates (2005) conducted a qualitative study in an attempt to provide insight into institutional actions which may affect student success. This multi-institutional study examined factors present in 20 universities with higher than predicted graduation and student engagement rates. The research team identified common institutional programs and activities that may have contributed to the success of students attending those universities. They also offered several recommendations for improving student success, such as aligning the institutional mission on student success, tying the strategic plan and budget to student outcomes, and employing rigorous program assessments. The study fell short, though, of offering a comprehensive model about how the internal environment affected student success. Furthermore, it examined only universities which had higher than predicted student achievement rates, and did not examine institutions with lower than predicted rates. Nonetheless, it offered a fruitful source for testing hypotheses about factors that may affect the organizational environment, which in turn affects the graduation rate.

Graduation rates have been slow to change. Remarkably, college completion rates have remained largely unchanged for decades. Cope and Hannah (1975) cited studies from the 1930s to the 1970s and estimated that college graduation rates had not changed appreciably. More recent evidence (Tinto, 1993; Astin, Keup, & Lindholm, 2002; Horn & Berger, 2004) shows the continued constancy of college graduation rates. The intractability of graduation rates may, in fact, reflect inertia that resists changes. Yet, there are examples of universities, such as the University of Florida (Capaldi, Lombard,

& Yellen, 2006) and the University of Minnesota – Twin Cities (Moore, 2007), that have been able to improve their graduation rates significantly. In general, though, college graduation rates seem to be constrained and have remained at the same relative level year after year.

What accounts for the unexplained variation left by prediction models in institutional graduation rates? What separates underachieving from overachieving institutions? Why have some universities created internal environments that produce higher graduation rates than similar universities? Could the answers to these questions lie outside of the universities in their unique external environments?

External Environments and Graduation Rates

Laden, Milem, and Crowson (2004) wondered if there were factors at play in the external environment which had made college graduation rates intractable. While there were constants in the external environments of public universities, like the regulatory requirements of the federal government, there also were notable differences. State governments had taken varying approaches to establishing expectations for the public universities subject to their control (Burke, 2001). Some universities shared a governing board with several other higher education institutions; other universities had an exclusive relationship with a governing board. Some governing boards had taken on an activist role and aggressively held public universities accountable (Hines, 2000), while other governing boards were more passive. These differences created unique external environments for each public university.

Interestingly, Pascarella (1985) and Astin (1993a) did not acknowledge external environmental effects in their models. They viewed universities as closed systems. Their models essentially assumed that the outcome being measured was important and had been accepted by institutions as a strategic priority. Perhaps that assumption was not valid for an outcome like graduation rate. Kuh, Kinzie, Schuh, Whitt, and Associates (2005) also did not acknowledge the external environment directly in their study, but some of their recommendations implied key roles for external parties. For example, governing boards may be empowered with approving institutional missions and strategic plans. Because of these differences, external environmental factors may need to be considered a variable, rather than a fixed factor. Differences in state policies and governance oversight mechanisms may be mediating the effects of the national accountability movement on graduation rates.

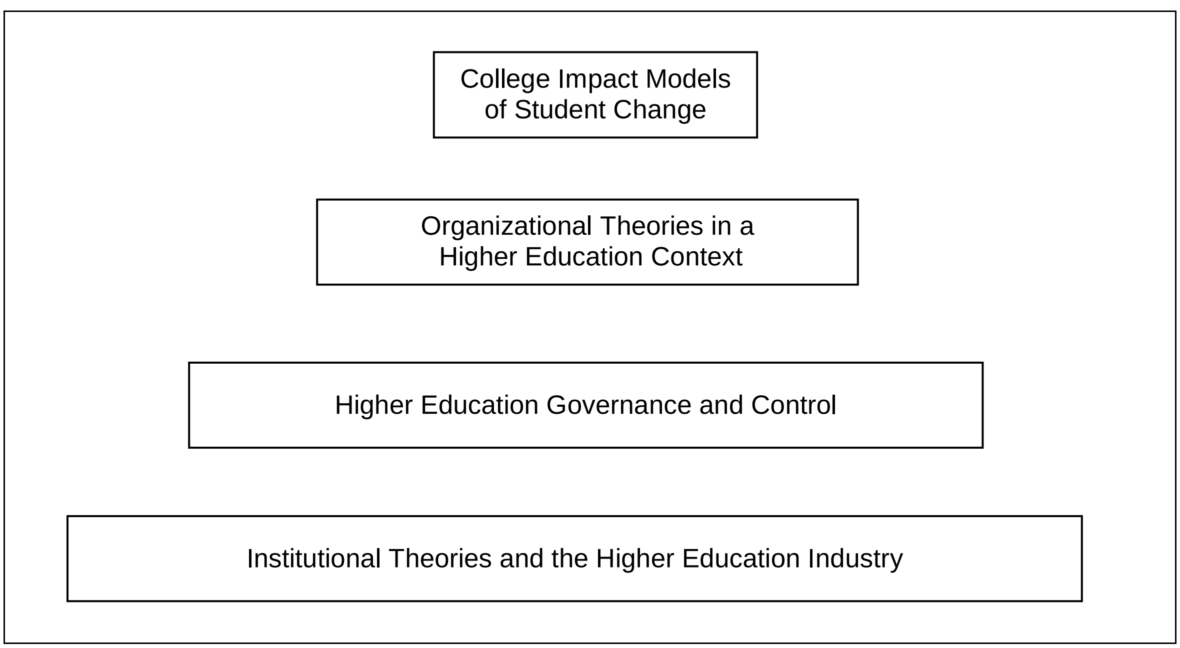
This study explored the external influences which may have affected college graduation rates by transforming nominal graduation rates into a more robust measure of productivity. The concept of productivity is rooted in economics as a relative measure of the efficiency by which an organization generates outputs, based on the quality and quantity of its inputs. Nominal college graduation rates mistakenly have been interpreted as a valid measure of productivity. That calculation, however, accounted only for the quantity of inputs (number of entering students) produced from a given quantity of outputs (number of students who graduated within six years). This study expanded the calculation to consider the qualitative features of entering students and institutional characteristics as additional input factors. Accordingly, it focused productivity more squarely on the unique internal environments of public universities.

The study then examined the extent to which differences in levels of institutional productivity for graduation rates were associated with differences in the unique external environments in which public universities existed. External environments for each university were constructed by its unique blend of external actors, including state policymakers, governing boards, and regional accreditation agencies. If graduation rates are to remain as a viable performance indicator, there should be evidence that universities have been able to create internal environments conducive to producing graduation rates which meet the expectations of their respective external audiences.

Chapter Two: Literature Review

Chapter 1explored the rationale and viability of using college graduation rates as an indicator of organizational effectiveness for U.S. public universities. This Chapter identifies hypothetical factors that may explain and affect change in an institution's graduation rates. Figure 1 provides a multi-level exploration of models and theories regarding college graduation rates. College impact models place the student as the primary unit of analysis. Organizational theories, framed within a higher education context, expand the review to the individual college or university as the unit of analysis. Organizational theories are considered primarily from a positivist paradigm based on rational cause and effect relationships, but also consider social constructivist and postmodernist viewpoints. Then the impact of distinct governing jurisdictions, such as state governments, is considered. Finally, at the broadest level, institutional theory is

Figure 1: Conceptual Levels for Exploring College Graduation Rates

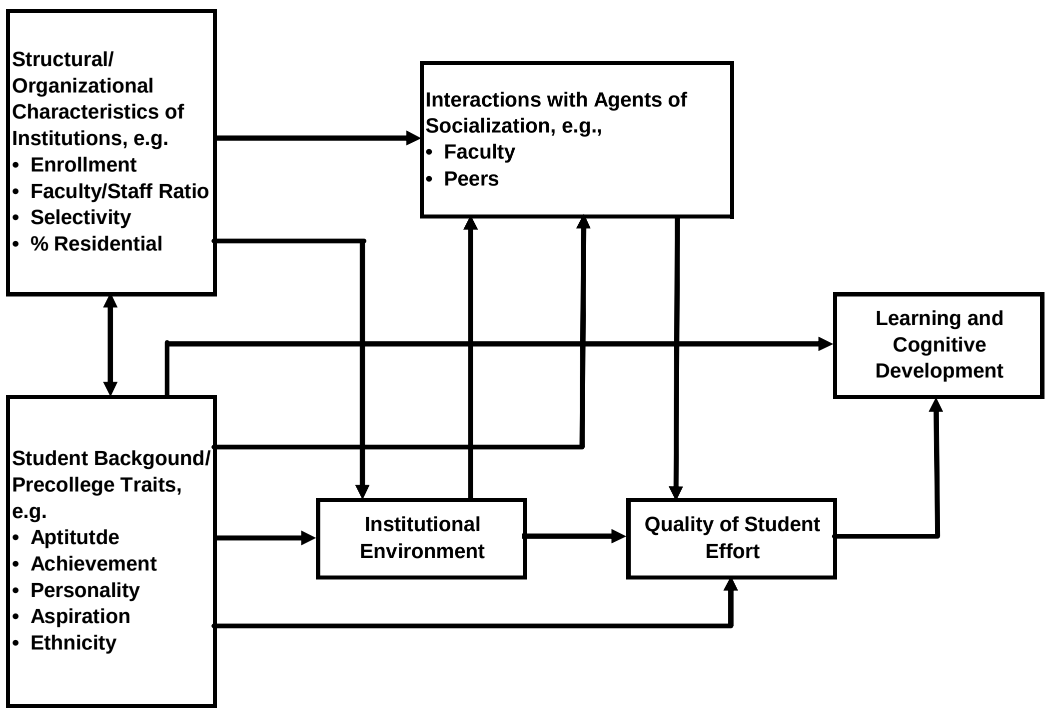


considered to examine the effects of the external environment on higher education as an industry in the U.S.

College Impact Theories of Student Development

An appropriate starting point for researching this topic is from the student perspective, which provides a vantage point for identifying the student demographic variables that affect graduation rates. As shown by the Pascarella (1985) model illustrated in Figure 2, student factors represent one cluster of variables which may be

Figure 2: General Causal Model for Differential Effects of Organizational Environments



Note: Although this model shows "learning and cognitive development" as the outcome, Pascarella and Terenzini (2005) suggest it as a model for other outcomes, such as educational attainment.

From "College environmental influences on learning and cognitive development: A critical review and synthesis" by E. Pascarella, 1985, In J.C. Smart (Ed.) *Higher Education: A Handbook of Theory and Practice*, p.10. Copyright 1985 by Kluwer Academic Publications. Reprinted with kind permission of Springer Science and Business Media.

used in a prediction model. Individual student characteristics may be aggregated into proportions to represent the characteristics of a student cohort or student body, thus facilitating comparisons between institutions.

Some student demographic factors, such as measures of ability, have been documented for decades. For example, Skelton (1959) conducted a very early study that indicated a strong relationship between intelligence test scores and student departure rates at Alabama Polytechnic Institute (now known as Auburn University). Skelton found that 12.0% of the students scoring in the highest decile on a psychological test measuring problem solving ability had withdrawn from the institute after one year, compared to 52.6% of the students scoring in the lowest decile on the test. Astin (1993b) expanded considerably on the efforts of earlier researchers to test the effects of numerous student demographic factors on college graduation rates. Astin identified student factors, such as gender, race, age, enrollment status, and socio-economic status that had a significant effect on graduation rates. More recent research (Chen, 2005; Engle & Tinto, 2008) has shown status as a first-generation college student as a significant barrier for college completion. Other researchers, such as Adelman (2006) have confirmed the importance of several student characteristics as factors affecting educational attainment and persistence.

Tinto (1993) advanced college impact theory into what has become the most recognized and cited model with his interactionalist theory of student departure. His theory focused on the impact of social and academic integration on students' intentions and commitments to earn a higher education degree. Tinto made an important definitional point in distinguishing among the various reasons students depart from higher education institutions. Some students, he observed, enter higher education without intending to earn a degree; these students may be interested in only taking a few courses for either personal or occupational enrichment. In other words, the graduation rate is a meaningful measure only if it tracks students who are degree seekers.

Tinto (1993) offered two particularly relevant limitations on the departure conditions for which his theory applied. First, it was intended to provide a theoretical framework for explaining a student's voluntary departure from a particular institution; it did not attempt to explain the factors that led to a student's dismissal for failing to meet academic standards. In some respects, though, academic dismissal may be explained, at least partially, by the background characteristics of entering students, particularly their academic preparedness. Second, the theory was intended primarily to explain departures from a single institution; factors that caused a student to transfer to another institution were largely beyond the scope of his theory. Hence, his theory was aimed at explaining why degree-seeking students depart voluntarily from a single institution.

Tinto's (1993) focus on the institution was of particular relevance to this study, for which graduation rates have been used to measure organizational effectiveness. Tinto (1993) cited "fit" between student and institution as an important concept for determining whether students remained enrolled at an institution. Cope and Hannah (1975) also emphasized the importance of "fit" in an earlier study that explored the phenomenon of college completion rates. From an academic perspective, Tinto suggested that students may depart from an institution if they found their academic courses to be too challenging or insufficiently challenging. In other words, he posited that academic coursework must fit a student's academic preparedness and commitment to academic work.

Tinto (1993) also suggested that students who felt isolated were more likely to depart from an institution, an observation which undergirded the importance his theory placed on social integration. Astin (1993b) supported this notion with his findings that students were more likely to persist when they were more involved in on-campus social activities. For example, Astin found a statistically positive association between students who lived on campus and their rate of persistence. Also, he found that persistence was higher for students who were involved with faculty members in activities outside of the classroom.

Although Tinto (1993) was interested primarily in the student as a unit of analysis, his focus on the concept of "fit" positioned him to make important observations and recommendations about institutional actions that affected college graduation. Tinto described the importance for institutions to use assessment techniques to understand their students and consider students' compatibility with institutional mission. He then listed two sets of institutional principles: (1) the fundamental aspects of successful retention programs, and (2) principles of implementation. In other words, it was not only important ***what*** institutions did, but ***how*** they did it. Kuh, Kinzie, Schuh, Whitt, and Associates (2005) would later reiterate the importance of careful implementation in their qualitative study of student success at 20 four-year universities.

Tinto (1993) listed three principles for effective retention programs. These principles provided the foundation that Tinto recommended for institutions aspiring to establish strong student retention programs. They represent the ***what*** in Tinto's recommendations:

1. Institutional Commitment to Students – Effective retention programs are committed to the students they serve. They put student welfare ahead of other institutional goals.
2. Educational Commitment – Effective retention programs are first and foremost committed to the education of all, not just some, of their students.
3. Social and Intellectual Community – Effective retention programs are committed to the development of supportive social and educational communities in which all students are integrated as competent members (pp. 146-147).

Tinto (1993) then listed seven "action principles" for effective implementation of retention programs. They represented Tinto's recommendations on ***how*** institutions should build retention programs:

1. Institutions should provide resources for program development and incentives for program participation that reach out to faculty and staff alike.
2. Institutions should commit themselves to a long-term process of program development.
3. Institutions should place ownership for institutional change in the hands of those across the campus who have to implement that change.
4. Institutional actions should be coordinated in a collaborative fashion to insure a systematic, campuswide approach to student retention.

5. Institutions should act to insure that faculty and staff possess the skills needed to assist and educate their students.
6. Institutions should frontload their efforts on behalf of student retention.
7. Institutions and programs should continually assess their actions with an eye toward improvement (pp. 149-153).

Tinto (1993) also contributed important ideas about institutional effects on graduation rates, such as the impact of budgeting and planning and the importance of institutional assessment. Although these ideas were not central tenets of his theory, they provided valuable insights about factors that may affect the institutional environment. These ideas also were supported by other scholars and are discussed further when this chapter addresses organizational theories.

Braxton, Sullivan, and Johnson (1997) conducted an extensive review of Tinto's (1993) interactionalist theory and concluded that empirical evidence provided partial support for its constructs. The researchers identified 15 testable propositions from the theory. They found particularly strong evidence to support four propositions that connected social integration to student persistence. Braxton and Hirschy (2004) offered the following narrative regarding these propositions:

> Students enter college with various characteristics that influence their initial level of commitment to the college or university they chose to attend. This initial level of institutional commitment also affects their subsequent institutional commitment. The greater a student's degree of social integration, the greater the student's subsequent commitment to the institution. The greater the degree of a student's

subsequent commitment to the institution, the greater the student's likelihood of persisting in college. (p. 92)

From a student perspective, the work of Adelman (2006) revealed further factors affecting student persistence and graduation rates. Adelman analyzed massive federal student surveys, e.g., NELS:88/2000, to conduct longitudinal studies of factors affecting student success. Whereas Tinto limited his theory to student success at a particular institution, Adelman elevated his focus to the entire U.S. higher education system. He oversaw the construction of national databases that allowed researchers to follow students over an extended time period throughout their academic journeys across institutional and state lines. The bulk of Adelman's work provided sound advice for students and their families, such as taking challenging high school coursework, not delaying entry into college after high school, and accumulating 20 or more additive credits during the first year of college. These findings helped put into operational terms the well-established understanding that students who enter higher education with better academic preparation are more likely to be successful in college.

Indirectly, Adelman made some important observations about institutional actions that should help change their internal environments. His research indicated that institutional policies which allow excessive no-penalty course withdrawals and no-credit course repeats were problematic. Such practices may have contributed to extending the time to degree completion and may use up financial aid resources without helping students progress toward a degree. Institutions that placed limits on course withdrawal and repeat practices also may strengthen students' commitments to achieving strong academic performances for each course in which they enroll. Adelman posited that when institutions establish policies that demand student accountability for their choice of course registrations, rather than policies that are unduly forgiving, they promote improved student outcomes. In addition, Adelman revealed programmatic and structural ideas for institutions that helped students progress toward graduation, such as better use of summer terms.

To assess the differences in graduation rates among universities, the unit of analysis must be shifted from the student to the higher education institution. Some of the factors identified by college impact theorists may be converted and used as organizational factors. For example, researchers (Ryan, 2004; Titus, 2004) used selectivity, measured by the median college admissions test scores for entering students, as an organizational factor and found it to have a statistically significant effect on university persistence and graduation rates. Titus also used a diversity index, as proposed by Chang (1999), percent female, and a measure of socioeconomic status, a composite of standardized parental income and standardized parental educational attainment, to translate student characteristics into organizational factors, although he found none of these three factors to have a statistically significant effect in his study.

A final factor to be considered from a student perspective is major field of study. Leppel (2001) found that persistence rates varied depending on the major field of study chosen by students. Feldman, Smart, and Ethington (2004) offered further evidence that the choice of academic major may impact student satisfaction with the academic environment. The types of academic majors offered by universities may impact their graduation rates. Also, the opportunity for students to change majors without transferring to another institution may be a factor that affects graduation rates. It is quite common for students to change their academic majors. Peterson (2006) found that 47% of the students at a major research university had changed their majors. The breadth of academic majors offered by an institution, thus, could affect the results of the official graduation rate measure, which does not count students who transfer as a success.

Organizational Theories in a Higher Education Context

The Pascarella (1985) model identified three structural/organizational factors, in addition to selectivity, which may affect the institutional environment: enrollment (often characterized as institutional size by other researchers), faculty/staff ratio, and percent residential. Titus (2004) and Ryan (2004) both included factors related to institutional size and percent residential in their studies and found these factors to have statistically significant effects on persistence and graduation rates. Ryan also included four variables for cost-per-student in his study: instructional costs, academic support costs, student services costs, and institutional support costs. He found that instructional costs ($p < .001$), which could serve as a proxy for Pascarella's faculty/staff ratio[1], and academic support costs ($p < .01$) had statistically significant effects in his study, but not the other two cost categories. Ryan found that instructional costs were the second strongest predictor of graduation rates (standardized beta coefficient [*b*] = .281) after SAT scores (*b* = .381) in

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[1] The trend for universities to use more part-time faculty members (Nutting, 2003) as a cost-saving measure may have confounding effects. Part-time faculty members may improve faculty/staff ratios for the same cost, but offer fewer opportunities for students to interact with faculty members outside of the classroom.

his study. The magnitude of academic support costs in Ryan's study was lower (b = .119), but still significant.

Beyond the Pascarella (1985) model, organizational theorists have offered several models that may offer further explanations for the variation in college graduation rates. Bess and Dee (2008) conducted a comprehensive analysis of organizational theories and their potential application to higher education. Bess and Dee assessed the theories through three paradigms: positivist, social constructionist, and postmodernist. The positivist paradigm has provided the traditional framework for organizational theories, and is based on rational assumptions about cause and effect relationships. Positivists believe that administrative actions, such as planning, goal setting, and directing, will result in desired organizational outcomes. Early organizational theories, including Taylor's (1916) principles of scientific management and Weber's (1922) theory of bureaucratic structure, were rooted in a strong positivist perspective. In a pure positivist sense, administrators should be able to improve graduation rates by declaring a goal and directing that faculty and staff take actions to meet it.

Positivist theories also provide the dominant lens for how U.S. businesses are managed. Because many college and university trustees have business backgrounds (Association of Community College Trustees, 2008; Minor, 2008), it is reasonable to hypothesize that higher education governing boards bear strong positivist viewpoints. Trustees hire leaders, like presidents, with the expectation that administrative actions should lead to improvements when warranted. Further exploration of positivist theories will come later, but first the other two paradigms will be considered briefly.

According to Bess and Dee (2008), social constructionists disagree with the positivist notion that there is one true reality. Rather, organizations agree to adopt a version of reality through communication and consensus, which Weick (1976) refers to as “sensemaking”. Because of the complexity of the higher education environment and its strong tradition of administrators sharing governance with the faculty, organizational theorists began to question the unilateral application of positivist theories to higher education. Simon (1946) suggested that complex organizations, like colleges and universities, could not possibly grasp all available information in order to establish certainty in decision-making. A latent assumption of positivist theory is that decisions are made based on perfect information. Simon offered that rather than a futile pursuit of perfect information, organizations should employ “bounded rationality” and settle for gathering sufficient information to make decisions that were satisfactory, but not necessarily best; Simon termed this decision-making process as “satisficing”.

Cohen and March (1974) conducted a study that provided a more comprehensive critical analysis of the assumptions underlying positivist theory. They asserted that higher education organizations had unclear goals, uncertain technologies (for teaching and learning), and fluid participation by constituents in the decision-making process. In other words, they claimed that these fundamental rational assumptions were not valid for higher education. They concluded, thus, that higher education organizations were “organized anarchies”, rather than rational bureaucracies. Despite their rather scathing critique of the primary assumptions on which many administrative roles were founded, Cohen and March offered a series of recommendations about how administrators, primarily presidents, could initiate meaningful organizational changes. Among their recommendations were to be selective about the number and timing of issues to pursue, be persistent in pursuing them, and remain mindful of the symbolic meanings attached to their actions. Cohen and March also identified four domains subject to administrative control: planning, academic policies, budgeting, and hiring personnel.

The third paradigm discussed by Bess and Dee (2008) is the postmodernist perspective. Whereas the modernist perspective was rooted in rationality, the postmodernists rejected rationality as simply the perspective asserted by those in power. Postmodernists search for anomalies that do not respond in accordance with rational expectations. Although social constructionists will settle for one version of reality built on consensus, postmodernists will insist on multiple versions of reality. For example, postmodernists, such as Tierney (1992), ask why an achievement gap persists for students of color in higher education. Critical analyses through racial or gender lenses are methods used by postmodernists to press for attention to issues that may not appear readily on the agendas of administrative leaders.

Universities may be served best by drawing from the strengths of all three theoretical paradigms identified by Bess and Dee (2008). Some authors have opened our eyes to the value of multiple perspectives. Bolman and Deal (2003) described four frames for evaluating administrative actions: structural, human resources, political, and symbolic. They asserted that using all four frames revealed the most comprehensive understanding of a situation, but depending on the circumstances, one frame may have held the most promise for finding an effective solution to a problem.

Birnbaum (1991) anticipated much of Bolman and Deal's (2003) thinking in an attempt to understand colleges and universities. Birnbaum cited four organizational models that may be applied to different types of higher educational institutions. In addition to a rational model, he identified models that emphasized collegial, political, or anarchical principles. Furthermore, he suggested that institutions may combine the best elements of all four models and function in a cybernetic mode which balances internal operations to remain in balance with external demands. Birnbaum described cybernetics as akin to the human body measuring internal body temperature and making automatic adjustments to maintain it at a constant level. The concept of cybernetics raises some interesting ideas by implying that there may be measurement practices at work in higher education institutions that are unintentional or possibly covert. For example, some courses, such as calculus, may serve as gateways to constrain enrollments in major fields of study, such as engineering. These underlying measurements, thus, may reinforce institutional inertia that resists change. The concept of institutional inertia will be explored further as part of organizational change theory.

Berger and Braxton (1998) elaborated Tinto's (1993) interactionalist theory and tested the effects of organizational attributes on student persistence at a private, selective university. They found three organizational constructs that had a positive relationship with student persistence: (1) effectively communicating rules and expectations, (2) enforcing rules fairly, and (3) encouraging students to participate in decision-making activities across campus. Although their study was limited to a single private institution, replicating the methodology for public universities could help expand the scope of its findings.

Kuh, Kinzie, Schuh, Whitt, and Associates (2005) led a team of esteemed researchers in a qualitative study that explored the practices of successful universities. The study sought to discover institutional actions that have positive effects on graduation rates and student engagement and offered 43 recommendations for improving student success. The recommendations cover the four administrative domains defined by Cohen and March (1974): planning, policies, budgeting, and hiring personnel. They also add a strong sense of using data for effective decision making and monitoring progress, as recommended by Birnbaum (1991), Tinto (1993), and Astin (1993a). Furthermore, the recommendations embrace the idea of honoring diversity as recommended by Tierney (1992). Finally, the recommendations encompass elements of each of the four frames identified by Bolman and Deal (2003) and used by Birnbaum (1991) to define institutional models.

Although the Kuh, Kinzie, Schuh, Whitt, and Associates (2005) study offered a comprehensive list of factors that may contribute to the internal environment of a university, it was not organized as a model. The study also was based on a purposive sample of high performing universities and did not provide any comparisons to low performing universities. If the same attributes were present at both high and low performing universities, then it may not be a distinguishing contributor to student success. Nonetheless, the study suggested that given appropriate commitment and resources, universities could establish internal environments that were supportive of graduating students. Indeed, Kuh (2008) later admonished universities for "ignoring the existing body of literature about what works to improve student retention" (p. A72).

Adapting other Organizational Effectiveness Models to Higher Education

Other comprehensive models of organizational effectiveness could offer considerations for higher education. Kaplan and Norton (1996) developed a contemporary model for organizational effectiveness, the Balanced Scorecard. Their model originally was designed to link strategies to financial outcomes for business organizations. The original model identified three perspectives that were linked to a financial perspective. The customer perspective focused on factors such as customer satisfaction, retention, and market share. The internal process perspective focused on quality and efficiency elements. The learning and growth perspective focused on employee satisfaction and technology development. These three perspectives fed into the ultimate financial perspective of businesses – return on investment.

The Kaplan and Norton (1996) Balanced Scorecard has been modified to fit non-profit and governmental organizations. O'Neil and Bensimon (1999) adapted the model into an 'academic scorecard' for use at the School of Education of the University of Southern California. They modified the basic model by substituting an academic management perspective in place of the financial perspective. The financial perspective focused on the interests of shareholders, e.g., making a profit, which was not applicable to most higher education institutions. The academic management perspective focused instead on the interests of university leadership. For example, universities could feature increasing graduation rates as a strategic priority in the academic management perspective of an academic scorecard. O'Neil and Bensimon also modified the scorecard to define the customer perspective explicitly as the interests of students and employers.

Karathanos and Karathanos (2005) observed that many features of the Balanced Scorecard were incorporated into a set of criteria for applying the Baldrige National Quality Program to educational institutions. The U.S. Department of Commerce (2008) oversees the Baldrige program, which is a widely recognized model of organizational effectiveness. The program has served as a national award program for U.S. businesses since 1987. Efforts to develop the criteria for educational institutions began in 1995 and culminated with the award being conferred on the first university, the University of Wisconsin – Stout, in 2001. The Commerce Department has refined the criteria over time. The education criteria for 2008 contained seven interrelated components. A cluster of three components (leadership, strategic planning, and student/stakeholder/market focus) were interrelated with a second cluster of three components (workforce focus, process management, and results). Both clusters were based on a foundational component: measurement, analysis and knowledge management. The model also acknowledged that overarching influence which the external environment had on an organization.

The Baldrige educational criteria showed some notable differences from the Pascarella (1985) causal model for differential effects of institutional environments (see Figure 2 earlier in this chapter). The overarching effects of the external environment and the cross-functional role of measurement and analysis were substantial additions introduced by the Baldrige criteria. Also, the criteria were heavily skewed toward a positivist perspective by adding prominent components for leadership and strategic planning. Social constructivists and postmodernists may be troubled by the Baldrige criteria if the concept of leadership were interpreted too narrowly. The criteria were designed to encompass all types of educational entities, including K-12, community colleges and universities. Accordingly, the definitions must be applied with a certain amount of flexibility. For universities, leadership would have to be interpreted in a shared governance context that respects the essential role of faculty members.

Although, the Baldrige educational criteria have been in existence for almost a decade, a review of the literature revealed no scholarly studies that tested their viability for higher education. The University of Wisconsin – Stout, the first university to receive the national Baldrige award, reported a six-year graduation rate of 48% in 2006. As shown in Table 1 of this proposal, the mean six-year graduation rate for similar universities (Public, Masters – Large Programs) was 46.2%. On its face, the university appears to have a graduation rate that is slightly above average, but a much more extensive statistical analysis would be needed to assess its performance after controlling for the differences in student demographics and institutional structural characteristics among these universities. Despite the absence of empirical evidence to support their validity, the Baldrige criteria have been adopted, with some modifications, to serve as an alternative accreditation model by a regional accrediting agency, the Higher Learning Commission (2008). The commission allows its member institutions to seek accreditation through its Academic Quality Improvement Program (AQIP), an adaptation of the Baldrige educational criteria. Accordingly, the criteria have begun to receive acceptance as a legitimate model for examining the effectiveness of higher education institutions.

Organizational Change Theories

Organizational effectiveness models provide limited insights about why organizations change. At best, they serve as a framework for continuous improvement and incremental change. Why, though, would some public universities institute changes in their internal environment in order to improve their graduation rates, while other universities would be more resistant to change? To consider that question, we turn to organizational change theory.

Van de Ven and Poole (1995) conducted a meta-analysis of organizational change and development theories and reduced the literature to four categories of organizational change. Two categories focused on change in single organizations: life-cycle and teleological theories. Life-cycle theories presume that organizations develop toward a state that is programmed or coded within the fiber of the organization. By contrast, teleological theories are based on the belief that organizational change is the purposive pursuit of a final goal. Goal attainment theory (Bess & Dee, 2008) would be a prime example of teleological theory. Although producing college graduates seems to be an inherent goal for a public university, it would have to emerge as the preeminent goal of a university in order to apply teleological change theory. The tripartite mission of higher education (i.e., teaching, research, and service) may result in graduation rates competing with other priorities at some universities.

Van de Ven and Poole (1995) contributed two other important observations about teleological change theories that warrant consideration for studying graduation rates. First, they observed that the principle of equifinality is often assumed, meaning there are many alternative paths for organizations to achieve the same goal. Indeed the literature does not offer one prescription for how universities might improve graduation rates. Tinto (1993) and others suggest a variety of programmatic solutions, such as first-year experience programs, supplemental instruction, and intrusive advising, but do not prescribe one path for improving graduation rates. The assumption of equifinality, thus, acknowledges the difficulty of creating constructs that focus on specific solutions in order to make generalizations about improving graduation rates across institutions.

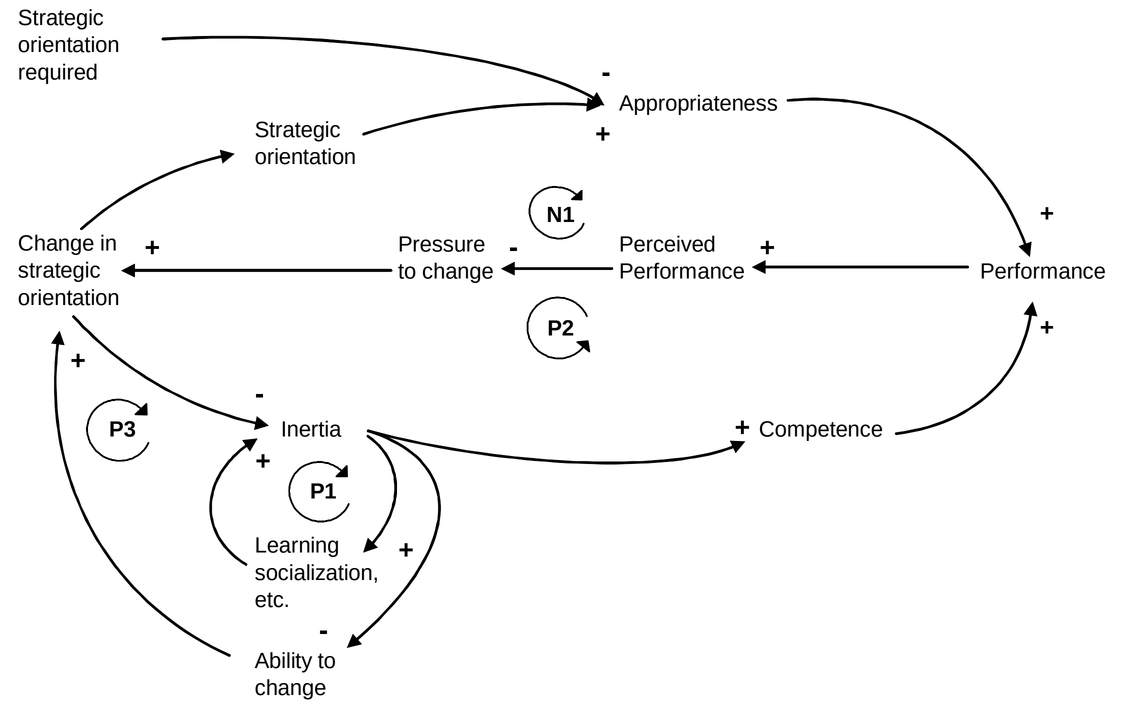
Van de Ven and Poole (1995) also acknowledged the existence of constraints that affect organizational goals. They cited resources and the external environment as common constraints on goal attainment. For example, state governments may reduce financial support for public universities, thus, shifting a larger financial burden to students. As a result, some students may choose to work longer hours or even stop-out for a semester in order to pay their tuition. Researchers (Astin, 1993b; Adelman, 2006) have shown that such student behavior decreases their odds of earning a college degree. Likewise, inadequate academic preparedness of entering students may create a resource constraint on a university's graduation rate, particularly if a significant proportion of students did not take the kind of high school courses needed to prepare for the academic challenges of higher education.

The other two categories of change theories classified by Van de Ven and Poole (1995) focused on changes experienced by multiple organizations, or perhaps an entire industry of similar organizations. Dialectical change theories contemplate that pluralistic priorities compete for attention and that change awaits the emergence of a dominant outcome. Cohen and March’s (1974) labeling of higher education institutions as “organized anarchies” provides an example of dialectical theory. According to Cohen and March, unclear goals were a persistent attribute of colleges and universities. Dialectical change theory, thus, suggests that to enable significant improvement in graduation rates, universities would have to establish them as a clear and compelling goal.

Evolutionary change theory is the other category that Van de Ven and Poole (1995) identified for multiple organizations. It is built on Darwinian assumptions of survival of the fittest and acknowledges the need for organizations to adapt to the external environment. Evolutionary change theories may be further divided based on temporal considerations. Whereas classical evolutionary theory assumes gradual change over an extended time period, transformational change occurs much more rapidly. Lindblom’s (1959) theory of incrementalism is in accord with classic evolutionary theory. By contrast, punctuated equilibrium theory (Gould, 1989) suggests that transformative change is possible when a dramatic disruption occurs.

Sastry (1997) used simulation techniques to develop a simplified model of punctuated change theory, as shown in Figure 3. The model posited that inertia would be shifted dramatically only when compelling evidence demonstrated that organizational performance was inadequate. The lower half of Figure 3 shows the reinforcing nature of organizational inertia. Any improvements which occurred would be incremental refinements to existing practices. The organization gradually became more assured with its current state and resistant to change. What is particularly noteworthy in Figure 3 is the role envisioned for the external environment. The "strategic orientation required" or the

Figure 3: Simplified Causal Diagram of the Punctuated Equilibrium Theory



N1 = As external forces demonstrate needed improvements in performance, confidence in existing strategy deteriorates and creates pressure for strategic change.
P1 = As organizational learning increases, inertia receives positive reinforcement.
P2 = Inertia creates enhanced internal competence which reinforces existing strategy.
P3 = Inertia erodes ability to change and reinforces current strategy.

Reprinted from "Problems and Paradoxes in a Model of Punctuated Organizational Change," by M. Sastry, 1997, published in *Administrative Science Quarterly, 42*(2), p. 244 by permission of *Administrative Science Quarterly*.

performance expectations for the organization emerged from the external environment. The theory suggested that actual organizational performance must be balanced against external performance expectations. Either an organization tempered external expectations so that actual performance was accepted or the expectations punctuated the inertia of the internal environment and led to the changes necessary to improve performance.

Based on this literature review, several factors underlie the graduation rates shown by public universities. Student demographics, mission, resource distribution, personnel, and planning capacity are among the factors that need to be taken into account. The idea, though, of punctuated equilibrium theory suggests that factors from outside the university also need to be considered. If a university cannot meet or temper external expectations for its graduation rate, it must strive to overcome the forces of inertia and adapt its internal operations to produce a level of performance that is perceived to be appropriate.

Perhaps the influence of external forces differs among public universities. In some cases, these forces may have converged to create an external environment that provides intense oversight and harsh judgments about the appropriateness of a university's performance. In other cases, universities may experience external environments that are more lenient and tolerant of institutional autonomy regarding performance. To consider this possibility further, the external environment is considered first from the perspective of institutional theory and then based on the major sources of external influences affecting higher education.

Institutional Theories and the External Environment

Meyer and Rowan (1977) defined institutionalization as “the processes by which social processes, obligations, or actualities come to take on a rule-like status in social thought and action” (p. 340). According to institutional theory, external environmental forces may cause organizations that are subject to their influences to adopt common structures and aspire to use common goals in order to retain their legitimacy. The pull toward common organizational means and ends is referred to as isomorphism. Rather than being a legal mandate, isomorphism shapes organizations through societal pressures. For example, in recent years, many public universities have invested significantly in renovating or building new student centers to help with student recruitment efforts. Although not mandated, these facilities have become widely adopted to satisfy the expectations that students and their parents have for reputable universities.

University graduation rates are not mandated to be at any particular prescribed level in the U.S., but certain forces are at work in the external environment that may compel universities to justify their graduation rates compared to similar institutions. Ranking methodologies, like the *U.S. News & World Report* college rankings, rely heavily on graduation rates. Analytic tools, like The Education Trust (2008) interactive Web site, permit ready comparisons of graduation rates. Many universities compare themselves to peer institutions to evaluate their performance.

University administrators are expected to understand the higher education environment and to detect and implement practices that will maintain or enhance the performance of their institutions. Birnbaum (1991) refers to organizational members, such as administrators, who are expected to connect the organization to its external environment as boundary spanners. Birnbaum drew from the work of Mintzberg (1979) and Thompson (1967) to suggest that the role of administrators (Birnbaum refers to it as the administrative subsystem) is to balance the functioning of the faculty and staff (referred to as the technical subsystem) with demands of the environment. Mitchell (1997) suggests that organizational boundaries may be penetrated by three distinct pathways that may overlap – policy, resources, and information. In a university setting, thus, other members may serve as boundary spanners. Faculty members and professional staff may discover external environmental forces through their solicitation of research grants or membership in professional organizations.

According to Thompson (1967), organizations may respond to environmental inputs in one of four ways. He cited three ways for maintaining the status quo of the technical subsystem: buffering it against changes, leveling the flow of inputs to ensure constancy and predictability, or, in extreme cases, rationing the availability of services. Theoretically, a university could improve its graduation rates simply by admitting students who were better prepared academically. Without changing its technical subsystems, e.g., instructional methods and student support services, the university could increase its graduation rates by constraining its admission policies in order to ration its services to students who had a better chance of graduating.

Constraining admissions policies in order to enroll better prepared students is a limited option for public universities; only some land-grant research universities are able to be highly selective in admitting students. Regional comprehensive public universities typically establish only minimal thresholds for admitting new students. Changing admissions standards also is a very challenging undertaking, because universities must compete for the best students and maintain their enrollments in order to remain financially viable. Furthermore, changing the quality of inputs, in this case the academic preparedness of entering students, does not translate into improved productivity, as defined in this proposal. Better prepared students are expected to graduate at a higher rate, without any changes in internal processes. Public universities, thus, must employ the final option identified by Thompson (1967) for improving the productivity of their graduation rates in response to environmental demands -- adapt the technical subsystem. In other words, public universities would have to modify their academic programs, curriculum, and student support services in order to produce more graduates from student cohorts with similar profiles of academic preparedness. In short, they must become more productive. Because public universities share this challenge with each other, institutional theory suggests that universities will share experiences and adopt practices that have proven successful elsewhere.

Scott (1987) also chronicled the development of institutional theory and the importance for organizations to be connected to their external environments. Several national organizations in the U.S. higher education environment have attempted to promote improved graduation rates. The National Conference of State Legislatures (2008) created a *Blue Ribbon Commission on Higher Education* which intended to move the higher education agenda toward improved institutional performance, including higher graduation rates. U.S. public policy organizations also have urged improved productivity from public universities. Hebel (2008) cited the influence of the National Center for Public Policy and Higher Education and its *Measuring Up* report card on assessing the performance of state higher education systems. One measure on the report card focused on college completion rates, which included undergraduate college credentials earned by students at all higher education institutions in the state, e.g., public and private universities and two-year colleges. As Table 3 shows the variability of the completion rates for public universities clearly was associated with the grade awarded in the

Measuring Up report. Finally, private foundations are exerting their influence by offering grant funds to promote improved graduation rates (Lumina Foundation for Education, 2008; Gose, 2008).

Table 3

Graduation Rates at U.S. Public Universities, by "Measuring Up" Grades for Completion Rates

Grade Awarded by *Measuring Up*	Number of States	6-Year Graduation Rates Lowest	Highest	Mean
A- to A	11	47.3%	66.6%	57.2%
B- to B+	20	46.1%	75.6%	56.6%
C- to C+	16	34.6%	63.4%	48.9%
D+ to F	3	24.4%	53.6%	40.3%

Sources: National Center for Public Policy and Higher Education (2008) for the *"Measuring Up"* grades; The Education Trust (2008) for the 2006 six-year graduation rates of public universities.

To the extent that external forces prompt across-the-board improvements in the graduation rates of public universities, the improvements could be attributed to institutionalized changes rather than variances in organizational characteristics. As cited earlier in this proposal, the evidence suggests that graduation rates have remained largely unchanged for decades. Horner and Berger (2005) examined recent data reported by U.S. colleges and universities to the U.S. Department of Education. Horner and Berger again found that college graduation rates had not improved significantly, but they detected an improvement in the persistence rates of students who had enrolled in recent cohorts. That discovery could foretell a possible improvement in future graduation rates. Accordingly, researchers will need to consider whether future improvements in graduation rates are attributable to institutional or organizational factors.

At its broadest level, U.S. higher education is an industry that is subject to common influences and expectations from the federal government. Although the U.S. constitution delegates responsibility for education to the states, the federal government wields considerable influence on higher education institutions by setting certain requirements for colleges and universities to participate in extensive student financial aid programs (Brubacher & Rudy, 2004). The U.S. Department of Education has used this leverage to collect a substantial amount of information from colleges and universities, provide greater transparency about matters such as graduation rates, and to promote practices that may have a positive effect on graduation rates, such as monitoring student academic progress.

National pressures to improve graduation rates, though, are mediated through intermediaries such as regional accrediting agencies and state governments and, thus, produce differential effects on institutions. Altbach, Berdahl, and Gumport (2005) identified three primary external forces that could create differential environments for U.S. public universities: regional accrediting agencies, state governments, and governing boards. To administer its student financial aid programs, the federal government requires colleges and universities to undergo periodic quality assessments from a recognized accreditation agency. The information exchange associated with the accreditation process further promotes the institutionalization of effective practices. State governments have employed various policy levers, such as state-level higher education strategic plans and performance programs, to encourage public universities to improve their graduation rates. States also have designed a wide variety of governing and coordinating board systems to oversee the administration of their public universities. The influences exerted by each of these three sources will be considered separately.

The Influence of Regional Accrediting Agencies

Although the U.S. constitution delegates the oversight authority for higher education to state governments, the federal government also has leveraged its significant investment in student financial aid programs to utilize another type of oversight mechanism, periodic reviews conducted by regional accrediting agencies. In order to be eligible to administer federal student financial aid programs, an accrediting agency must assess whether meets criteria established by the U.S. Department of Education (2009). Among the criteria is a requirement that an accrediting agency establish standards for assessing the quality of an institution, including its "success with respect to student achievement in relation to the institution's mission" (Subpart B, 602.16 (a)(1)(i)). The department recognizes six regional accrediting agencies that meet its criteria: Middle States Association of Colleges and Schools, New England Association of Schools and Colleges, North Central Association of Colleges and Schools (the Higher Learning Commission), Northwest Commission on Colleges and Universities, Southern Association of Colleges and Schools, and Western Association of Schools and Colleges.

The accrediting agencies train and assemble teams of expert examiners from peer institutions to conduct on-site visits and determine whether an institution has adhered to their standards (Wiley, 2009). Accreditation teams, thus, may promote practices for improving graduation rates by exchanging information with other universities in their region. Regions with a concentration of universities producing higher than expected graduation rates may have an indirect effect on enhancing the graduation rates of other universities in the region.

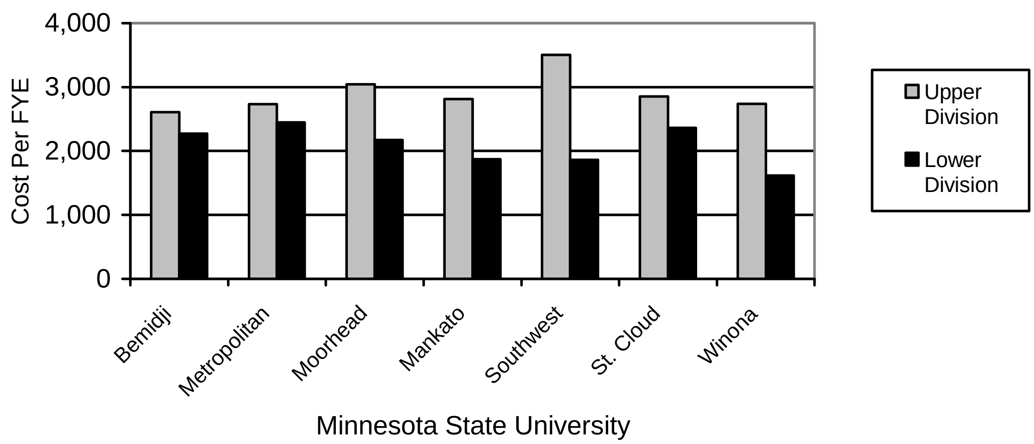
An umbrella organization, the Council for Higher Education Accreditation, provides coordination and advocacy for the efforts of the six regional agencies. In 2001, Burke observed that the six regional agencies had begun requiring universities to assess student outcomes. Although, the agencies have been reluctant to dictate particular outcomes, some agencies have been more proactive on urging universities to improve their outcomes. Dodd (2004) noted that the Higher Learning Commission of the North Central Association and the Middle State Association had been particularly aggressive in focusing on outcomes. Peterson and Augustine (2000) cited three of the regional accrediting agencies (North Central, Middle States, and Southern) as leaders in student assessment efforts. The differences in the standards and practices of the regional accrediting agencies may produce varying expectations about college graduation rates. The literature search, though, did not reveal any scholarly studies that compared graduation rates for public universities by regional accrediting agency.

The Influence of State Governments

The U.S. Constitution delegates primary responsibility for overseeing higher education to state governments (Brubacher & Rudy, 2004). Most fundamentally, states are a primary funding source for higher education, particularly public institutions. Hauptman (2001) found that state governments provided about twice the funding for higher education as the federal government, even after considering federal student financial aid programs and research grants. About 90% of state funding was directed to public institutions. Hauptman, though, was critical of state funding methods, because they allocated funds based mostly on enrollments and other inputs, such as costs per student; less than 5% of state funding was distributed based on performance.

Existing state higher education funding formulas may, in fact, create dincentives for increasing graduation rates. McKeown-Moak (1999) observed that most states built their higher education funding formulas based on student enrollments, but as college enrollments became stable or declined slightly, many states shifted to incremental budgeting to avoid funding cuts. The legacy, though, of relying on enrollments remains built into these formulas. Furthermore, as states reduced their appropriations, public universities were forced to rely more heavily on tuition revenue collected from students. The combination of trends in state appropriations and tuition, thus, incent public universities to focus more on maintaining enrollments, rather than producing graduates. Also, the typical cost distributions for public higher education means that universities are rewarded financially for maintaining higher enrollments in lower division courses than upper division courses. Smaller class sizes and greater specialization in upper division courses translates into higher costs per student. Figure 4 shows this phenomenon for the seven public universities in the Minnesota State Colleges and Universities system. It is less expensive for each university to provide lower division courses than upper division courses; on average, the state appropriation consumed per full-time equivalent student in upper division courses was $2,847, compared to $2,050 for lower division courses. Due to the relatively higher attrition rates in the early years of college, almost 60% of the students in the universities within the Minnesota State College and University system were taking lower division courses. This combination of costs and enrollment patterns has allowed the system to support higher enrollments than if its enrollment were evenly divided between upper and lower division students.

Figure 4: Minnesota State Universities – Upper Division vs. Lower Division Net Instructional Costs Per Full-time Equivalent Student for Fiscal Year 2007



Source: Minnesota State Colleges and Universities (2008).
Note: Cost per FYE represents the estimated state appropriation consumed (instructional costs less tuition) for teaching each full-time equivalent student.

Heller (2005) cited California as an extreme example of how state higher education funding policies can produce the seemingly conflicting results of high participation rates, yet low production of baccalaureate degrees. California has used its community colleges as the primary access point for students entering higher education. Heller found that California had 76% of its higher education students enrolled in community colleges, compared to an overall 49% community college enrollment rate in the rest of the U.S. Despite its relatively high college participation rate, California spent less per capita on higher education, because it was cheaper to fund community colleges than state universities or research universities. Heller estimated this model allowed California to spend about $1,000 per student less than most other states on higher education. The downside to this strategy, though, was that California students were earning baccalaureate degrees at a much lower rate than most other states. Pascarella and Terrenzini (2005) estimated that students intent on earning a baccalaureate degree were 15% less likely to do so if they started at a community college rather than a four-year university.

To improve the results produced by higher education, states have experimented with varying combinations of coordination and governance structures (Glenny, 1959; Millett, 1984; and McGuinness, 2002a). McGuinness adopted a common typology used by earlier scholars for classifying state postsecondary structures (i.e., consolidated governing board, coordinating board, or planning/service agencies that relied on institutional governing boards). McGuinness suggested that states with strong coordinating boards were more focused on leading higher education toward fulfilling the public interest, whereas states with consolidated governing boards were more focused on internal institutional issues. According to this typology, McGuinness (2002a) listed 22 states with primarily consolidated governing boards, 25 states with primarily coordinating boards, and three states with primarily institutional governing boards.

Minnesota is an example of a state which McGuinness (2002a) classified as having consolidated governing boards. Minnesota diluted the statewide coordinating authority for higher education and vested governance responsibilities with statewide systems. In Minnesota, there are two statewide systems for public higher education institutions. The University of Minnesota, which was established prior to creation of the state of Minnesota, possesses constitutional autonomy from the state. A Board of Regents governs the five public universities operated by the University of Minnesota. In 1995, the Minnesota Legislature created the Minnesota State Colleges and Universities Board of Trustees to oversee seven public state universities and a network of two-year community colleges and technical colleges. These two consolidated governing boards have substantial authority to hire their leaders, approve academic programs, establish tuition rates, allocate state funds among their campuses, and set strategic priorities. As discussed earlier in this paper, these two governing boards have taken strides to establish strategic priorities for improving student success at their universities.

Massachusetts is an example of a state which McGuinness (2002a) classified as a coordinating board state. Bastedo (2009) chronicled the efforts of the Massachusetts's Board of Higher Education as an activist coordinating board. For example, the board took steps to differentiate the missions of its institutions, mandated transfer policies, attempted to increase the power of presidents by eliminating faculty tenure, and directed students needing remedial education toward community colleges. Although the Massachusetts Board of Higher Education had not established explicit policies regarding college graduation rates, that goal was inherent in many of the actions it initiated.

Michigan is an example of one of the three states in which McGuinness (2002a) found primary governance responsibilities vested with institutional governing boards. In

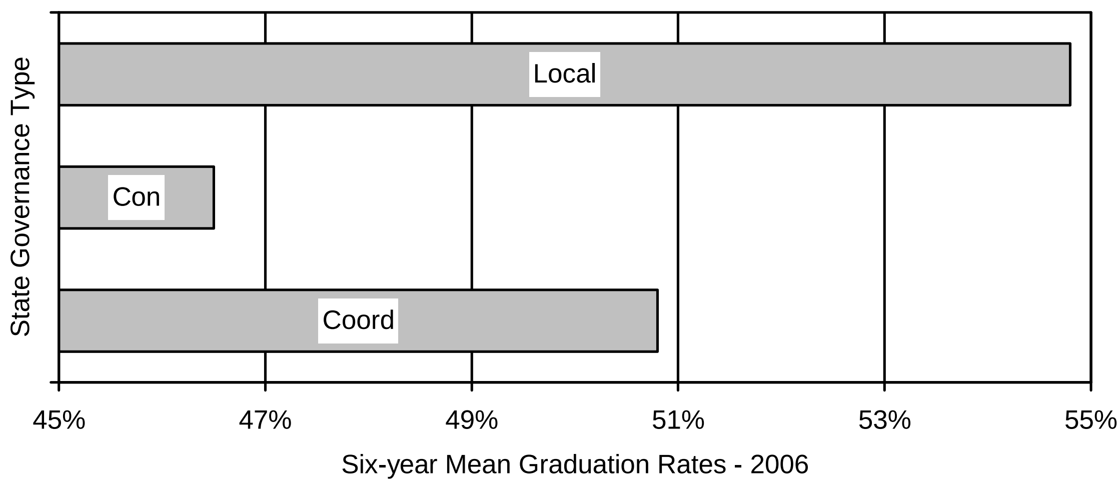
Michigan, the governing board for each of its fifteen public universities had the prerogative to choose whether its graduation rate was a strategic priority.

McGuinness (2002b) has advocated that the consolidated coordination model of higher education would improve the performance of higher education institutions. Gross (2005) used the McGuinness typology to compare the performance of states with consolidated governing boards to states with consolidated coordinating boards, using the results from *Measuring Up 2000* (National Center for Public Policy and Higher Education, 2008) as performance indicators. Although Gross found statistically significant differences for some performance categories, her study did not find a statistically significant difference in completion rates for states with consolidated governing boards compared to consolidated coordinating boards.

The *Measuring Up* performance reports combine the results for all higher education institutions in a state. States, though, do not exercise governance oversight of private institutions. Also, state influence over two-year colleges may differ from their influence over four-year universities. To explore whether, completion rates for public universities alone may vary among the McGuinness (2002a) coordination/governance typology groups, the simple analysis shown in Figure 5 was prepared. It shows the mean 2006 six-year graduation rates for public universities grouped by the three types of state coordination/governance.

Figure 5 shows that public universities located in states with strong coordinating boards had higher mean graduation rates than public universities located in states with consolidated governing boards. Somewhat surprisingly, public universities located in

Figure 5: Comparative Six-year Mean Graduation Rates, by State Governance Type



Source: Six-year graduation rates for public universities recorded in The Education Trust (2008) grouped by state governance type defined by McGuinness (2002a): Local = local institutional governing boards, Con = consolidated governing boards, and Coord = Coordinating boards.

states that relied on institutional governing boards showed the highest mean graduation rates. This analysis suggests the possibility that institutional governing boards may be a more effective structure than consolidated governing boards for improving the graduation rates of public universities.

The McGuinness (2002a) postsecondary structure typology, although widely cited, has been criticized as being too simplistic. For the most part, McGuinness classified a state as focused on either coordination or governance. In practice, though, state governments must consider the need for both the coordination of their higher education systems and the governance of public institutions. Accordingly, greater insights about the influence of state governments on higher education may be gained by considering aspects of each function separately, rather than using a simple coordination/governance dichotomy. Some states may have a strong coordinating function and a consolidated governance authority. Other states may delegate governance to local boards, but still maintain a strong central coordinating board. Still other states may have a relatively weak central coordinating agency that has essentially only advisory powers.

In addition, it must be recognized that governance/coordination is not a one-dimensional concept. The seminal work of Glenny (1959) identified four functions for central higher education agencies: planning, academic program allocation, coordinating operating budgets, and coordinating capital budgets. Richardson, Bracco, Callan, and Finney (1998) developed an alternative conceptual framework for evaluating higher education governance structures, in which they delineated four major work processes associated with day-to-day governance and administrative practices: performance reporting, budgeting, monitoring academic programs, and system integration. Their framework incorporated most of the four administrative domains identified by Cohen and March (1974): planning, academic policies, budgeting, and hiring personnel. Barak (2007) has tracked the varying roles played by state coordinating and governing boards with academic program review and approval. Other governance experts (Duryea, 1973; Kauffman, 1980; and Carver, 1997) have emphasized the responsibility for appointing and evaluating the chief executive officer as the primary governance responsibility. Together, these sources suggest that there are at least five key coordination and governance duties: (1) Strategic planning, including system integration and (2) Monitoring performance, (3) Hiring/evaluating presidents, (4) Budgeting decisions, including setting tuition rates, and (5) Reviewing and approving academic programs. Most states have attempted to carry out their planning and performance monitoring duties through some statewide coordinating function. States then assign the latter three duties to a consolidated governing board, local governing board, or some combination of both.

State-Level Higher Education Planning Efforts

Many states have attempted to express their priorities for higher education by developing statewide master or strategic plans. Mingle (1997) distinguished that master plans were intent on establishing role and mission differentiation and strategic plans were oriented toward addressing issues based on likely future conditions. In practice, though, statewide higher education plans usually blend elements of both master planning and strategic planning. Of 31 states with current higher education plans in 2001, nearly two-thirds of the plans had a component that addressed mission and role differentiation (Education Commission of the States, 2001). Quite often, state-level higher education plans have been produced by blue ribbon commissions or special task forces that include broad representation from constituency groups and higher education officials. The California Master Plan for Higher Education, developed in 1960, under the leadership of Dr. Clark Kerr, has guided the structure of public higher education in that state for nearly 50 years. It has been touted widely as a concept for sorting students into the types of higher education institutions that best match their academic preparedness. Presley and Leslie (1999), though, asserted that the California Master Plan has shown its age and lost its relevance because of significant changes in the California economy and demographics.

The effect of most state-level planning efforts are not as enduring as the

California Master Plan. Many states have established coordinating boards to lead periodic planning efforts (Mingle, 1997). A compilation of state-level master/strategic plans prepared by the Education Commission of the States (2001) showed that 31 of the 50 states had current plans in place. The contents of the plan varied widely. The most common areas addressed included access (25 plans), technology (24 plans), economic development (22 plans), and finance (21 plans). The study did not indicate whether the plans established graduation rates as a priority, but did show that 11 plans incorporated some kind of performance indicators.

Presley and Leslie (1999) compared the evolution of strategic planning in the business sector to the higher education sector. They found that the concept was widely promoted in the literature, but that business had "ceased practicing strategic planning as its mantra for success at least ten years ago" (p. 234). Nonetheless, they found that strategic planning may have value for sorting out environmental priorities. Again drawing on corporate experience, Presley and Leslie (1999) concluded that planning is "at best a necessary, but not sufficient tool with which to achieve timely and appropriate responses to those (environmental) challenges" (p. 234). Mingle (1997) cited the roles and authorities established for state higher education coordinating agencies as a variable that may affect the efficacy of planning efforts. Accordingly, the existence of a plan, by itself, may not foretell the strategic priorities that will be adopted by colleges and universities. To consider the prospects for state-level higher education plan to produce results, it may be necessary to consider the combination of the contents of state-level plans and the degree that higher education authority is distributed in a state.

State Higher Education Performance Programs

In May 2001, Dr. Joseph Burke, a leading scholar on the higher education accountability movement, suggested that external forces had converged and prompted state governments to promote improved outcomes from public universities (Burke, 2001). Burke noted that during the 1990s, states had shifted the emphasis of accountability from expenditures to results. By 1997, he found that 32 states had adopted retention/graduation rates as a performance indicator, making it the most popular indicator in use. If the accountability movement was making a difference, it might be reasonable to expect that students entering public universities in the Fall of 2001 would graduate at record rates.

Burke (2001), though, understood the complexities of performance indicators and higher education governance structures. He did not predict that a heightened interest in accountability would translate into dramatic across-the-board increases in graduation rates. Rather, he posited that the movement would have a differential effect, depending on the particular emphasis it received by state governments. He cited three types of performance programs being created by state governments: performance reporting, performance budgeting, and incentive funding. By 2001, 39 states required universities to prepare periodic performance reports, only 27 states used performance data to inform budget decisions, and just 17 states allocated some funding to universities based on performance (Burke & Minassians, 2001).

Burke (2001) also cautioned that there were differences in the magnitude and depth at which awareness about state performance programs had penetrated public universities. He surveyed presidents, vice presidents, academic deans, and department chairs from five states that had adopted performance funding (i.e., Florida, Missouri, Ohio, South Carolina, and Tennessee). For respondents from four-year public universities, his survey showed that 90% of senior administrators were familiar with their state's performance program, compared to 54% of academic deans, and only 36% of department chairs. He also noted differences among the states in the familiarity of campus leaders with their state's performance program, ranging from a high of 66% in South Carolina to a low of 35% in Ohio. He wondered if the lack of familiarity with these programs would mute their effectiveness, because "after all, the actions of academic departments are most responsible for the results on the common indicators of retention, graduation, and transfer rates" (p. 20).

Sastry's (1997) model of organizational change is consistent with Burke's (2001) concerns about the extent to which campus leaders were familiar with state performance programs. Sastry suggested that organizational inertia would resist change until an awareness about inadequate performance punctuated its equilibrium. Pfeffer and Salancik (1978) observed years ago that organizations may not respond to their external environments because "they do not notice every event, nor are all occurrences important enough to require a response" (p. 526).

Resource dependency theory (Pfeffer & Salancik, 1978) suggests that performance programs would be most effective if tied to funding incentives. Some states have experimented with performance funding formulas that created incentives for public universities to achieve prescribed outcomes, such as improved graduation rates. Zumeta (2001) cited performance funding efforts in four states (i.e., Tennessee, South Carolina, Missouri, and Washington), which is noteworthy since McGuinness (2002a) categorized all four of these states as having strong centralized coordinating boards. Tennessee has used a performance funding formula since 1979. At the time of Zumeta's article, South Carolina was experimenting with making its higher education funding based entirely on higher education institutions meeting certain goals. Performance funding programs recently have received renewed attention. Private foundations were offering grant funds as an incentive for states to improve their graduation rates. In 2008, the Lumina Foundation for Education, based in Indianapolis, launched its *Making Opportunity Affordable* program and provided planning grants to assist eleven states with improving their college graduation rates (Lumina, 2008). Four of the states (Indiana, Ohio, Tennessee, and Texas) have agreed to use their planning grants to explore modifying their funding formulas to reward institutions for graduating students, not just enrolling them. Ironically, Missouri and South Carolina, early adopters of performance funding, dropped their performance funding programs due to budget cuts (Midwestern Higher Education Compact, 2009).

The experimentation by states with performance budgeting and funding systems indicates their desire to link financial support to outcomes. The success of these efforts, though, remains in doubt. Empirical studies of the effectiveness of these programs are limited. Woodley (2005) tested whether graduation rates for four-year public universities in nineteen state higher education systems were affected by the use of performance funding or budgeting adopted by those states and found no statistically significant effects. Woodley acknowledged, but was not able to account for, the difficulty of measuring the effectiveness of these programs due to the complexity of higher education governance structures.

The Design of Governing Boards

From the very beginning, U.S. higher education institutions have had governing boards. The first U.S. college, Harvard College, had two governing boards at one time. In 1701, Yale College introduced the model of a single lay governing board (Brubacher & Rudy, 2004). Public colleges later followed the Yale model and had a lay governing board positioned between state government and the institution of higher education. The essential role of the public higher education governing board has been described as "bridging the gap between public accountability and professional autonomy" (Clark & Youn, 1976, p. 11). McLendon (2003) rightly observed that the issue of centralization/decentralization of public higher education is really about the state and campus relationship. On one hand, governing boards may encounter tensions with state legislators and governors about responsibilities for setting the higher education agenda. On the other hand, governing boards may be accused of micromanagement if they attempt to intervene too far into campus administrative matters. Proper governance is indeed a delicate balance.

Some observers have suggested that governance duties consist primarily of hiring a good president to entrust with managing the organization. For example, Trustee Ora Wildermuth, secretary of the Association of Governing Boards of State Universities, commented in 1949 (as cited in Duryea (1973, p.71): "If a governing board contents itself with the selection of the best president available and with him develops and determines the broad general principles . . . and then leaves the administration and academic processes to the administrative officers and the Faculty, it will have done its work well." Carver (1997) also emphasized that boards should focus on hiring a good president, establishing strategic policies focused on outcomes, and keep policies on administrative matters to a minimum.

Rainey (1960) expressed a skepticism that many administrators may harbor about their board members by citing Lord Chesterton as saying, "men who do not understand universities and who do not love them should have nothing to do with them. Unhappily, many university presidents have to work with board members who possess neither of these qualifications. They neither understand universities nor love them, and they often seek a position on the board to achieve some personal end or promote special interests they represent" (p. 380). A recent qualitative study (Moltz, 2009b) gave voice to community college presidents who had experienced rogue trustees overstepping their governance authority. Also, a recent scandal over preferential admissions treatment sought by trustees at the University of Illinois provides an example of how trustees may abuse their authority (St. Clair & Cohen, 2009). Despite this skepticism, trustees have important governance duties to perform and even faculty members may implore them to take action periodically (Asimov, 2009).

The Yale model of a single governing board for a single institution survived as the predominant governance structure well into the 1900s. Because of concerns about duplicate courses and facilities, states began forming centralized agencies to coordinate or govern multiple higher education institutions in the early 1900s (Klein & Smittle, 1933). State officials became increasingly concerned about accountability and the need to replace institutional competition with improved planning and coordination in the 1950s (Glenny, 1959; Millett, 1984). Governors and legislators also grew weary of being lobbied by board members and constituents of single institutions (Kauffman, 1980). The centralized governance movement, thus, gained momentum and became predominant late in the century. As the twentieth century came to a close, it was estimated that 80% of college students attending public higher education institutions that were part of a multicampus system (Gaither, 1999).

Consolidated governance models eased the prospects for trustees to interfere with administrative matters at individual campuses, but created their own set of challenges. Kerr (1971) cited several liabilities of the multicampus governance model: (1) increased bureaucracy, (2) reduced influence for faculty and student senates, (3) stifled innovation due to centralized planning, (4) removal of the lay board from the local atmosphere, (5) heightened possibility of friction between campus and system executives, due to the dilution of both their powers, (6) isolated campus events resulting in policy restrictions for all campuses, and (7) concentrated governance power being more vulnerable to gubernatorial manipulation than diffused governance. As a result, some states reverted to a decentralized model of higher education governance.

In 1994, the State of New Jersey enacted legislation to disband its centralized higher education coordinating authority. The New Jersey coordinating board had been established in the 1960s and was regarded as one of the most powerful higher education governing boards in the county. It was credited with expanding educational programs, securing substantial operating and capital funding, and relieving state colleges from state mandates. Nonetheless, its demise came quickly and was attributed to dissatisfaction expressed by the college presidents subject to its jurisdiction. In essence, New Jersey returned to a model of strong local governing boards for its public higher education institutions. It created a council of campus presidents that was expected to meet periodically and consider statewide coordination issues (Hollander, 1994).

Other states followed the New Jersey lead, and decentralized governance of their public colleges and universities. In Arkansas, Hawaii, and Illinois, local governance advocates, most prominently campus presidents, exercised timely political strategies to achieve decentralization (McLendon, 2003). The State of Illinois eliminated two multicampus governing boards and replaced them with local governing boards. The multicampus governing boards were viewed as bureaucratic obstacles by state legislators. Again, institutional presidents were behind the effort to return the locus of control to local boards (Snyder, 1995). West Virginia and Maine have moved toward local governance in recent years. Their decentralization actions have been attributable to a desire to make public higher education more responsive to the needs of students and local businesses (Schmidt, 2001).

The disadvantages of local governance, though, may become apparent again, such as was the case in the State of Florida. In 2000, Florida shifted governance authority for its public universities away from a statewide board to local boards. It listened to campus presidents who had been complaining that the centralized governing board would not permit them to develop new academic programming, such as a law school (Schmidt, 2001). In 2002, though, Florida voters overturned the 2000 legislative action and approved a constitutional amendment to create a Board of Governors to oversee the state's eleven universities. Voters were motivated by local governing boards hiring presidents without academic experience and approving substantial presidential salary increases (Schmidt, 2003).

The effect of the locus of higher education governance control on institutional performance is unclear. Hines (2000) identified assessing institutional performance as an important function for higher education governing boards. Carver (1997) asserted that governing board members are ideally situated to weigh environmental influences and work with administrators to select strategic priorities for an organization. As such, governing boards also may serve a valuable role as boundary spanners. It is debatable whether this role is best achieved by multicampus or local governing boards. Carver also asserted that governing boards play an important role in monitoring organizational performance and policy implementation. Local boards may be positioned to monitor performance more closely and push higher education administrators to improve the performance of higher education institutions. Consolidated boards, on the other hand, may facilitate information sharing across several institutions and create a comparative context for motivating improved performance.

The McGuinness (2002a) typology was developed from the perspective of the state, not individual public universities. Public universities in the same state may have very different governance structures. For example, the state of Minnesota had two separate governing boards that oversee its public universities. The University of

Minnesota Board of Regents possessed oversight responsibility for one of the largest public research extensive universities in the country and four other coordinate campuses. The Minnesota State Colleges and Universities Board of Trustees had oversight responsibility for seven public regional comprehensive universities and 30 two-year colleges. Each board also had a different and distinct relationship with its state government; the University of Minnesota had constitutional autonomy from state government and was able to operate more independently than the Minnesota State Colleges and Universities. The governance structure experienced by individual public universities in the same state, hence, may be very different. It, thus, may be worthwhile to consider the scope of a governing board's jurisdiction in order to determine the intensity of the governance oversight experienced by an individual institution.

Finally some states, e.g., Massachusetts, North Carolina, and Pennsylvania, have created layers of governance authority (Education Commission of the States, 2008). Under those structures, a state may assign some governance duties, like approving tuition rates and academic program approvals, to a consolidated board, while it assigns other duties, like evaluating presidents, to a local board.

A methodology more sophisticated than the McGuinness (2002a) typology is needed to capture the complexity and variability of the postsecondary governance structures from the perspective of individual institutions. Further research is needed to determine whether the locus and intensity of governance control for three primary duties (i.e., appointment/evaluation of presidents, budgeting, and academic program approval) is related to organizational effectiveness.

Research Question

This exploration of factors affecting college graduation rates started with a student perspective and introduced Pascarella’s (1985) simplified causal model (see Figure 2). Ample research has established that student demographics and institutional resources (Adelman, 2006; Astin, 1993a; Astin 1993b; Porter, 1999; Tinto, 1993) affect graduation rates. Pascarella's model also offered the mysterious “black box” effects of the internal environments. Astin's (1993a) I-E-O model further emphasized that outcomes like graduation rates are affected by both inputs and internal environments. Astin acknowledged the difficulties of studying the effects of internal environments on graduation rates. It has remained the province of primarily qualitative studies, such as the extensive study conducted by Kuh, Kinzie, Schuh, Whitt, and Associates (2005).

The idea of equifinality (Van de Ven & Poole, 1995) suggested that there may not be one precise formula constituting the "black box" of internal environments. Although the ingredients of effective internal environments may differ, their composite effect may explain the variation that remains in graduation rates after accounting for the differences in inputs and institutional resources. These complications likely have discouraged researchers from searching for a quantitative model for internal environments. Shifting the research focus to the external environment may help explain why the internal environments of public universities differ in their support of graduation rates.

Both organizational theorists (Van de Ven & Poole, 1995) and institutional theorists (Scott, 1987) highlight the importance of being connected to the external environment. The Baldrige educational criteria posited that organizational leadership draws from the external environment to create a strategic plan for moving the organization toward prescribed results. The punctuated change model (Gould, 1989; Sastry, 1997) suggested that the external environment helped universities recognize performance shortcomings, such as subpar graduation rates, in order to overcome internal inertia and compel transformational changes to their internal environments.

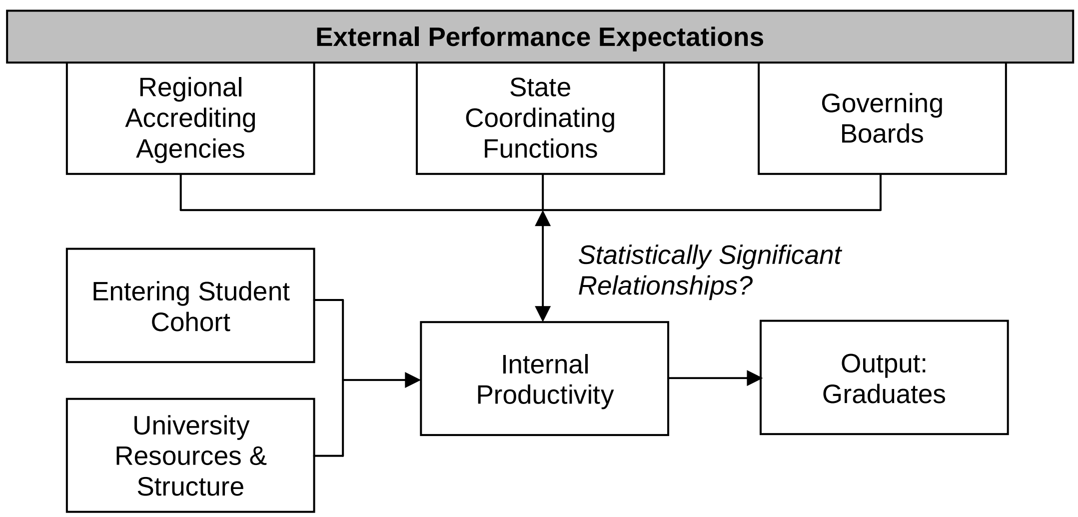
Higher education governance structures, though, complicate the process of recognizing and accepting substandard performance. The federal government has been a rather loud voice in urging improved graduation rates, but its message must weave through multiple governance layers and find its way to the internal environment of a university. Differences in state governance structures may impact graduation rates. A simple comparison that grouped public universities by their type of state governance structure (McGuinness, 2002a) suggested that graduation rates may vary by the type of state governance structure. Clearly more sophisticated quantitative techniques that control for other differences among public universities are needed to explore this issue further.

Burke (2001) attempted to study whether performance programs sponsored by state governments were producing better outcomes for universities. At the time, though, he concluded that "It is still too soon to tell whether performance programs will eventually improve the results of colleges and universities, or increase their responsiveness to state and student needs" (p. 21).

Improving U.S. college graduation rates is an important strategic initiative for higher education. State policymakers and governing boards are anxious to weigh in on this issue, but will their interest matter? To examine whether the structure and interests of external parties are related to the internal environments of public universities, the following research question (depicted in Figure 6) will be studied:

- To what extent is the relative productivity of the graduation rates of public universities influenced by their external environments?

Figure 6: Research Question: Simplified Conceptual Framework



Chapter Three: Methodology

Punctuating organizational inertia would require public universities both to recognize the importance of graduation rates and be committed to improving their internal operations. To see whether internal operations supported improved graduation rates, it was necessary to parse out the effects of differences in the inputs available to public universities. The residuals remaining after controlling for input differences, thus, offered a relative measure of the productivity of the graduation rates achieved by public universities. Figure 7 shows the variables used in the research design for this study. It focused on year-to-year changes in graduation rates for the first hypothesis, and then considered a series of hypotheses about the differences among public universities that could not be explained by the variation in their organizational inputs. To explore why some universities showed higher productivity in their graduation rates than other universities, this study looked outside the boundaries of public universities and tested hypotheses about the differential effects associated with the influences from their external environments.

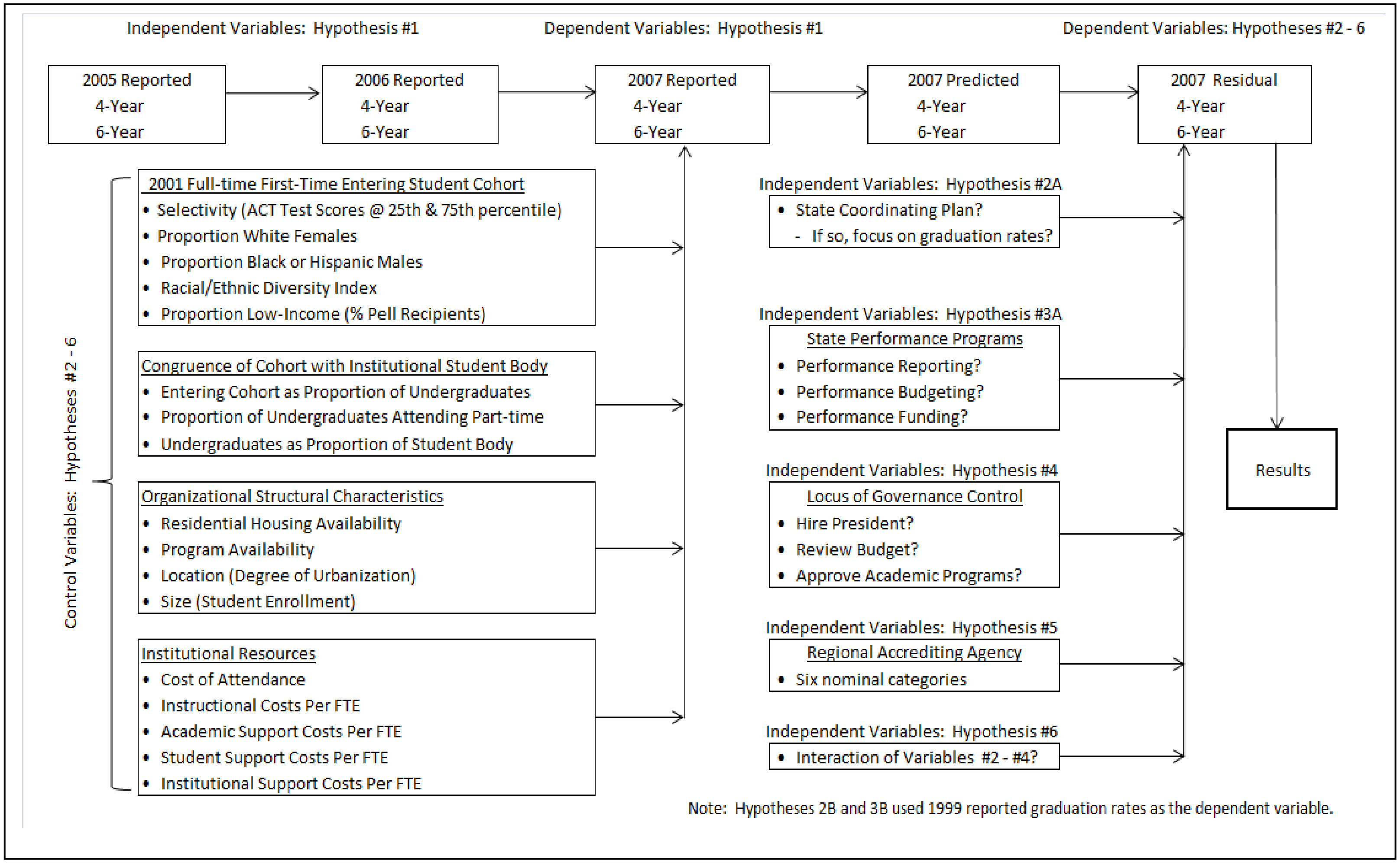
Research Hypotheses

The hold of internal inertia suggests that universities would show little change in their graduation rates from year-to-year. It provides the first research hypothesis:

- Hypothesis #1: The short-term changes in graduation rates reported by public universities will not be statistically significant.

To test this hypothesis, the six-year graduation rates produced by full-time, first-time student cohorts who entered each public university in the Falls of 1999, 2000, and 2001

Figure 7: Variables in Research Design



were compared. Analyzing the results over a three-year period provided stronger evidence about the stability of the rates than just one comparison of two adjacent years. In essence, hypothesis #1 examined whether there was evidence to support the notion that internal inertia has held graduation rates in place at public universities. The results helped set the stage for interpreting results from the remaining hypotheses.

Other hypotheses focused on the differences among the graduation rates reported by public universities, after accounting for the differences in their inputs and resources. Applying Pascarella's (1985) and Astin's (1993a) I-E-O models, the variation not explained by inputs was assumed to be related to the internal environments in place at the universities or, as defined in this proposal, the productivity of their graduation rates. These research hypotheses addressed possible relationships between the influences imposed by external environments and the productivity of graduation rates.

- Hypothesis #2A: Differences in state-level higher education plans will be associated with statistically significant differences in the productivity of the graduation rates of public universities.
- Hypothesis #3A: Differences in state performance programs will be associated with statistically significant differences in the productivity of the graduation rates of public universities.
- Hypothesis #4: Differences in the locus and intensity of board governance oversight will be associated with statistically significant differences in the productivity of the graduation rates of public universities.
- Hypothesis #5: Differences in regional accrediting agencies used by public

universities will be associated with statistically significant differences in the productivity of their graduation rates.

- Hypothesis #6: The interactions among state higher education plans, state performance plans, and the locus of board governance oversight will be associated with statistically significant differences in the productivity of the graduation rates of public universities.

The time sequence for hypotheses #2A, #3A, and #4-#6 tested for the possibility that conditions in the external environment influenced the productivity of graduation rates generated in subsequent years. Punctuated equilibrium theory also held the possibility that influence could flow in the opposite direction, e.g., reported graduation rates could influence environmental conditions. Accordingly, supplemental versions of hypotheses #2 and #3 were tested for evidence of such influence.

- Hypothesis #2B: Differences in reported graduation rates will be associated with statistically significant differences in types of state-level higher education plans.
- Hypothesis #3B: Differences in reported graduation rates will be associated with statistically significant differences in state performance programs.

To test these supplemental hypotheses, graduation rates reported prior to the presence of the environmental conditions had to be considered rather than the graduation rates reported in future years. Also, unlike the tests of hypotheses #2A and #2B, for hypotheses #2B and #3B, graduation rates were not controlled for differences in the student and institutional characteristics among the universities. Rather, reported graduation rates were tested for statistically significant differences among the various types of state-level higher education plans and performance programs. External stakeholders could observe differences in reported graduation rates, but not differences in the productivity levels, as defined in this study. Accordingly, differences in reported graduation rates would offer a more plausible explanation for differences in environmental conditions, than differences in productivity levels. The supplemental tests were conducted only on hypotheses #2 and #3 because their environmental conditions -- types of state-level higher plans and performance programs -- were subject to change by state policy makers more readily than the conditions tested in hypotheses #4 and #5.

The Population and the Sample

The population of interest for this study was U.S. public four-year universities subject to state control. It excluded private universities because they were exempt from many state controls. It also excluded two-year colleges because, as discussed in Chapter 1, graduation was not necessarily a valid goal for large numbers of students attending those institutions. For the cohort of full-time, first-time students entering college in Fall 2001 (the basis for the dependent variable), the U.S. Department of Education (2008) Integrated Postsecondary Education Data System (IPEDS) contained 576 post-secondary institutions which were both subject to public control and granted baccalaureate degrees. Preliminary analysis of this group of public universities revealed the need to develop additional criteria for the suitability of including them in the study. For example, some universities, such as U.S. military academies, were not subject to state control. Other universities only offered a limited number of baccalaureate degrees and were more similar to two-year colleges.

The initial data extraction from IPEDS, which identified the 576 public universities, simply required that a university both be subject to public control and grant baccalaureate degrees. Six additional criteria were established for sample selection to improve the reliability and external validity of test results. Accordingly, universities were excluded from the sample for any of the following reasons.

- Missing graduation rate data. The 2007 graduation rate was missing from the IPEDS database for 11 universities. Eight of these 11 universities also were excluded for one or more of the other reasons listed below. Only three universities -- Sam Houston State University (TX), Texas A& M International University (TX), and Texas Southern University (TX HBCU) -- would have been added to the samples if data on their graduation rates were available. The 2005 and 2006 graduation rates were missing for one university which met the other criteria for inclusion in the sample, the University of Texas at Brownsville, resulting in its exclusion from the testing of Hypothesis #1. Finally, the 1999 graduation rates were missing for 12 universities which met the other criteria for inclusion, resulting in their exclusion from the testing of Hypotheses #2B and #3B. Because of the criticality of graduation rate data for testing the hypotheses, cases were deleted from the respective tests when it was missing, rather than attempting an type of imputation methods.
- Not subject to state control. State governments did not exercise control over 24 public universities: Twelve universities located outside the United States, mostly in Puerto Rico; five service academies controlled by branches of the U.S. military;

three universities subject to the control of American Indian tribes; and one university controlled by the District of Columbia. State control was an integral part of constructing most of the independent variables, so only universities subject to state control were included in the sample.

- Conferred primarily sub-baccalaureate degrees. The IPEDS database did not always provide a clear distinction between community colleges, which were excluded from this research study, and four-year universities. When the mission of a community college had been expanded to allow offering some baccalaureate degrees, the IPEDS database classified it as a baccalaureate granting institution. The database contained 34 post-secondary institutions that offered some baccalaureate degrees, but primarily granted sub-baccalaureate degrees. Because those institutions were more similar to community colleges than four-year universities, they were excluded from the sample.
- Not accredited separately. Some university systems included multiple branch campuses, but were combined with a main campus for purposes of regional accreditation. The branch campuses in these systems often were smaller entities which typically served as transfer institutions for a main campus. The IPEDS database included 44 such branch campuses. The Penn State system accounted for 19 of the campuses; another 12 campuses were affiliated with one of the public university systems in the state of Ohio. Other campuses excluded from the samples because of this criterion were affiliated with Rutgers University, the University of Pittsburgh, and the University of Connecticut. Without being

subject to the rigors of the accreditation process, these branch campuses were isolated from a primary environmental force, the regional accrediting agency, and, thus, were excluded from the sample.

- Too few students in the entering cohort. When measuring a proportion such as a graduation rate, a small denominator increases the likelihood of random error in the measurement. With a cohort of 100 students, the confidence interval around a graduation rate could be as high as plus or minus 10%. The variance of a sample (n) is highest for a proportion (p) of 50%. The 95% confidence interval when p = 50% and n = 100 is calculated as: .50 ±1.984 ×Square root of (.5×(1-.5)÷100) or 40% to 60% (Agresti & Finlay, 1997). The confidence interval shrinks to plus or minus 5% when the cohort size increases to 385 (.50 ±1.96 ×Square root of (.5×(1-.5)÷385) or 45% to 55%). For the cohort of students entering in 2001, 31 universities had fewer than 100 students, and another 95 universities had 100 to 385 students. The majority of these 126 universities would have been omitted from the sample due to other exclusion criteria. To increase confidence in the graduation rates as a valid indicator, only public universities with more than 384 students in the entering cohort were included in the sample.
- Unstable board governance structures. State governments sometimes resorted to dramatic redesigns of the board structure for governing public universities. In the Fall of 2001, 27 public universities were experiencing significant changes in their board governance structures. The status of their governance structure in Fall 2001

was in such a state of flux that it may not have served as a valid indicator of any possible relationship with the productivity of those universities. The 27 universities were located in three states -- Colorado, Florida, and West Virginia -- where state legislatures either had made significant changes in 2001 or were contemplating changes that occurred soon thereafter. In 2001, Florida and West Virginia disbanded strong centralized governance structures and replaced them with local governing boards (Education Commission of the States, 2008). Mills (2007) studied the political environment surrounding the public higher education governance structure in Florida and found it to be highly unstable even after the local boards were created in 2001. This instability introduced significant uncertainty about whether the productivity of the 2001 entering cohort could be related to the predecessor consolidated governing board, the newly created local governing boards, some combination of these governance structures, or neither governance structure. McGuinness (2002b) identified changes in the West Virginia and Colorado higher education governance structures that also introduced uncertainty about the relationship of those structures to the productivity of their respective universities. Selingo (2000) and Hebel (2000) reported on the political environments surrounding the changes in West Virginia and Colorado, respectively. The changes in West Virginia affected all public universities in that state. The Colorado changes affected only certain universities and left the governance structure for other universities intact. The Colorado universities not affected by these changes were left in the sample. None of the Florida or West Virginia universities were included in the sample.

Based on these criteria, 178 of the 576 universities were excluded from the complete sample, leaving 398 universities for testing most of the hypotheses (as discussed early cases had to be deleted for some tests because graduation rate data was missing for 1999 or 2005/2006). The complete sample also included 27 historically black colleges and universities (HBCUs), which arguably could have been excluded because of their unique status. It was uncertain whether HBCUs would experience the same degree of influence from the external environmental factors identified in this study as other public universities. Rather than exclude the HBCUs altogether, many of the statistical tests were conducted on both the complete sample and a subsample which excluded the HBCUs. This approach was taken rather than treating HBCU status as a control variable. HBCU status encapsulates several student and institutional characteristics, and does not represent a distinct characteristic like the control variables which were included in the study.

A comparison of the statistical profiles of universities included and excluded from the sample is shown in Table 4. It is noteworthy that the mean graduation rates were lower for the excluded universities, suggesting the need to take care in inferring results from the included universities to the universe of all public universities listed in the IPEDS database. The distinct profile of HBCUs also should be noted in Table 4.

Table 4

Comparison of Public Universities Included in Research Sample

Statistic	Universities in Sample: Subset	HBCUs[a]	Complete	Excluded[b]	Total[b]
Count of Universities	371	27	398	178	576
% of Public Universities	64.4	4.7	69.1	30.9	100.0
Sum of 2001 Cohort	675,394	22,342	697,736	93,063	790,799
% of 2001 Cohort	85.4	2.8	88.2	11.8	100.0
4-Year Graduation Rates Percentages					
Mean	25.2%	15.7%	24.5%	20.1%	23.2%
Standard Deviation	15.3%	5.1%	15.0%	14.7%	15.1%
Minimum Value	1.6%	6.4%	1.6%	1.0%	1.0%
Maximum Value	84.2%	23.2%	84.2%	82.0%	84.2%
6-Year Graduation Rates Percentages					
Mean	49.8%	35.7%	48.8%	39.1%	45.9%
Standard Deviation	15.4%	7.4%	15.4%	16.5%	16.3%
Minimum Value	13.0%	18.9%	13.0%	3.8%	3.8%
Maximum Value	93.2%	48.5%	93.2%	82.0%	93.2%

[a] Historically Black Colleges and Universities (HBCUs) were excluded from the sample subset.
[b] The total column shows descriptive statistics for the 565 of the 576 public universities listed in the IPEDS database. Data is excluded for the 11 universities, enrolling 4,040 students in the Fall 2001 entering cohort, which were missing graduation rate data for the 2001 cohort.

Specification of Independent Variables - Hypothesis #1

Hypothesis #1 considered the four and six-year graduation rates reported by public universities in 2005 and 2006 as the independent variables for testing the effect on the graduation rates reported in a third year, 2007. The data source was the annual Integrated Postsecondary Education Data System (IPEDS) graduation rate (GR) survey conducted by the U.S. Department of Education, National Center for Education Statistics. The GR survey is based on tracking cohorts of first-time, full-time students that entering universities each Fall. The 2005 graduation rates were based on the entering student cohort from Fall 1999, and the 2006 graduation rates were based on the entering student cohort from Fall 2000.

Federal law required U.S. public universities to report data for IPEDS, as a condition of establishing eligibility to administer Title IV student financial assistance programs, such as the Pell grant program and Stafford guaranteed loan programs. Because Title IV programs were an essential source of financial resources for public universities, all U.S. public universities participated in the IPEDS surveys, but occasionally a university failed to report its graduation rate. The only university included in the sample which did not report its graduation rates for 2005 and 2006 was the University of Texas at Brownsville. Accordingly, it was excluded from the tests of hypothesis #1.

Table 5 shows the methodology for calculating the reported graduation rate.

Table 5

Independent Variables for Hypothesis #1- 2005 and 2006 Graduation Rates

Independent Variable	Source
2005 and 2006 Reported Graduation Rates - 4 Years	
The proportion of first-time, full-time students who entered a university in the Fall 1999 or 2000 academic terms and earned a baccalaureate or equivalent degree from the same university by the Fall 2003 and 2004 academic terms, respectively.	2005 and 2006 IPEDS GR Surveys: grrace24 (code value 17 divided by code value 12)
2005 and 2006 Reported Graduation Rates - 6 Years	
The proportion of first-time, full-time students who entered a university in the Fall 1999 or 2000 academic terms and earned a baccalaureate or equivalent degree from the same university by the Fall 2005 and 2006 academic terms, respectively.	2005 and 2006 IPEDS GR Survey: grrace24 (code value 16 divided by code value 12)

Specification of Independent Variables - Hypothesis #2

The set of independent variables for testing the second hypothesis were derived by the author from a review of state-level higher education plans in effect in 2001. The hypothesis was tested against dependent variables for students who entered college in the Fall 2001 academic term, hence it was appropriate to gather data on this independent variable from the same period.

The condition of state-level higher education plans provided an indicator of where higher education, and in particular college completion, was on the governmental agenda for each state. In addition to higher education, state governments have many diverse responsibilities, such as building highways, operating prisons, collecting taxes, and distributing funds to needy persons. Kingdon (1984) found that an issue needed to be perceived as a problem and have political support in order to be recognized on the governmental agenda. A state-level higher education plan would have provided its political leaders (e.g., governor and legislature) with an assessment of the condition of higher education and facilitated their consideration of whether to initiate any actions. If the plan revealed evidence of a problem, such as poor performance, Kingdon would suggest that the issue would more likely be placed on the governmental agenda. Accordingly, if governmental leaders perceived college completion as a problem, it was more likely to appear as an area of focus in a state-level higher education plan.

The initial data source for determining the status of state-level higher education plans in 2001 was a survey conducted by the Education Commissions of the States (2001). That survey provided links to Web sites for downloading copies of many of the plans. When the links had been broken, an internet archive site, the *Wayback Machine* located at http://www.archive.org/web/web.php, was searched for a copy of the plan. In a few cases, the search had to be extended with other Web-based tools, such as *Google*. Eventually copies of all state-level plans listed in the ECS survey were located and downloaded. The survey listed plans for 31 states and indicated that six more states had plans under development. It indicated that 13 states did not have state-level higher education plans.

The information from the ECS survey (2001) was supplemented with an on-line search of the state government Web sites for the 19 states which the survey listed as not having current state-level higher education plans. The search revealed that two states (California and Georgia) completed their plans shortly after the ECS survey, and that plans existed for two states (Connecticut and Oregon) which the survey listed as not having plans. Accordingly, for purposes of testing hypothesis #2, these four states were classified as having state-level higher education plans in place. Plans from these four states were downloaded for further analysis and classification by plan contents.

Based on a review of the contents of the 35 plans, a categorical variable was created and coded for each university. The coding scheme for the variable had four mutually exclusive levels: (1) No state-level plan, (2) State-level plan, but no focus on graduation rates, (3) State-level plan with a focus on graduation rates, but no targets for improvement, and (4) State-level plan including targeted improvements in graduation rates. Universities in the 15 states for which no plan was located were coded as level 1. In addition, universities from two other states were coded as level 1 because the plan was either outdated (the Indiana plan had not been updated since 1973) or only defined the missions of the universities and did not cite particular strategies (Nevada plan). Universities from West Virginia were later excluded from the study due to changes underway in their governance structure, leaving universities from 16 states coded as not having a plan in place in 2001. For similar reasons, universities from Florida were excluded from the study, leaving universities from 32 states coded as levels 2-4 depending on the contents of their respective plans. Table 6 shows the final classifications of the higher education plans in effect for each state included in the study.

Table 6

State-Level Higher Education Plans - Fall 2001

Plan/Focus	States (Number of public universities in complete sample)
No Plan	16 states (112 universities): AK(2), AL (12), AR (8), DE (2), IN[a] (11), MA (11), ME (3), MI (15), MN (9), NH (3), NM (3), NV[a] (2), PA (17), VT (2), WI (12), and WY (1)
Plan, but no focus on completion	18 states (149 universities): AZ (3), CA[a] (28), HI[b] (2), IA[b] (3), KS (7), KY (7), MD (10), MO (12), NC[b] (14), ND (3), OH (12), OK (8), RI (2), SC (11), SD[b] (4), UT[b] (4), VA (13) and WA (6).
Plan with a focus on completion, but no targets	11 states (92 universities): CO (7), CT[a] (5), GA[ab] (15), ID (3), IL(10), MS[b] (6), MT[b] (3), NE (5), NJ (10), NY (23), and OR[ab] (5).
Plan with a focus on completion and targets	3 states (45 universities): LA (12), TN (9), and TX (24).

[a] Based on a review of the plans, the author classified the plan types for these six states differently than the ECS 2001 Survey. See detailed explanations in the text of this chapter.
[b] The plans for these states were developed by governing boards with statewide jurisdiction for public universities.

As shown in Table 6, nine states had consolidated governing boards which were empowered with the responsibility for planning the coordination of higher education statewide. Another 23 states either had statewide higher education coordinating agencies or created special commissions which developed state-level higher education plans. The remaining 16 states represented in the sample (recall that two states, Florida and West Virginia, were excluded entirely from the sample) had no state-level higher education plans in place in 2001. Plans in 18 states had no focus on college completion, while the other 14 plans had such a focus.

Specification of Independent Variables - Hypothesis #3

The set of independent variables for testing the third hypothesis was obtained from a survey of state performance plans in effect in 2001 (Burke & Minassians, 2001). The hypothesis was tested against dependent variables for students who entered college in the Fall 2001 academic term, hence it was appropriate to gather data on this independent variable from the same period.

Burke and Minassians (2001) surveyed state governments and established the condition of performance programs at the time. Their survey classified performance programs into three categories: reporting, budgeting, and funding. Performance reporting programs constituted structured methods for periodically gathering common performance data and ensuring that it was reported publicly. Performance budgeting programs went a step further and used performance data to inform the state budgeting process. Performance funding programs used performance data to distribute at least part of state appropriations to public universities. Burke and Minassians also noted whether a program was mandated by state law or implemented voluntarily from a consultative process that involved public universities. They posited that mandatory programs would be less successful than voluntary programs, because public universities had not participated in their design.

Three categorical variables were created to record the survey results for each university: performance reporting, performance budgeting, and performance funding. Each variable was defined with three mutually exclusive levels: (1) No performance program, (2) Voluntary performance program, or (3) Mandatory performance programs. The survey considered a program to be mandatory if it was enacted by state law.

The Burke and Minassians (2001) survey conducted a rigorous, scholarly review of state performance plans in effect in 2001. Accordingly, the author did not conduct any further reliability checks on its results. Table 7 provides summary information on these performance programs; Appendix C shows more detailed information for each state.

Table 7

Higher Education Performance Programs - 2001

Status of	Reporting Program		Budgeting Program		Funding Program	
Program	States	Universities	States	Universities	States	Universities[a]
No Program	12	80	22	159	32	240
Mandatory	25	227	13	108	7	74
Voluntary	11	91	13	131	9	84

[a] In two states (New York and Pennsylvania), voluntary performance funding programs were in place for only their state university systems; no programs were in place for the other public universities in those states.

Specification of Independent Variables - Hypothesis #4

The independent variables for testing the fourth hypothesis were a set of values that represented the locus and intensity of control for the responsibility of three primary board governance duties (i.e., hiring presidents, reviewing budgets, and approving academic programs). An initial determination of the board governance structures in place for the public universities was based on the results from two surveys of postsecondary governance structures (McGuinness, 2002a; Education Commission of the State, 2008). These surveys, though, used the state, not the university, as the unit of analysis and grouped all public universities in a state into the same category (coordinating, governing, or planning). Further analysis revealed that of the 48 states included in this study, 17 states had adopted multiple governance models for their public universities.

The variations in governing board structures was further complicated when states disaggregated the three primary governance responsibilities (hiring the college president, budgeting, and academic program approval) among different entities. Quite often, more than one entity shared the responsibility for carrying out a functional duty. For example, a statewide coordinating board often has some responsibilities for reviewing and processing budget requests even after it had been approved by a local or consolidated board. In an extreme case, thirteen public universities were required to process academic program approvals through three governance levels: a local board, consolidated board, and statewide coordinating board.

Accordingly, the information from the surveys was augmented by reviewing descriptions of board governance structures available through the Web sites of the public universities in the sample. When necessary, board bylaws or state laws were examined to determine where responsibility for each of the primary governance duties was assigned. The results from this review and analysis were coded into a database which included information on the board(s) with any governance oversight responsibility for the public universities in the samples. Recorded information included the name of the board, its Web site address, and the number of entities subject to its jurisdiction.

The information in the governance database was coded into variables for use in testing the hypothesis. For each of the three primary governance duties (i.e., hiring presidents, reviewing budgets, and approving academic programs), three dichotomous variables were created to represent the locus of governance authority: (1) whether a local governing board had some responsibility for the function, (2) whether a consolidated governing board had some responsibility for the function, and (3) whether a statewide coordinating board had some responsibility for the function.

This research also found that the governance structures for 21 public universities in three states were unstable in 2001 and undergoing significant structural changes (10 Florida universities, 6 West Virginia universities, and 5 Colorado universities). Because this lack of stability introduced too much uncertainty for drawing inferences related to governance structure, these 21 universities were excluded from the study (see discussion regarding sample selection earlier in this chapter for additional information).

The 398 public universities included in the sample were governed by an assortment of 148 local boards, 67 consolidated boards, and 24 statewide coordinating boards. These structures could be categorized into 11 basic governance models, as shown in Tables 8 and 9. The number of universities in each model varied widely from three universities in model 6 to 112 universities in model 1. Also, most structures were exclusive to only one or two states.

Table 8

Governance Models for U.S. Public Universities

Model	Responsibilities for Primary Governance Duties: Hiring	Budgeting	Academic Programs	States	Univ
1 C Only	C Only	C Only	C Only	19	112
2 C+Crd(AB)	C Only	C + Crd	C + Crd	17	105
3 C+Crd(A)	C Only	C Only	C + Crd	4	33
4 C + L(ABH)	C + L	C + L	C + L	2	18
5 C + L(ABH) +Crd(A)	C + L	C + L	C + L + Crd	1	13
6 C + L(AB)	C	C + L	C + L	1	3
7 L Only	L	L	L	5	17
8 L + Crd(AB)	L	L+ Crd	L + Crd	12	73
9 L + Crd(A)	L	L	L + Crd	2	12
10 L + Crd(B)	L	L + Crd	L	1	6
11 L + Crd(ABH)	L + Crd	L + Crd	L + Crd	1	6

Abbreviations used in the table are: C = Consolidated Board, L = Local Board, Crd = Coordinating Board, A = Responsible for approving academic programs, B = Responsible for budget approval, and H = Responsible for hiring and evaluating college presidents. Counts are for number of universities included in the complete sample.

Table 9

Governance Models for U.S. Public Universities - by State

Model	States (Number of universities from the complete sample)
1 C Only	AK(2), AZ(3), CA[a](28), GA(15), HI(2), IA(3), ID(3), KS(6), MI(3), MN[a](9), MS(6), MT(3), ND(3), NV(2), OR(5), RI(2), SD(4), VT(1), and WI(12)
2 C+Crd(AB)	AL[a](5), AR[a](5), CO[a](5), CT[a](5), IL[a](4), IN[a](8), KY(1), LA[a](12), MA(4), MD(8), NE[a](5), NJ(1), OK[a](8), SC(3), TN[a](9), TX[a](21), and VA(1).
3 C+Crd(A)	NY[a](23), MO(4), NH(3), and NM[a](3).
4 C + L(ABH)	NC(14) and UT(4).
5 C + L(ABH) +Crd(A)	PA(13).
6 C + L(AB)	ME(3).
7 L Only	DE(2), KS(1), MI(12), VT(1), and WY(1).
8 L + Crd(AB)	AL(7), AR(3), CO(2), IL(6), IN(3), KY(6), MD(2), NJ(9), OH(12), SC(8), TX(3), and VA(12).
9 L + Crd(A)	PA(4) and MO(8).
10 L + Crd(B)	WA(6).
11 L + Crd(ABH)	MA(6).

See note to table 8 for definitions of the abbreviations for each model.
[a] States with more than one consolidated governing board in this category.

The small sizes of some model groupings likely would confound or weaken statistical tests designed to detect significant differences among the models. Accordingly, the models were combined into logical clusters and examined from three perspectives to test for possible differences in the productivity levels of graduation rates:

- The first perspective focused on whether the existence of a local governing board mattered. It was coded as a dichotomous variable depending on whether or not a university had a local governing board. For the complete, 148 universities had a local board and 250 universities did not. The 34 universities that had both a local and consolidated governing board were coded as having local governance control, because it was their initial governance source.
- The second perspective examined whether the scope of responsibility for consolidated governing boards mattered. For the complete sample, 284 universities were distributed among 67 different consolidated governing boards. Fifteen consolidated governing boards had oversight responsibility for only 2-3 entities, while four consolidated governing boards oversaw more than 30 entities. Accordingly, this perspective considered whether the intensity of oversight would diminish as the scope of responsibilities increased for consolidated boards. For each consolidated governing board, an intensity value, representing the number of entities subject to its control, was calculated. The entity count included two-year community colleges and four-year universities, plus some specialty entities, such as museums. The reciprocal of the intensity values represented an approximation of the proportion of attention that a consolidated governing board was able to

provide for a particular governance duty to each entity.

- The third perspective considered whether assigning some governance duties to more than one governing board mattered. For the complete sample, 269 universities were subject to governance oversight from more than one board, while 129 universities were subject to governance oversight exclusively by one board. Usually a second level of governance oversight was exercised by a statewide coordinating board after a local or consolidated board had made an initial recommendation. Half of the states represented in the samples had a statewide coordinating board which exercised some governance responsibilities. For 263 of universities in the complete sample, academic program approval was the ultimate responsibility of a statewide coordinating board. For 224 of the universities in the complete sample, statewide coordinating boards had budget review responsibilities. For 37 of the universities in the complete sample, a local governing board had its decisions subject to review and acceptance by a consolidated governing board.

Specification of Independent Variables - Hypothesis #5

The independent variable for testing hypothesis #5 was the regional accrediting agency used by each public university. All universities in a state used the same accrediting agency, as shown in Table 10. A categorical variable was created with six levels representing the respective regional accrediting agencies listed in Table 10.

Table 10

Independent Variable for Hypothesis #6 - Regional Accrediting Agencies

Accrediting Agency	States Using the Agency
Higher Learning Commission (HLC)	Arizona, Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, New Mexico, North Dakota, Ohio, Oklahoma, South Dakota, West Virginia, Wisconsin, and Wyoming.
Middle States (MS)	Delaware, Maryland, New Jersey, New York, and Pennsylvania.
New England Association of Schools and Colleges (NE)	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.
Northwest Commission of Colleges and Universities (NW)	Alaska, Idaho, Montana, Nevada, Oregon, Utah, and Washington.
Southern Association of Colleges and Schools (SO)	Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia.
Western Association of Schools and Colleges (WS)	California and Hawaii.

Source: Council on Higher Education Accreditation (2009)

The U.S. Department of Education required accreditation as a condition for universities to administer student financial aid programs. Accordingly, all U.S. public universities were accredited by one of six regional accrediting agencies. Although the accrediting agencies roughly correspond to geographic regions, the largest agency, the Higher Learning Commission, stretched from West Virginia to Wyoming and from Michigan to Arizona, and suggested that some discretion was exercised when states selected an agency for their universities. The matching of accrediting agency to states, though, has remained unchanged for many years and is not prone to the kinds of choices that states could exercise with hypotheses #2 to #4.

In 2001, regional accrediting agencies mostly used a rather episodic model for conducting their reviews. Typically, universities were subjected to a rigorous review once every ten years. In intervening years, though, universities were expected to participate in other activities with their accrediting agency, such as preparing extensive self-study reports, applying for changes in status related to mission or program locations, and sending its representatives to other universities as review team members. This exchange of faculty and administrators on review teams across universities facilitated the spread of best practices and may have provided a subtle means by which the internal inertia of member universities could become isomorphic. To the extent that phenomenon occurred, the productivity levels of universities should show a clustering effect, whereby a greater proportion of variation was accounted for between accrediting agencies than within them.

Specification of Independent Variables - Hypothesis #6

For testing the sixth hypothesis, a set of independent variables was created for the interactions among the independent variables that had been identified as statistically significant for hypotheses #2 - #4. It tested whether particular combinations of state-level higher education plans, performance programs, and board governance structures produced differential results for the productivity of graduation rates. Interactions which showed statistical significance suggested that the effect produced by a particular source of external influence depended on the nature of one or more other external influences. For example, it indicated whether the productivity associated with the type of state-level plan differed depending on whether the university had a local governing board.

Specification of Dependent Variables

The dependent variables used for the study were four and six-year graduation rates primarily for the student cohorts who entered public universities in the Fall 2001 academic term. The data for calculating these rates was obtained from the U.S. Department of Education 2007 annual IPEDS GR survey. The methodology shown in Table 5 was used to calculate the 2007 graduation rates by substituting the data for the Fall 2001 entering cohort into the formulas.

Although the IPEDS GR survey also included data on five-year graduation rates, those rates were not used in this study. Bowen, Chingos, and McPherson (2009) conducted an extensive study of college completion at U.S. public universities, and found that analyzing five-year graduation rates, in addition to four-year and six-year rates, provided limited value. Accordingly, this study design was simplified to include only four and six-year graduation rates as dependent variables.

Finally, the dependent variable for testing hypotheses #2B and #3B were six-year graduation rates reported in 1999, not 2007. To consider whether environmental expectations, as manifested in the contents of state-level higher education plans (hypothesis #2B) or performance programs (hypothesis #3B, were affected by the performance of public universities, the time sequencing of the graduation rate data must precede the existence of those environmental conditions. In 2001, state policymakers would not have known their 2007 graduation rates. To test for the plausibility of performance affecting the environment, it would be necessary to establish the graduation rates which states could observe in 2001. Due to the time required to gather and publish data, the 1999 graduation rates would have been the most recent comparable data available in 2001.

The Education Trust (2008) has created a repository of college graduation rate data at its *College Results Online* Web site. It has organized data that had been collected by the U.S. Department of Education on graduation rates for U.S. colleges and universities from 1997 to 2007. The Web site contained 1999 six-year graduation rate data for 386 of the 398 universities in the complete sample.

Control Variables

The significant differences in input factors experienced by public universities make it difficult to interpret graduation rates as a performance indicator. The graduation rate masquerades as an efficiency measure, but really is a compound indicator of productivity that reacts to differences in both organizational inputs and internal processes.

Graduation rates do not discern whether they occur because of selective admissions standards (an input factor) or supportive internal environments (a process factor). Because of their compound nature, graduation rates offer public universities another strategy for buffering their internal operations -- rationalization. In essence, campus leaders may defend their current graduation rates by citing differences in their inputs, rather than pursuing improvements to their internal operations. Some universities may argue that they produced lower graduation rates due to an open access mission, or because they were located in an urban area where students faced more demands on their time, or because they were a commuter university and lacked residential housing.

To control for the differences in input and resource factors, and to convert graduation rates to a measure of relative productivity, the dependent variables were regressed against four blocks of control variables, as shown in Figure 8, in order to test hypotheses #2A, #3A, and #4 to #6. One block captured factors related to student characteristics and the other three blocks captured factors related to institutional characteristics. The control variables were identified based on prior research which had shown them to have a significant effect on college graduation rates. The control variables were entered into regression models to predict graduation rates for the public universities included in the samples. The residual between the predicted and actual rates represented the relative productivity of the graduation rates achieved for each university.

Control Variables - Data Sources

The data source for the control variables used in this study was the Integrated Postsecondary Education Data System (IPEDS) surveys conducted by the U.S.

Department of Education, National Center for Education Statistics. As mentioned earlier in this chapter, all U.S. public universities participated in these surveys in order to be eligible for administering federal student financial aid programs. Some universities, though, did not provide data on all variables needed for this study. In those cases, missing values were estimated using reasonable imputation methods, as explained later in this chapter. The study used data from seven of the eight IPEDS surveys, as shown in Table 11, for its control variables. The human resources IPEDS survey was not used in the study and, thus, is not listed in Table 11.

Because the unit of analysis for the dependent variables was a cohort of entering students, the data from the IPEDS survey had to be converted or scaled so that it would be meaningful in the statistical analyses. For example, student characteristics often had to be presented in the form of proportional measures, such as the percentage of students in the entering cohort who qualified as low-income students. For other variables, proportional measures were based on different denominators, such as the percentage of undergraduate students who attended part time. More details on the definitions and methods for measuring the control variables are presented in the following sections of this chapter.

Specification of Control Variables - Student Characteristics

This block of control variables captured the demographic profile of the first-time, full-time student cohorts entering each public university in the Fall 2001 academic term. Astin (1993), Tinto (1993), Adelman (2005), Bowen, Chingos, and McPherson (2009) and other researchers have found a strong relationship between student demographic

Table 11

Integrated Postsecondary Data System Surveys Used as Data Sources

Survey	Description
Institutional Characteristics (IC)	Basic information on the university, including admissions test scores, location, degree of urbanization, residential capacity.
Degree Completions (DC)	Level, type, and program of study for academic awards conferred.
12-Month Enrollment (E)	Student enrollments for an academic year, basis for calculating full-term equivalents.
Fall Enrollment (EF)	Student enrollments in the Fall term, including full-time versus part-time.
Finance (FI)	Financial information on major revenues sources and program categories of expenses.
Financial Aid (SFA)	Numbers and amounts of financial aid provided to enrolled students.
Graduation Rates (GR)	Numbers of first-time, full-time students entering in Fall term who earn an academic award four, five, and six years after enrollment; breakdowns by race/ethnicity and gender.

characteristics and college outcomes, such as graduation rates. Academic preparation, gender, race, and socio-economic status, in particular, have been shown to be key demographic characteristics related to graduation rates. Table 12 shows the definitions and measurement methods used in the study to represent the student characteristics of the entering cohorts.

Table 12

Specification of Control Variables - Student Characteristics

Control Variable	Source
Selectivity	
The composite ACT admissions test scores reported by each university at the 25th and 75th percentile.	2001 IPEDS IC Survey: ACTCM25 and ACTCM75.
Gender - Proportion White Females	
The proportion of the entering cohort that reported gender as female and race as white compared to the number of students in the cohort who reported their gender and race.	2007 IPEDS GR Survey: GRRACE(12) divided by GRRACE(15+16-14-13) [code value = 12 for all].

- - Table 12 continued - -

Table 12 (continued)

Control Variable	Source
Gender - Proportion Black or Hispanic Males The proportion of the entering cohort that reported gender as male and race as Black or Hispanic compared to the number of students in the cohort who reported their gender and race.	2007 IPEDS GR Survey: GRRACE(3+9)divided by GRRACE(15+16-14-13) [code value = 12 for all].
Racial/Ethnic Diversity Index The probability that two randomly selected students had different race/ethnicities. Formula is 1 - (%White^2 + %Asian^2 + %Black^2 + %Hispanic^2 +%American Indian^2). Percentages were calculated on the number of students who reported their race/ethnicity in one of the five categories used in the formula.	2007 IPEDS GR Survey: GRRACE(22) = White, non-Hispanic; GRRACE(20) = Asian or Pacific Islander; GRRACE(18) = Black, Non-Hispanic; GRRACE(21) = Hispanic; GRRACE(19) = American Indian or Alaska Native [Code values = 12].
Proportion Low-Income The proportion of first-time, full time students enrolling in Fall 2001 who received a federal grant aid (need-based).	2001 IPEDS SFA Survey: FGRNT_P variable

To measure the academic preparation of the entering cohort, admissions test scores reported at the 25th and 75th percentiles were used. Bowen, Chingos, and McPherson (2009) found a high correlation between admission test scores and graduation rates. They found that a better predictor at the student-level was high school class rank, but that data was not widely available. Accordingly, ACT test scores were used as a proxy for institutional selectivity.

Bowen, Chingos, and McPherson (2009) also found a significant interaction of gender and race associated with predicting graduation rates. They found that white females showed the highest graduation rates and that black/Hispanic males showed the lowest graduation rates. Accordingly, those combinations of gender and racial/ethnic status were included as control variables for student demographics. One additional factor included to consider the racial/ethnic diversity of the entering cohort was a diversity index proposed by Chang (1999). The index measured the likelihood that students from different racial/ethnic backgrounds would encounter each other in the collegiate environment.

The final student characteristic measured the proportion of low-income students in the entering cohort. Several studies had identified income as a socio-economic factor that had an adverse effect on college completion (Astin, 1993; U.S. General Accounting Office, 2003). Other socio-economic factors, such as levels of parental education, though, could not be considered in the study because consistent data was not readily available for the universities in the study.

Specification of Control Variables - Congruence with the Existing Student Body

The first of the three institutional clusters used as control variables in the study was the degree to which a student cohort was congruent with the rest of the student body. The concept of "fit" was established as a significant factor affecting whether a student persevered to earn a degree (Cope & Hannah, 1975; Feldman, Smart, & Ethington (2004); and Tinto, 1993). The concept of "fit" could be applied to the cohorts of entering students included in the U.S. Department of Education official measurement of graduation rates (first-time college entrants, registered as full-time students). The congruence of this cohort with other students entering or returning to a university could be related to their proportional representation in the student body. The opportunities for members of the cohort to interact with other students will depend on the extent that other students enroll part time, have transferred to the university, or are focused on graduate studies. Table 13 provides the sources, definitions, and calculation methods for these "fit" control variables.

Specification of Control Variables - Structural Characteristics of the University

Astin (1993b) has established that certain structural factors, such as size, location, and availability of residential housing affect whether students remain enrolled and earn degrees. Peterson (2006) also found that almost half of undergraduate students changed their choice of major during their college career. The extent to which a variety of academic majors was available to students, thus, may have affected their willingness to remain enrolled at their original institution, rather than transferring elsewhere. Accordingly, the proportion of college majors, termed "program availability", offered at

Table 13

Specification of Control Variables - Institutional Congruence with Existing Student Body

Control Variable	Source
Entering Cohort as Proportion of Undergraduates	2001 IPEDS EF Survey:
Proportion of the undergraduate students who were members of the first-time, full-time cohort of students entering the university in Fall 2001.	Sum of EFRACE(15 +16) [Code Value = 1 for both] divided by sum of EFRACE(15 +16) [Code Value = 29 for both].
Proportion of Undergraduates Attending Part-time	2001 IPEDS EF Survey:
Proportion of undergraduate students who were enrolled part-time (less than 12 semester credits) during Fall 2001.	Sum of EFRACE(15+16) [Code Value = 20 for both) divided by sum of EFRACE(15+16) [Code Value = 6) + EFRACE(15+16) [Code Value = 20).
Undergraduates as Proportion of Student Body	2001 IPEDS EF Survey:
Proportion of the student body that was enrolled as degree-seeking undergraduates (not graduate or professional students).	Sum of EFRACE(15 + 16) [Code Value = 6] + EFRACE(15+16) [Code Value = 20] divided by EFRACE(15 + 16) [Code Value = 29 for both].

each public university was considered a structural control variable. Table 14 shows the definitions, sources, and calculation methods for this block of control variables.

Table 14

Specification of Control Variables - Structural Characteristics of the University

Control Variable	Source
Residential Housing Availability	
Proportion of housing rooms available for students enrolled at the university.	2001 IPEDS IC Survey: ROOMCAP divided by 2001 IPEDS EF2001a Survey: EFRACE(15+16) [Code Value 29].
Program Availability	
Likelihood that students will find their baccalaureate field of study offered at the university.	2001 IPEDS DC Survey: Sum of lookup values[a] of If(CRACE15 +CRACE16 at AWLEVEL 5 (Bachelor's Degree) for each two-digit CIP code > 0).
Location	
Degree of Urbanization. Measured on a seven-point scale from large city (1) to rural (7). Six dummy codes were used with "large city" as the reference code	2001 IPEDS IC Survey: LOCALE variable

- - Table 14 continued - -

Table 14 (continued)

Control Variable	Source
Size	
Total enrollment of degree-seeking students in Fall 2001.	2001 IPEDS EF2001a Survey EFRACE15 + EFRACE16 (Code Values = 29).

[a] Lookup values represent the proportion all U.S. baccalaureate degrees (public and private) awarded in 2001 for each particular two-digit Classification of Instructional Programs (CIP) code as recorded in the U.S. Department of Education IPEDS survey.

Specification of Control Variables - Institutional Resources

The financial resources available to public universities vary by their fund-raising ability, level of support provided by state governments, and discretion for setting tuition rates. In particular, institutional spending per student on instructional and academic support services have been shown to affect graduation rates (Astin, 1993; Ryan, 2004). Bowen, Chingos, and McPherson (2009) also found that the cost of attendance at public universities had a statistically significant relationship with graduation rates. Table 15 provides more detailed information on this block of control variables.

Statistical Methods

The research hypotheses were designed to test the extent that punctuated equilibrium theory might help explain the relative productivity of graduation rates generated by U.S. public universities. A variety of statistical methods were chosen to test the research hypotheses. Statistical methods were matched to the specific research hypotheses and the nature of the data available for the analyses.

Table 15

Specification of Control Variables - Institutional Resources

Control Variable	Source
Cost of Attendance	
Estimated average cost for an in-state student to cover tuition, fees, books and living expenses for off-campus housing.	2001 IPEDS HD Survey: CINSOFF variable.
Instructional Costs Per FTE	
Expense amounts reported as instructional costs on a full-term equivalent student basis	2001 IPEDS IC and FI Surveys: B013 (FI) divided by FTE (IC) [a b].
Academic Support Costs Per FTE	
Expense amounts reported as academic support costs on a full-term equivalent student basis.	2001 IPEDS IC and FI Surveys: B043 (FI) divided by FTE (IC) [a b].
Student Support Services Costs Per FTE	
Expense amounts reported as student support services on a full-term equivalent student basis.	2001 IPEDS IC and FI Surveys: B063 (FI) divided by FTE (IC) [a b].

- - Table 15 continued - -

Table 15 (continued)

Control Variable	Source
Institutional Support Costs Per FTE	
Expense amounts reported as institutional support costs (primarily administrative costs) on a full-term equivalent student basis.	2001 IPEDS IC and FI Surveys: B073 (FI) divided by FTE (IC) [a b].

[a] The formula for converting student headcounts to full-time equivalents (FTEs) is based on the methodology used by the U.S. Department of Education.
[b] Two accounting frameworks were available for public universities to report their financial information: the Government Accounting Standards Board (GASB) and the Financial Accounting Standards Board (FASB) formats. Nearly all public universities used the GASB framework in 2001.

Statistical Methods - Hypothesis #1

To test hypothesis #1, the graduation rates that universities reported in 2005, 2006, and 2007 from the student cohorts which had entered in Fall 1999, 2000, and 2001 terms, respectively, were compared. Both four and six-year graduation rates were analyzed. Because the assumption about internal inertia should be unaffected by whether a university was recognized as an HBCU, the complete sample was used to test hypothesis #1. As discussed previously, though, graduation rate data for 2005 and 2006 was missing for one university in the sample (University of Texas at Brownsville), accordingly, the actual sample size used for testing hypothesis #1 was 397 universities.

Table 16 shows the descriptive statistics for the three student cohorts analyzed from the 397 universities included for the sample.

Table 16

Descriptive Data for Graduation Rates Produced by 2005, 2006, and 2007 Cohorts

	4-Year Graduation Rates		6-Year Graduation Rates	
Cohort	Mean	SD	Mean	SD
2005	23.1%	14.4%	47.9%	15.2%
2006	24.3%	14.6%	48.7%	15.2%
2007	24.6%	15.0%	48.9%	15.3%

Note. n = 397 (Based on Sample B, except for University of Texas at Brownsville which was missing graduation rate data for 2005 and 2006.

Two types of statistical tests were performed to assess hypothesis #1. First, correlation analyses were conducted to determine the extent to which graduation rates for specific universities were associated from year to year. The correlation analyses could provide evidence about the overall relationship of graduation rates from one year to the next. They could not, however, provide direct evidence about the constancy of graduation rates. High correlation coefficients may be achieved when rates are changing in a consistent direction. Table 16 showed that graduation rates, on average, have increased slightly from 2005 to 2007. More analysis, thus, was needed to examine the magnitude of changes in graduation rates at individual universities. Accordingly, a series of paired t-tests were conducted on the year-to-year differences in the graduation rates for each of the 397 universities.

The paired t-tests determined whether the mean differences in graduation rates between years for individual universities remained relatively stable. These tests examined whether there were significant relationships between the graduation rates reported by public universities from 2005 to 2006, 2006 to 2007, and 2005 to 2007.

The paired t-tests treated the student cohorts entering each university each year as separate independent samples. The tests compared whether the graduation rates produced by the university showed statistically significant differences between each pair of years. This statistical technique was chosen, rather than an alternative such as repeated measures Analysis of Variance (ANOVA), because the results from each pair-wise comparison were needed for the scheme used to classify the stability of each university's graduation rate. Also, the standard error calculations for the t-tests could account for the varying sizes of the entering student cohorts. Larger sample sizes had increased sensitivity to changes in proportions, like graduation rates. For example, the standard error for a graduation rate of 50% (proportion for which the variance is highest) for a sample size of 385 was .0255 (square root of (.50) × (1-.50) ÷ square root of 385), but it was reduced to .0158 for a sample size of 1,000 (square root of (.50) × (1-.50) ÷ square root of 1,000). As a result, for an alpha level of 5%, a change of four percentage points from 50% would be significant for a sample size of 1,000, but not 385.

Using a t-test approach, required some additional steps for the statistical analyses. First, to protect against an inflated familywise error rate because of multiple comparisons for each university, a Bonferroni adjustment was applied (Howell, 2007). At an alpha-level of 5%, the probability of a Type I error rises to 15% when three comparisons are performed. To maintain the probability of a Type I error at the desired alpha-level of 5% when conducting multiple t-tests, a Bonferroni adjustment resulted in a new critical value for evaluating statistical significance of .0167 (.05 ÷ 3). The Bonferroni adjustment increased the critical value at the .05 alpha-level for a large sample from 1.96 for a single t-test to about 2.40 when conducting three t-tests on a phenomena. Under similar conditions, the critical value at the .01 significance level increased from 2.58 to 2.94, and at the .001 significance level, it increased from 3.29 to 3.59.

Also, due to the complexities of differing numbers of student cohorts entering a university each year, pooled standard error calculations were used. Howell (2007) recommended using pooled variances when conducting hypothesis tests of mean differences. The pooled variance was calculated as: $s_p^2 = ((n_1\text{-}1)\ s_1^2 + (n_2\text{-}1)\ s_2^2) \div (n_1 + n_2\text{-}2)$. For this study, n = number of students in an entering cohort and s^2 = the variance associated with the graduation rate produced by a cohort (the variance of a proportion, such as a graduation rate, was calculated as p(1-p)). For difference tests, variances are additive and resulted in the following formula for calculating standard errors: se = square root of $(s_p^2 \times ((1 \div n_1) + (1 \div n_2)))$.

Separate analyses were conducted on four-year and six-year graduation rates for each university. Although four-year and six-year graduation rates showed strong correlations (for 2005 rates, r = .886; for 2006 rates, r = .905; and for 2007 rates, r = .901), the two rate series represented somewhat different phenomena. Six-year rates have been the official measure used by the U.S. Department of Education since passage of the 1990 Student Right to Know and Campus Security Act (Public Law 101-542). The six-year time period was deemed to be a reasonable time period to allow full-time, first-time students to explore various academic programs, decide on a major, and navigate the availability of course offerings in order to graduate. Four-year rates have received more attention recently as an indicator of *timely* college completion. In 1999-2001, many universities may have established internal environments intended to support six-year graduation rates, but not yet focused on four-year graduation rates. Accordingly, four-year and six-year rates were considered as independent tests.

Using the t-test approach to test the year-to-year difference in graduation rates required a framework for interpreting the statistical results. Accordingly, a series of categories were devised to characterize the degree of stability in each university's graduation rates:

- **Unchanged -** None of the three t-tests revealed a statistically significant difference in the graduation rates for the comparisons.
- **Improved** - The difference over the two-year period, comparing 2005 to 2007 rates, showed a statistically significant increase and neither of the other two t-tests revealed conflicting information (a statistically significant decrease). Improved rates could be the result of a gradual increase over the two-year period where neither of the year-to-year tests showed a statistically significant increase. Improved rates also could be the result of a statistically significant increase in the rate in one year, which then was sustained over the two-year period.
- **Declined** - The difference over the two-year period, comparing 2005 to 2007 rates, showed a statistically significant decrease and neither of the other two t-tests revealed conflicting information (a statistically significant increase). Declined rates could be the result of a gradual decrease over the two-year period where neither of the year-to-year tests showed a statistically significant decrease.

Declined rates also could be the result of a statistically significant decrease in the rate in one year, which then was sustained over the two-year period.

- **Bounced** - One of the year-to-year tests showed a statistically significant increase or decrease, but was offset by an opposite, but not statistically significant, change in the other year so that a statistically significant change was not evident in the 2005 to 2007 comparison. Bounced changes may be interpreted as a temporary change in performance.
- **Erratic** - Indicated that at least two of the three tests produced statistically significant changes, but the changes were in opposite directions. Erratic changes may be interpreted as unstable and unpredictable. They provided the strongest evidence against the inertia assumption.

It was unreasonable to expect no statistically significant changes in the graduation rates. Punctuated equilibrium theory anticipated that changes could occur under certain conditions. Incremental change could occur as the result of ongoing continuous improvements made to operations. More transformative change could occur when organizational performance failed to meet the expectations of the external environment. The theory held, though, that absent either incremental or transformative change, inertia would retain stability in organizational performance. In other words, organizational performance was not a random event. Accordingly, the evidential support for the presence of inertia would become more compelling as a greater percentage of universities showing "unchanged" graduation rates from these tests.

Statistical Methods - Hypotheses #2A, #3A,#4,#5, and #6

The statistical technique used for testing these hypotheses was the Multivariate Analysis of Covariance (MANCOVA) technique (Tabachnick & Fidell, 2007). The MANCOVA for each hypothesis combined multiple regression analysis, which controlled for the effects of the covariates, and Multiple Analysis of Variance (ANOVA) for testing whether differences in levels of the independent categorical variables accounted for the variance in the residuals for either four-year or six-year graduation rates. When an omnibus MANCOVA showed a statistically significant effect for an independent variable, the univariate effects for four-year and six-year graduation rates were examined to determine if one or both of them showed statistically significant results. Finally, post-hoc comparisons were examined for any statistically significant differences in either four-year or six-year graduation rates. To protect against inflated alpha-levels for the post-hoc pairwise comparisons, the Bonferroni adjustment was used to maintain the alpha-level at 5%.

Any significant effects from the MANCOVAs for #2A, #3A, and #4 were used to identify statistically significant interactions in hypothesis #6. Initially, all statistically significant main effects from those three hypothesis tests and all possible interactions among them and the main effects from hypothesis #5, were included in a comprehensive MANCOVA for hypothesis #6. Then a backward stepwise technique was used to eliminate interactions which were not statistically significant.

Using the MANCOVA technique required that the control variables be tested to determine whether the assumptions needed for multiple regression analysis would be satisfied reasonably. For example, the variables had to be tested for normality and homoscedasticity. When necessary, variables were transformed to improve their conformance with key assumptions. The control variables also were tested for multicollinearity to determine whether certain variables needed to be eliminated from the model. The results from these tests and any data preparation techniques which were applied are discussed later in this chapter in the *Data Preparation* section.

Statistical Methods - Hypotheses #2B and #3B

Hypotheses #2B and #3B shifted the unit of analysis from the university to the state. In assessing performance, state policymakers likely would consider the collective performance of their public universities and compare it to graduation rates produced in other states. To shift the analysis to the state-level and determine whether the differences in the unadjusted graduation rates remained statistically significant after accounting for the particular state in which a public university was located, a nested ANOVA design was used (McDonald, 2009). Public universities were nested within states, which were nested within type of state-level higher education plan. The nested ANOVA partitioned the variance so that the between-states effects were separated from the between-plans effects.

A complication related to using the nested ANOVA design for this sample was that the group sizes were not equal. The differences in number of universities within each state varied widely, from 28 universities in California to one university in Wyoming. Unequal group sizes may confound the results for a nested ANOVA design. Satterthwaite (1946) developed an approximation technique to adjust the degrees of freedom for calculating the mean square errors with unequal group sizes. Accordingly, the results for testing hypothesis #2B and #3B were determined using a spreadsheet that McDonald (2009) developed to apply the Satterthwaite approximation to data in a nested ANOVA design.

Data Preparation for Testing Hypotheses #2A,#3A,and #4, #5, and #6

Because the MANCOVA statistical techniques used multiple regression analysis to regress graduation rates on the control variables for testing hypotheses #2A, #3A, and #4 - #6, it was necessary to analyze the dataset to determine whether the variables and cases reasonably satisfied the underlying assumptions of regression analysis (Tabachnick & Fidell, 2007). As warranted, adjustments were initiated to improve conformance to the assumptions. Imputation methods, as discussed in the following sections, were used when possible to create reasonable estimations for missing values. Transformation methods were used to improve the distribution of continuous variables for normality and linearity, and homoscedasticity. The set of predictor variables were examined for multicollinearity and the presences of outliers.

The challenge of dealing with missing data was confined mostly to the control variables used in the analysis. As described earlier in this chapter regarding sample selection, complete data was available for the 2007 graduation rates in both samples. Graduation rate data from earlier years, e.g., 1999, 2005, or 2006, was missing for a few cases. Missing graduation data was not imputed, rather those cases were deleted from the respective analyses. Case deletions, though, were minimal and did not have a significant effect on the results. The IPEDS surveys which contained data for the conditions present at the sample universities in 2001, however, lacked values for some universities on eight of the 17 factors from which the control variables were derived (Note: The factors yielded 23 control variables because two factors had multiple variables. ACT scores were measured at two points, the 25th and 75th percentiles, and six dummy variables were created for location codes). Case deletion was not a viable option for missing control variables, because it would have severely depleted the sample and likely limited the ability to generalize the test results. For example, only 223 of the 398 universities in the sample had reliable data on the ACT scores of the incoming cohort. Public universities on the East and West Coasts relied more heavily on SAT scores for evaluating potential students, and eliminating them from the sample would have been very problematic. Tabachnick and Fidell (2007) recommended against deleting cases unless values were missing for only a few cases completely at random. They suggested several alternative methods for estimating missing values, but urged the first choice to be a "well-educated guess" (p. 66).

Estimating Missing Values for Selectivity (ACT admissions test scores)

Bowen, Chingos, and McPherson (2009) studied graduation rates at U.S. public universities and found that ACT and SAT test scores had nearly identical predictive value for college graduation rates. In the 2001 IPEDS survey, 224 of the 398 universities in the sample reported ACT test scores for at least 10% of the student cohort entering in the Fall 2001 term. Of the universities reporting ACT test scores for less than 10% of the student cohort, an additional 133 universities reported SAT test scores for more than 10% of the student cohort. Except for one university, University of Hawaii at Hilo, the reported ACT test scores appeared to be within reasonable limits of reliability. The composite ACT test scores reported for the University of Hawaii at Hilo were 34 at the 25^{th} percentile and 36 (a perfect score) at the 75^{th} percentile. The values reported ostensibly represented 20% of the incoming student cohort, but were not consistent with the test scores reported for the university in either ACT Math (17 at the 25^{th} percentile and 22 at the 75^{th} percentile) or ACT English (16 at the 25^{th} percentile and 22 at the 75^{th} percentile). The University of Hawaii at Hilo reported SAT test scores for 72% of its incoming student cohort and those scores (combined SAT scores of 850 at the 25^{th} percentile and 1080 at the 75^{th} percentile) appeared to be more reasonable values and, thus, were used for estimating its composite ACT test scores.

To convert SAT test scores to ACT test scores, a simple regression analysis was performed, based on 193 universities which reported both ACT and SAT test scores for over 25% of the entering student cohort from the Fall 2001 term. The resulting prediction formula for composite ACT scores at the 25^{th} percentile was $ACT_{25CM} = (SAT_{Verbal25} + SAT_{Math25}) \times .02391 - 2.817$ with a very significant effect size of $R^2 = .930$ ($F_{(1,191)} = 2{,}540.616$, $p < .001$). The resulting prediction formula for composite ACT scores at the 75^{th} percentile was $ACT_{75CM} = (SAT_{Verbal75} + SAT_{Math75}) \times .02453 - 3.660$ with a very significant effect size of $R^2 = .909$ ($F_{(1,191)} = 1{,}910.713$, $p < .001$). The predicted ACT scores were rounded to the nearest whole number to be consistent with the reported ACT scores.

For universities not reporting either ACT or SAT test scores in 2001, values were imputed from later IPEDS surveys (2002 to 2007) when available. For the 14 universities without ACT or SAT test scores reported in any of the IPEDS surveys, the values were imputed from the other control variables with a multiple regression analysis ($R^2 = .765$, $F_{(21,362)} = 56.113$, and $p < .001$). Table 17 shows the descriptive statistics for the ACT test scores used in the study.

Table 17

Analysis of Reported and Estimated ACT Test Scores

		ACT Scores - 25th Percentile			ACT Scores - 75th Percentile		
Source[a]	n	Mean	SD	Range	Mean	SD	Range
ACT 2001	223	19.25	2.266	14 - 27	24.41	2.435	18 - 31
SAT 2001	134	19.45	2.663	13 - 27	24.37	2.652	18 - 32
ACT 2002-07	22	17.73	1.579	14 - 20	22.02	2.130	18 - 27
SAT 2002-03	5	15.00	1.225	14 - 17	19.80	1.643	18 - 22
Regression	14	16.86	1.994	13 - 20	21.86	2.248	17 - 25
Total	398	19.10	2.464	13 - 27	24.16	2.584	17 - 32

[a] ACT 2001 were the actual values reported for the universities. All other sources indicate the basis from which ACT 2001 was imputed for the respective public universities.

Note that the test scores reported in the 2001 IPEDS survey were higher, on average, than the scores derived from later surveys or estimated from the regression analysis based on the other control variables. It suggests that less selective universities may not collect test score data as readily as more selective universities. Accordingly, excluding universities without reported test scores could have weakened the ability to generalize the results, thus, justifying the efforts to impute missing test scores.

Estimating a Missing Value for Location (Degree of Urbanization)

One university, Auburn University in Alabama, was missing a value for its location. The location codes ranged from values of 1 to 7 and indicated the degree of urbanization for the location of the university. Auburn University had a location code recorded in the 2002 IPEDS survey, but the scale for this variable had been expanded and did not coincide with the location scale used in the 2001 survey. To impute a location code for Auburn University, the 2002 IPEDS survey was scanned for universities that had the same the location code as Auburn University. Tracing those universities back to the 2001 survey revealed that they were coded with a value of "2", which corresponded to a "mid-sized city" category. Accordingly, Auburn University was assigned a location code of "2" in the dataset.

Estimating Missing Values for Housing

The numerator for calculating the percentage of available housing units for enrolled students (labeled "Housing" in the dataset) was the room capacity reported in the IPEDS institutional characteristics survey. In the 2001 survey, 26 of the 398 universities were missing the value for room capacity. Also, the University of California at Los Angeles had reported only 3 available rooms in the 2001 survey, which appeared to be an unreasonable value. Six of the universities with missing values and the University of California at Los Angeles, though, had room capacity values, which appeared more reasonable, reported in the 2002 IPEDS survey. The values for these seven universities were recorded as imputed values for room capacity in the dataset. The remaining 20 universities were coded in the IPEDS institutional characteristics survey as not offering on-campus housing. Accordingly, those universities were coded with a value of zero for room capacity.

Estimating Missing Values for Institutional Resources

Expenses reported in four functional categories (instructional costs, academic support costs, student services costs, and institutional support costs) provided the numerator for calculating institutional resources per full-time equivalent student. Public universities had two possible models for reporting their expenses -- the Governmental Accounting Standards Board (GASB) or the Financial Accounting Standards Board (FASB) model. In 2001, the GASB model was the predominant model in use, and 394 of the 398 universities used it to report their expenses in the IPEDS Finance survey. Three universities (University of Delaware, Lincoln University in Pennsylvania, and Temple University in Pennsylvania) used the FASB model to report their expenses in 2001. The primary differences between the GASB and FASB models are in the recognition of asset and liability amounts. For expenses, the two models have some differences, primarily in the timing of recognizing certain transactions, but the amounts should be comparable. Accordingly, using the expenses based on the FASB model for these three universities was a reasonable imputation.

One university, Rutgers University at New Brunswick, did not have expense amounts reported for either the GASB or FASB model. The 2002 and 2003 IPEDS Finance Survey also did not have expenses reported for Rutgers University. Financial statements for fiscal year 2003 were located on the university Web site at http://postaward.rutgers.edu/RU20004FinlSt.pdf. The functional expenses from 2003 were discounted to estimate 2001 amounts and allocated among the three Rutgers campuses at New Brunswick, Camden, and Newark based on full-time equivalent students for each campus. The resulting amount was used as the numerator for the imputed value for the Rutgers University resource variables.

Estimating Missing Values for Cost of Attendance

The 2001 IPEDS institutional characteristics survey contained a variety of values for the cost of attending an institution. Available values represented expected costs for full-time, first-time degree-seeking students under differing circumstances. The value reported most frequently, by 387 of the 398 universities, was for in-state students who lived off-campus. Cost of attendance for in-state students living on campus was not reported for 25 universities, but most of them also reported that on-campus housing was not available. Accordingly, the value for in-state students living off campus was used for this control variable.

Three universities (Wright State University in Ohio, Purdue University - North Central campus in Indiana, and Troy University in Alabama) did not have a value reported for either in-state students who lived on campus or off campus. Cost of attendance values were imputed for those universities based on the values reported by comparable universities in the same state. The remaining eight universities had values reported for in-state students living on campus, but not off campus. For four universities (Fayatteville State University in North Carolina, Minnesota State University, Mankato, Bemidji State University in Minnesota, and the University of Akron main campus in Ohio), similar universities in the same state provided a reasonable pattern for estimating an off-campus value from the value reported for the on-campus cost of attendance. For the other four universities (Arkansas Technical University, University of Wyoming, Black Hills State University in South Dakota, and Citadel Military in South Carolina), similar universities in the same state were not available for estimating the off-campus cost of attendance. To impute values for those four universities, a simple regression formula was developed to predict an off-campus cost of attendance based on the on-campus cost reported for the university. The regression formula was derived from the 365 universities that reported both the on-campus and off-campus cost of attendance for in-state students. The prediction formula, $COA_{off\text{-}campus} = \$3{,}522 + .776 \times COA_{on\text{-}campus}$, had a reasonable effect size of $R^2 = .567$ ($F_{(1,362)} = 473.099$, $p < .001$).

Tables 18 - 21 show the descriptive statistics of the control variables for the complete sample of 398 public universities after populating them for any missing values.

Table 18

Descriptive Statistics (Complete Sample)- Control Variables: Demographics of Entering Student Cohort

			Range		Distribution		r-value	
Category/Variable	Mean	SD	Min	Max	Skew	Kurt	4-Yr	6-Yr
ACT - 25th Percentile	19.10	2.46	13	27	.41	.46	.76	.83
ACT - 75th Percentile	24.16	2.58	17	32	.06	.38	.68	.76
White Women %	38.92	16.56	.00	.78	-.94	.18	.24	.25

- - Table 18 Continued - -

Table 18 (continued)

Category/Variable	Mean	SD	Range		Distribution		r-value	
			Min	Max	Skew	Kurt	4-Yr	6-Yr
Black/Hispanic Men %	8.52	10.25	.00	.49	2.32	4.75	-.31	-.38
Diversity Index	30.41	18.86	.00	.74	.53	-.73	-.07	-.04
Low Income %	30.87	15.72	.07	.95	1.25	1.45	-.45	-.55

Table 19

Descriptive Statistics (Complete Sample) - Control Variables: Congruence of Cohort with Existing Student Body

Category/Variable	Mean	SD	Range		Distribution		r-value	
			Min	Max	Skew	Kurt	4-Yr	6-Yr
% Cohort of Undergrads	14.12	4.24	3	28	.10	-.035	.33	.26
% Part-time Undergrads	17.01	11.05	0	53	.87	.072	-.62	-.65
% Undergrads	77.97	12.39	6	100	-1.97	7.08	-.05	-.07

Table 20

Descriptive Statistics (Complete Sample) - Control Variables: Structural Characteristics[a] of the University

			Range		Distribution		r-value	
Category/Variable	Mean	SD	Min	Max	Skew	Kurt	4-Yr	6-Yr
% Programs Offered	83.67	11.61	3	98	-3.07	14.0	-.06	.04
Enrollment Size (000's)	13.4	9.6	1.4	50.6	1.29	1.44	.30	.45
% Available Housing	23.66	14.63	0	74	.52	.120	.47	.40

[a] Location is represented by a series of six dummy coded variables which are not shown in this table. The number of universities in each location category are: Large city (reference code) = 64, Mid-Size City = 141, Urban Large City = 47, Urban Mid-Size City = 35, Large Town = 24, Small Town = 77, and Rural = 10. The correlations for the each location category with four and six year graduation rates were small (r < .10).

Table 21

Descriptive Statistics (Complete Sample) - Control Variables: Institutional Resources - Costs (000's)Per FTE

			Range		Distribution		r-value	
Category/Variable	Mean	SD	Min	Max	Skew	Kurt	4-Yr	6-Yr
Cost of Attendance	12.7	2.1	6.6	20.5	.39	.66	.25	.23
Instructional Costs	5.81	2.42	2.68	21.5	2.40	8.50	.45	.49
Academic Support Costs	1.53	.90	.16	7.4	2.52	9.72	.36	.42
Student Services Costs	.99	.42	.25	3.1	.95	1.63	.11	.11
Institutional Support Costs	1.56	.71	.52	6.0	1.86	6.74	.18	.15

Tables 22 -25 show the descriptive statistics of the control variables for the sample subset of 371 public universities excluding HBCUs, after populating them for any missing values.

Table 22

Descriptive Statistics (Sample Subset - Excluding HBCUs)- Control Variables: Demographics of Entering Student Cohort

			Range		Distribution		r-value	
Category/Variable	Mean	SD	Min	Max	Skew	Kurt	4-Yr	6-Yr
ACT - 25th Percentile	19.38	2.28	13	27	.64	.66	.78	.84
ACT - 75th Percentile	24.50	2.30	18	32	.43	.49	.71	.78
White Women %	41.62	13.62	1	78	-.89	.71	.18	.14
Black/Hispanic Men %	6.27	5.96	0	38	2.57	8.41	-.33	-.36
Diversity Index	32.02	18.33	3	74	.53	-.77	-.13	-.12
Low Income %	28.66	13.25	7	79	1.19	1.58	-.47	-.55

Table 23

Descriptive Statistics (Sample Subset - Excluding HBCUs) - Control Variables:

Congruence of Cohort with Existing Student Body

			Range		Distribution		r-value	
Category/Variable	Mean	SD	Min	Max	Skew	Kurt	4-Yr	6-Yr
% Cohort of Undergrads	13.83	4.09	3	27	.00	-.19	.41	.36
% Part-time Undergrads	17.27	11.25	1	53	.83	-.05	-.66	-.70
% Undergrads	77.82	12.31	6	100	-1.9	7.1	-.05	-.07

Table 24

Descriptive Statistics (Sample Subset - Excluding HBCUs) - Control Variables:

Structural Characteristics[a] of the University

			Range		Distribution		r-value	
Category/Variable	Mean	SD	Min	Max	Skew	Kurt	4-Yr	6-Yr
% Programs Offered	88.94	11.83	3	98	-3.10	14.2	-.070	.019
Enrollment Size (000's)	14.0	9.7	1.7	50.6	1.24	1.30	.274	.422
% Available Housing	22.41	13.78	00	71	.448	-.073	.568	.524

[a] Location is represented by a series of six dummy coded variables which are not shown in this table. The number of universities in each location category are: Large city (reference code) = 60, Mid-Size City = 133, Urban Large City = 45, Urban Mid-Size City = 28, Large Town = 23, Small Town = 75, and Rural = 7. The correlations for the each location category with four and six year graduation rates were small (r < .10).

Table 25

Descriptive Statistics (Sample Subset - Excluding HBCUs) - Control Variables: Institutional Resources - Costs (000's)Per FTE

			Range		Distribution		r-value	
Category/Variable	Mean	SD	Min	Max	Skew	Kurt	4-Yr	6-Yr
Cost of Attendance	12.8	2.1	6.6	20.5	.378	.652	.256	.239
Instructional Costs	5.84	2.48	2.68	21.5	2.36	8.04	.45	.49
Academic Support Costs	1.53	.92	.16	7.4	2.53	9.78	.39	.46
Student Services Costs	.98	.40	.25	2.6	.72	.51	.15	.18
Institutional Support Costs	1.49	.65	.52	6.0	1.88	7.69	.28	.30

Normality, Linearity and Homoscedasticity Assumptions

Some fundamental assumptions for multiple regression analysis are related to normality, linearity, and homscedasticity (Tabachnick & Fidell, 2007). Each dependent variable is assumed to have a normal distribution and a linear relationship with each continuous predictor variable. Homoscedasticity means that the variance of residual values is assumed to be the same across all predicted scores. Although there is no distributional assumption for the predictor variables, Tabachnick and Fidell (2007) noted that the linearity of the relationship of a predictor variable with the dependent variable often was improved as normality was enhanced.

Cohen and Cohen (1983) emphasized that variances are not uniform across values for proportional measurements. In particular, they noted that assumptions about homoscedasticity and normality may be violated when proportional values were less than 25% or greater than 75%. Because both dependent variables and most control variables in the samples were measured as proportions, the validity of these assumptions were at risk. Tabachnick and Fidell (2007) recommended reviewing residual plots to determine whether a dataset met the assumptions about normality, linearity, and homoscedasticity.

Using SPSS, two types of residual plots were created for each dependent variable. Scatterplots graphed the standardized residuals against the predicted values. Normal P-P Plots compared the cumulative expected probabilities of the graduation rate residuals to the cumulative observed probabilities. The plots for six-year graduation rates appeared reasonable, but the plots for the four-year graduation rates showed potential problems. The scatterplot for the four-year graduation rates was fan-shaped, rather than rectangular, indicating significantly more variance for higher graduation rates than lower rates. This finding was not too surprising because the four-year graduation rates were centered much lower in the range(the mean for six-year rates was nearly 50%, while the mean for four-year rates was about 22%). A frequency distribution revealed that about 63% of the four-year graduation rates were less than 25%. Conversely for six-year graduation rates, about 12% of the values were less than 25% or greater than 75% (the tolerable range cited by Cohen and Cohen (1983) for proportions meeting the regression assumptions).

To improve conformance of the variables to the regression assumptions, the skewedness and kurtosis statistics were analyzed for the dependent and control variables.

The skewedness statistic indicates the symmetry of the distribution. Tabachnick and Fidell (2007) found that for large samples ($n > 200$), the actual size of the skewedness mattered more than its statistical significance. The kurtosis statistic indicates the peakedness of a distribution and the relative weight of its tails, but Tabachnick and Fidell (2007) found that its importance diminished for large samples ($n > 200$).

To search for possible transformations to apply to the variables, the skewedness and kurtosis of the distribution for each dependent and control variable in its original form was compared to its skewedness and kurtosis when restated with common transformations. For the variables measured as proportions, Cohen and Cohen (1983) recommended three possible transformations for improving normality and homoscedasticity: arcsine, probit, and logit. The formula for the arcsine transformation was A = 2 × arcsine × square root of p, where p was the value of the variable stated as a proportion. The formula for the probit transformation was $P = z_p + 5$, where the z-value at "p" represented the cumulative proportion of a normal curve stated in terms of as standard deviation units away from the mean of zero. The 5 was added to the formula to assure that the transformed value was positive (negative values introduce unnecessary complications in statistical analyses). Also, the probit transformation formula would have converted values of zero or one to minus or plus infinity, and been handled as missing data by SPSS. To avoid that statistical problem , alternative formulas suggested by Cohen and Cohen (1983) were used for those conditions. When p equaled 0, the alternative p-value used to calculate the transformation was $p_0 = 1 \div 2v$, where v was the denominator of the proportional calculation. When p equaled 1, the alternative p-value used to calculate the transformation was $p_1 = (2v-1) \div 2v$. Finally, the formula for the logit transformation was $L = .5 \times \ln(p \div (1-p))$, based on the natural logarithm (base *e*) of the odds ratio for the proportion. Similar to the probit transformation, proportional values of zero or one would have resulted in missing values. Accordingly the alternative probit calculations of the p-values also were substituted into the logit transformations. Tables 26 and 27 show the effects on the normality statistics for the possible transformations of the proportional variables.

Table 26

Normality Statistics for Proportional Variables (Complete Sample of 398 universities)

	Unadjusted		Arcsine		Probit		Logit	
Variable	Skew	Kurt	Skew	Kurt	Skew	Kurt	Skew	Kurt
4-Year Graduation Rates	1.24	1.55	.844	.870	.499	.654	.225	.712
6-Year Graduation Rates	.408	-.118	.475	.271	.535	.612	.587	.916
White Women %	.442	.414	-1.48	1.67	-2.19	4.3	-2.62	7.01
Black/Hispanic Men %	2.32	4.75	1.60	2.23	.871	.736	.426	.286
Diversity Index	.525	-.729	.171	-.665	-.252	.011	-.673	1.28
Low Income %	1.25	1.45	1.12	1.53	1.04	1.73	.985	1.95
% Cohort of Undergrads	.101	-.035	-.307	.142	-.605	.634	-.792	1.07
% Part-time Undergrads	.866	.072	.342	-.405	-.225	.226	-.685	.482
% Undergrads	-1.97	7.08	-1.32	5.24	-.627	5.15	.099	7.05
% Programs Offered	-3.03	14.0	2.20	9.78	-1.61	7.53	-1.23	6.38
% Available Housing	.521	.120	-.367	.295	-3.00	9.36	-2.09	5.34

Note: Boxed amounts indicate the best fit for meeting the assumption of normality.

Table 27

Normality Statistics for Proportional Variables (Sample Subset Excluding HBCUs)

	Unadjusted		Arcsine		Probit		Logit	
Variable	Skew	Kurt	Skew	Kurt	Skew	Kurt	Skew	Kurt
4-Year Graduation Rates	1.16	1.30	.770	.699	.429	.541	.156	.639
6-Year Graduation Rates	.343	-.151	.417	.240	.482	.582	.538	.887
White Women %	-.893	.712	-1.37	2.43	-1.9	5.2	-2.3	8.0
Black/Hispanic Men %	2.5	8.4	1.30	2.50	.41	.595	-.022	.368
Diversity Index	.529	-.771	.302	-.816	-.117	-.75	-.031	-.64
Low Income %	1.19	1.58	.931	1.10	.749	1.86	.611	.727
% Cohort of Undergrads	.000	-.192	-.382	.076	-.669	.608	-.847	1.06
% Part-time Undergrads	.828	-.047	.332	-.503	-.152	-.15	-.515	.555
% Undergrads	-1.93	7.09	-1.30	5.33	-.582	5.37	.173	7.48
% Programs Offered	-3.10	14.2	-2.29	9.99	-1.70	7.71	-1.31	6.51
% Available Housing	.448	-.073	-.465	.245	-2.13	5.2	-2.96	8.85

Note: Boxed amounts indicate the best fit for meeting the assumption of normality.

The values boxed in Tables 26 and 27 indicate the optimal normality statistics for each variable. As recommended by Tabachnick and Fidell (2007), most emphasis was given to reducing the skewedness statistic as close to zero when choosing the optimal values. Note that except for the "Diversity Index" and the "% Available Housing" variables, the same optimal choices would be made for both the complete sample and the sample subset which excluded HBCUs. The normality for those two variables improved the most from the arcsine transformation in the complete sample, but not in sample subset. For the "Diversity Index", the best transformation was the logit in sample subset.

For the "% Available Housing" variable, the unadjusted data showed the best results, in terms of normality, than any of the possible transformations for the sample subset.

The other type of transformation considered was whether it was beneficial to convert variables measured in dollar values or size into logarithmic units. A logarithmic transformation would give more weight to earlier increases in amounts rather than later increases. For example, an increase in cost of attendance from $5,000 to $6,000 represents a 20% increase, and may have more influence on students than an increase from $20,000 to $21,000, which represents a 5% increase. Tables 28 and 29 show the effect on the normality statistics of six control variables after they were converted with a logarithmic transformation, using the natural log (base *e*). The statistical benefits of using these transformations were apparent for the both the complete sample and its subset.

Table 28

Effect of Logarithmic Transformation of Variables (Complete Sample - 398 Universities)

	Unadjusted		Logarthmic	
Variable	Skew	Kurt	Skew	Kurt
Enrollment Size (000's)	1.29	1.45	-.09	-.60
Cost of Attendance (000's)	.39	.66	-.22	.61
Instructional Costs (000's per FTE)	2.40	8.50	.99	1.22
Academic Support Costs (000's per FTE)	2.52	9.72	.15	1.19
Student Services Costs (000's per FTE)	.95	1.63	-.21	-.26
Institutional Support Costs (000's per FTE)	1.86	6.74	.19	.08

Abbreviations: Skew = Skewedness. Kurt = Kurtosis.

Table 29

Effect of Logarithmic Transformation of Variables (Sample Subset Excluding HBCUs)

	Unadjusted		Logarthmic	
Variable	Skew	Kurt	Skew	Kurt
Enrollment Size (000's)	1.24	1.30	-.11	-.60
Cost of Attendance (000's)	.38	.65	-.23	.62
Instructional Costs (000's per FTE)	2.36	8.04	.99	1.14
Academic Support Costs (000's per FTE)	2.53	9.78	.15	1.17
Student Services Costs (000's per FTE)	.72	.51	-.27	-.34
Institutional Support Costs (000's per FTE)	1.88	7.70	.18	.13

Abbreviations: Skew = Skewedness. Kurt = Kurtosis.

Transformed variables were used for testing the hypotheses in the study when a transformation improved the normality of the variable. Although transformed variables may complicate interpreting results, most of the transformations were for control variables which were not of primary interpretative interest. The transformation of four-year graduation rates to logit units, though, had to be considered when interpreting those respective results. As necessary, effects on the four-year graduation rates were converted back to proportions to aid in the discussion and analysis of results.

Finally, as discussed in the next chapter, some additional steps were taken to improve the efficiency and fit of the regression model. Control variables were excluded from the model if they produced redundancy due to multicollinearity or showed insignificant predictive value. Then the variables were checked to assure that outliers were not adversely influencing the model.

Chapter Four: Results

The purpose of this study was to explore whether the productivity by which public universities produced graduates was related to influences from their unique external environments. It used punctuated equilibrium theory (Sastry, 1997) as a conceptual framework for examining the research question. The research hypotheses were designed to test the applicability of punctuated equilibrium theory to the organizational behavior of public universities.

Testing Hypothesis #1 - Evidence of Internal Inertia

The first hypothesis addressed a fundamental assumption associated with punctuated equilibrium theory -- that internal inertia generally would hold organizational performance in place. For this study, organizational performance was measured in terms of graduation rates reported by the universities. Hypothesis #1, thus, was stated as follows:

- The short-term changes in graduation rates reported by public universities will not be statistically significant.

To test the hypothesis, the graduation rates that universities reported in 2005, 2006, and 2007 from the student cohorts which had entered in Fall 1999, 2000, and 2001 terms, respectively, were compared. Both four and six-year graduation rates were analyzed. Because the assumption about internal inertia should be unaffected by whether a university was recognized as an HBCU, the most-inclusive sample, Sample B, was used to test hypothesis #1. As discussed in the previous chapter, graduation rate data for 2005 and 2006 was missing for one university in both samples (University of Texas at

Brownsville), accordingly, the actual sample size used for testing hypothesis #1 was 397 universities.

Two types of statistical tests were performed to assess hypothesis #1. First, correlation analyses were conducted to determine the extent to which graduation rates for specific universities were associated from year to year. Table 30 shows the Pearson correlation coefficients for the four and six-year graduation rates tested across the three cohorts.

Table 30

Correlation Analyses for Comparisons of 2005, 2006, and 2007 Graduation Rates

Comparisons			Correlation Coefficients for	
Duration	From	To	4-Year Rates	6-Year Rates
1 Year	2005	2006	.977**	.981**
1 Year	2006	2007	.979**	.983**
2 Years	2005	2007	.970**	.974**

**p<.01, two-tailed.

The correlation analyses provided strong evidence that graduation rates were correlated from one year to the next. They did not, however, provide direct evidence about the constancy of graduation rates. High correlation coefficients may be achieved when rates are changing in a consistent direction. Table 16 in the previous chapter showed that graduation rates, on average, have increased slightly from 2005 to 2007. More analysis, though, was needed to examine the magnitude of changes in graduation rates at individual universities. Accordingly, a series of t-tests was conducted on the year-to-year differences in the graduation rates for each of the 397 universities.

Null hypotheses were constructed for testing the differences in graduation rates between years for each university. Three null hypotheses were tested for differences in four-year graduation rates between years for each university (notation indicates hypothesis number, type of graduation rate - 4 or 6 year, and years compared):

- $H_{o(1.i\_4GR\_05\text{-}06)}$: $4GR_{i\_2006} - 4GR_{i\_2005} = 0$
- $H_{o(1.i\_4GR\_06\text{-}07)}$: $4GR_{i\_2007} - 4GR_{i\_2006} = 0$
- $H_{o(1.i\_4GR\_05\text{-}07)}$: $4GR_{i\_2007} - 4GR_{i\_2005} = 0$

Three additional null hypotheses were tested for differences in six-year graduation rates between years for each university:

- $H_{o(1.i\_6GR\_05\text{-}06)}$: $6GR_{i\_2006} - 6GR_{i\_2005} = 0$
- $H_{o(1.i\_6GR\_06\text{-}07)}$: $6GR_{i\_2007} - 6GR_{i\_2006} = 0$
- $H_{o(1.i\_6GR\_05\text{-}07)}$: $6GR_{i\_2007} - 6GR_{i\_2005} = 0$

Using this approach to test the year-to-year difference in graduation rates provided a framework for evaluating the statistical significance of changes in the rates for each university. The results of testing the 397 universities then were aggregated to assess whether there was a preponderance of evidence to support hypothesis #1. The fewer universities that exhibited statistically significant changes in their graduation rates, the more compelling would be the evidential support for the presence of inertia.

Appendix B shows the results of applying this statistical analysis to the differences in graduation rates for each university. To aid in interpreting this analysis, a series of categories were devised to characterize the degree of stability in each university's graduation rates: unchanged, improved, declined, bounced, and erratic (see previous chapter for definitions of each category).

Tables 31 and 32 show the results of the stability analysis for the 4-Year and 6-Year rates, respectively. It is particularly noteworthy that 257 universities (65%) in the 4-Year rate test and 290 universities (73%) in the 6-Year rate test were in the "unchanged" category. Conversely, less than 10% of the changes for each rate series were in the "bounced" or "erratic" categories, which would have suggested evidence of instability or randomness. Interestingly, the bulk of the rate changes with statistical significance showed improvements, e.g., for 4-Year rates, 91 universities (23%), and for 6-Year rates, 60 universities (15%) showed improvement.

Table 31

Analysis of the Stability of 2005, 2006, and 2007 4-Year Graduation Rates

Stability		2005 Grad Rates		2006 Grad Rates		2007 Grad Rates	
Category	N	Mean	SD	Mean	SD	Mean	SD
Unchanged	257	21.7%	14.0%	22.1%	14.1%	22.1%	14.2%
Improved	91	26.5%	14.9%	30.1%	14.3%	32.3%	14.8%
Declined	12	30.1%	15.8%	27.6%	15.9%	22.8%	16.6%
Bounced	26	26.0%	15.5%	26.6%	15.8%	27.1%	16.0%
Erratic	11	14.1%	7.2%	17.5%	11.6%	13.8%	7.0%
Total	397	23.1%	14.4%	24.3%	14.6%	24.6%	15.0%

Note: SD indicates the standard deviation for each group.

Table 32

Analysis of the Stability of 2005, 2006, and 2007 6-Year Graduation Rates

Stability		2005 Grad Rates		2006 Grad Rates		2007 Grad Rates	
Category	n	Mean	SD	Mean	SD	Mean	SD
Unchanged	290	48.3%	15.1%	48.6%	15.2%	48.8%	15.1%
Improved	60	48.8%	17.5%	52.3%	16.8%	54.5%	16.5%
Declined	15	48.5%	9.8%	45.7%	9.9%	41.3%	10.7%
Bounced	26	43.3%	13.2%	44.4%	13.7%	44.3%	13.9%
Erratic	6	38.2%	12.7%	41.3%	11.0%	38.3%	12.9%
Total	397	47.9%	15.2%	48.7%	15.2%	48.9%	15.3%

Note: SD indicates the standard deviation for each group.

The combination of high correlation coefficients and a preponderance of universities not showing year-to-year significant differences in their graduation rates provided strong evidence to support hypothesis #1. It suggested that internal inertia may have existed to hold graduation rates in place at these public universities over the three year time period examined.

The Productivity Models for Testing Hypotheses #2A, #3A, #4, #5, and #6

The previous chapter on methodology defined 17 factors, resulting in 23 control variables, which would be used in a multiple regression model to compare the actual graduation rates of public universities to their predicted graduation rates. The residual values from the comparative calculations represented the productivity by which each university conferred baccalaureate degrees on its undergraduate students. The multiple regression model became a fundamental component of a series of multiple analysis of covariances (MANCOVAs) for testing the statistical significance among the independent variables for hypotheses #2A, #3A, 4, 5, and 6.

Multicollinearity and Model Efficiency

Multiple regression analysis models may produce invalid results if the ratio of cases to variables is not sufficient. Tabachnick and Fidell (2007) recommended the following formula for determining the minimum number of cases (n) needed to support a model with m predictor variables: n > or = 50 + 8m. Deriving m from this equation, suggested that the complete sample would have been limited to 43 predictor variables and the sample subset would have been limited to 40 predictor variables. The 23 possible control variables for the study would consumed over half the degrees of freedom for each model. Tabachnick and Fidell (2007) recommended eliminating control variables that were either redundant or insignificant in order to improve the efficiency of the model and release more degrees of freedom for the independent variables.

One source of redundancy for the control variables would be multicollinearity, where two variables were highly correlated and accounted for much of the same variance in the sample. It would result in inflated standard error calculations and weakened prospects of detecting significant effects from each variable. It also would have introduced redundancy that unnecessarily consumed degrees of freedom. According to Tabachnick and Fidell (2007), when a bivariate correlation for two predictor variables exceeds .90, one of the variables should be eliminated from the model. Of the 23 control variables, the bivariate correlation exceeded .90 for only the two selectivity variables.

The correlation coefficient for ACT test scores at the 25th percentile and 75th percentile was .940 for the complete sample and .931 for the sample subset. Because the values at the 25th percentile had a higher correlation coefficient with the dependent variables, it was retained as a control variable and the values at the 75th percentile were eliminated from the models.

The remaining 22 control variables were entered into a series of regression analyses to test their significance for predicting the four and six-year graduation rates for both the complete sample and the sample subset. Ten control variables showed no statistical significance for any of the four regression analyses, and removing them decreased the effect sizes only slightly, but boosted the F-ratios significantly for each analysis.

Table 33 shows the 12 control variables that were retained in the model and their statistical significance. Note that the table combined the seven variables remaining from the three clusters of institutional characteristics into one cluster.

As a final test for multicollinearity, the tolerance statistic for each variable was checked. Tolerance was measured on a scale of 0 to 1, with lower amounts indicating a higher degree of multicollinearity. Tabachnick and Fidell (2007) recommended that variables with tolerance values below .20 may need to be eliminated from a model. The tolerance statistic for all 12 control variables, though, exceeded .20 for both the complete sample and the sample subset.

Table 33

Beta Values and Statistical Significance of Control Variables Retained in Models

	Sample Subset				Complete Sample			
Control Variable	4-Yr GR		6-Yr GR		4-Yr GR		6-Yr GR	
Student Characteristics								
ACT Scores - 25th Percentile	.407	***	.442	***	.456	***	.501	***
White Women %	.185	***	.012		.175	***	.004	
Black/Hispanic Men %	.063		-.019		.127	*	-.024	
Diversity Index	.124	**	.038		.070	*	.043	
Low Income %	-.049		-.079	**	-.040		-.066	*
Institutional Characteristics								
% Part-time Undergrads	-.319	***	.307	***	-.304	***	-.291	***
% Undergrads	-.028		.058	*	-.031		.057	*
Enrollment Size	.051		.222	***	.037		.219	***
% Available Housing	.208	***	.141	***	.246	***	.152	***
Cost of Attendance	.071	*	.032		.067	*	.018	
Student Services Costs	.015		.059	*	-.006		.039	
Institutional Support Costs	.058		.105	***	.075	*	.116	***
Significance of Each Model								
F-Ratios	91.02		162.24		93.11		165.48	
R^2	.753		.845		.744		.838	
Adjusted R^2	.745		.839		.736		.833	

There were 12 degrees of freedom assigned to the models for the complete sample and the sample subset, leaving 385 degrees of freedom for error in the complete sample and 358 degrees of freedom for error in the sample subset.
* indicates $p < .05$, ** indicates $p < .01$, and *** indicates $p < .001$.

Checking for Outliers and Influential Cases

The final step of ensuring that the regression models showed a good fit with the data was to check for the existence of outliers which might exert undue influence. An outlier would be an extreme case that showed inordinate influence on a regression formula and distorted the results. It could represent an unusual combination of variables or indicate possible erroneous data. A variety of tests exist to check for outliers in a sample. One of the most common tests is to calculate the Mahalanobis distance for each case, which indicates the distance of a case from the centroid of the remaining cases. Tabachnick and Fidell (2007) recommended using a very conservative probabilty estimate, $p < .001$, for evaluating whether Mahalanobis distances represented outlier cases. Using this threshold ($\chi^2_{(12)} = 32.909$) to evaluate universities for the complete sample and the subsample revealed 11 and 14 possible outlier cases, respectively. Seven universities appeared as possible outliers in both the complete sample and the sample subset. Control variables for the possible outlier cases were reviewed to ensure they were within reasonable limits for the samples. If data appeared somewhat unreasonable, it was rechecked to its source for accuracy. This exercise revealed no problems with the accuracy of the data recorded for these cases.

Although outliers represent unusual cases, they are problematic for regression models only when their influence may impair the model fit. Kutner, Nachtsheim, Neter, and Li (2005) recommended using a *DFFITS* statistic to evaluate whether a case produces excessive influence in a regression model. Their guideline for identifying excessive influence was cases with *DFFITS* values in excess of an absolute value of 1.0.

For the complete sample and the sample subset, only one case had a *DFFITS* value beyond that guideline. California State University at Monterey Bay had a *DFFITS* value of -1.08 for the sample subset and -.93 for the complete sample. Because it was within the guideline for the complete sample and only slightly high for the sample subset, it was left in the analyses.

Based on these final checks of model efficiency and fit, the testing of hypotheses #2A, #3A, 4, 5, and 6 proceeded with 398 public universities in the complete sample, 371 public universities in the sample subset which excluded HBCUs, and the 12 control variables which had shown statistically significant effects in at least one of the regression models.

Creating a Scale and Context for Evaluating Productivity

After controlling for the effects of the five student characteristics and the seven institutional characteristics shown in Table 33, the residual graduation rates indicated the productivity level at which each university was graduating students. The regression analyses used the control variables to predict a graduation rate for each university and the residual amounts represented the extent that actual rates differed from the predictions. To present the productivity levels on a scale that was more readily interpretable, the standardized regression residuals were converted to percentages which corresponded to the probability of a random value being less than its z-value. The *CDFNORM* function in SPSS was used to calculate the percentages. The percentages then were centered at the mean to produce a scale which indicated the extent to which a university's internal environment added to, or conversely diminished, the graduation rates predicted for its entering student cohort. A productivity level of zero, thus, would indicate that a university's actual graduation rate equaled the rate predicted by the regression model. A negative productivity level would indicate that a university had produced fewer graduates than expected for its mix of student and institutional characteristics. A positive productivity level would indicate that a university had produced more graduates than expected for its mix of student and institutional characteristics. The magnitude of the productivity level would correspond to the percentiles by which the university's productivity departed from the mean.

The productivity calculation assessed the magnitude of an outcome after accounting for differences in the quality of inputs. For this study, two types of inputs were examined as control variables: student characteristics and institutional characteristics. These types of input variables were consistent with the theoretical constructs suggested by Pascarella's (1985) general causal model for differential effects of organizational environments on educational outcomes (see Figure 2). To provide further context for evaluating graduation rate productivity, percentile scales were calculated to represent the relative predicted graduation rates for each university based on its student and institutional characteristics, respectively. Two separate regression analyses were run to calculate predicted graduation rates: one prediction based solely on student characteristics and the other prediction based solely on institutional characteristics. As shown in Tables 34 and 35, these regression models were significant ($p < .001$) for both the complete sample of 398 universities and the sample subset which excluded the 27 HBCUs criteria for inclusion in the study.

Table 34

Graduation Rate Prediction Models Based on Student Characteristics

	Sample Subset		Complete Sample	
Statistics	4-Yr GR[a]	6-Yr GR	4-Yr GR[a]	6-Yr GR
Mean Graduation Rates	-.6259	.4978	-.6424	.4882
Standard Dev - Predicted Rates	.3307	.1300	.3308	.1304
Significance of Each Model				
Degrees of Freedom	$F_{(5,365)}$	$F_{(5,365)}$	$F_{(5,392)}$	$F_{(5,392)}$
F-Ratios	117.93	185.95	110.86	194.18
R^2	.618	.718	.586	.712
Adjusted R^2	.612	.714	.580	.709

[a] As discussed in the previous chapter, 4-Year graduation rates were transformed to logits (as shown in this table) to improve their normality; restated as proportions, those rates were 22.2% and 21.7% for the sample subset and the complete sample, respectively. It was not necessary to transform 6-Year rates and they are shown in proportions in this table. The five student characteristics shown in Table 33 were used as predictors for all models. All models were significant ($p < .001$).

The predicted values were converted to standardized z-values and then converted to percentiles using the *NORMINV* function in Microsoft Excel. These calculations simply compared and scaled the predicted graduation rates based on either student or institutional characteristics. For example, the percentiles based on student characteristics indicated at which percentile the predicted graduation rate would be on average for a cohort of entering students with those characteristics. The percentiles for student and institutional characteristics were not compared to actual graduation rates and should not be interpreted as productivity levels.

Table 35

Graduation Rate Prediction Models Based on Institutional Characteristics

	Sample Subset		Complete Sample	
Statistics	4-Yr GR[a]	6-Yr GR	4-Yr GR[a]	6-Yr GR
Mean Graduation Rates	-.6259	.4978	-.6424	.4882
Standard Dev - Predicted Rates	.3307	.1300	.3308	.1304
Significance of Each Model				
Degrees of Freedom	$F_{(7,363)}$	$F_{(7,363)}$	$F_{(7,390)}$	$F_{(7,390)}$
F-Ratios	95.88	134.76	80.40	103.80
R^2	.649	.722	.591	.651
Adjusted R^2	.642	.717	.583	.644

[a] As discussed in the previous chapter, 4-Year graduation rates were transformed to logits (as shown in this table) to improve their normality; restated as proportions, those rates were 22.2% and 21.7% for the sample subset and the complete sample, respectively. It was not necessary to transform 6-Year rates and they are shown in proportions in this table. The five student characteristics shown in Table 33 were used as predictors for all models. All models were significant ($p < .001$).

Table 36 illustrates the projected graduation rates based on student and institutional characteristics at various percentiles. Notice how the effect changes when the two rates interact. When both measures exceed the 50th percentile, their combined effect is to increase the predicted rates somewhat, but not substantially. Likewise, when both measures are below the 50th percentile, their combined effect lowers the rate somewhat. This phenomenon occurs because the student and institutional characteristics share much of the variance that accounts for the difference in graduation rates. The predictive powers of the two sets of variables are reasonable equivalent, so when the percentiles of their predicted rates are equidistant on opposite sides of the 50th percentile, they offset one another and result in an overall predicted graduation rate near the mean for the sample.

Table 36

Illustrative Predicted Six-Year Graduation Rates Based on Student and Institutional Characteristics

	Sample Subset Projections			Complete Sample Projections		
Percentile	Student Factors	Institution Factors	Both	Student Factors	Institution Factors	Both
95th	71.2%	71.3%	73.1%	70.2%	69.3%	72.0%
90th	66.5%	66.5%	67.9%	65.5%	64.7%	66.9%
75th	58.6%	58.6%	59.3%	57.6%	57.2%	58.3%
60th	53.1%	53.1%	53.4%	52.1%	52.0%	52.4%
55th	51.4%	51.4%	51.6%	50.5%	50.4%	50.6%
50th	49.8%	49.8%	49.8%	48.8%	48.8%	48.8%
45th	48.1%	48.1%	48.0%	47.2%	47.3%	47.1%
40th	46.5%	46.5%	46.2%	45.5%	45.7%	45.3%
25th	41.0%	41.0%	40.2%	40.1%	40.4%	39.3%
10th	33.1%	33.0%	31.7%	32.2%	32.9%	30.8%

The projected six-year graduation rates based on either student or institutional characteristics used the regression models from Tables 34 and 35, respectively. The projected rates were converted to percentiles by entering the means and standard deviations for each projection series into the "NORMINV" function in Microsoft Excel.

To illustrate the use of the productivity scale and contextual predictions based on student and institutional characteristics, consider the example of regional state university which consistently has earned high scores in ranking services like *U.S. News & World Report*. It was awarded high rankings, in part, because its graduation rate was considerably above average. In 2007, it reported a six-year graduation rate of just under 70%, over twenty percentage points higher than the mean six-year graduation rate for all public universities in the sample. Based on the regression models from this study, the student and institutional factors for this university resulted in predicted graduation rates at the 99th and 91th percentiles, respectively. Using the 12 significant control variables from Table 33, resulted in a predicted six-year graduation rate of nearly 80% for this particular university. The resulting residual rate of -9.5%, corresponded to a productivity level of -44 which was far below average. These measures suggest that given its student and institutional characteristics, rather than being a high performing producer of graduates, this regional state university may be under performing. The measures could be used to make a similar kind of assessment of other public universities.

Testing Hypothesis #2 - State-Level Higher Education Plans

Hypothesis #2 concerned whether there was evidence that state-level higher education planning efforts were related to differences in college graduation rates. Hypothesis #2A tested whether the existence of a state-level higher education plan was associated with the productivity of graduation rates produced in the future. It was stated as follows:

- Differences in state-level higher education plans will be associated with statistically significant differences in the productivity of the graduation rates of public universities.

The existence of a state-level higher education plan was interpreted as evidence that higher education was on a state's governmental agenda (Kingdon, 1984) in 2001. Based on a review of the plans, each state was coded into one of four categories: (1) no state-level plan existed, (2) a state-level plan existed, but did not include a focus on college completion, (3) a state-level plan had a focus on college completion, but did not set completion targets, or (4) a state-level plan had a focus on college completion, plus set completion targets. The absence of a state-level plan would not indicate that individual universities or university systems lacked strategic planning, rather it meant that planning had not emanated from the external environment.

The null hypotheses for testing for statistically significant effects associated with differences in state-level higher education plans were as follows (τ represents the treatment effect of the group, after accounting for the effects of the control variables):

- $H_{o(2A\_4GR)}$: $\tau_{4GR\_NoPln} = \tau_{4GR\_Plan\_NoCom} = \tau_{4GR\_Pln\_Com\_NoTarget} = \tau_{4GR\_Pln\_Com\_Target}$
- $H_{o(2A\_6GR)}$: $\tau_{6GR\_NoPln} = \tau_{6GR\_Plan\_NoCom} = \tau_{6GR\_Pln\_Com\_NoTarget} = \tau_{6GR\_Pln\_Com\_Target}$

These null hypotheses were tested with both the complete sample and the sample subset which excluded HBCUs.

To test hypothesis #2A for differences in the productivity levels of the graduation rates, first Multivariate Analysis of Covariances (MANCOVAs) tested the combined effect of both four and six-year graduation rates as the dependent variables. One underlying assumption of the MANCOVA technique was homogeneity of the variance / covariance matrices of the dependent variables. Box’s M test provided an inferential comparison of the variance / covariance matrices; its results suggested homogeneity of the variance / covariance matrices. For the complete sample, Box’s M = 11.153 ($F_{(9, 270,608.018)}$ = 1.225, p = .274) and for the sample subset Box's M = 9.384 ($F_{(9, 219,915.879)}$ = 1.030, p = .413). The null hypothesis for Box’s M test was that the variance / covariance matrices were equal; and the test results accepted that hypothesis. Also, the equality of variances across groups was tested for each dependent variable using Levene’s test. The null hypotheses were accepted for both dependent variables, again suggesting homogeneity of their variance / covariance matrices. For the complete sample, Levene's test for four-year rates showed p = .987 ($F_{(3,394)}$ = .046) and for six-year rates it showed p = .704 ($F_{(3,394)}$ = .469). For the sample subset, Levene's test for four-year rates showed p = .977 ($F_{(3,367)}$ = .068) and for six-year rates it showed p = .694 ($F_{(3,367)}$ = .483).

The test statistic used for assessing multivariate results was Wilk’s Lambda. It showed highly significant results for testing hypothesis #2A with both the complete sample and the subsample which excluded HBCUs. For the complete sample, the significance of Wilk's Lambda for differences in the state-level planning factor was p = .003 ($F_{(6,762)}$ = 3.272) and for the sample subset it was p = .016 ($F_{(6,708)}$ = 2.611).

It, thus, was reasonable to explore further with univariate techniques to assess where specific mean differences resided in the state-level plans. As shown in Table 37, three of the four omnibus tests revealed statistically significant results when comparing the productivity levels of the graduation rates by type of state-level plan. Only the productivity levels using four-year graduation rates in the sample subset did not show a statistically significant result.

Table 37

Hypothesis #2A: Productivity Levels by State-Level Plan Type - Univariate Test Results

	Degrees of Freedom			
Hypothesis Test	Model[a]	Error	F-Value	Sig. (p)
Complete Sample Results				
$H_{o(2A\_4GR)}$	3	382	3.012	.030
$H_{o(2A\_6GR)}$	3	382	6.017	.001
Sample Subset Results				
$H_{o(2A\_4GR)}$	3	355	1.419	.237
$H_{o(2A\_6GR)}$	3	355	4.104	.007

[a] The covariates also consumed 12 degrees of freedom and the intercept consumed one degree of freedom in the full model.

To identify the specific types of state-level higher education plans which showed the statistically significant differences in the productivity of graduation rates, pairwise comparisons were generated for the three tests which showed statistically significant results. To hold the familywise alpha level at 5%, a Bonferroni adjustment was applied for determining the statistical significance of the pairwise comparisons. As shown in Table 38, universities located in states which had plans with completion targets showed statistically significant lower productivity levels than universities located in states which had plans, but no focus on completion targets. No other comparisons showed statistically significant differences in the productivity levels of the graduation rates.

Table 38

Significant Comparisons in the Productivity Levels Associated with Types of State-Level Higher Education Plans

Base Plan Type			Comparison Plan Type			
Plan Type[a]	n	Productivity	Plan Type[a]	n	Productivity	Sig.[b] (*p*)
6 -Year Graduation Rates -- Complete Sample						
Type 1	112	-2.5	Type 4	45	-18.2	.038
Type 2	149	+6.7	Type 4	45	-18.2	<.001
Type 3	92	+1.4	Type 4	45	-18.2	.008
4 -Year Graduation Rates -- Complete Sample						
Type 2	149	+6.3	Type 4	45	-11.0	.041
6 -Year Graduation Rates -- Sample Subset Excluding HBCUs						
Type 2	136	+6.2	Type 4	41	-15.1	.007

[a]Plan Types were: (1) no state-level plan existed, (2) a state-level plan existed, but did not include a focus on college completion, (3) a state-level plan had a focus on college completion, but did not set completion targets, and (4) a state-level plan had a focus on college completion, plus set completion targets.
[b]Significance was measured after applying a Bonferroni adjustment for multiple comparisons.

Table 38 illustrates that the inclusion of the HBCUs in the complete sample resulted in more statistically significant comparisons. It should be noted, however, that the Type 4 plans (state-level plans which included targets focused on college completion) were a component of each statistically significant comparison. Accordingly, the evidence is quite compelling that the universities subject to the most aggressive state-level plans (those with completion targets) consistently had lower productivity, particularly when compared to universities which existed in states with state-level plans where college completion had not been included as an area of focus (Type 2).

Table 39 provides additional context about the differences between the universities in states with plan types 2 and 4. Interestingly, it shows that student and institutional characteristics explain much of the deviation from mean graduation rates. The universities in states with plans which did not address completion (Type 2) had student and institutional characteristics that projected above average six-year graduation rates, yet produced more college graduations than predicted. Conversely, universities in states with plans which included college completion targets (Type 4) had student and institutional characteristics that projected below average six-year graduation rates, yet failed to produce the number of college graduates predicted.

Table 39

Comparative Productivity Levels: Types of State-Level Plans

		Percentile Associated with			
Plan Type[a]	Reported Graduation Rate	Student Characteristics	Institutional Characteristics	Projected Graduation Rate	Productivity Level
Type 2	52.0%	54.8	56.0	50.9%	+6.7
Type 4	39.0%	34.7	37.3	42.0%	-18.2

Note: Results based on six-year graduation rates for the complete sample (mean =48.8%).
[a]Plan Types were: (2) a state-level plan existed, but did not include a focus on college completion, and (4) a state-level plan had a focus on college completion, plus set completion targets.

The time sequence for hypotheses #2A tested for the possibility that the type of state-level higher education plan influenced the productivity of graduation rates generated in subsequent years. Punctuated equilibrium theory also held the possibility that influence could flow in the opposite direction, e.g., reported graduation rates could influence the type of state-level higher education plan. Accordingly, a supplemental version of hypotheses #2 was tested for evidence of such influence.

- Hypothesis #2B: Differences in reported graduation rates will be associated with statistically significant differences in types of state-level higher education plans.

Table 40 shows the results from using a nested ANOVA design with the Satterthwaite approximation to test for significant differences in 1999 graduation rates among the four types of state-level higher education plans. The results revealed statistically significant effects related to both states and type of state-level higher education plan. In other words, even after controlling for the significant differences in graduation rates among the states, type of state-level higher education plan continued to show a statistically significant effect

Table 40

Relationships between 1999 Graduation Rates and 2001 Plans

Nested ANOVA[a] Results	Sample Subset			Complete Sample		
	df	F-Value	Sig.(*p*)	df	F-Value	Sig.(*p*)
Between Plans	3, 29.0	3.395	.031	3, 27.9	3.789	.022
Between States	29.0, 311	2.310	<.001	27.9, 338	2.058	<.001

[a] The Satterthwaite approximation was applied to adjust the degrees of freedom in a nested ANOVA test to account for unequal samples sizes in groups. For sample A, R^2 = .231 and for sample B, R^2 = .199.

Table 41 shows the results from the comparisons of the 1999 six-year graduation rates for the four types of state-level plans. The results are quite similar to the comparisons shown in Table 38 using 2007 six-year graduation rates in the complete sample. The relative consistency in results from 1999 to 2007 provided additional evidence that internal inertia may have been holding performance in place (see hypothesis #1).

Table 41

Comparative Statistics - 1999 Six-Year Graduation Rates by State-Level Plan Type

Base Plan Type			Comparison Plan Type			
Plan Type[a]	n	1999 GR	Plan Type[a]	n	1999 GR	Sig.[b] (*p*)
6 -Year Graduation Rates -- Complete Sample						
Type 1	108	43.9%	Type 4	42	33.5%	.014
Type 2	146	47.3%	Type 4	42	33.5%	<.001
Type 3	90	42.4%	Type 4	42	33.5%	.045
6 -Year Graduation Rates -- Sample Subset Excluding HBCUs						
Type 1	103	44.6%	Type 4	38	33.7%	.003
Type 2	133	48.0%	Type 4	38	33.7%	<.001
Type 3	85	43.3%	Type 4	38	33.7%	.032

[a]Plan Types were: (1) no state-level plan existed, (2) a state-level plan existed, but did not include a focus on college completion, (3) a state-level plan had a focus on college completion, but did not set completion targets, and (4) a state-level plan had a focus on college completion, plus set completion targets.
[b]Significance was measured after applying a Bonferroni adjustment for multiple comparisons.

Testing Hypothesis #3 - Performance Programs

In addition to creating state-level higher education plans, state governments also had enacted a variety of performance programs in 2001 to hold public universities accountable. Hypothesis #3A considered whether the existence of performance programs accounted for differences in the graduation rates produced by public universities. It was stated as follows:

- Differences in state performance programs will be associated with statistically significant differences in the productivity of the graduation rates of public universities.

Like state-level higher education plans, performance programs provided an indication about the extent that higher education was on the governmental agenda for a state (Kingdon, 1984). The existence of performance programs suggested that a state government wanted to monitor its public universities closely and implore them to perform well. These programs became increasingly popular as the accountability movement escalated across the United States (Burke, 2001; Burke, 2005).

To evaluate hypothesis #3A, public universities were analyzed to determine whether each type of performance program accounted for a statistically significant difference in the productivity levels of their graduation rates. The three types of performance programs were used as the independent variables for a series of Multivariate Analysis of Covariances (MANCOVAs) which first controlled for the effects of the 12 covariates shown in Table 33. The status of the program (mandatory, voluntary, or no program) served as the three levels for each independent variable in the analyses.

Hypothesis #3A.1 - Performance reporting programs

The null hypotheses for the tests regarding performance reporting were as follows (the notation used a similar construction as used for testing hypothesis #2A, "PR" indicating the hypothesis tested for significance of "Performance Reporting" programs):

- $H_{o(3A.1\_4GR)}$: $\tau_{4GR\_PR\_None} = \tau_{4GR\_PR\_Mandated} = \tau_{4GR\_PR\_Voluntary}$
- $H_{o(3A.1\_6GR)}$: $\tau_{6GR\_PR\_None} = \tau_{6GR\_PR\_Mandated} = \tau_{6GR\_PR\_Voluntary}$

These null hypotheses were tested with both the complete sample and the sample subset which excluded HBCUs.

The combined effect of both dependent variables were tested first with MANCOVAs. The test results from the MANCOVAs, though, found no statistically significant results associated with differences in performance reporting programs. For the complete sample, the significance of Wilk's Lambda for differences in the types of performance reporting programs was $p = .104$ ($F_{(4,764)} = 1.933$) and for the sample subset it was $p = .291$ ($F_{(4,710)} = 1.245$). Accordingly, no further testing of univariate results or multiple comparisons was justified.

Hypothesis #3A.2 - Performance budgeting programs

Next, hypothesis #3A.2 tested whether the status of state performance budgeting was associated with differences in the productivity levels of graduation rates.
The null hypotheses for testing for statistically significant effects associated with differences in performance budgeting programs were as follows (τ represents the treatment effect of the group, after accounting for the effects of the control variables and "PB" indicating "Performance Budgeting" programs):

- $H_{o(3A.2\_4GR)}$: $\tau_{4GR\_PB\_Mandated} = \tau_{4GR\_PB\_Voluntary} = \tau_{4GR\_PB\_None}$
- $H_{o(3A.2\_6GR)}$: $\tau_{6GR\_PB\_Mandated} = \tau_{6GR\_PB\_Voluntary} = \tau_{6GR\_PB\_None}$

The null hypotheses were tested with both the complete sample and the sample subset which excluded HBCUs.

First, Multivariate Analysis of Covariances (MANCOVAs) tested the combined effect of both four and six-year graduation rates as the dependent variables. Box’s M test, though, provided mixed results about the assumption of homogeneity of the variance / covariance matrices. The test results were significant for the complete sample, Box’s M = 14.169 ($F_{(6, 2,322,389.701)} = 2.344$, $p = .029$) and for the sample subset, Box's M = 10.523 ($F_{(6, 1,574,236.828)} = 1.739$, $p = .107$). The null hypothesis for Box’s M test was that the variance / covariance matrices were equal; and the complete sample and sample subset provided mixed results on that hypothesis. Levene’s test provided further evidence about the equality of variances across groups by testing each dependent variable separately. The null hypotheses were accepted for both dependent variables, suggesting homogeneity of their variance / covariance matrices. For the complete sample, Levene's test for four-year rates showed $p = .734$ ($F_{(2,395)} = .243$) and for six-year rates it showed $p = .263$ ($F_{(2,395)} = 1.339$). For the sample subset, Levene's test for four-year rates showed $p = .726$ ($F_{(2,368)} = .320$) and for six-year rates it showed $p = .270$ ($F_{(2,368)} = 1.314$). These results provided reasonable evidence to support use of the MANCOVA results for testing hypothesis #3A.2.

The test results for the MANCOVA found statistically significant differences associated with differences in performance budgeting programs. For the complete sample, the significance of Wilk's Lambda for differences in the types of performance budgeting programs was $p < .000$ ($F_{(4,764)} = 6.251$) and for the sample subset it was $p < .000$ ($F_{(4,710)} = 6.330$).

It, thus, was reasonable to explore further with univariate techniques to assess where specific mean differences resided in the performance budgeting programs. As shown in Table 42, the omnibus tests for performance budgeting revealed statistically significant results when comparing productivity levels associated with four-year graduation rates among the types of performance budgeting. Differences in six-year graduation rates were not statistically significant.

Table 42

Hypothesis #3A.2: Productivity Levels by Performance Budgeting Status - Test Results

	Degrees of Freedom			
Hypothesis Test	Model[a]	Error	F-Value	Sig. (p)
Complete Sample Results				
$H_{o(3A.2\_4GR)}$	2	383	5.133	.006
$H_{o(3A.2\_6GR)}$	2	383	2.421	.090
Sample Subset Results				
$H_{o(3A.2\_4GR)}$	2	356	3.536	.030
$H_{o(3A2\_6GR)}$	2	356	2.253	.107

[a] The covariates also consumed 12 degrees of freedom and the intercept consumed one degree of freedom in the full model.

Accordingly, post-hoc pairwise comparisons were generated to determine the particular differences in performance budgeting types that were producing statistically significant results for the four-year graduation rates. To hold the alpha level at .05, the Bonferroni adjustment was applied before assessing the significance of the post-hoc pairwise comparisons.

As shown in Table 43, the post-hoc pairwise comparisons for four-year graduation rates showed that the productivity levels of the public universities located in states which had mandatory performance budgeting programs were lower by a statistically significant amount compared to universities located in states which did not have performance budgeting programs. Universities subject to voluntary performance budgeting programs did not show statistically significant differences from either universities subject to mandatory programs or without a performance budgeting program.

Table 43

Significant Comparisons in the Productivity Levels Associated with Status of Performance Budgeting Programs

Base Program Status			Comparison Program Status			
Status	N	Productivity	Status	n	Productivity	Sig.[a] (p)
4 -Year Graduation Rates -- Complete Sample						
No Program	159	+6.0	Mandatory	108	-7.6	.005
4 -Year Graduation Rates -- Sample Subset Excluding HBCUs						
No Program	153	+5.5	Mandatory	94	-6.1	.034

[a]Significance was measured after applying a Bonferroni adjustment for multiple comparisons.

Table 44 provides additional context about the differences between the universities in states without performance budgeting programs and universities in states with mandatory performance budgeting programs. Student and institutional characteristics explain much of the deviation from mean four-year graduation rates. The universities in states without performance budgeting programs had student and institutional characteristics that projected above average four-year graduation rates, yet produced more college graduations than predicted in four years. Conversely, universities in states with mandatory performance budgeting programs had student and institutional characteristics that projected below average four-year graduation rates, yet failed to produce the number of college graduates predicted within four years.

Table 44

Comparative Productivity Levels: Types of Performance Budgeting Programs

Program Type	Reported Graduation Rate[a]	Percentile Associated with Student Characteristics	Percentile Associated with Institutional Characteristics	Projected Graduation Rate[a]	Productivity Level
None	23.9%	58.7	53.6	22.7%	+6.0
Mandatory	18.0%	39.6	42.2	19.3%	-7.6

Note: Results based on four-year graduation rates for the complete sample (mean =21.7%).
[a]For presentation purposes in this Table, four-year graduation rates were converted to proportions from logits (which was the transformation used in the statistical analyses).

Hypothesis #3A.3 - Performance funding programs

Finally, hypothesis #3A.3 tested whether the status of state performance funding was associated with differences in the productivity levels of graduation rates.

The null hypotheses for testing for statistically significant effects associated with differences in performance funding programs were as follows (τ represents the treatment effect of the group, after accounting for the effects of the control variables and "PF" indicating "Performance Funding" programs):

- $H_{o(3A.3\_4GR)}$: $\tau_{4GR\_PF\_Mandated} = \tau_{4GR\_PF\_Voluntary} = \tau_{4GR\_PF\_None}$
- $H_{o(3A.3\_6GR)}$: $\tau_{6GR\_PF\_Mandated} = \tau_{6GR\_PF\_Voluntary} = \tau_{6GR\_PF\_None}$

The null hypotheses were tested with both the complete sample and the sample subset which excluded HBCUs.

First, Multivariate Analysis of Covariances (MANCOVAs) tested the combined effect of both four and six-year graduation rates as the dependent variables. Box's M test examined the assumption of homogeneity of the variance / covariance matrices. The test result for the complete sample was Box's M = 8.402 ($F_{(6,\ 477,856.581)} = 1.387$, $p = .216$) and for the sample subset was Box's M = 9.997 ($F_{(6,\ 430,510.613)} = 1.649$, $p = .129$). The null hypothesis for Box's M test was that the variance / covariance matrices were equal; and the complete sample and sample subset supported that hypothesis. Levene's test provided further evidence about the equality of variances across groups by testing each dependent variable separately. The null hypotheses were accepted for both dependent variables, suggesting homogeneity of their variance / covariance matrices. For the complete sample, Levene's test for four-year rates showed $p = .445$ ($F_{(2,395)} = .811$) and for six-year rates it showed $p = .793$ ($F_{(2,395)} = .232$). For the sample subset, Levene's test for four-year rates showed $p = .289$ ($F_{(2,368)} = 1.245$) and for six-year rates it showed $p = .783$ ($F_{(2,368)} = .245$). These results provided reasonable evidence to support use of the MANCOVA results for testing hypothesis #3A.3.

The test results for the MANCOVA found statistically significant differences associated with differences in performance funding programs. For the complete sample, the significance of Wilk's Lambda for differences in the types of performance funding programs was p = .011 ($F_{(4,764)}$ = 3.298) and for the sample subset it was p = .004 ($F_{(4,710)}$ = 3.890).

It, thus, was reasonable to explore further with univariate techniques to assess where specific mean differences resided in the performance funding programs. As shown in Table 45, the omnibus tests revealed some unusual results. Although the MANCOVA test had shown statistically significant results for the sample subset, neither of the univariate tests showed a statistically significant results. For the complete sample, only differences in the productivity of six-year graduation rates were statistically significant.

Table 45

Hypothesis #3A.3: Productivity Levels by Performance Funding Status - Test Results

	Degrees of Freedom			
Hypothesis Test	Model[a]	Error	F-Value	Sig. (p)
Complete Sample Results				
$H_{o(3A.3\_4GR)}$	2	383	.993	.372
$H_{o(3A.3\_6GR)}$	2	383	3.838	.022
Sample Subset Results				
$H_{o(3A.3\_4GR)}$	2	356	1.608	.202
$H_{o(3A.3\_6GR)}$	2	356	2.001	.137

[a] The covariates also consumed 12 degrees of freedom and the intercept consumed one degree of freedom in the full model.

The post-hoc pairwise comparisons for the six-year graduation rates in the complete sample revealed that the productivity level was lower by a significant margin for universities subject to a voluntary performance funding program compared to universities without a performance funding program. A deeper analysis of the differences between the productivity of six-year graduation rates in complete sample and in the sample subset which excluded HBCUs, though, revealed that the statistical significance detected in the complete sample likely resulted from a statistical anomaly. Of the 27 HBCUs included in the complete sample, only five of them were in the voluntary performance funding group, but the productivity level for these five universities were all below average, and two cases were quite extreme. The 18 HBCUs without a performance funding program were more evenly distributed, but overall showed above average productivity levels. While the sample subset had not shown a statistically significant difference related to performance funding type, the extreme values clustered in relatively small sample sizes for the HBCUs created a statistically significant effect for the complete sample. Accordingly, the reliability of the test result for six-year graduation rates in the complete sample was suspect and it was disregarded from further analysis in this study.

Hypothesis #3B - Effect of 1999 Graduation Rates on Performance Programs

As with the testing of hypothesis #2, hypothesis #3 was tested using a nested ANOVA design and 1999 graduation rates as the dependent variable. It tested for the possibility that influence flowed in the opposite direction, e.g., reported graduation rates influenced the type of state performance programs enacted. Accordingly, a supplemental version of hypotheses #3 was tested for evidence of such influence.

- Hypothesis #3B: Differences in reported graduation rates will be associated with statistically significant differences in state performance programs.

The results of the tests, though, did not yield statistically significant results for any of the between-plan effects of the three performance programs. The differences in 1999 reported graduation rates were results showed statistically significant differences due to between-states effects, but not between-plans. The result may suggest that states adopted performance plans without regard to how the graduation rates of their public universities compared to universities in other states. Perhaps governors and state legislators learned of these programs from their participation in national organizations and adopted them, regardless of the performance of their own universities.

Testing Hypothesis #4 - Board Governance Structures

Hypothesis #4 concerned whether there was evidence that the variations in the board governance structures of public universities were related to differences in their college graduation rates. It was stated as follows:

- Differences in the locus and intensity of board governance oversight will be associated with statistically significant differences in the productivity of the graduation rates of public universities.

In Chapter 3, eleven different board governance models were identified for U.S. public universities. Because the small sizes of some model groupings likely would confound or weaken statistical tests designed to detect significant differences among them, the models were combined into logical clusters and examined from three perspectives.

Hypothesis #4.1 - Existence of Local Governing Board

The first perspective focused on whether the existence of a local governing board mattered. The null hypotheses to test for significant differences depending on whether a university had a local governing board (148 of 398 universities in the complete sample and 134 of 371 universities in sample subset) or not were as follows:

- $H_{o(4.1\_4GR)}$: $\tau_{4GR\_LocalBd} = \tau_{4GR\_NoLocalBd}$
- $H_{o(4.1\_6GR)}$: $\tau_{6GR\_LocalBd} = \tau_{6GR\_NoLocalBd}$

The null hypotheses were tested with both the complete sample and the sample subset which excluded HBCUs.

First, Multivariate Analysis of Covariances (MANCOVAs) tested the combined effect of both four and six-year graduation rates as the dependent variables. Box's M test examined the assumption of homogeneity of the variance / covariance matrices. The test result for the complete sample was Box's M = 8.716 ($F_{(3, 3,389,356.136)}$ = 2.888, p = .034) and for the sample subset was Box's M = 8.759 ($F_{(3, 2,405,880.540)}$ = 2.9091, p = .034). The null hypothesis for Box's M test was that the variance / covariance matrices were equal; and it was rejected for both the complete sample and sample subset. The lack of homogeneity of the variance / covariance matrices for the MANCOVA suggested the need for caution in interpreting the combined effects of the dependent variables. The hypotheses, though, were stated in terms of the univariate results for each dependent variable, accordingly, Levene's test was used to examine the equality of variances across groups for each dependent variable separately. The null hypotheses were accepted for both dependent variables, suggesting homogeneity of their variances. For the complete sample, Levene's test for four-year rates showed p = .454 ($F_{(1,396)}$ = .561) and for six-year rates it showed p = .803 ($F_{(1,396)}$ = .062). For the sample subset, Levene's test for four-year rates showed p = .234 ($F_{(1,369)}$ = 1.421) and for six-year rates it showed p = .253 ($F_{(1,369)}$ = 1.311). These results provided reasonable evidence to support using the test results for hypothesis #4.1.

The test results for the MANCOVA found statistically significant differences associated with whether or not a local governing board existed. For the complete sample, the significance of Wilk's Lambda for differences in the types of performance funding programs was p = .001 ($F_{(2,383)}$ = 7.066) and for the sample subset it was p = .002 ($F_{(2,356)}$ = 6.560).

It, thus, was reasonable to explore further with univariate techniques to assess the mean differences for each dependent variable. As shown in Table 46, all four tests showed statistically significant differences when comparing the unadjusted graduation rates for public universities with and without local governing boards.

Tables 47 and 48 show the comparative statistics between the universities which had a local governing board and those universities which did not. The results suggest that universities with local governing boards out-performed universities without local governing boards. Student and institutional characteristics explain much of the deviation from mean graduation rates. The universities with local governing boards had student and institutional characteristics that projected above average graduation rates, yet produced more college graduations. Conversely, universities without local governing boards had student and institutional characteristics that projected below average graduation rates, yet failed to produce the number of college graduates predicted.

Table 46

Hypothesis #4.1: Productivity Levels: Local Governing Board Existence - Test Results

Hypothesis Test	Degrees of Freedom: Model[a]	Degrees of Freedom: Error	F-Value	Sig. (p)
Complete Sample Results				
$H_{o(4.1\_4GR)}$	1	384	14.021	<.001
$H_{o(4.1\_6GR)}$	1	384	8.669	.003
Sample Subset Results				
$H_{o(4.1\_4GR)}$	1	357	13.108	<.001
$H_{o(4.1\_6GR)}$	1	357	7.291	.007

[a] The covariates also consumed 12 degrees of freedom and the intercept consumed one degree of freedom in the full model.

Table 47

Comparative 6-Year Graduation Rate Productivity Levels:

Local Governing Board Existence

Local Board	Reported Graduation Rate	Percentile Associated with Student Characteristics	Percentile Associated with Institutional Characteristics	Projected Graduation Rate	Productivity Level
Yes	51.1%	60.8	52.3	50.0%	+7.0
No	47.5%	43.6	48.6	48.2%	-4.1

Note: Results based on six-year graduation rates for the complete sample (mean =48.8%).

Table 48

Comparative 4-Year Graduation Rate Productivity Levels:

Local Governing Board Existence

		Percentile Associated with			
Local Board	Reported Graduation Rate[a]	Student Characteristics	Institutional Characteristics	Projected Graduation Rate[a]	Productivity Level
Yes	25.5%	62.6	56.0	23.7%	+8.8
No	19.6%	42.5	46.5	20.5%	-5.2

Note: Results based on four-year graduation rates for the complete sample (mean =21.7%).
[a]For presentation purposes in this Table, four-year graduation rates were converted to proportions from logits (which was the transformation used in the statistical analyses).

Hypothesis #4.2 - Intensity of Consolidated Governing Boards

Absent a local governing board, a public university would share governance oversight with other entities, e.g., universities, community colleges or other education related entities. The second perspective considered whether the intensity of that shared governance mattered. In other words, would the results vary depending on how many entities were subject to oversight by a consolidated governing board? Would universities in smaller higher education systems, with only 2-3 entities, produce results similar to the results from universities with local boards? Would universities in larger higher education systems show significantly different results from universities in smaller systems?

The second perspective added the number of entities subject to consolidated governing board oversight as a continuous variable to the MANCOVA statistical analyses. The null hypotheses for testing the second perspective were that the regression coefficient for the continuous variable equaled zero.

The test results from the MANCOVAs, though, found no statistically significant results associated with the intensity of consolidated governing boards. For the complete sample, the significance of Wilk's Lambda for the number of governed entities was $p = .449$ ($F_{(2,382)} = .802$) and for the sample subset it was $p = .766$ ($F_{(2,355)} = .267$). Accordingly, no further testing of univariate results was justified.

Hypothesis #4.3 - Exclusivity of Board Governance Duties

The third perspective considered whether assigning some governance duties, e.g., approving academic programs, reviewing budgets, or hiring presidents, to more than one governing board mattered. For the complete sample, 269 universities were subject to governance oversight from more than one board, while 129 universities were subject to governance oversight exclusively by one board. Half of the states represented in the sample had a statewide coordinating board which exercised some governance responsibilities.

The null hypotheses to test for significant differences depending on whether a university was subject to oversight from multiple governing boards or oversight from only a single board were as follows (ExclusiveGov = All governance duties vested in a single board and MultiGov = More than one governing board responsible for at least one governance duty):

- $H_{o(4.3\_4GR)}$: $\tau_{4GR\_ExclusiveGov} = \tau_{4GR\_MultiGov}$
- $H_{o(4.3\_6GR)}$: $\tau_{6GR\_ExclusiveGov} = \tau_{6GR\_MultiGov}$

The null hypotheses were tested with both the complete sample and the sample subset which excluded HBCUs.

First, Multivariate Analysis of Covariances (MANCOVAs) tested the combined effect of both four and six-year graduation rates as the dependent variables. Box's M test examined the assumption of homogeneity of the variance / covariance matrices. The test result for the complete sample was Box's M = 17.491 ($F_{(9, 21952.766)}$ = 1.903, p = .047) and for the sample subset was Box's M = 16.153 ($F_{(9, 19321.573)}$ = 1.755, p = .071). The null hypothesis for Box's M test was that the variance / covariance matrices were equal; and it produced mixed results for the complete sample (rejected) and sample subset (accepted). The lack of homogeneity of the variance / covariance matrices for the MANCOVA in the complete sample suggested the need for caution in interpreting the combined effects of its dependent variables. The hypotheses, though, were stated in terms of the univariate results for each dependent variable, accordingly, Levene's test was used to examine the equality of variances across groups for each dependent variable separately. The null hypotheses were accepted for both dependent variables, suggesting homogeneity of their variances. For the complete sample, Levene's test for four-year rates showed p = .728 ($F_{(3,394)}$ = .436) and for six-year rates it showed p = .850 ($F_{(3,394)}$ = .266). For the sample subset, Levene's test for four-year rates showed p = .384 ($F_{(3,367)}$ = 1.018) and for six-year rates it showed p = .675 ($F_{(3,367)}$ = .511). These results provided reasonable evidence to support using the test results for hypothesis #4.3.

The test results for the MANCOVA found statistically significant differences associated with whether or not a university was subject to multiple levels of board governance. For the complete sample, the significance of Wilk's Lambda for existence of multiple governance levels was p < .001 ($F_{(2,382)}$ = 8.328) and for the sample subset it was

$p < .001$ ($F_{(2,355)} = 9.274$).

It, thus, was reasonable to explore further with univariate techniques to assess the mean differences for each dependent variable. Table 49 shows the results for this test. It shows strong evidence of a statistically significant difference in the productivity of four-year graduation rates for universities subject to multiple levels of governance, compared to universities which had governance duties confined to one board. Interestingly, no differences were noted in the productivity associated with six-year rates.

Table 49

Hypothesis #4.3: Productivity Levels: Exclusivity of Governance Duties - Test Results

	Degrees of Freedom			
Hypothesis Test	Model[a]	Error	F-Value	Sig. (*p*)
Complete Sample Results				
$H_{o(4.1\_4GR)}$	1	383	6.437	.012
$H_{o(4.1\_6GR)}$	1	383	.143	.706
Sample Subset Results				
$H_{o(4.1\_4GR)}$	1	356	8.924	.003
$H_{o(4.1\_6GR)}$	1	356	.003	.953

[a] The covariates also consumed 12 degrees of freedom and the intercept consumed one degree of freedom in the full model.

To determine which type of primary governance duties may have accounted for the differences in the productivity of four-year graduation rates, another univariate analysis was run on the four-year graduation rates. It replaced the dummy variable for existence of multiple levels of governance with three dummy variables (one variable for each type of governance duty (academic program approval, budget review, and hiring presidents).

Levene's test was used to examine the equality of variances across these groups. The null hypotheses were accepted, suggesting homogeneity of variances. For the complete sample, Levene's test showed $p = .099$ ($F_{(7,390)} = 1.735$). For the sample subset, Levene's test showed $p = .090$ ($F_{(7,363)} = 1.781$). These results provided reasonable evidence to support using the test results for hypothesis #4.3.

Table 50 clearly shows that only shared responsibility for academic program approval was associated with statistically significant differences in the productivity of four-year graduation rates. Adding a second layer of governance review for budgets and hiring presidents had no statistically significant effect. Table 51 shows how the productivity of four-year graduation rates varied depending on governance structures.

Table 50

Productivity of Four-Year Graduation Rates by Exclusivity of Type of Governance Duties - Test Results

	Sample Subset		Complete Sample	
Primary Governance Duty	F-Value	Sig. (*p*)	F-Value	Sig. (*p*)
Academic Program Approval	7.407	.007	5.459	.020
Budget Review	1.290	.257	1.362	.244
Hiring Presidents	.670	.414	2.468	.117

Statistical significance was evaluated at $F_{(1,354)}$ for the subset and $F_{(1,381)}$ for the complete sample.

Table 51

Productivity of Four-Year Graduation Rates by Crossing Initial Governance with Existence of Secondary Authority for Academic Program Approval

Initial Governance Authority	Secondary Level of Governance - Academic Program Approval? Yes	No	Marginal Mean - Initial Gov
Complete Sample			
Consolidated Board	-0.5 (138)	-11.0 (112)	-5.2 (250)
Local Board	+9.4 (125)	+5.4 (23)	+8.8 (148)
Marginal Mean - Secondary Gov	+4.2 (263)	-8.2 (135)	0.0 (398)
Sample Subset - Excluding HBCUs			
Consolidated Board	+0.7 (130)	-12.0 (107)	-5.1 (237)
Local Board	+9.6 (112)	+5.6 (22)	+8.9 (134)
Marginal Mean - Secondary Gov	+4.9 (242)	-9.0 (129)	0.0 (371)

Number of universities in each group are shown in parentheses. Differences between marginal means for each variable were significant (p < .05) in the complete sample and the subset.

Testing Hypothesis #5 - Regional Accrediting Agencies

Hypothesis #5 tested for differences in the productivity of graduation rates among regional accrediting agencies. The U.S. Department of Education required accreditation as a condition for universities to administer student financial aid programs. Accordingly, all U.S. public universities were accredited by one of six regional accrediting agencies. The matching of accrediting agency to states, though, had remained unchanged for many years and was not prone to the kinds of choices that states exercised with hypotheses #2 to #4. Although not mediated through state governments, accrediting agencies were positioned to exercise influence over the practices of public universities through their periodic visits and reviews. Hypothesis #5 was stated as:

- Differences in regional accrediting agencies will be associated with statistically significant differences in the productivity of the graduation rates of public universities.

The null hypotheses for testing for statistically significant effects associated with differences in regional accrediting agencies were as follows (τ represents the treatment effect of the group, after accounting for the effects of the control variables):

- $H_{o(5\_4GR)}$: $\tau_{4GR\_MS} = \tau_{4GR\_NE} = \tau_{4GR\_NW} = \tau_{4GR\_SO} = \tau_{4GR\_West} = \tau_{4GR\_HLC}$
- $H_{o(5\_6GR)}$: $\tau_{6GR\_MS} = \tau_{6GR\_NE} = \tau_{6GR\_NW} = \tau_{6GR\_SO} = \tau_{6GR\_West} = \tau_{6GR\_HLC}$

These null hypotheses were tested with both the complete sample and the sample subset which excluded HBCUs.

To test hypothesis #5 for differences in the productivity levels of the graduation rates, first Multivariate Analysis of Covariances (MANCOVAs) tested the combined effect of both four and six-year graduation rates as the dependent variables. Box's M test provided an inferential comparison of the assumption regarding homogeneity of the variance / covariance matrices. For the complete sample, Box's M = 25.617 ($F_{(15, 77421.33)} = 1.671$, $p = .049$) and for the sample subset Box's M = 27.903 ($F_{(15, 80358.249)} = 1.819$, $p = .026$). The null hypothesis for Box's M test was that the variance / covariance matrices were equal; and it was rejected for both the complete sample and sample subset.

The lack of homogeneity of the variance / covariance matrices for the MANCOVA suggested the need for caution in interpreting the combined effects of the dependent variables. The hypotheses, though, were stated in terms of the univariate results for each dependent variable, accordingly, Levene’s test was used to examine the equality of variances across groups for each dependent variable separately. The null hypotheses were accepted for both dependent variables, suggesting homogeneity of their variances. For the complete sample, Levene's test for four-year rates showed p = .086 ($F_{(5,392)}$ = 1.946) and for six-year rates it showed p = .069 ($F_{(5,392)}$ = 2.063). For the sample subset, Levene's test for four-year rates showed p = .112 ($F_{(5,365)}$ = 1.799) and for six-year rates it showed p = .119 ($F_{(5,365)}$ = 1.767). These results provided reasonable evidence to support using the test results for hypothesis #5.

The test statistic used for assessing multivariate results was Wilk’s Lambda. It showed highly significant results for testing hypothesis #5 with both the complete sample and the subsample which excluded HBCUs. For the complete sample, the significance of Wilk's Lambda for differences in regional accrediting agencies was p <.001 ($F_{(10,758)}$ = 7.132) and for the sample subset it was p < .001 ($F_{(10,704)}$ = 7.904).

It, thus, was reasonable to explore further with univariate techniques to assess whether significant mean differences were evident in each dependent variable. As shown in Table 52, the four omnibus tests revealed statistically significant results when comparing the productivity levels of the graduation rates across the regional accrediting agencies.

Table 52

Hypothesis #5: Productivity Levels by Regional Accrediting Agency - Univariate Test Results

	Degrees of Freedom			
Hypothesis Test	Variable[a]	Error	F-Value	Sig. (p)
Complete Sample Results				
$H_{o(5\_4GR)}$	5	380	6.437	.000
$H_{o(5\_6GR)}$	5	380	8.921	.000
Sample Subset Results				
$H_{o(5\_4GR\_A)}$	5	353	7.218	.000
$H_{o(5\_6GR\_A)}$	5	353	9.953	.000

[a] The covariates also consumed 12 degrees of freedom and the intercept consumed one degree of freedom in the full model.

As shown in Table 52, statistically significant differences were detected in the productivity levels of universities across the regional accrediting agencies. To detect where specific differences existed, post-hoc pairwise comparisons were conducted. To maintain the familywise alpha level at 5%, the Bonferroni adjustment was applied to the comparisons. Tables 53 and 54 show the statistically significant comparisons for the productivity of four-year and six-year graduation rates, respectively.

Table 53

4-Year Graduation Rates - Significant Comparisons in the Productivity Levels Associated with Regional Accrediting Agencies

Base Regional Accrediting Agency			Comparison Agency			
Agency [a]	n	Productivity	Agency [a]	n	Productivity	Sig. [b] (p)
Complete Sample						
MS	62	+17.4	NW	25	-14.2	<.001
MS	62	+17.4	SO	123	+1.9	.038
MS	62	+17.4	HLC	133	-7.8	<.001
MS	62	+17.4	West	30	-8.2	.018
Sample Subset - Excluding HBCUs						
MS	56	+18.3	NW	25	-14.9	<.001
MS	56	+18.3	SO	105	+2.6	.029
MS	56	+18.3	HLC	130	-7.8	<.001
MS	56	+18.3	West	30	-7.4	.013

[a] Regional Accrediting abbreviations are MS = Middle States, NW = Northwest, SO = Southern, HLC = Higher Learning Commission, and West = Western.
[b] Significance was measured after applying a Bonferroni adjustment for multiple comparisons.

Table 54

6-Year Graduation Rates - Significant Comparisons in the Productivity Levels Associated with Regional Accrediting Agencies

Base Regional Accrediting Agency			Comparison Agency			
Agency [a]	n	Productivity	Agency [a]	n	Productivity	Sig. [b] (p)
Complete Sample						
MS	62	+18.3	NW	25	-15.9	<.001
MS	62	+18.3	SO	123	-2.0	<.001
MS	62	+18.3	HLC	133	-7.8	<.001
West	30	+11.6	NW	25	-15.9	.003
West	30	+11.6	SO	123	-2.0	.048
West	30	+11.6	HLC	133	-7.8	.002
Sample Subset - Excluding HBCUs						
MS	56	+20.0	NW	25	-15.5	<.001
MS	56	+20.0	SO	105	-2.7	<.001
MS	56	+20.0	HLC	130	-7.6	<.001
West	30	+13.1	NW	25	-15.5	.001
West	30	+13.1	SO	105	-2.7	.016
West	30	+13.1	HLC	130	-7.6	.001

[a] Regional Accrediting abbreviations are MS = Middle States, NW = Northwest, SO = Southern, HLC = Higher Learning Commission, and West = Western.
[b]Significance was measured after applying a Bonferroni adjustment for multiple comparisons.

This study did not attempt to gain an understanding of why universities subject to review by certain regional accrediting agencies showed significantly different productivity levels than universities subject to review by other agencies. For both four and six-year graduation rates, universities subject to review by the Middle States agency showed significantly higher productivity levels than universities subject to review by 3-4 of the other regional accreditation agencies.

Testing Hypothesis #6 - Interactions Among State Accountability Mechanisms

Hypothesis #6 integrated the results from testing hypotheses #2A, #3A, and #4 and examined whether different combinations of accountability mechanisms affected productivity differently. Hypothesis #5 was not included in the interactions because it was considered to be a fixed attribute for state governments and not subject to the trade-off decisions that policymakers may make when designing accountability measures. It was, however, included in the model for testing this hypothesis so that the most complete picture of the external environment could be considered when analyzing the productivity levels. Hypothesis #6, thus, was stated as follows:

- The interactions among state higher education plans, state performance programs, and the locus of governance oversight structures will be associated with statistically significant differences in the productivity of the graduation rates of public universities.

Hypotheses #2A, #3A, and #4 revealed that some accountability mechanisms used by state governments helped explain the differences in the productivity levels in the graduation rates of public universities. Each hypothesis, though, was tested without considering the effects of the other accountability mechanisms. To recap the results from these three tests:

- The results from testing hypothesis #2A indicated that universities subject to state-level plans which included completion targets had lower productivity levels than universities subject to plans which did not include completion as a goal area. Four levels of state-level plans were tested for this independent variable: (1) no plan, (2) plans without a focus on completion, (3) plans with a completion focus, but not setting completion targets, and (4) plans with completion targets.
- The results from hypothesis #3A indicated that universities subject to mandatory performance budgeting programs had lower productivity levels than universities which were not subject to performance budgeting programs. Three levels of performance plans were tested for this independent variable: (1) no program, (2) voluntary program, and (3) mandatory program.
- The results from hypothesis #4 indicated that universities which had governance duties assigned to local boards and also were subject to a secondary level of oversight for academic program approval produced the highest productivity levels. Two dichotomous independent variables were tested: (1) existence of a local governing board versus and (2) subject to secondary governance oversight of academic program approval.

Combining these results into a statistical analysis allowed testing for any significant interactions among them and indicated whether certain combinations accounted for more of the variation in productivity levels. Did it matter whether universities subject to state-level higher education plans also had local governing boards? Did it matter whether universities subject to a mandatory performance budgeting programs also had state-level higher education plans? Testing for statistically significant interactions helped address those types of questions.

The null hypotheses for these tests were that all possible interactions, e.g., two-way, three-way, and four-way, among the independent variables would equal zero. To test for significant effects from the interactions, MANCOVAs were run with both the complete sample and the sample subset excluding HBCUs. Using the General Linear Model in SPSS, the six-year graduation rates and the logit transformation of the four-year graduation rates were loaded as dependent variables. The 12 variables identified in Table 33 were loaded into the model as covariates. Main effects from the five independent variables which showed significant effects from testing hypotheses #2A (state-level planning), #3A2 (performance budgeting program), #4A1 (existence of a local governing board), #4A3 (existence of a secondary level of oversight for academic program review), and #5 (regional accrediting agency) were loaded into the model. Finally, the two-way, three-way, and four-way interactions among variables #2A, #3A, #4A1, and #4A3 were included into an initial version of the model. To create a more parsimonious model, a backward stepwise technique was used to eliminate interactions which did not show statistical significance. Interactions were eliminated sequentially based on their *p*-values (highest *p*-value over .05 eliminated for each successive analysis) until only statistically significant interactions remained in the model.

This approach eliminated all possible three-way interactions and the four-way interaction as not showing statistical significance. Also, four of six possible two-way interactions were eliminated as not statistically significant. Table 59 shows that including the interactions in the model produced many more significant effects than any of the models which included only the effects of one accountability mechanism. The two-way interactions which were statistically significant for both the complete sample and the sample subset were: state-level plan type by performance budget status and state-level plan type by existence of local governing board.

The assumption regarding homogeneity of the variance / covariance matrices was then checked for this model.For the complete sample, Box's M = 240.616 ($F_{(114, 5693.017)} = 1.756$, $p < .001$) and for the sample subset Box's M = 229.403 ($F_{(114, 5707.788)} = 1.661$, $p < .001$). The null hypothesis for Box's M test was that the variance / covariance matrices were equal; and it was rejected for both the complete sample and sample subset. The lack of homogeneity of the variance / covariance matrices for the MANCOVA suggested the need for caution in interpreting the combined effects of the dependent variables. The hypotheses, though, were stated in terms of the univariate results for each dependent variable, accordingly, Levene's test was used to examine the equality of variances across groups for each dependent variable separately. The null hypotheses were accepted for both dependent variables, suggesting homogeneity of their variances. For the complete sample, Levene's test for four-year rates showed $p = .535$ ($F_{(50,347)} = .970$) and for six-year rates it showed $p = .283$ ($F_{(50,347)} = 1.116$). For the sample subset, Levene's test for four-year rates showed $p = .533$ ($F_{(50,320)} = .971$) and for six-year rates it showed $p = .253$ ($F_{(50,320)} = 1.139$). These results provided reasonable evidence to support using the test results.

The test statistic used for assessing multivariate results was Wilk's Lambda. It showed highly significant results for the two interactions identified in hypothesis #6 for both the complete sample and the subsample which excluded HBCUs. For the complete sample, the significance of Wilk's Lambda for the interaction of state-level plan and performance budgeting was p =.003 ($F_{(10,728)}$ = 2.729) and for the sample subset it was p = .003 ($F_{(10,674)}$ = 2.690). For the complete sample, the significance of Wilk's Lambda for the interaction of state-level plan and local governing board was p =.008 ($F_{(6,728)}$ = 2.919) and for the sample subset it was p = .027 ($F_{(6,674)}$ = 2.396).

It, thus, was reasonable to explore further with univariate techniques to assess whether significant mean differences for the two interactions were evident in each dependent variable. Table 55 shows the results of these univariate tests. It shows that the state-level plan type by performance budget status interaction was statistically significant for both the productivity of four and six-year graduation rates in the complete sample and the sample subset which excluded HBCUs. The interaction of state-level plan type by existence of local governing board was statistically significant for four-year graduation rates with both the complete sample and the sample subset. That interaction, though, was not statistically significant for six-year graduation rates with either the complete sample or the sample subset.

Table 55

Hypothesis #6: Univariate Test Results for Statistically Significant Two-way Interactions

Interaction	Degrees of Freedom: Variable[a]	Degrees of Freedom: Error	F-Value	Sig. (*p*)
<u>Complete Sample Results</u>				
Plan X Budgeting - 4 YR	5	365	4.591	<.001
Plan X Budgeting - 6 YR	5	365	2.750	.019
Plan X Local Board - 4 YR	3	365	3.336	.020
Plan X Local Board - 6 YR	3	365	1.085	.355
<u>Sample Subset Results</u>				
Plan X Budgeting - 4 YR	5	338	4.678	<.001
Plan X Budgeting - 6 YR	5	338	3.501	.004
Plan X Local Board - 4 YR	3	338	3.300	.021
Plan X Local Board - 6 YR	3	338	.765	.515

[a] The full model had 32 degrees of freedom, including the covariates, main effects from the independent variables, and two interactions.

The significant interactions shown in Table 55 indicate that combinations of the independent variables produced differing results depending on the condition of each variable. Tables 56 to 58 show how the productivity levels varied by level for the independent variables involved in the interactions. Tables 56 and 57 show the interaction that was significant for all samples and dependent variables, type of state-level plans crossed with type of performance budgeting program.

Table 56

Productivity of Four-Year Graduation Rates by Crossing State-Level Plan Type with Performance Budgeting Program Status

State-Level Plans	Performance Budgeting (PB) None	Performance Budgeting (PB) Voluntary	Performance Budgeting (PB) Mandated	Marginal Mean by Plan Type
Complete Sample				
No Plan	+2.3 (65)	-17.6 (29)	a	-3.1 (112)
Plan without completion	+3.6 (42)	+6.4 (82)	+10.4 (25)	+6.3 (149)
Completion Plan, No Targets	+13.9 (43)	-6.4 (20)	-19.0 (29)	-1.0 (92)
Targeted Completion Plans	a	b	-13.7 (36)	-11.0 (45)
Marginal Mean - PB	+6.0 (159)	-1.0 (131)	-7.6 (108)	0.0 (398)
Sample Subset - Excluding HBCUs				
No Plan	+2.3 (62)	-18.9 (29)	a	-3.1 (107)
Plan without completion	+5.0 (40)	+5.5 (75)	+4.3 (21)	+5.2 (136)
Completion Plan, No Targets	+12.4 (43)	-5.2 (20)	-23.6 (24)	-1.9 (87)
Targeted Completion Plans	A	b	-5.1 (33)	-5.0 (41)
Marginal Mean - PB	+5.5 (153)	-2.1 (124)	-6.2 (94)	0.0 (371)

a = value suppressed because less than 20 universities in the cell. b = no universities in the cell. Number of universities in each group are shown in parentheses.

Table 57

Productivity of Six-Year Graduation Rates by Crossing State-Level Plan Type with Performance Budgeting Program Status

State-Level Plans	Performance Budgeting (PB) None	Performance Budgeting (PB) Voluntary	Performance Budgeting (PB) Mandated	Marginal Mean by Plan Type
Complete Sample				
No Plan	-2.8 (65)	-3.8 (29)	a	-2.5(112)
Plan without completion	-4.1 (42)	+10.3 (82)	+12.3 (25)	+6.7 (149)
Completion Plan, No Targets	+11.1 (43)	-1.6 (20)	-11.0 (29)	+1.4 (92)
Targeted Completion Plans	a	b	-14.8 (36)	-18.2 (45)
Marginal Mean - PB	-1.1 (159)	+5.4 (131)	-5.0 (108)	0.0 (398)
Sample Subset - Excluding HBCUs				
No Plan	-4.3 (62)	-5.4 (29)	a	-2.3 (107)
Plan without completion	-4.6 (40)	+11.7 (75)	+6.6 (21)	+6.2 (136)
Completion Plan, No Targets	+10.3 (43)	-1.4 (20)	-16.0 (24)	+0.3 (87)
Targeted Completion Plans	a	b	-9.5 (33)	-15.1 (41)
Marginal Mean - PB	-2.1 (153)	+5.7 (124)	-4.1 (94)	0.0 (371)

a = value suppressed because less than 20 universities in the cell. b = no universities in the cell. Number of universities in each group are shown in parentheses.

Table 58 shows the other interaction that was significant for four-year graduation rates, state-level plan crossed with existence of a local governing board.

Table 58

Productivity of Four-Year Graduation Rates by Crossing State-Level Plan Type with Existence of Local Governing Board

State-Level Plans	Local Governing Board? No	Local Governing Board? Yes	Marginal Mean by Plan Type
Complete Sample			
No Plan	-14.4 (57)	+8.9 (55)	-3.1 (112)
Plan without completion	+0.4 (76)	+12.3 (73)	+6.3 (149)
Completion Plan, No Targets	+0.5 (75)	a	-1.0 (92)
Targeted Completion Plans	-12.4 (42)	a	-11.0 (45)
Marginal Mean - Local Gov	-5.2 (250)	+8.8 (148)	0.0 (398)
Sample Subset - Excluding HBCUs			
No Plan	-17.0 (56)	+12.6 (51)	-3.1 (107)
Plan without completion	+1.2 (73)	+9.7 (63)	+5.2 (136)
Completion Plan, No Targets	-1.0 (70)	a	-1.9 (87)
Targeted Completion Plans	-6.3 (38)	a	-5.0 (41)
Marginal Mean - Local Gov	-5.1 (237)	+8.9 (134)	0.0 (371)

a = value suppressed because less than 20 universities in the cell. Number of universities in each group are shown in parentheses.

Adding more variables to the model shifted the significance of variables previously included. Tables 59 and 60 show the effect sizes of all variables and significant interactions included in the final models.

Table 59

Effect Sizes (Partial η^2) of Statistically Significance Variables Retained in Models

Variable	Sample Subset 4-Yr GR		Sample Subset 6-Yr GR		Complete Sample 4-Yr GR		Complete Sample 6-Yr GR	
Control Variables - Student Characteristics								
ACT Scores - 25th Percentile	.185	***	.313	***	.212	***	.341	***
White Women %	.027	**	.000		.017	*	.000	
Black/Hispanic Men %	.002		.000		.014	*	.000	
Diversity Index	.015	*	.003		.005		.002	
Low Income %	.021	**	.048	***	.011	*	.026	**
Control Variables Institutional Characteristics [a]								
% Part-time Undergrads	.093	***	.121	***	.074	***	.100	***
% Undergrads	.000		.009		.000		.011	*
Enrollment Size	.021	**	.199	***	.020	**	.188	***
% Available Housing	.038	***	.038	***	.067	***	.047	***
Independent Variables								
State-Level Plan Type	.037	**	.017		.042	**	.019	
Performance Budgeting	.015		.031	**	.026	**	.022	*
Local Board	.006		.009		.006		.008	
Academic Program Review	.013	*	.024	**	.013	*	.021	**
Regional Accreditor	.100	***	.138	***	.105	***	.136	***
Plan X Budgeting	.065	***	..049	**	..059	***	.036	**
Plan X Local Board	.028	*	.007		.027	*	.009	

[a] Excludes three control variables which showed no statistical significance in any model (Cost of Attendance, Institutional Support per FYE, and Student Support Services per FYE).

Table 60

Statistical Significance of Final Models

	Sample Subset		Complete Sample	
Statistic	4-Yr GR	6-Yr GR	4-Yr GR	6-Yr GR
F-Ratios	44.633	79.058	46.081	78.844
Degrees of Freedom	32, 338	32, 338	32, 365	32, 365
R^2	.809	.882	.802	.874
Adjusted R^2	.791	.871	.784	.863

Note: Final models used all variables shown in Table 59, plus the three control variables cited in note a to that table.

Productivity of Historically Black Colleges and Universities

Because historically black colleges and universities (HBCUs) may be subject to unique influences from their environments, the study tested a sample subset which excluded them. The sample subset excluded 27 HBCUs which had been included in the complete sample. HBCUs have bristled at the perception that their graduation rates are too low and have urged a new method for measuring their success (Hernandez, 2009). Supporters of HBCUs have argued that measures of graduation rate success should consider the academic preparation and socio-economic status of students (similar to the methodology used in this study to calculate productivity levels). Table 61 shows the comparative student and institutional profiles between HBCUs and non-HBCUs. For student factors, HBCUs faced a decided disadvantage in producing graduation rates from both their student ACT test scores and the percentage of low-income students served. The institutional characteristics also showed some distinct differences.

Table 61

Comparative Profiles: HBCUs and Non-HBCUs

University Type	Student Characteristics		Institutional Characteristics		
	ACT[a] scores	Low Income	Part-time	Housing	Enrollment
HBCUs	15	63%	12%	40%	4,311
Non-HBCUs	19	27%	15%	20%	11,141

[a] Admission test scores were measured as cumulative scores at the 25th percentile for the universities.

Table 62 used the prediction models to assess the performance of HBCUs compared to non-HBCUs. Although it shows HBCUs with markedly lower reported graduation rates than non-HBCUs, after accounting for differences in student and institutional characteristics, HBCUs actually outperformed non-HBCUs. Productivity levels for the four-year graduation rates of HBCUs was +9.5, compared to -0.7 for

Table 62

Comparative Productivity Levels: HBCUs and Non-HBCUs

University Type	Reported Graduation Rate	Percentile Associated with Student Characteristics	Percentile Associated with Institutional Characteristics	Projected Graduation Rate	Productivity Level
4-Year Rates					
HBCUs	15.0%	14.1	56.1	13.7%	59.5
Non-HBCUs	22.2%	53.1	49.6	22.4%	49.3
6-Year Rates					
HBCUs	35.7%	11.6	44.0	34.9%	54.9
Non-HBCUs	49.8%	53.5	50.4	49.8%	49.6

non-HBCUs. For six-year rates, HBCUs showed a productivity level of +4.9, compared to -0.4 for non-HBCUs. Again, more research is merited, but this analysis suggests an important role was played by HBCUs.

Summary of External Effects Related to Graduation Rates

The results of this study found some evidence to support the notion that the graduation rate productivity of public universities was aligned with expectations from the external environment. Tests of hypotheses #2A, #3A.2, #4.1, and #4.3 revealed that the differences in a variety of state accountability mechanisms, e.g., state-level higher education plans, performance budgeting programs, and board governance structures helped explain differences in the productivity levels of college graduation rates. While tests of hypotheses #3A.1, #3A.3, and #4 failed to show a statistically significant relationship between other accountability mechanisms, e.g., performance reporting programs, performance funding programs, and the scope of jurisdiction for consolidated governing boards and graduation rate productivity.

The results from hypothesis #6 indicated that additional complexities associated with state actions because of statistically significant interactions among the types of state-level plans, performance budgeting programs, and the existence of local governing boards. Also, the results from testing hypothesis #5 showed that another source of external influence, regional accrediting agencies, offered further explanation for the variation in graduation rate productivity.

The results from testing hypothesis #2B suggested that influence between public universities and their external environments may flow both ways. It showed that the most aggressive state-level higher education plans existed in states which had the lowest reported graduation rates. A similar test in hypothesis #3B, though, failed to show that the status of performance programs was related to differences in graduation rates reported among the states.

The final chapter sorts out these results and analyzes them in the context of the conceptual framework used by the study. It also identifies opportunities to extend this research in future studies.

Chapter Five: Discussion, Conclusions and Implications

This study was designed to examine the extent to which the performance of U.S. public universities was related to influences in their unique external environments. It was structured around a conceptual framework derived from punctuated equilibrium theory (Gould, 1989; Sastry, 1997), which proposed that the force of internal inertia would hold organizational performance in a steady state as long as it was perceived as appropriate externally. 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 by overcoming internal inertia to change performance. If changes occurred, internal inertia would become reestablished to hold performance steady again.

The study used college graduation rates as a measure of basic performance. Hypotheses were tested on four and six-year graduation rates reported by 398 public universities for cohorts of full-time, first-time students entering in the Fall 2001 academic term. The hypotheses addressed various elements of punctuated equilibrium theory. The results from hypothesis #1 provided reasonable evidence that internal inertia was holding graduation rates quite stable within universities from 2005 to 2007. Statistical tests found that for 73% of the public universities tested, six-year graduation rates showed no statistically significant changes during that time period. For four-year rates, the tests showed no statistically significant changes over that time period for 65% of the same universities. Graduation rates, though, varied widely among universities, ranging from 13% to 93% for six-year rates and from 2% to 84% for four-year rates in 2007 for the public universities in the complete sample.

Prior research studies (e.g., Astin, 1993; Tinto, 1993; Adelman, 2006; and Bowen, Chingos, & McPherson, 2009) suggested several student and institutional characteristics which could have accounted for much of the variation in graduation rates among universities. A multiple regression model was designed to control for the variation associated with the differences in those characteristics. The residual values from the graduation rates, which remained unaccounted for in the model, were used as a proxy for productivity when testing hypotheses #2 to #6.

In 2001, college completion was emerging as an important goal for many state governments. Almost half (14) of the 32 states which had prepared state-level higher education plans cited it as a goal area (see Table 34 on page 123). A special commission created by the federal government to study higher education (U.S. Department of Education, 2006) also emphasized the importance of students graduating from college. In an era of tight resources and high competition for the brightest students, improved productivity would be a laudable goal. Indeed, when state policymakers lack capacity for providing additional resources and demand "more from less", in essence, they are seeking improved productivity.

Since the federal government began requiring universities to publish their graduation rates following passage of the 1990 Student Right to Know and Campus Security Act (Public Law 101-542), it has become more active in urging improvements in college completion rates. In 2003, the U.S. Congress mandated a study of college completion rates (U.S. General Accountability Office, 2003). In 2009, the Obama administration set an ambitious target for elevating the number of college-educated adults by the year 2020 (Obama, 2009). Federal expectations uniformly are directed to all U.S. universities, although the federal government does not have direct governance authority for public universities. Its influence becomes mediated through intermediaries, including state governments, governing boards, and regional accrediting agencies, that may filter, amplify, or diminish national expectations for improved college completion rates. This research study was designed to detect whether differences in the actions or structure of those intermediaries were associated with differences in the graduation rate productivity of their public universities.

The external environments in which public universities operated in 2001 were complex and dynamic. Some universities were located in states where public higher education was prominent on the state-level governmental agenda. In other states, governors and legislators relied more heavily on governing boards to oversee higher education. Governing boards, themselves, varied widely in structure and intensity. Some universities shared a governing board with numerous other public higher education institutions in a state; other universities had an exclusive relationship with their governing boards. State governments also had enacted a host of performance programs which imposed various reporting, budgeting, or funding provisions on public universities. In addition, public universities were subject to periodic organizational assessments by one of six regional accrediting agencies. Although accrediting agencies served the same purpose, their methods varied. For example, the Higher Learning Commission (2008), which accredited the most public universities of any agency, had experimented with an alternative process, the Academic Quality Improvement Program, to focus on continuous quality improvement efforts rather than the traditional ten-year comprehensive review.

The primary objective of this study was to examine whether significant relationships existed between the productivity of public universities and the influences exerted in their external environments. In order to conduct that examination, first, productivity had to be defined and measured. The results of that exercise reinforced several theories and findings previously offered by higher education scholars (e.g., Astin, 1993; Tinto, 1993; Adelman, 2006; and Bowen, Chingos, & McPherson, 2009).

Measuring the Productivity of Public Universities

The literature review revealed 23 possible predictors of college graduation rates for which data was available for public universities. This study organized predictors around a framework proposed by Pascarella (1985) which suggested the existence of student and institutional clusters that accounted for differences in college outcomes. From the original model, a more parsimonious model of 12 predictors was derived. It included five characteristics for the full-time, first-time cohorts of students entering each public university in 2001: ACT test scores measured at the 25th percentile, proportion of white female students, proportion of Black or Hispanic male students, an index of the cohort's racial/ethnic diversity, and the proportion of low-income students measured as a percentage of students receiving federal Pell grants. The other seven control variables represented characteristics of each institution in 2001: proportion of undergraduate students who attended part-time, undergraduate students as a proportion of the total student body, size measured by total student enrollment, availability of student housing, average cost of attendance for a student living off campus, cost of student support services per full-time equivalent student, and cost of institutional support services per full-time equivalent student.

Ten possible control variables were dropped from the model due to a lack of statistical significance, including six dummy variables which represented the geographic location of the university (e.g., large city, rural, etc.), two additional measures of cost per full-time equivalent student - instructional costs and academic support costs, a program availability variable which measured the proportion of program majors offered by each university, and the proportion of undergraduate students represented in the entering cohort of full-time, first-time students. Also, ACT test scores measured at the 75^{th} percentile were dropped due to having high multicollinearity with ACT test scores measured at the 25^{th} percentile. Although, the literature review suggested that these eleven variables may have had a significant relationship with graduation rates, their significance was lost when the other control variables were included in the model. To improve model efficiency and save degrees of freedom for testing the independent variables, these eleven variables were omitted from the hypotheses tests.

Also, as observed in the Results Chapter, the three covariates related to institutional resources which had been retained in the full model (cost of attendance, cost of student support services per full-time equivalent student and cost of institutional support services per full-time equivalent student), lost their significance when the independent variables were added to it. As a result, the final models did not contain any variables which were direct measures of institutional finances. This result was somewhat surprising, but should be interpreted with caution. The effects of institutional finances may have been accounted for in other more significant variables, such as availability of student housing. Also, the measurement of institutional costs becomes confounded as the proportion of graduate students increases. It was difficult to achieve consistent and reliable methods for allocating costs among functional expense categories, and that difficulty was exacerbated when institutions served students with diverse educational goals. The whole area of finances for public universities and their relationship on outcomes, clearly deserves more study.

Although the student and institutional factors were intended to serve as covariates in the tests of the hypotheses, the magnitude of their explanatory power was quite noteworthy. The 12 covariates retained in the model accounted for an extraordinary amount of the variation in the graduation rates among the public universities in the sample. For the four-year rates, the model produced adjusted R^2 values of .736 and .745, respectively, for the complete sample and the sample subset which excluded HBCUs. The adjusted R^2 values for the six-year rates were .833 and .839, respectively, for the complete sample and sample subset. Accounting for such a high amount of variation left only modest amounts of variation to represent productivity differences among the universities. This phenomenon suggests that public universities may have highly similar internal environments, perhaps due to the effects of isomorphism as universities mimicked the best practices identified elsewhere.

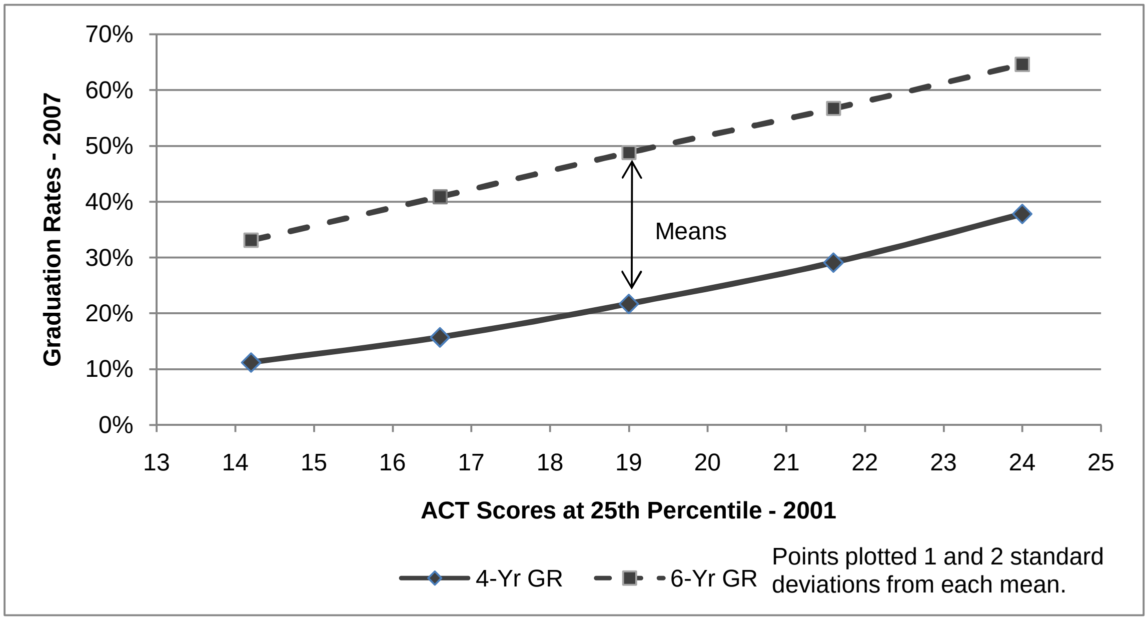
When the final models included the independent variables and any statistically significant interactions among them, five covariates remained significant for both four and six-year rates. Figure 8 illustrates the relationships of two student characteristics with graduation rates. Figure 9 provides a similar illustration for two institutional characteristics.

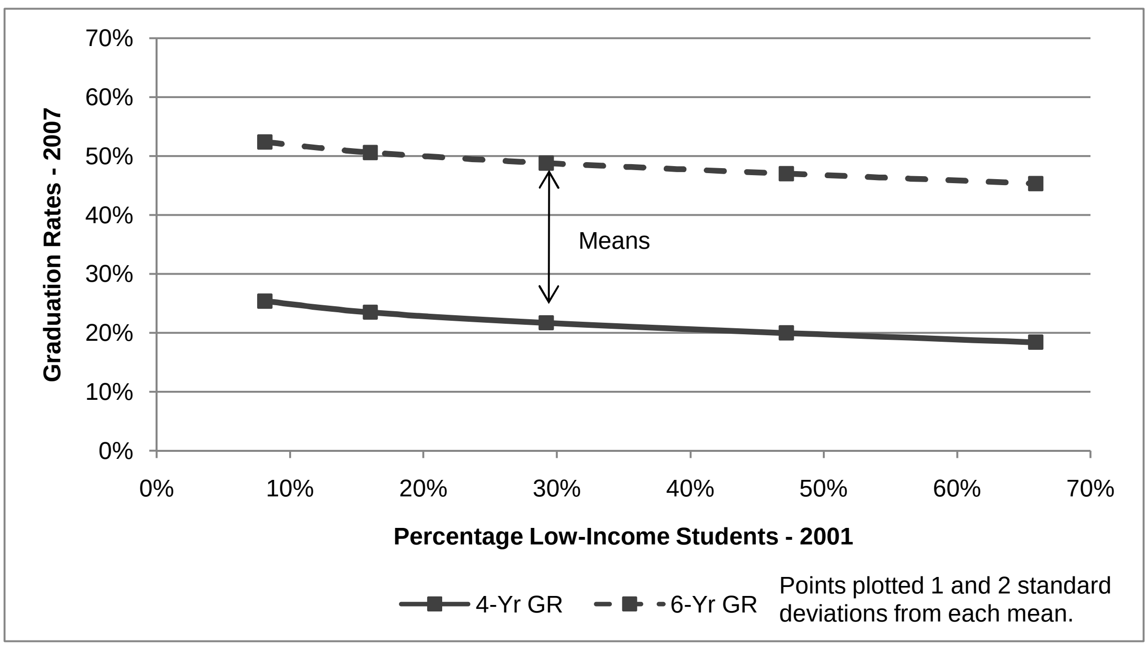
Figures 8 and 9 show several interesting relationships with college graduation rates. Both figures show one factor with a strong positive effect on both four and six-year graduation rates, and another factor with a strong negative effect on the rates. For student characteristics, the strong positive effect of ACT scores, measured at the 25th percentile for each university, reinforced evidence about higher education that has been apparent for many decades -- better students generally produce better results, vis à vis graduation rates.

Recent studies (Adelman, 2006; Bowen, Chingos, & McPherson, 2009) have found better predictors of student success than admissions test scores, such as the rigor of high school curriculum or high school class rank, but data was not readily available on those predictors for public universities. Nonetheless, this study showed that average admissions tests scores of a student cohort remained a strong predictor of institutional graduation rates.

It also was not surprising that an increased percentage of low-income students had a negative effect on graduation rates. Adelman (2006), Astin (1993), and other higher education scholars have called attention to this phenomenon. Low income tends to correlate with lower levels of parental education (data not available for this study) and racial/ethnic minority status (the Pearson correlation coefficient between the percentage low income and percentage of Black or Hispanic males was .557 in the complete sample).

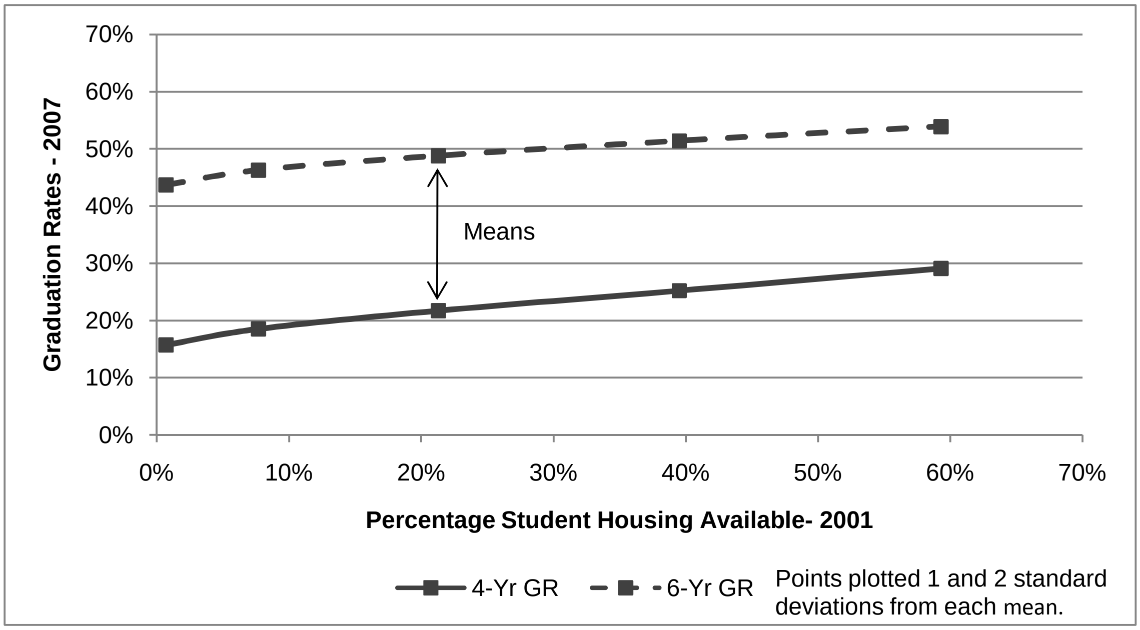
Figure 8: Examples of How Student Characteristics Related to Graduation Rates

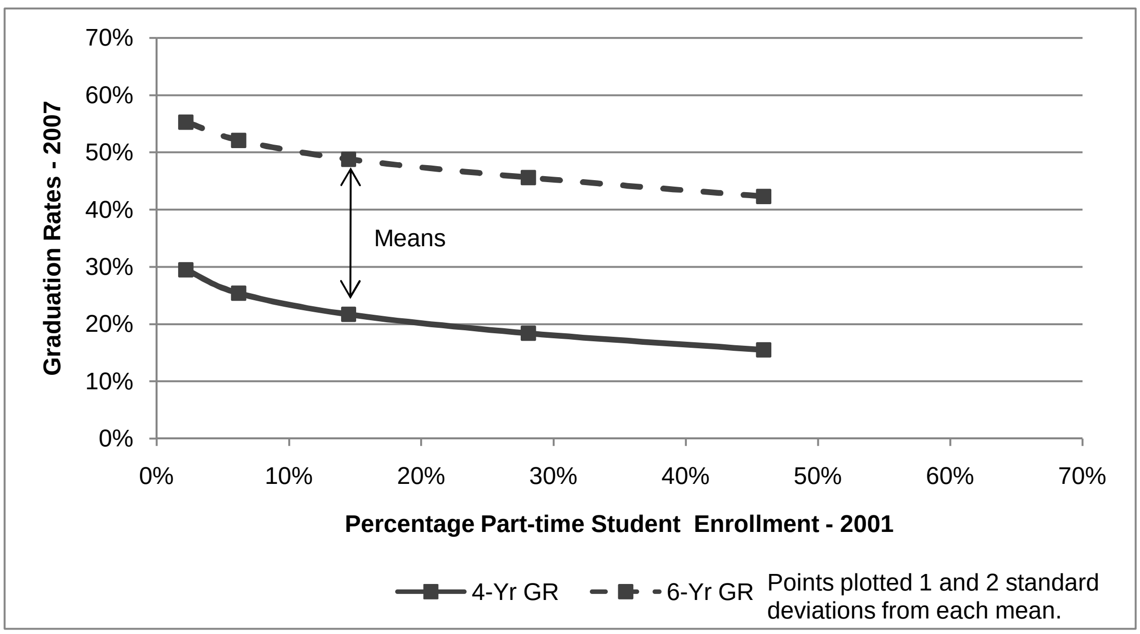




Notes: Results based on using the final models with the complete sample (See Table 59 for more data on statistical significance of variables). Four-year rates were transformed from logits to proportions for display in the graphs.

Figure 9: Examples of How Institutional Characteristics Related to Graduation Rates





Notes: Results based on using the final models with the complete sample (See Table 59 for more data on statistical significance of variables). Four-year rates were transformed from logits to proportions for display in the graphs.

For institutional characteristics, Astin (1993) found that the availability of student housing had a positive relationship with college completion when the student was the unit of analysis. Similarly this study showed a positive relationship between the availability of student housing and graduation rates when the institution was the unit of analysis.

The negative effect of increased part-time students on the graduation rates of a full-time, first-time cohort of students provided a somewhat fresh perspective. Although other researchers (Chen, 2007) demonstrated that part-time attendance generally had a negative consequence when the student was the unit of analysis, this study showed that it also had a negative relationship when the university was the unit of analysis. Tinto (1993) and Cope and Hannah (1975) had emphasized the concept of "fit" when measuring the success of individual students. This study extended the concept of "fit" to an entering cohort of full-time, first-time students as the unit of analysis. It found that as "fit" diminished between the entering cohort and the attendance status of other university students, particularly part-time students, graduation rates also declined. The work of Kuh, Kinzie, Schuh, and Whitt (2005) implied this phenomenon. They found that institutional mission was an important element of student success. As universities served higher proportions of part-time students, their ability to focus on the needs of full-time students would be diffused and may have contributed to lower graduation rates for the traditional full-time, first-time cohort of students.

Finally, enrollment size (not pictured in Figure 9) was an institutional characteristic which had a significant positive relationship with both four and six-year graduation rates. Because it was entered into the model as a logarithmic transformation, graduation rates rose rather sharply in the early stages of increased enrollments and then increased more gradually. For example, in the complete sample, the model predicted six-year graduation rates for universities with enrollments of 2,448 students (two standard deviations below the mean size) to be 41%. The enrollment size at the mean graduation rate (48.8%) was 10,445 students. Graduation rates at two standard deviations above the mean rose to 56.7%, but enrollment size at that level was 44,566 students. Perhaps smaller public universities faced more enrollment challenges than larger universities. Larger universities tend to be classified as universities with very high research activity (a variable not included in this study). In their recent study of college completion, Bowen, Chingos, and McPherson (2009) treated flagship universities, which have a major focus on research activities, as a separate category because of their unique features. More analysis, thus, would be needed to determine whether larger enrollments coincided with classifications an increased focus on research activity.

In addition to calculating productivity levels, two regression models were used to predict graduation rates for each university based separately on its student and institutional characteristics. Although these student and institutional variables shared a substantial amount of variance, these predicted graduation rates provided some additional context for analyzing the relative performance of the universities.

To illustrate an application of the prediction models, reconsider the comparison between six-year graduation rates of the two public universities cited in the Introduction Chapter. Although the universities appeared similar, one university had a six-year graduation rate of 32.6%, while the other university had a six-year graduation rate of

65.2%. The comparison was based on actual data from two U.S. public universities included in this study. Table 63 shows a profile of the significant student and institutional characteristics for the two universities. Although the enrollment sizes were similar, most of the other key characteristics showed a decided advantage for University #2 to produce a higher graduation rate than University #1. Based on the raw data, officials at University #1 could have rationalized why their rates were significantly lower than University #2. Table 64 adds information on the predicted graduation rates based on student and institutional characteristics and the productivity levels of the universities.

Table 63

Comparative Institutional Profiles of Two Universities

	Student Characteristics		Institutional Characteristics		
University	ACT[a] scores	Low Income	Part-time	Housing	Enrollment
University #1	19	13%	42%	7%	13,940
University #2	21	21%	12%	34%	14,410

[a] Admission test scores were measured as cumulative scores at the 25th percentile for the universities.

Table 64 shows how the factors cited in Table 63 were translated by the prediction models. The models ranked the student and institutional characteristics at University #2 considerably higher than those characteristics at University #1 and accounted for those differences in the projected graduation rates. The projected rates accounted for about half the differences in the reported graduation rates between the universities. The remaining difference was captured in the respective productivity levels for the universities. University #1 fell substantially short of its predicted performance

Table 64

Comparative Productivity Levels of Two Universities

University	Reported Graduation Rate	Percentile Associated with Student Characteristics	Percentile Associated with Institutional Characteristics	Projected Graduation Rate	Productivity Level
University #1	32.6%	50.8	13.6	40.8%	-40.5
University #2	65.2%	79.0	72.0	58.9%	+34.2

with a productivity level of -40.5. On the other hand, University #2 showed a productivity level of +34.2, meaning that it outperformed expectations by a significant margin.

Perhaps the difference in productivity levels of those two universities was related to differences in their unique external environments. Both universities were located in states which had state-level higher education plans in place in 2001. The plan for University #1, though, cited college completion as a goal area, whereas the plan for University #2 did not. Both state legislatures, nonetheless, had enacted mandatory performance budgeting programs. The final model used in this study incorporated those elements from the external environment and offered some possible explanation for their differential effect on the productivity levels of these two universities.

Connecting External Influences to Productivity

In 2001, outside the boundaries of each U.S. public university existed a unique elixir of environmental forces. Governors and state legislators, often motivated by a sense of responsibility for public entities, created a myriad of planning and performance programs for public universities. A wide array of governance structures were in place to offer university operations varying degrees of insulation from state politics. Often states had an added layer of oversight to review budgets or academic programs. The accreditation review process subjected the universities to inspection by teams of peers drawn from other campuses within the jurisdiction of the same regional accrediting agency.

This study identified various factors as possible indicators of influence from the external environments experienced by public universities. It then used statistical techniques to explore whether significant relationships existed between the factors and the productivity of graduation rates. Hypotheses #2A, #3A, 4 and #5 consisted primarily of single variable analyses and revealed several conditions that bore statistically significant relationships with the productivity of graduation rates, irrespective of the other factors.

Results from Hypothesis #2 - State-Level Higher Education Plans

In 2001, 32 of the 48 states included in the study had state-level higher education plans in place. The plans were developed by an assortment of blue ribbon task forces, coordinating boards, and consolidated statewide governing boards, but their existence signaled that higher education was on the state's agenda (Kingdon, 1984). Of the 32 plans, 18 plans included a goal area related to college completion, further signaling expectations for improved performance or a phenomenon that Kingdon may have considered as placing the topic on the state's action agenda. Three states (Louisiana, Tennessee, and Texas) had adopted particularly aggressive plans and set targeted completion rates for their public universities. From a rational perspective, the clarity of the expectations in those three states seems more likely to have produced better results. The statistical analysis, though, showed an opposite effect, particularly for six-year graduation rates. Productivity was lowest for the universities in the three states with the most aggressive plans. Interestingly, it was highest in the states which had plans, but did not cite completion as a goal area. In Kingdon's terms, the best scenario may have been for public universities to be on the governmental agenda in a state, but not its action agenda.

Although states which developed targeted completion goals may have intended to improve the graduation rates for their public universities, the test results showed that those universities had below average productivity levels, even after accounting for their student and institutional characteristics. This result could be attributed to the difficulty of state policymakers penetrating the internal inertia of the universities in order to create improved productivity. It also is worth noting that the universities in states with targeted completion plans had the lowest predicted rates based on student and institutional characteristics, in addition to the lowest productivity levels. Perhaps states which observed relatively low graduation rates among their public universities may have been more inclined to mandate change than invest in it.

Interestingly, the public universities located in states with higher education plans which did not focus on college completion had the highest productivity levels of any group. This phenomenon could indicate that state policymakers had recognized rightly that their public universities were producing graduates at a high level and need not be pushed to improve in the state-level plan. Productivity, though, is not an easily recognizable trait. Instead, policymakers more likely observed unadjusted rates and used them as a basis for determining the need for introducing more rigorous accountability measures, such as setting completion targets.

Results from Hypothesis #3 - State Performance Programs

The tests of hypothesis #3A raised significant doubt that state performance programs have had a positive influence on the productivity of public universities. Of the three types of performance programs examined, only performance budgeting programs showed a statistically significant relationship with productivity. In 2001, a slight majority of the states in the study (26 of 48) had performance budgeting programs in place. The programs were split evenly between 13 programs which were mandated by state law and 13 programs which were enacted voluntarily by the higher education community. The statistical significance of the relationship between type of performance budgeting program and productivity was evident for four-year graduation rates, but not six-year rates. It showed that productivity was lowest for universities in states with mandatory performance budgeting programs, reinforcing a notion from Burke and Minassians (2001) that mandatory performance programs would be least effective. The highest productivity levels were shown by universities in states which did not have performance budgeting programs in place.

Burke and Minassians (2001) suggested that performance budgeting programs may provide the optimal solution for state legislatures which wished to express their concern about the performance of public higher education without being obligated to take any prescribed action. It is interesting to note that the measures of institutional characteristics, which included available housing, cost of attendance, and investments in student services, were substantially lower in states that enacted performance budgeting programs. Possibly, it suggests that states were more willing to demand accountability from public universities than to invest in them.

Performance reporting programs did not show a statistically significant relationship with the productivity levels of public universities. In 2001, Burke and Minassians (2001) found that performance reporting programs had become widespread and were in place for 36 of the 48 states included in this study. Perhaps these programs offered an example of rather blind isomorphism, whereby states enacted popular programs without considering their state's unique circumstances.

Fewer states had adopted performance funding programs than the other performance program options in 2001. Only 16 states had some form of performance funding in place and in two of those states (Pennsylvania and New York), performance funding was used by some, not all their public universities. Zumeta (2001) had traced the origins of performance funding to Tennessee in 1979 and indicated that other states had followed suit. In 2001, South Carolina was charting a particularly aggressive strategy for performance funding, which it later abandoned. In 2009, several states were considering whether to implement performance funding programs (Marklein, 2009; Moltz, 2009a). This study did not find a statistically significant relationship between the existence of performance funding programs and productivity. Perhaps the experimental nature of these programs did not allow for any relationship to mature and become evident. The renewed interest in such programs, though, merits further study of their effectiveness.

Burke and Minassians (2001) also offered possible explanations for the lack of significant productivity effects associated with performance reporting or performance funding programs. They found that performance funding programs were unsettled in 2001, perhaps because state legislatures were unsure of their effectiveness or possibly because state legislatures wanted to retain the prerogative to exercise discretionary solutions, without being tied to a particular prescription, like performance funding. Performance reporting programs had become somewhat ubiquitous at that time, yet did not demonstrate the seriousness that a performance budgeting program conveyed.

Results from Hypothesis #4 - Governance Board Structures

The governing board structures for public universities varied widely in 2001; often universities in the same state were subject to different governing boards. The 398 universities in the complete sample were governed by an assortment of 148 local boards, 67 consolidated boards, and 24 statewide coordinating boards. The combination of governance arrangements in place showed 11 different models used by public universities. The element of board governance that showed a statistically significant relationship with productivity, for both four and six-year graduation rates, was the existence of a local governing board. The 148 public universities with local governing boards showed significantly higher levels of productivity levels than the 250 universities subject to oversight from consolidated governing boards. Early research from Glenny (1959) and a more recent qualitative case study of higher education governance conducted by MacTaggart and Associates (1996) had recommended that states vests a high degree of authority and autonomy in local governance, while placing responsibilities for coordination and accountability in a statewide entity. The least productive arrangement from testing hypothesis #4 was assigning primary governance duties to a consolidated board without any statewide coordination.

Because the existence of a local governing board was associated with higher levels of productivity, it suggested the possibility that the influence of consolidated governing boards may diminish as their scope of jurisdiction increased in terms of the number of entities subject to their oversight. This study, though, found no evidence to support that notion.

The governance duty which showed a statistically significant difference when a secondary level of governance oversight existed was academic program approval. Barak (2007) studied state-level structures for academic program review and approval for over thirty years. He traced the origins of the academic program approval process to South Dakota in 1896. Glenny (1959), Millett (1984), and MacTaggart and Associates (1996) have suggested that states have a means to coordinate academic programming offered by their public universities. In 2001, the majority of public universities were subject to a secondary level of governance for academic program approval. In the complete sample, 263 of the 398 universities were subject to such secondary oversight. For four-year graduation rates, a statistically significant relationship existed between existence of an academic program approval process and productivity. Productivity was higher for universities which were subject to secondary level of academic program approval. This relationship occurred for both local and consolidated governing board models. Again, though, the highest productivity levels were associated with universities subject to the authority of a local governing board and subject to secondary oversight for academic program approval by another entity.

Although secondary oversight of university budgets was a relatively common occurrence (224 of 398 universities in the complete sample had this arrangement), its existence did not reveal a statistically significant difference in graduation rate productivity compared to universities without it. Perhaps the secondary review for budgets was ineffectual because ultimate approval still rested with state legislatures. Conversely, entities with secondary review duties for academic program approval would have been more empowered with final decision-making authority.

Finally, although it was beyond the scope of this study, it is noteworthy that the universities excluded from the study due to unstable governance structures (Florida, West Virginia, and some universities in Colorado) were in the process of adopting a structure similar to the arrangements recommended by MacTaggart and Associates (1996). The effects of the changes in those three states merit further research. Also, it is unclear why the productivity of four-year graduation rates showed significant differences based on the existence of a secondary level of governance for academic program approval, but not the productivity of six-year graduation rates. Perhaps the added scrutiny of academic programs resulted in more emphasis on the timeliness of program completion. Again, more research is needed to address those possibilities.

Results from Hypothesis #5 - Regional Accrediting Agencies

All U.S. public universities must be accredited in order to administer federal financial aid programs. Accreditation duties were dispersed among six regional accrediting agencies. The jurisdiction of these agencies aligned somewhat with the geographic locations of the universities, but the largest agency, the Higher Learning Commission, served universities from across the country. When regional accrediting agencies were included in the MANCOVA models, universities accredited by the Middle States agency (62 of the 398 universities in the complete sample) showed significantly higher productivity levels for both four and six-year rates than universities served by most other agencies. For six-year rates, but not four-year rates, universities accredited by the Western Association of Schools and Colleges (30 of the 398 universities in the complete sample) also showed significantly higher productivity levels than universities accredited through three other accrediting agencies. The Western agency, though, was dominated by universities located in California and may have represented more of that state's influences than influence associated with the accrediting process. The reason for the higher productivity associated with the Middle States agency was beyond the scope of this study. It could be evidence that the isomorphic effects of exchanging best practices is clustered within the jurisdictions of the accrediting agencies. Alternatively, it could be attributed to the distinct processes used by the accrediting agencies. Moreover, it could represent the confounding effects associated with geography, disparate pressures to compete with private universities, or other factors. Clearly, the observation merits further study.

Results from Hypothesis #6 - Interaction of State Accountability Mechanisms

Hypothesis #6 combined the significant factors identified from hypotheses #2A,

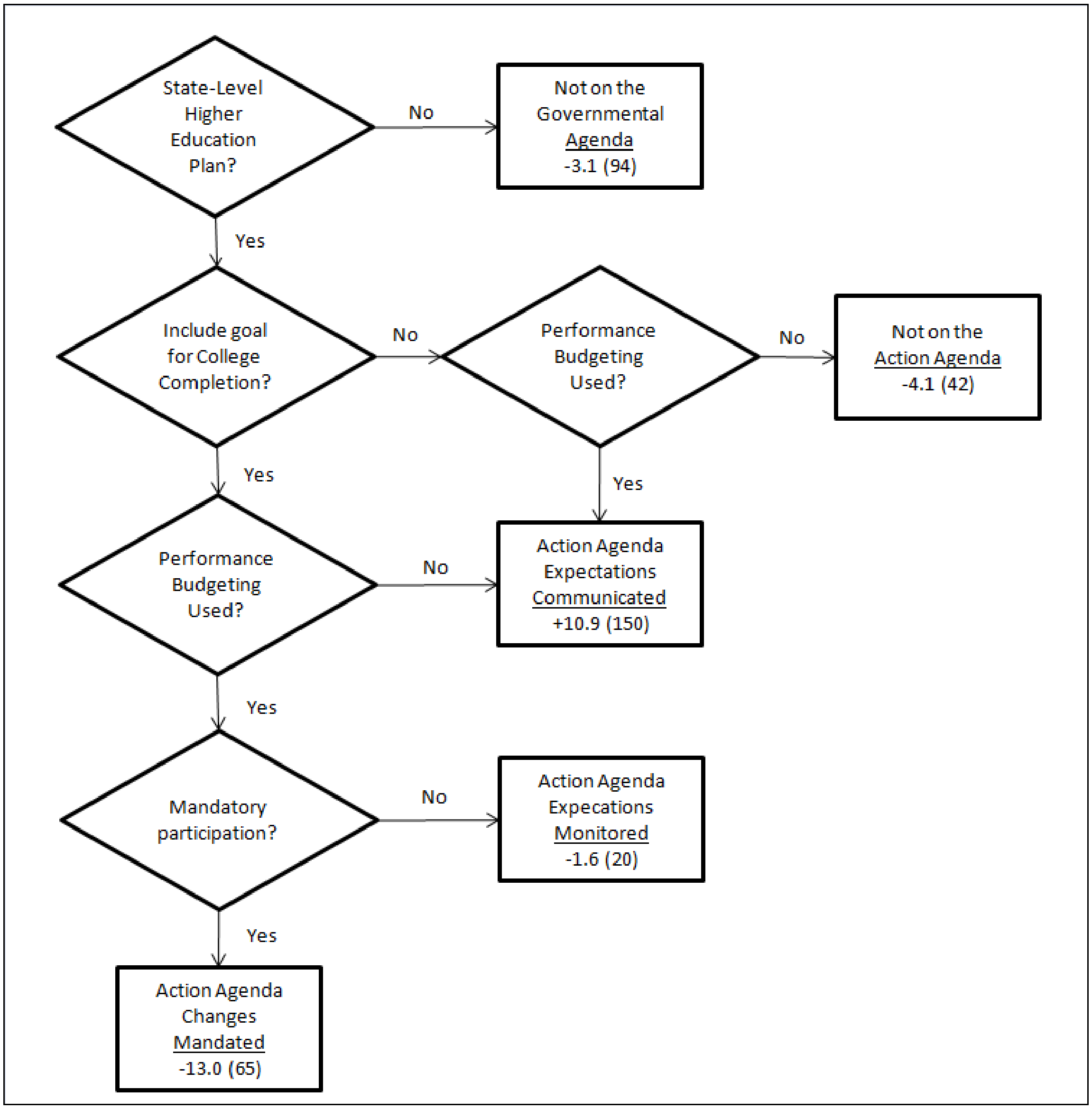
#3A, #4, and #5 and tested whether the interactions of certain factors offered additional explanatory power. It revealed a significant interaction between state-level higher education plans and performance budgeting programs. This interaction provided an intriguing proposition regarding the relationships between state governments and their public universities. Figure 10 shows the various combinations of these two factors.

Figure 10 shows that the highest productivity levels were associated with states which paid attention to their public universities, but did not enact overly aggressive mandates for change. From Kingdon's (1984) perspective, it was better for higher education to be on the governmental agenda than off it, so long as the action agenda was not too demanding.

Public universities which were not on their state's governmental agenda showed mediocre productivity levels in their graduation rates. The lowest productivity was evident for public universities which were on their state's action agenda, were subject to completion goals cited in state-level plans, and had mandatory performance budgeting programs thrust upon them. Perhaps state governments that squeezed public universities too hard for improved productivity ended up with the opposite effect. Too much accountability oversight may have drained energy and attention away from achieving the intended goal. Conversely, perhaps the inertia was more intractable for the least productive universities and had rendered aggressive state actions to be ineffective.

The best productivity results were associated with two scenarios; both implied possible benefits for states using an approach akin to Birnbaum's (1991) collegial model. When state-level plans did not cite college completion as a goal, the use of performance

Figure 10: Combined Effects of State-Level Planning and Performance Budgeting



This analysis is based on six-year graduation rates for the complete sample (See Table 57 for more detailed information). The numbers in the boxes represent the mean productivity levels of universities subject to the combined effects of state-level higher education planning and performance budgeting programs in place. The count of universities is noted parenthetically and does not include universities for which data was suppressed in Table 57.

budgeting was related with high productivity levels. Hypothesis #2B had indicated that state-level plans excluded the completion goal when public universities had reported above average 1999 graduation rates. In that situation, perhaps a performance budgeting process had a reinforcing effect.

In the other scenario, high productivity was associated with universities which had a completion goal in their state-level plan, but were not subject to a performance budgeting process. The plan communicated an expectation for high productivity, but was not coupled with added pressure from performance budgeting process. Again, the results suggest that some accountability may be related to positive results, but too much accountability pressure may produce negative results or be an ineffective solution for when productivity is relatively low.

The results from testing hypothesis #6 also showed one additional interaction which was significant for the productivity of four-year graduation rates. The interaction between state-level plan type and existence of local governing board was significant (see Table 58 in Chapter 4). Most importantly, it showed a divergent result when no state-level plan existed. In that situation, universities with a local governing board showed high productivity levels, while universities with consolidated governing boards showed low productivity levels. Possibly not being on the governmental agenda for the state was compensated by the presence of a local governing board, but aggravated by the absence of a local board.

Putting it all together - A modified punctuated equilibrium model for higher education

This study supported some elements of the simplified punctuated equilibrium model offered by Sastry (1997), but indicated that some modifications may be warranted in a higher education context. The elements of the theory supported by this study include:

- Hypothesis #1 offered reasonable support that internal inertia may have held the performance of public universities stable. Inertia was an important element of the theory because it established that performance was not a random event, but a product of internal processes. Furthermore, the stability of graduation rate performance suggested that universities may have been committed to their practices, reinforcing the power of internal inertia.
- Although hypothesis #1 found relative stability in graduation rates, it also indicated that those universities which were experiencing changes were much more likely to be improving their graduation rates. This observation supports the positive reinforcement associated with internal learning and continuous improvement.
- The supplemental testing associated with hypothesis #2B showed evidence that the external environment was more prone to action when performance was perceived as inappropriate. That test found that states which had below average 1999 graduation rates were more likely to cite college completion as a goal area in their state-level higher education plans, than states which had above average 1999 graduation rates

The results from testing hypotheses #2A, #3A, #4, #5, and #6, though, did find that productivity levels were aligned entirely with the influences exerted from the external environment. The results suggested two modifications may be warranted for applying punctuated equilibrium theory to higher education institutions.

- States must take some action to develop informed perceptions about the appropriateness of the performance of their public universities. State-level higher education plans seemed to provide a good basis for such judgments. Their absence was associated with mediocre performance. High productivity existed when universities were on their state's governmental agenda (Kingdon, 1984).
- Accountability mechanisms required a certain finesse and tuning in order to produce high productivity. Punctuated equilibrium theory anticipated that organizations would resist changes demanded from their external environments until their boundaries were pierced, prompting transformative change. In other words, organizational resistance could be overcome with more aggressive action from the external environment. The results from this study did not support that notion. Low productivity was associated with the most aggressive external environments. High productivity existed when more moderate accountability mechanisms were in place. This observation suggests that Birnbaum's (1991) collegial model may offer greater benefits than a rational model of oversight.

Other Observations

The study also provided some other noteworthy observations. Although these observations were not central to the research question being studied, they emerged from trends apparent from analyzing the dataset.

Graduation Rates on the Rise?

Horner and Berger (2005) observed an increase in persistence rates five years ago, but did not see an improvement in graduation rates. Using more current data, this study found some evidence suggesting that those increased persistence rates may, in fact, have translated into improved graduation rates. Although, the results from testing hypothesis #1 showed that for the most part institutional graduation rates had remained stable over the short-term period of 2005 to 2007, the mean graduation rate for public universities showed a slight increase during that period. As shown in Tables 31 and 32, for the universities tested in hypothesis #1, the mean four-year graduation rates had increased from 23.1% to 24.6% and the mean six-year rates had increased from 47.9% to 48.9%.

The results from hypothesis #1 also showed that when a statistically significant change in institutional rates had occurred, institutions with increased rates far outnumbered institutions with declining rates. Table 31 showed that for four-year graduation rates, 91 universities had a statistically significant improvement in their rates, while rates declined for only 12 universities. Table 32 showed that for six-year graduation rates, 60 universities had a statistically significant improvement in their rates, while rates declined for only 15 universities. Quite possibly, four-year graduation rates had more room for improvement because they had not received the same amount of attention as the six-year rates, which had served as the official measure used by the U.S. Department of Education since enactment of the 1990 Student Right to Know and Campus Security Act (Public Law 101-542).

Finally, the dataset maintained by the Education Trust (2008) for its *CollegeResults.org* Web site, showed a gradual increase in six-year graduation rates for public universities from 1999 to 2007. Their dataset was derived from the U.S. Department of Education IPEDS database. It contained graduation rates data for 371 of the 398 universities included in the complete sample of this study (note: Those 371 universities were not the same ones included in sample subset which excluded HBCUs). The 371 universities had a mean six-year graduation rate of 43.3% in 1999 which rose to 48.9% in 2007. Comparable data for four-year graduation rates was not available. The reasons behind the upward trend in six-year graduation rates needs further study, but may be traced in part to the transparency in graduation rates initiated by the 1990 Student Right to Know and Campus Security Act (Public Law 101-542).

Timely Degree Completion: Four-Year versus Six-Year Graduation Rates

While the 1990 Student Right to Know and Campus Security Act (Public Law 101-542) ensured that data on six-year graduation rates was available widely beginning in the late 1990s, attention to four-year graduation rates has been more recent. The four-year rate has become associated with the idea of timely degree completion and is expected to become a more important indicator of college performance. Zemsky (2009), for example, has advocated more emphasis on universities offering three-year programs for completing baccalaureate programs. This study showed that more variance was unaccounted for with four-year rates than six-year rates. Because attention has been focused on six-year rates for more years, perhaps they have been more likely targets for internal improvement efforts exerted by public universities and more prone to isomorphism.

The final model analyses (See Table 59) did show some differences in the significance of the covariates, depending on whether four or six-year graduation rates were being measured. The variables measuring the gender and racial characteristics of students (percentage white females, percentage Black or Hispanic males, and the diversity index) showed significant effects for four-year rates, but not six-year rates. For example, percentage white females had a significant positive effect on four-year graduation rates (p = .011 in the complete sample and p = .002 in the sample subset), but showed no significance for six-year rates (p = .582 for the complete sample and p = .889 for the sample subset). The reasons for this phenomenon were unclear. Perhaps, on average, white females received more support from family and friends to graduate timely. Possibly, male students, particularly minority males, had more outside commitments that delayed their degree completion. Gender differences in degree choices also could have accounted for some of the differences. Variables were not available to measure those possibilities in this study, but deserve further study.

The institutional characteristic which showed a differential effect for four-year graduation rates compared to six-year rates was the percentage of the student body represented by undergraduates. The percentage of undergraduates had a significant positive effect on six-year graduation rates (p = .009 in the complete sample and p = .026 in the sample subset). That variable, though, showed no statistical significance for four-year graduation rates (p = .929 for the complete sample and p = .989 for the sample subset). This variable is a function of the research mission of the university. As universities enroll more students in graduate programs, their focus becomes more diffused and the needs of undergraduate students may have to compete with the needs of graduate students. Interestingly, the variable did not have a statistically significant effect on four-year graduation rates, suggesting that students committed to finishing their baccalaureate degree in four years may be unaffected by the proportion of graduate students attending the university. Why this factor may affect six-year graduation rates, again is unclear, but deserves further study.

As policymakers focus more attention on timely degree completion, and even innovations like three-year degrees (Zemsky, 2009), more research will be needed to assist universities with discovering successful pathways for those outcomes.

Delimitations

The sampling design used for this study clearly limited its conclusions to the larger set of all public universities. It did not include private universities, community colleges, or universities with smaller numbers of students (fewer than 385) entering in the Fall 2001 academic term. Private universities and community colleges may face unique factors in their external environments that were not captured in the statistical models used for this study. Although the results may apply in some respects to the smaller public universities, the variability associated with such small sample sizes may obscure valid interpretations of the environmental effects.

The study also focused only on cohorts of full-time, first-time students. The results cannot be extended to the productivity of part-time students, transfer students, or students attending multiple universities. The unique needs of preparing those students for graduation deserves further study.

Limitations

The research design did not allow reaching definitive conclusions about causality, despite finding evidence of correlations. The external environments were complex and it was not possible to account for all environmental factors. The study, thus, could not eliminate alternative explanations for the relationships observed. The variables included in this research study served as mere indicators of the conditions that existed outside the boundaries of public universities. Also, the levels identified for these variables required the application of judgment and may not have captured the granularity of available choices. For example, the four levels of state higher education plans were not exhaustive of all possibilities. Other factors which may have affected the effectiveness of the plans include the year of initiation, representation on the planning committee, other goals which may have competed with college completion for focus in the plans, and more.

Also, the definition of organizational effectiveness - college graduation rates - introduced the possibility that universities will be sacrificing other objectives to gain this goal. For example, it could be argued that universities that graduate a higher proportion of students are willing to compromise academic rigor. The design of this study could not consider the potential trade-offs with these other important educational outcomes.

Policy implications

Throughout this chapter, several policy implications have been cited. As painful as it may be for university administrators to be on the governmental agenda of their states, it likely is better than being ignored. State policymakers need to pay attention to their public universities and care about their productivity. In addition, they need to respect the autonomy of these universities and give them space to improve their performance, if necessary. Too much accountability pressure was associated with low productivity levels and may not be an effective improvement strategy under those circumstances. Establishing a collegial relationship between state policymakers and public universities may produce more effective outcomes.

Both policymakers and administrators need to be concerned about matching student needs to the missions of public universities. For cohorts of full-time, first-time students, residential universities outperform non-residential universities. The graduation rates of full-time, first-time cohorts also waned as the percentage of part-time students increased, possibly because focus was diffused among more diverse student needs. Public universities, though, must continue to serve large numbers of non-residential and part-time students. Strategies are needed for serving those students without compromising the productivity of full-time, first-time students.

Finally, the renewed focus on performance funding is somewhat worrisome. Although this study did not detect significant effects associated with performance funding in 2001, it was not a common performance program at that time. The aggressive nature of performance funding may cause public universities to over-invest in defending the results they are producing. It also could penalize universities which are serving under-prepared students or result in a downward spiraling effect for universities which have been experiencing low productivity levels. Accordingly, caution is needed in exercising this funding methodology for higher education.

Opportunities for Future Research

This study only scratched the surface of research opportunities for studying the productivity of U.S universities. Additional research opportunities include:

- <u>Changes in external environments</u> - The study focused on universities that had rather stable external environments in 2001. It excluded universities from three states which were undergoing significant changes in their governance structures. A different research design could attempt to test for relationships between environmental changes and the outcomes produced by those universities.

- Different outcomes - Reported graduation rates were used as the basis for determining the productivity of the universities. Different measures, based on factors such as access or affordability may have produced different results. Also, other methods for evaluating graduation rates could be considered. For example, Archibald and Feldman (2008) proposed using a production frontier approach, which would compare university graduation rates to the best-in-class performances of other universities.
- Makeup of Local Boards - The study treated all local governing boards the same. Possibly differences among the boards based on how members were appointed, frequency of meetings, committee structures, or other characteristics would reveal more insights.
- The Middle States Regional Accrediting Agency - Why this regional accrediting agency was associated with higher than average productivity levels is unknown. A qualitative study could be conducted to compare the criteria related to graduation rates or assessments of student learning used by the six regional accrediting agencies.
- Applicability to Private Universities - Are private universities more insulated from their external environments or more sensitive to them? Extending this study to include private universities may provide a richer understanding of designing

effective accountability mechanisms.

- Effectiveness of Performance Funding - As performance funding emerges as a more common accountability mechanism, its effectiveness should be studied carefully. This study suggested that its aggressiveness may be detrimental or ineffectual for public universities, but insufficient data was available to address that concern fully.
- Improving the Academic Preparedness of Entering Students - Given the magnitude of the effects related to academic ability, perhaps the most important body of research will continue to focus on improving the academic preparedness of incoming college students or helping them overcome shortcomings in their academic preparation as soon as possible after they enter college.

Closing Thought

As college graduation rates assume a more prominent position on the national agenda, it behooves state governments to temper their pressures on their public universities. They are advised to communicate their expectations clearly, and establish a collegial relationship with their public universities. In the meantime, public universities should continue their efforts to improve graduation rates. This study suggests that focused institutional missions and increased residential housing opportunities may be among the most fruitful strategies.

References

Adelman, C. (2006). *The toolbox revisited: Paths to degree completion from high school through college*. Washington. DC: U.S. Department of Education.

Agresti, A., & Finlay, B. (1997). *Statistical methods for the social sciences* (3rd ed.). Upper Saddle River, NJ: Prentice Hall, Inc.

Almanac Issue (2008, August 15). *Chronicle of Higher Education.*

Almanac Issue (2010, August 27). *Chronicle of Higher Education.*

Altbach, P., Berdahl, R., & Gumport, P. (2005). *American higher education in the twenty-first Century: Social, political, and economic challenges (2nd Ed.).* Baltimore: The John Hopkins University Press.

American Association of State Colleges and Universities & National Association of State Universities and Land Grant Colleges (2008). *Voluntary system of accountability.* Retrieved November 2, 2008, on-line at http://www.voluntarysystem.org/index.cfm.

Archibald, R., & Feldman, D. (2008). Graduation rates and accountability: Regression versus production frontier. *Research in Higher Education, 49*(1), 80-100.

Asimov, N. (2009, June 19). UC faculty attack regents in scathing letter. *San Francisco Chronicle.* Retrieved on June 19,2009 from http://www.sfgate.comcgi.?f=/c/a/2009/06/19/MN73189OUH.DTL&type= printable.

Association of Community College Trustees (2008). The citizen trustee: Profile in leadership. Retrieved December 28, 2008, on-line at http://www.acct.org/Citizen%20Trustee%20Initial%20Findings.pdf

Astin, A. (1993a). *Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education*. New York: American Council on Education/Oryx Series on Higher Education.

Astin, A. (1993b). *What matters in college? Four critical years revisited.* San Francisco: Jossey-Bass.

Astin, A. (2004, October 22). To use graduation rates to measure excellence, you have to do your homework. *Chronicle of Higher Education.*

Astin, A., Keup, J., & Lindholm, J. (2002). A decade of changes in undergraduate education: A national study of system "transformation." *Review of Higher Education, 25*, 141-162.

Barak, R. (2007). *Thirty years of academic review and approval by state postsecondary coordinating and governing boards.* Denver: State Higher Education Executive Officers.

Bastedo, M. (2009). Convergent institutional logics in public higher education: State policymaking and governing board activities. *Review of Higher Education, 32*(2), 209-234.

Berger, J., & Braxton, J. (1998). Revising Tinto's interactionalist theory of student departure through theory elaboration: Examing the role of organizational attributes in the persistence process. *Research in Higher Education, 39* (2).

Bess, J., & Dee, J. (2008). *Understanding college and university organizations: Theories for effective policy and practice*. Sterling, VA: Stylus.

Birnbaum, R. (1991*). How colleges work: The cybernetics of academic organizations and leadership.* San Francisco: Jossey-Bass.

Bolman, L., & Deal, T. (2003). *Reframing organizations: Artistry, choice, and leadership (3rd Ed.).* San Francisco: Jossey-Bass Publishers.

Bowen, W., Chingos, M., & McPherson, M. (2009). *Crossing the finish line: Completing college at America's public universities.* Princeton, New Jersey: Princeton University Press.

Bracco, K., Richardson, R., Callan, P., & Finney, J. (1999). Policy environments and system design: Understanding state governance structures. *The Review of Higher Education, 23*(1), 23-44.

Braxton, J., & Hirschy, A. (2004). Reconceptualizing antecedents of social integration in student departure. In M. Yorke & B. Longden (Eds.), *Retention and student success in higher education.* (pp. 89-102). London: Society for Research into Higher Education & Open University Press.

Braxton, J., Sullivan, A., & Johnson, R. (1997). Appraising Tinto's theory of college student departure. In J. Smart (ed.) *Higher Education: Handbook of Theory and Research, 12*, 107-64. New York: Agathon.

Brubacher, J., & Rudy, W. (2004). *Higher education in transition: A history of American colleges and universities (4th Ed.).* New Brunswick: Transaction Publishers.

Burke, J. (2001, May). Accountability, reporting, and performance: Why haven't they made more difference? Keynote address presented at the *Annual Conference of the Research and Planning Group for California Community Colleges*. Lake Arrowhead, CA.

Burke, J. (2005). *Achieving accountability in higher education.* San Francisco: Jossey-Bass.

Burke, J., & Minassians, H. (2001). Linking state resources to campus results: From fad to trend: The fifth annual survey (2001). *The Nelson A. Rockefeller Institute of Government.* Albany, New York.

Capaldi, E. Lombard, J., & Yellen, V. (2006). Improving graduation rates: A simple method that works. *Change* (July/August), 44-50.

Carey, K. (2004). *A matter of degrees: Improving graduation rates in four-year colleges and universities*. Washington, DC: The Education Trust.

Carver, J. (1997). *Boards that make a difference: A new design for leadership in nonprofit and public organizations (2nd Ed.).* San Francisco: Jossey-Bass.

Chang, M. (1999). Does racial diversity matter? The educational impact of a racially diverse undergraduate population. *Journal of College Student Development*, *40*(4), 377-395.

Chen, X. (2005). *First-generation students in postsecondary education: A look at college transcripts*. U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Chen, X. (2007). *Part-time undergraduates in postsecondary education: 2003-04* (NCES 2007-165). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Chickering, A., & Resisser, L. (1993). *Education and identity (2nd Ed.).* San Francisco: Jossey-Bass.

Clark, B., & Youn, T. (1976). Academic power in the United States: Comparative, historical and structural perspectives. *AAHE-ERIC Higher Education Research Report No. 3*, 10-43.

Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Cohen, M., & March, J. (1974). *Leadership and ambiguity: The American college presidency (2nd Ed.).* Boston: Harvard Business Press.

Cope, R., & Hannah, W. (1975). *Revolving college doors: The causes and consequences of dropping out, stopping out, and transferring.* New York: John Wiley & Sons.

Council on Higher Education Accreditation (2009). *Database of Institutions and Programs.* Retrieved April 4, 2009, from http://www.chea.org/search/search.asp.

Dodd, A. (2004). Accreditation as a catalyst for institutional effectiveness. *New Directions for Institutional Research, 102*, 13-25.

Duryea, E. (1973). Evolution of university organization. In J. A. Perkins *The university as an organization* (pp. 55-77). New York: McGraw Hill.

Education Commission of the States (2001). *ECS State Notes: Governance Postsecondary - State Master/Strategic Plans for Postsecondary Education.* Retrieved February 16, 2009 from www.ecs.org/clearinghouse/31/14/3114.pdf.

Education Commission of the States (2008). *ECS State Notes: Governance Postsecondary - System/Institutional Governing Boards.* Retrieved February 16, 2009 from www.ecs.org.

Elton, L. (2004). Goodhart's law and performance indicators in higher education. *Evaluation and Research in Education, 18 (1&2*), 120-128.

Engle, J., & Tinto, V. (2008). *Moving beyond access: College success for low-income, first-generation students.* The Pell Institute for the Study of Opportunity in Higher Education.

Feldman, K., Smart, J., & Ethington, C. (2004). What do college students have to lose? Exploring the outcomes of differences in person-environment fits. *The Journal of Higher Education, 75*(5), 528-555.

Gaither, G. (1999). *The multicampus system: Perspectives on practice and prospects*. Sterling, Virginia: Stylus Publishing, LLC.

Gilmore, J. (1990). *Price and quality in higher education*. Washington, D.C.: Office of Educational Research and Improvement.

Glenny, L. (1959). *Autonomy of public colleges: The challenge of coordination.* New York: McGraw-Hill Book Company, Inc.

Gose, B. (2008, November 21). Gates Fund creates plan for college completion. *Chronicle of Higher Education.*

Gould, S. (1989). Punctuted equilibrium in fact and theory. *Journal of Social Biological Structure*, *12*, 117-136.

Gross, D. (2005). State governance structures and higher education performance: An examination of structures and performance in 46 states. *Dissertations Abstracts International, 67* (02).

Hauptman, A. (2001). Reforming the ways in which states finance higher education. In D. E. Heller (Ed.) 2001. *The states and public higher education policy: Affordability, access, and accountability* (pp. 64-80). Baltimore: The Johns Hopkins University Press.

Hebel, S. (2000, September 29). Colorado urged to start charter colleges. *Chronicle of Higher Education.*

Hebel, S. (2008, December 12). U.S. Falling behind on education and lacks data, report card finds. *Chronicle of Higher Education.*

Heller, D. (2005). Public subsidies for higher education in California: An exploratory analysis of who pays and who benefits. *Educational Policy, 19(2)*, 349-370.

Hernandez, A. (2009). Changing the measure of success for HBCUs. *Diverse Education.* Retrieved December 16, 2009, from http://diverseeducation.com/cache/print.php?articleId=13270.

Higher Learning Commission (2008). *Academic quality improvement program*. Retrieved on-line on July 21, 2008 at http://www.aqip.org/index.php.

Hines, E. (2000). The governance of higher education. In J.C. Smart (Ed.)., *Higher Education: Handbook of Theory and Research xv* (pp. 105-155). Bronx, NY: Agathon Press.

Hollander, T. (1994, April 20). Coordinating boards under attack. *The Chronicle of Higher Education*.

Horn, L., & Berger, R. (2005). *College persistence on the rise? Changes in 5-Year degree completion and postsecondary persistence rates between 1994 and 2000.* (NCES 2005-156). U.S. Department of Education, National Center for Education Statistics Washington, D.C.: U.S. Government Printing Office.

Howell, D. (2007). *Statistical methods for psychology* (6^{th} Ed.). Belmont, CA: Thomson Wadsworth.

Kaplan, R., & Norton, D. (1996). *The balanced scorecard: Translating strategy into action*. Boston: Harvard Business Press.

Karathanos, D., & Karathanos, P. (2005). Applying the balanced scorecard to education. *Journal of Education for Business,* (March/April 2005), 222-230.

Kauffman, J. (1980). *At the pleasure of the board.* Washington, DC: American Council on Education.

Kerr, C. (1971). Foreward. In E.C. Lee & F.M. Bowen, *The Multicampus university* (pp. xi-xix). Berkeley, California: The Carnegie Commission on Higher Education.

Kingdon, J. (1984). *Agendas, alternatives, and public policies*. Boston: Little, Brown and Company.

Klein, A., & Smittle, W. (1933). Legal bases for Co-ordination. *The Journal of Higher Education, 4* (3), 146-150 and 164.

Knapp, L.G., Kelly-Reid, J.E., & Ginder, S.A. (2009). *Enrollment in postsecondary institutions. Fall 2007; graduation rates, 2001 & 2004 cohorts; and financial statistics, fiscal year 2007 (NCES 2009-155).* U.S. Department of Education. Washington, D.C.: National Center for Education Statistics. Retrieved June 12, 2009, from http://nces.ed.gov/pubs2009/2009155.pdf.

Kuh, G., Kinzie, J., Schuh, J., & Whitt, E. (2005). *Student success in college: Creating conditions that matter.* San Francisco: Jossey-Bass.

Kuh, G. (2008, December 12). Diagnosing why some students don't succeed. *Chronicle of Higher Education.*

Kutner, M., Nachtscheim, C., Neter, J., & Li, W. (2005). *Applied linear statistical models (5th Ed.).* New York: The McGraw-Hill Companies, Inc.

Laden, B., Milem, J., & Crowson, R. (2004). New institutional theory and student departure. In J. M. Braxton (Ed.) *Reworking the student departure puzzle.* Nashville: Vanderbilt University Press.

Leppel, K. (2001). The impact of major on college persistence among freshmen. *Higher Education*, *41*, 327-342.

Lindblom, C. (1959). The science of muddling through. *Public Administration Review, 19*, 79-88.

Lumina Foundation for Education (2008, December 16). *Press release: Lumina foundation awards grants to 11 states to graduate more students by making higher education more efficient and cost effective.* Retrieved December 23, 2008 from www.makingopportunityaffordable.org/files/20081216_moa_press_release.pdf

MacTaggart, T., & Associates (1996). *Restructuring higher education: What works and what doesn't in reorganizing governing systems.* San Francisco: Jossey-Bass Publishers.

Marklein, M. (2009, May 27). State may link college funding to graduation rates. *USA Today.*

McDonald, J. (2009). *Handbook of Biological Statistics (2nd Ed.).* Baltimore: Sparky House Publishing. Retrieved February 7, 2010, from http://udel.edu/~mcdonald/statnested.html.

McGuinness, A. (2002a). *The authority of state boards of postsecondary education. Denver: Education Commission of the States.* Retrieved December 20, 2008, from http://www.ecs.org/clearinghouse/42/87/4287.pdf .

McGuinness, A. (2002b). *Reflections on postsecondary governance changes. Denver: Education Commission of the States.* Retrieved December 22, 2008 from http://www.ecs.org/clearinghouse/37/76/3776.doc.

McKeown-Moak, M. (1999). Higher education funding formulas. *New directions for higher education, 107*, 99-107.

McLendon, M. (2003). Setting the governmental agenda for state decentralization of higher education. *The Journal of Higher Education, 74* (5), 479-515.

Meyer, J., & Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. In J. M. Shafritz, J. S. Ott, & Y. S. Jang (Eds.) 2005. *Classics of organization theory (6th Ed.)*. Belmont, CA: Thomson Wadsworth.

Midwestern Higher Education Compact (2009). *Completion-based funding for higher education.* Minneapolis, MN.

Millett, J. (1984). *Conflict in higher education: State government coordination versus institutional independence.* San Francisco, Josey- Bass Publishers.

Mills, M. (2007). Stories of politics and policy: Florida's higher education governance reorganization. *The Journal of Higher Education, 78* (2), 162-187.

Mingle, J. (1997). Effective coordination of higher education: What is it? Why is it so difficult to achieve? In L.F. Goodchild, C.D. Lovell, E.R. Hines, & J. I. Gill (Eds.) 1997. *ASHE reader series: Public policy and higher education* (pp. 410-420). Boston: Pearson Custom Publishing.

Minnesota State Colleges and Universities (2008). *Instructional data by institution.* Retrieved December 8, 2008 on-line from http://www.finance.mnscu.edu/budget/allocations/docs/2007fy_instruction_detail_by_institution.xls.

Minor, J. (2008). The relationship between selection processes of public trustees and state higher education performance. *Educational Policy, 22 (6)*, 830-853.

Mintzberg, H. (1979). The five basic parts of the organization. In J. M. Shafritz, J. S. Ott, & Y. S. Jang (Eds.) 2005. *Classics of organization theory (6th Ed.)*. Belmont, CA: Thomson Wadsworth.

Mitchell, T. (1997). Border crossings: Organizational boundaries and challenges to the American professoriate. *Daedalus, 126(*4), 265-292.

Moltz, D. (2009a, May 5). Competing completion initiatives. *Inside Higher Ed.* Retrieved May 5, 2009 from http://www.insidehighered.com/layout/set/print/news/2009/05/05/completion.

Moltz, D. (2009b, June 17). Trustee troubles. *Inside Higher Ed.* Retrieved June 18, 2009 from http://www.insidehighered.com/layout/set/print/news/2009/06/17/rogue.

Moore, R. (2007). Graduation rates continue to rise on Twin Cities campus. *UMNEWS.* Minneapolis: University of Minnesota. Retrieved January 19, 2009, on-line from http://www1.umn.edu/umnnews/Feature_Stories/Graduation_rates_continue_to_rise_on_Twin_Cities_campus.html# .

National Center for Public Policy and Higher Education (2008). *Measuring up 2008: The National report card on higher education.* Retrieved January 19, 2009, on-line from http://measuringup2008.highereducation.org/print/NCPPHEMUNationalRpt.pdf .

National Conference of State Legislatures (2008). *Big questions, practical answers: New strategies for setting and moving a higher education agenda.* Retrieved December 26, 2008, on-line from www.ncsl.org/print/educ/NCSLBroFnlPFR.pdf.

National Survey of Student Engagement (2008a). *Benchmarks of effective educational practice.* Bloomington, Indiana: Indiana University Center for Postsecondary Research. Retrieved January 19, 2009, on-line from http://nsse.iub.edu/pdf/NSSE_benchmarks.pdf.

National Survey of Student Engagement (2008b). *Promoting engagement for all students: The Imperative to look within – 2008 results.* Bloomington, Indiana: Indiana University Center for Postsecondary Research. Retrieved January 1, 2009, on-line from http://nsse.iub.edu/NSSE_2008_Results/docs/withhold/NSSE2008_Results_revised_11-14-2008.pdf.

Nutting, M. (2003). Part-time faculty: Why should we care? *New Directions for Higher Education, 123,* 33-39.

Obama, B. (2009, February 24). *Remarks of President Barack Obama - Address to Joint Session of Congress.* Washington DC: White House Press Release.

O'Neil Jr., H., & Bensimon, E. (1999). Designing and implementing an academic scorecard. *Change, 31*(6), 32-40.

Pascarella, E. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. In J.C. Smart (Ed.) *Higher education: A handbook of theory and research 1,* (pp. 1-61). Bronx, NY: Agathon Press.

Pascarella, E., & Terenzini, P. (2005). *How college affects students*. San Francisco: Jossey-Bass Publishers.

Peterson, K. F. (2006). Changing their majors: How do students choose their majors and why do so many change? Ph.D. dissertation, University of Minnesota, United States -- Minnesota. Retrieved June 13, 2009, from *Dissertations & Theses @ CIC Institutions database*. (Publication No. AAT 3207663).

Peterson, M., & Augustine, C. (2000). External and internal influences on institutional approaches to student assessment: Accountability or improvement? *Research in Higher Education, 41*(4), 443-479.

Pfeffer, J., & Salancik, G. (1978). External Control of Organizations: Formal Structure as Myth and Ceremony. In J. M. Shafritz, J. S. Ott, & Y. S. Jang (Eds.) 2005. *Classics of organization theory (6th Ed.)*. Belmont, CA: Thomson Wadsworth.

Porter, S. (1999). The robustness of the "graduation rate performance" indicator used in the U.S. News and World Report college ranking. *Paper presented at the 2nd AIR-CASE conference.* Washington, D.C.: Georgetown University.

Presley, J., & Leslie, D. (1999). Understanding strategy: An assessment of theory and practice. In J. C. Smart (Ed.) 1999. *Higher education: Handbook of theory and practice, xiv (*pp. 201-239). Bronx, NY: Agathon Press.

Rainey, H. (1960). How shall we control our universities? Why college presidents leave their jobs. *The Journal of Higher Education, 31* (7), 376-383.

Ryan, J. (2004). The relationship between institutional expenditures and degree attainment at baccalaureate colleges. *Research in Higher Education, 45*(2), 97-114.

Sastry, M. (1997). Problems and paradoxes in a model of punctuated organizational change. *Administrative Science Quarterly*, 42(2), 237-275.

Satterthwaite, J. (1946). An approximate distribution of estimates of variance components. *Biometrics Bulletin*, *2(6)*, 110-114.

Schmidt, P. (2001, March 23). Weakening the grip of multicampus boards. *The Chronicle of Higher Education*, A24.

Schmidt, P. (2003, May 16). Happily stuck in a power vacuum. *The Chronicle of Higher Education*, A23.

Scott, W. (1987). The adolescence of institutional theory. *Administrative Science Quarterly, 32*, 493-511.

Searching for signs of engagement. (2008, November, 9). *USA Today*. Retrieved January 1, 2009, on-line from www.usatoday.com/news/education/2008-11-09_nsselist_N.htm.

Selingo, J. (2000, March 31). West Virginia lawmakers vote to revamp college system. *The Chronicle of Higher Education*, A41.

Simon, H. (1946). The proverbs of administration. In J. M. Shafritz, J. S. Ott, & Y. S. Jang (Eds.) 2005. *Classics of organization theory (6th Ed.)*. Belmont, CA: Thomson Wadsworth.

Skelton, R. (1959). Factors Governing Retention in College. *The Modern Language Journal, 43*, 143-146.

Snyder, J. (1995, March 3). Decentalization in Illinois. *The Chronicle of Higher Education.*

St. Clair, S., & Cohen, J. (2009, June 8). University of Illinois application cloud list fallout grows. *Chicago Tribune.* Retrieved on July 5, 2009 from http://www.chicagotribune.com/news/local/chi-college-clout-08-jun08,0,346433,print.story.

Tabachnick, B., & Fidell, L. (2007). *Using Multivariate Statistics (5th Ed.)*. Boston: Pearson Education, Inc.

Taylor, F. (1916). The principles of scientific management. In J. M. Shafritz, J. S. Ott, & Y. S. Jang (Eds.) 2005. *Classics of organization theory (6th Ed.)*. Belmont, CA: Thomson Wadsworth.

The Education Trust (2008). *College results online*. Retrieved July 21, 2008 from http://collegeresults.org/.

Thompson, J. (1967). Organizations in action. In J. M. Shafritz, J. S. Ott, & Y. S. Jang (Eds.) 2005. *Classics of organization theory (6th Ed.)*. Belmont, CA: Thomson Wadsworth.

Tierney, W. (1992). An anthropological analysis of student participation in college. *Journal of Higher Education*, *63*(6), 603-618.

Tinto, V. (1993). *Leaving college: rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.

Titus, M. (2004). An Examination of the influence of institutional context on student persistence at 4-year colleges and universities: A Multilevel approach. *Research in Higher Education*, *45*(7), 673-699.

Trow, M. (1970). Reflections on the transition from mass to universal higher education. In S. Graubard & G. Ballotti (Eds). *The embattled university*, 1-42. New York: George Braziller.

U.S. Department of Commerce (2008). *The Baldrige national quality program: Educational criteria for performance excellence.* Washington DC: U.S. Department of Commerce, National Institute of Standards and Technology.

U.S. Department of Education (2003). *Percentage distribution of enrollment completion status of first-time postsecondary students starting during the 1995-96 academic year, by type of institution and other student characteristics.* Washington, DC: U.S. Department of Education, National Center for Education Statistics, 1996/01 Beginning Postsecondary Students Longitudinal Study (BPS:96/01).

U. S. Department of Education. (2006). *A Test of Leadership: Charting the Future of U.S. Higher Education.* Washington, DC.

U.S. Department of Education (2008). *Integrated postsecondary education data system: Glossary – Graduate rates (GRS).* Washington, DC: U.S. Department of Education, National Center for Education Statistics, Retrieved November 2, 2008, from http://nces.ed.gov/ipeds/glossary/index.asp?id=812.

U.S. Department of Education (2009). *Financial Aid for Postsecondary Students: Accreditation in the United States.* Retrieved on July 3, 2009, from http://www.ed.gov/admins/finaid/accred/accreditation_pg14.html#Recognition Criteria.

U.S. Department of Education (2010). *Digest of Educational Statistics: 2009.* Retrieved September 19, 2010, from http://nces.ed.gov/programs/digest/.

U.S. General Accounting Office (2003). *College completion: Additional efforts could help Education with its completion goals.* U.S. General Accounting Office. Washington, DC.

U.S. Office of Management and Budget (2009). *President Obama's Fiscal 2010 Budget: Opening the Doors of College and Opportunity*. Retrieved May 10, 2009 from http://www.whitehouse.gov/omb/fy2010_key_college/.

Van de Ven, A., & Poole, M. (1995). Explaining development and change in organizations. *The Academy of Management Review, 20* (3), 510-540.

Weber, M. (1922). Bureaucracy. In J. M. Shafritz, J. S. Ott, & Y. S. Jang (Eds.) 2005. *Classics of organization theory (6th Ed.)*. Belmont, CA: Thomson Wadsworth.

Weick, K. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly, 21*, 1-19.

Wiley, J. (2009). Quality, accreditation, and graduate education: What does the future hold? *Inside Accreditation, 5* (3). Retrieved on June 24, 2009, from http://www.chea.org/ia/IA_2009.04.14.html.

Woodley, S. (2005). A critical analysis of the effect of performance funding and budgeting systems on university performance. *Dissertations Abstracts International, 66* (06), 2134. (UMI No. 932364891).

Zemsky, R. (2009). *Making reform work: The case for transforming American higher education.* New Brunswick, New Jersey: Rutgers University Press.

Zheng, H., & Stewart, A. (2000, May). *Assessing the effectiveness of public research universities: Using NSF/NCES data and data envelopment analysis technique.* Paper presented at the Annual Forum of the Association of Institutional Research.

Zumeta, W. (2001). Public policy and accountability in higher education: Lessons from the past and present for the new millennium. In D. S. Heller (Ed.), 2001. *The States and public higher education policy: Affordability, access, and accountability*. Baltimore: The Johns Hopkins Press, 155-197.

Appendix A: U.S. Public Universities Included in the Complete Sample

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
University of Alaska Anchorage	AK	701	6.6%	22.1%
University of Alaska Fairbanks	AK	516	8.9%	30.6%
Alabama A & M University[a]	AL	1,038	13.3%	33.2%
Alabama State University[a]	AL	1,263	11.6%	27.3%
Auburn University Main Campus	AL	3,739	34.3%	63.4%
Auburn University-Montgomery	AL	475	9.9%	26.9%
Jacksonville State University	AL	874	16.7%	37.9%
The University of Alabama	AL	2,384	38.6%	65.1%
Troy University	AL	959	22.0%	42.9%
University of Alabama at Birmingham	AL	1,224	14.3%	37.7%
University of Alabama in Huntsville	AL	592	14.0%	44.1%
University of Montevallo	AL	522	24.5%	47.1%
University of North Alabama	AL	816	18.0%	40.7%
University of South Alabama	AL	1,097	14.6%	36.7%
Arkansas State University-Main Campus	AR	1,594	19.4%	37.5%
Arkansas Tech University	AR	1,195	19.7%	38.5%
Henderson State University	AR	478	16.3%	32.6%
Southern Arkansas University Main Campus	AR	552	11.2%	33.9%
University of Arkansas at Little Rock	AR	703	8.1%	18.6%
University of Arkansas Main Campus	AR	2,190	32.8%	58.0%
University of Arkansas at Pine Bluff[a]	AR	699	13.9%	32.9%
University of Central Arkansas	AR	1,668	22.0%	42.4%
Arizona State University at the Tempe Campus	AZ	5,950	27.7%	55.5%
Northern Arizona University	AZ	2,146	28.4%	48.2%
University of Arizona	AZ	5,727	32.7%	56.1%
California Polytechnic State University-San Luis Obispo	CA	2,957	21.3%	66.1%
California State Polytechnic University-Pomona	CA	2,412	9.5%	48.9%
California State University-Bakersfield	CA	610	14.1%	39.8%
California State University-Chico	CA	2,092	15.0%	52.4%
California State University-Dominguez Hills	CA	561	4.6%	28.2%
California State University-East Bay	CA	692	10.8%	39.9%
California State University-Fresno	CA	1,946	14.1%	48.1%
California State University-Fullerton	CA	2,772	15.0%	49.9%
California State University-Long Beach	CA	4,324	9.7%	46.8%

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
California State University-Los Angeles	CA	1,223	9.6%	31.3%
California State University-Monterey Bay	CA	559	11.8%	36.1%
California State University-Northridge	CA	3,168	9.0%	40.5%
California State University-Sacramento	CA	2,278	9.7%	42.4%
California State University-San Bernardino	CA	1,273	10.0%	38.3%
California State University-Stanislaus	CA	516	18.6%	51.6%
Humboldt State University	CA	725	11.2%	41.5%
San Diego State University	CA	3,338	19.9%	56.4%
San Francisco State University	CA	1,820	11.5%	44.2%
San Jose State University	CA	2,577	7.2%	42.0%
Sonoma State University	CA	1,018	25.3%	55.5%
University of California-Berkeley	CA	3,847	60.9%	88.1%
University of California-Davis	CA	4,400	42.6%	79.1%
University of California-Irvine	CA	3,986	51.4%	79.6%
University of California-Los Angeles	CA	4,241	66.2%	90.0%
University of California-Riverside	CA	2,458	38.2%	65.9%
University of California-San Diego	CA	3,981	56.4%	84.3%
University of California-Santa Barbara	CA	3,628	49.9%	79.9%
University of California-Santa Cruz	CA	2,939	45.7%	68.3%
Colorado School of Mines	CO	595	41.2%	67.2%
Colorado State University	CO	3,683	34.9%	62.3%
Colorado State University-Pueblo	CO	634	18.1%	36.3%
University of Colorado at Boulder	CO	4,962	40.6%	67.4%
University of Colorado at Colorado Springs	CO	785	21.8%	40.6%
University of Colorado Denver	CO	492	12.8%	39.0%
University of Northern Colorado	CO	2,108	29.6%	48.4%
Central Connecticut State University	CT	1,261	13.4%	44.3%
Eastern Connecticut State University	CT	828	29.7%	48.3%
Southern Connecticut State University	CT	1,429	9.4%	37.6%
University of Connecticut	CT	3,087	54.1%	74.6%
Western Connecticut State University	CT	834	13.3%	37.9%
Delaware State University[a]	DE	686	15.6%	37.3%
University of Delaware	DE	3,362	63.9%	77.5%
Albany State University[a]	GA	420	18.8%	41.4%
Armstrong Atlantic State University	GA	538	7.2%	24.5%
Augusta State University	GA	719	7.0%	24.3%
Columbus State University	GA	752	11.2%	32.3%

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
Fort Valley State University[a]	GA	408	14.7%	32.4%
Georgia College & State University	GA	879	23.1%	46.4%
Georgia Institute of Technology-Main Campus	GA	2,223	33.1%	77.7%
Georgia Southern University	GA	2,632	16.5%	45.1%
Georgia State University	GA	2,136	16.7%	47.2%
Kennesaw State University	GA	1,314	7.7%	32.6%
North Georgia College & State University	GA	625	23.7%	47.8%
Savannah State University[a]	GA	440	13.2%	40.5%
University of Georgia	GA	4,459	47.9%	77.0%
University of West Georgia	GA	1,551	12.5%	36.8%
Valdosta State University	GA	1,517	17.5%	41.1%
University of Hawaii at Hilo	HI	400	13.3%	36.3%
University of Hawaii at Manoa	HI	1,521	14.7%	54.8%
Iowa State University	IA	4,589	31.9%	65.8%
University of Iowa	IA	3,930	39.6%	65.9%
University of Northern Iowa	IA	2,055	32.4%	65.2%
Boise State University	ID	1,646	6.2%	26.0%
Idaho State University	ID	1,480	3.6%	19.9%
University of Idaho	ID	1,642	20.7%	53.0%
Chicago State University	IL	395	4.1%	16.2%
Eastern Illinois University	IL	1,431	31.1%	60.3%
Illinois State University	IL	3,331	39.5%	65.2%
Northeastern Illinois University	IL	964	2.2%	18.7%
Northern Illinois University	IL	2,792	26.0%	52.3%
Southern Illinois University Carbondale	IL	2,085	24.0%	45.7%
Southern Illinois University Edwardsville	IL	1,573	21.1%	44.8%
University of Illinois at Chicago	IL	2,637	22.4%	50.0%
University of Illinois at Urbana-Champaign	IL	6,209	62.6%	81.9%
Western Illinois University	IL	1,677	33.2%	56.6%
Ball State University	IN	3,542	30.1%	57.7%
Indiana State University	IN	2,018	20.5%	41.2%
Indiana University-Bloomington	IN	6,662	50.3%	71.9%
Indiana University-Purdue University-Fort Wayne	IN	1,293	5.3%	23.1%
Indiana University-Purdue University-Indianapolis	IN	2,020	9.3%	31.5%
Indiana University-South Bend	IN	695	5.8%	26.5%

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
Indiana University-Southeast	IN	718	7.9%	29.0%
Purdue University-Calumet Campus	IN	863	4.3%	19.9%
Purdue University-Main Campus	IN	6,082	36.5%	69.1%
Purdue University-North Central Campus	IN	509	1.6%	13.0%
University of Southern Indiana	IN	1,845	12.8%	30.7%
Emporia State University	KS	695	22.2%	45.2%
Fort Hays State University	KS	713	21.2%	47.8%
Kansas State University	KS	3,358	24.9%	58.3%
Pittsburg State University	KS	822	45.1%	51.0%
University of Kansas	KS	4,024	31.5%	59.7%
Washburn University	KS	469	19.4%	47.1%
Wichita State University	KS	1,061	17.3%	42.0%
Eastern Kentucky University	KY	1,703	11.6%	38.9%
Morehead State University	KY	1,258	14.7%	41.1%
Murray State University	KY	1,299	32.6%	50.7%
Northern Kentucky University	KY	1,719	8.7%	31.8%
University of Kentucky	KY	3,094	30.4%	61.1%
University of Louisville	KY	2,208	15.9%	43.7%
Western Kentucky University	KY	2,118	30.7%	49.3%
Grambling State University[a]	LA	879	10.7%	30.4%
Louisiana State University - Main Campus	LA	5,214	24.6%	58.4%
Louisiana State University-Shreveport	LA	461	9.1%	26.0%
Louisiana Tech University	LA	1,709	28.1%	48.0%
McNeese State University	LA	1,281	11.8%	34.4%
Nicholls State University	LA	1,067	11.3%	29.8%
Northwestern State University of Louisiana	LA	1,137	17.4%	37.9%
Southeastern Louisiana University	LA	1,974	10.1%	32.3%
Southern University and A & M College[a]	LA	1,168	6.4%	29.8%
University of Louisiana at Lafayette	LA	2,299	14.0%	41.0%
University of Louisiana at Monroe	LA	1,158	11.1%	31.1%
University of New Orleans	LA	1,977	7.0%	24.0%
Bridgewater State College	MA	1,139	22.4%	47.8%
Fitchburg State College	MA	405	22.5%	47.4%
Framingham State College	MA	645	22.5%	42.8%
Salem State College	MA	808	11.5%	37.3%
University of Massachusetts Amherst	MA	4,146	49.3%	66.7%
University of Massachusetts-Boston	MA	617	10.9%	33.1%

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
University of Massachusetts-Dartmouth	MA	1,148	27.0%	46.7%
University of Massachusetts-Lowell	MA	967	27.8%	43.8%
Westfield State College	MA	965	38.4%	55.6%
Worcester State College	MA	562	21.0%	39.9%
Bowie State University[a]	MD	594	15.0%	36.5%
Coppin State University[a]	MD	540	6.7%	18.9%
Frostburg State University	MD	923	22.1%	51.1%
Morgan State University[a]	MD	1,125	15.3%	37.7%
Salisbury University	MD	945	45.4%	67.9%
St Mary's College of Maryland	MD	457	75.3%	82.7%
Towson University	MD	1,910	35.7%	66.4%
University of Maryland-Baltimore County	MD	1,332	34.6%	60.5%
University of Maryland-College Park	MD	4,341	58.4%	79.9%
University of Maryland Eastern Shore[a]	MD	1,194	21.9%	37.3%
University of Maine	ME	1,545	32.0%	59.0%
University of Maine at Farmington	ME	479	36.3%	61.6%
University of Southern Maine	ME	907	10.3%	34.0%
Central Michigan University	MI	3,596	19.5%	57.2%
Eastern Michigan University	MI	2,706	10.5%	38.8%
Ferris State University	MI	802	15.3%	37.2%
Grand Valley State University	MI	2,977	19.1%	52.4%
Lake Superior State University	MI	418	19.9%	37.6%
Michigan State University	MI	6,614	43.5%	74.3%
Michigan Technological University	MI	1,162	24.2%	63.5%
Northern Michigan University	MI	1,336	18.1%	47.9%
Oakland University	MI	1,814	14.3%	44.3%
Saginaw Valley State University	MI	1,044	10.2%	36.1%
University of Michigan-Ann Arbor	MI	5,531	70.4%	88.3%
University of Michigan-Dearborn	MI	658	13.7%	52.9%
University of Michigan-Flint	MI	549	9.8%	34.8%
Wayne State University	MI	1,878	12.6%	32.4%
Western Michigan University	MI	4,562	18.8%	53.6%
Bemidji State University	MN	585	3.4%	50.3%
Minnesota State University-Mankato	MN	2,114	18.5%	49.9%
Minnesota State University-Moorhead	MN	1,236	18.4%	45.1%
Saint Cloud State University	MN	2,313	17.6%	45.2%
Southwest Minnesota State University	MN	448	20.8%	43.3%

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
University of Minnesota-Duluth	MN	2,109	23.5%	49.6%
University of Minnesota-Morris	MN	474	43.5%	57.4%
University of Minnesota-Twin Cities	MN	5,259	36.9%	63.4%
Winona State University	MN	1,581	25.9%	53.4%
Lincoln University[a]	MO	396	9.8%	22.0%
Missouri Southern State University	MO	726	16.1%	32.5%
Missouri State University	MO	2,508	26.8%	54.8%
Missouri University of Science and Technology	MO	691	20.8%	60.9%
Missouri Western State University	MO	1,079	13.0%	29.7%
Northwest Missouri State University	MO	1,177	27.6%	52.1%
Southeast Missouri State University	MO	1,502	23.7%	50.9%
Truman State University	MO	1,456	45.7%	69.9%
University of Central Missouri	MO	1,434	19.2%	47.7%
University of Missouri-Columbia	MO	4,112	41.0%	67.2%
University of Missouri-Kansas City	MO	734	14.4%	42.5%
University of Missouri-St Louis	MO	515	18.6%	43.3%
Alcorn State University[a]	MS	495	19.6%	43.2%
Delta State University	MS	430	17.9%	44.9%
Jackson State University[a]	MS	930	16.6%	36.3%
Mississippi State University	MS	1,826	26.5%	58.2%
University of Mississippi Main Campus	MS	2,126	18.9%	53.3%
University of Southern Mississippi	MS	1,346	21.3%	47.6%
Montana State University	MT	1,720	17.0%	47.7%
Montana State University-Billings	MT	514	9.3%	28.8%
The University of Montana	MT	1,846	18.6%	40.8%
Appalachian State University	NC	2,303	37.2%	62.6%
East Carolina University	NC	3,182	25.5%	54.5%
Fayetteville State University[a]	NC	762	15.7%	35.8%
North Carolina A & T State University[a]	NC	1,760	20.1%	41.4%
North Carolina Central University[a]	NC	763	22.8%	48.5%
North Carolina State University at Raleigh	NC	3,801	36.9%	69.7%
University of North Carolina at Asheville	NC	446	33.4%	54.3%
University of North Carolina at Chapel Hill	NC	3,681	70.9%	82.6%
University of North Carolina at Charlotte	NC	2,309	26.4%	50.7%
University of North Carolina at Greensboro	NC	1,898	26.9%	49.8%
University of North Carolina at Pembroke	NC	688	14.5%	33.9%
University of North Carolina-Wilmington	NC	1,983	41.6%	64.9%

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
Western Carolina University	NC	1,176	22.6%	47.5%
Winston-Salem State University[a]	NC	614	20.2%	45.1%
Minot State University	ND	390	11.0%	31.0%
North Dakota State University-Main Campus	ND	1,144	14.2%	46.8%
University of North Dakota	ND	1,969	22.1%	53.8%
Chadron State College	NE	388	21.4%	44.8%
University of Nebraska at Kearney	NE	1,038	20.5%	57.7%
University of Nebraska at Omaha	NE	1,588	10.7%	41.0%
University of Nebraska-Lincoln	NE	3,480	22.6%	63.4%
Wayne State College	NE	583	23.7%	46.1%
Keene State College	NH	940	30.1%	57.2%
Plymouth State University	NH	871	31.2%	52.9%
University of New Hampshire-Main Campus	NH	2,369	58.8%	73.5%
Kean University	NJ	1,132	17.3%	42.4%
Montclair State University	NJ	1,378	26.9%	61.2%
New Jersey City University	NJ	540	8.0%	31.3%
New Jersey Institute of Technology	NJ	706	14.4%	51.1%
Ramapo College of New Jersey	NJ	628	48.2%	64.6%
Rowan University	NJ	1,276	39.0%	63.8%
Rutgers University-New Brunswick	NJ	5,433	47.6%	73.1%
The College of New Jersey	NJ	1,258	67.7%	83.4%
The Richard Stockton College of New Jersey	NJ	751	44.6%	67.8%
William Paterson University of New Jersey	NJ	1,247	14.8%	47.2%
Eastern New Mexico University-Main Campus	NM	549	9.5%	32.2%
New Mexico State University-Main Campus	NM	2,051	12.2%	44.9%
University of New Mexico-Main Campus	NM	2,364	11.8%	43.8%
University of Nevada-Las Vegas	NV	2,416	13.4%	40.6%
University of Nevada-Reno	NV	1,956	13.7%	46.3%
CUNY Bernard M Baruch College	NY	1,688	32.8%	59.8%
CUNY Brooklyn College	NY	1,009	20.7%	46.8%
CUNY City College	NY	705	7.7%	36.2%
CUNY Hunter College	NY	1,877	12.5%	35.9%
CUNY John Jay College Criminal Justice	NY	850	19.4%	42.1%
CUNY Lehman College	NY	642	12.0%	33.6%
CUNY Queens College	NY	1,204	27.0%	52.7%
CUNY York College	NY	464	7.5%	27.6%
Stony Brook University	NY	2,187	39.2%	59.3%

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
SUNY at Albany	NY	2,202	50.2%	63.9%
SUNY at Binghamton	NY	2,227	62.3%	77.2%
SUNY at Buffalo	NY	2,990	39.0%	61.3%
SUNY at Fredonia	NY	913	47.6%	62.4%
SUNY at Geneseo	NY	1,134	63.3%	79.1%
SUNY College at Brockport	NY	1,023	34.1%	58.5%
SUNY College at Buffalo	NY	1,327	14.7%	43.1%
SUNY College at Cortland	NY	1,195	35.4%	57.0%
SUNY College at New Paltz	NY	915	36.7%	65.5%
SUNY College at Oneonta	NY	1,143	40.5%	58.7%
SUNY College at Oswego	NY	1,311	31.7%	53.9%
SUNY College at Plattsburgh	NY	1,006	34.8%	55.0%
SUNY College at Purchase	NY	677	36.8%	51.0%
SUNY-Potsdam	NY	644	31.7%	50.5%
Bowling Green State University-Main Campus	OH	3,599	32.7%	56.8%
Central State University[a]	OH	397	8.3%	20.9%
Cleveland State University	OH	1,008	9.4%	31.2%
Kent State University-Kent Campus	OH	1,774	31.3%	51.0%
Miami University-Oxford	OH	3,440	67.0%	80.0%
Ohio State University-Main Campus	OH	5,955	40.0%	71.4%
Ohio University-Main Campus	OH	3,695	48.1%	70.3%
University of Akron Main Campus	OH	2,626	11.0%	33.9%
University of Cincinnati-Main Campus	OH	2,666	18.4%	51.7%
University of Toledo-Main Campus	OH	3,273	21.6%	44.5%
Wright State University-Main Campus	OH	2,117	17.6%	43.0%
Youngstown State University	OH	1,833	13.3%	36.8%
Cameron University	OK	474	11.6%	24.5%
East Central University	OK	557	13.8%	35.2%
Northeastern State University	OK	1,066	10.4%	31.4%
Oklahoma State University-Main Campus	OK	3,104	26.9%	57.6%
Southeastern Oklahoma State University	OK	579	13.0%	32.1%
Southwestern Oklahoma State University	OK	847	15.1%	33.5%
University of Central Oklahoma	OK	1,619	10.6%	31.0%
University of Oklahoma Norman Campus	OK	3,629	24.7%	60.7%
Oregon State University	OR	2,982	29.7%	60.8%
Portland State University	OR	1,020	12.6%	35.0%
Southern Oregon University	OR	759	19.6%	35.4%

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
University of Oregon	OR	3,049	40.8%	65.3%
Western Oregon University	OR	811	17.8%	45.5%
Bloomsburg University of Pennsylvania	PA	1,684	38.4%	61.5%
California University of Pennsylvania	PA	769	27.0%	49.7%
Clarion University of Pennsylvania	PA	1,238	25.3%	50.5%
East Stroudsburg University of Pennsylvania	PA	969	26.7%	51.5%
Edinboro University of Pennsylvania	PA	1,382	23.4%	46.7%
Indiana University of Pennsylvania-Main Campus	PA	2,385	26.2%	51.1%
Kutztown University of Pennsylvania	PA	1,630	29.1%	54.6%
Lincoln University of Pennsylvania[a]	PA	476	21.4%	37.6%
Lock Haven University of Pennsylvania	PA	916	31.2%	50.8%
Mansfield University of Pennsylvania	PA	614	32.6%	47.9%
Millersville University of Pennsylvania	PA	1,238	41.8%	67.4%
Pennsylvania State University-Main Campus	PA	6,145	58.2%	84.0%
Shippensburg University of Pennsylvania	PA	1,478	46.2%	65.3%
Slippery Rock University of Pennsylvania	PA	1,314	28.8%	53.0%
Temple University	PA	2,997	30.7%	59.4%
University of Pittsburgh-Pittsburgh Campus	PA	3,195	54.6%	75.1%
West Chester University of Pennsylvania	PA	1,626	34.5%	63.7%
Rhode Island College	RI	921	13.7%	45.0%
University of Rhode Island	RI	2,069	38.3%	57.5%
Citadel Military College of South Carolina	SC	564	59.2%	65.2%
Clemson University	SC	2,530	46.1%	78.3%
Coastal Carolina University	SC	931	22.8%	43.9%
College of Charleston	SC	1,967	44.1%	59.5%
Francis Marion University	SC	634	20.0%	42.3%
Lander University	SC	488	24.2%	46.5%
South Carolina State University[a]	SC	615	22.0%	45.4%
University of South Carolina-Aiken	SC	418	22.7%	40.9%
University of South Carolina-Columbia	SC	3,227	40.4%	62.8%
University of South Carolina-Upstate	SC	570	18.8%	38.2%
Winthrop University	SC	940	31.4%	58.3%
Black Hills State University	SD	556	11.7%	22.3%
South Dakota School of Mines and Technology	SD	396	9.3%	39.1%
South Dakota State University	SD	1,414	22.3%	54.0%
University of South Dakota	SD	873	22.5%	47.2%

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
Austin Peay State University	TN	881	8.7%	26.6%
East Tennessee State University	TN	1,456	17.5%	38.4%
Middle Tennessee State University	TN	2,788	26.6%	43.5%
Tennessee State University[a]	TN	1,234	22.1%	40.2%
Tennessee Technological University	TN	1,289	17.8%	43.5%
The University of Tennessee	TN	3,896	29.4%	57.8%
The University of Tennessee at Chattanooga	TN	1,062	24.3%	41.9%
The University of Tennessee-Martin	TN	1,086	17.7%	43.9%
University of Memphis	TN	1,923	18.4%	34.3%
Angelo State University	TX	1,145	17.4%	33.4%
Lamar University	TX	1,043	19.5%	35.6%
Midwestern State University	TX	665	10.4%	29.6%
Prairie View A & M University[a]	TX	1,380	13.2%	37.7%
Stephen F Austin State University	TX	2,191	16.4%	38.7%
Tarleton State University	TX	783	16.1%	36.5%
Texas A & M University	TX	6,271	38.4%	77.7%
Texas A & M University-Commerce	TX	547	17.6%	37.7%
Texas A & M University-Corpus Christi	TX	1,034	16.4%	35.2%
Texas A & M University-Kingsville	TX	820	8.0%	30.2%
Texas State University-San Marcos	TX	2,469	22.4%	54.8%
Texas Tech University	TX	4,075	27.8%	56.2%
Texas Woman's University	TX	546	22.5%	40.8%
The University of Texas at Arlington	TX	1,838	14.7%	37.2%
The University of Texas at Austin	TX	7,198	47.0%	77.5%
The University of Texas at Brownsville	TX	797	3.6%	16.2%
The University of Texas at Dallas	TX	984	30.9%	55.5%
The University of Texas at El Paso	TX	2,156	4.1%	28.8%
The University of Texas at San Antonio	TX	1,910	7.2%	29.7%
The University of Texas-Pan American	TX	1,945	9.7%	32.8%
University of Houston	TX	3,191	12.6%	42.7%
University of Houston-Downtown	TX	869	2.2%	15.5%
University of North Texas	TX	2,803	16.6%	44.3%
West Texas A & M University	TX	759	14.4%	37.4%
Southern Utah University	UT	529	21.4%	42.3%
University of Utah	UT	1,877	20.8%	56.0%
Utah State University	UT	1,892	20.3%	44.6%
Weber State University	UT	884	5.3%	39.8%

University Name	State	2001 Cohort	4-Yr Grad Rate	6-Yr Grad Rate
Christopher Newport University	VA	1,042	30.5%	51.5%
College of William and Mary	VA	1,358	83.9%	91.5%
George Mason University	VA	2,068	30.5%	58.3%
James Madison University	VA	3,244	64.8%	81.2%
Longwood University	VA	891	46.0%	63.6%
Norfolk State University[a]	VA	981	11.5%	30.8%
Old Dominion University	VA	1,502	22.6%	48.5%
Radford University	VA	1,875	35.9%	56.2%
University of Mary Washington	VA	840	67.9%	75.7%
University of Virginia-Main Campus	VA	2,974	84.2%	93.2%
Virginia Commonwealth University	VA	2,675	20.4%	46.7%
Virginia Polytechnic Institute and State University	VA	4,960	50.6%	77.5%
Virginia State University[a]	VA	1,085	23.2%	42.2%
Castleton State College	VT	386	22.5%	37.8%
University of Vermont	VT	1,826	55.7%	71.6%
Central Washington University	WA	1,231	28.0%	55.5%
Eastern Washington University	WA	1,179	21.7%	46.9%
The Evergreen State College	WA	460	44.8%	58.5%
University of Washington-Seattle Campus	WA	5,288	48.3%	75.4%
Washington State University	WA	2,575	33.1%	62.9%
Western Washington University	WA	2,205	29.1%	66.8%
University of Wisconsin-Eau Claire	WI	2,125	18.4%	59.7%
University of Wisconsin-Green Bay	WI	866	24.7%	53.5%
University of Wisconsin-La Crosse	WI	1,596	27.8%	65.9%
University of Wisconsin-Madison	WI	6,050	45.6%	79.0%
University of Wisconsin-Milwaukee	WI	2,884	14.7%	41.2%
University of Wisconsin-Oshkosh	WI	1,822	13.7%	45.7%
University of Wisconsin-Parkside	WI	854	9.8%	32.1%
University of Wisconsin-Platteville	WI	1,039	16.9%	53.2%
University of Wisconsin-River Falls	WI	1,108	23.9%	52.0%
University of Wisconsin-Stevens Point	WI	1,505	19.7%	58.8%
University of Wisconsin-Stout	WI	1,272	16.0%	52.9%
University of Wisconsin-Whitewater	WI	1,857	20.4%	53.1%
University of Wyoming	WY	1,411	26.2%	56.9%

[a] Historically Black College or University (excluded from sample subset)

Appendix B - Stability of Graduation Rates 2005 to 2007

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
University of Alaska Anchorage	AK	7.2%	7.9%	6.6%	25.7%	24.3%	22.1%	U	U
University of Alaska Fairbanks	AK	5.3%	9.4%	8.9%	21.6% +	28.6%	30.6% ++	U	I
Alabama A & M University	AL	8.7%	11.6%	13.3% ++	32.0%	33.5%	33.2%	I	U
Alabama State University	AL	8.6% +++	14.6%	11.6% +	22.9% ++	28.8%	27.3% +	I	I
Auburn University Main Campus	AL	32.2%	33.1%	34.3%	61.9%	62.7%	63.4%	U	U
Auburn University-Montgomery	AL	13.3%	12.1%	9.9%	30.0%	28.8%	26.9%	U	U
Jacksonville State University	AL	17.6%	14.9%	16.7%	35.5%	35.3%	37.9%	U	U
The University of Alabama	AL	35.3%	36.0%	38.6% +	62.9%	63.1%	65.1%	I	U
Troy University	AL	33.0%	30.6% ***	22.0% ***	50.2%	48.5% *	42.9% **	D	D
University of Alabama at Birmingham	AL	14.3%	14.0%	14.3%	35.9%	35.7%	37.7%	U	U
University of Alabama in Huntsville	AL	13.6%	14.8%	14.0%	43.8%	44.3%	44.1%	U	U
University of Montevallo	AL	20.5%	21.7%	24.5%	45.4%	41.4%	47.1%	U	U
University of North Alabama	AL	15.7%	17.4%	18.0%	37.6%	37.6%	40.7%	U	U
University of South Alabama	AL	14.1%	16.0%	14.6%	32.9% ++	39.4%	36.7%	U	B

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
Arkansas State University-Main Campus	AR	18.3%	19.3%	19.4%	38.6%	40.1%	37.5%	U	U
Arkansas Tech University	AR	14.1% +	18.4%	19.7% ++	34.2%	37.8%	38.5%	I	U
Henderson State University	AR	12.7% +	17.7%	16.3%	32.1%	27.7%	32.6%	B	U
Southern Arkansas University Main Campus	AR	2.5% +++	16.7% *	11.2% +++	42.9% *	35.8%	33.9% **	E	D
University of Arkansas at Little Rock	AR	6.2%	8.7%	8.1%	20.9%	23.9% *	18.6%	U	B
University of Arkansas at Pine Bluff	AR	11.6% **	6.8% +++	13.9%	30.3%	29.1%	32.9%	E	U
University of Arkansas Main Campus	AR	30.4%	29.6%	32.8%	56.4%	55.5%	58.0%	U	U
University of Central Arkansas	AR	15.7% ++	20.0%	22.0% +++	40.0% +	44.3%	42.4%	I	B
Arizona State University at the Tempe Campus	AZ	26.8%	28.0%	27.7%	54.9%	56.4%	55.5%	U	U
Northern Arizona University	AZ	26.0%	27.0%	28.4%	48.1%	47.1%	48.2%	U	U
University of Arizona	AZ	31.7%	29.6% ++	32.7%	58.9% *	56.4%	56.1% **	B	D
California Polytechnic State University-San Luis Obispo	CA	20.8%	19.9%	21.3%	68.8%	66.9%	66.1%	U	U

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
California State Polytechnic University-Pomona	CA	9.1%	10.2%	9.5%	45.9%	48.3%	48.9%	U	U
California State University-Bakersfield	CA	13.3%	14.1%	14.1%	37.5%	41.5%	39.8%	U	U
California State University-Chico	CA	15.1%	17.4%	15.0%	52.4%	53.5%	52.4%	U	U
California State University-Dominguez Hills	CA	5.7%	6.3%	4.6%	35.1%	32.9%	28.2%	U	U
California State University-East Bay	CA	16.7%	16.3% **	10.8% **	43.7%	43.2%	39.9%	D	U
California State University-Fresno	CA	13.2%	12.0%	14.1%	43.3%	45.5%	48.1% +	U	I
California State University-Fullerton	CA	13.7%	14.4%	15.0%	48.2%	49.1%	49.9%	U	U
California State University-Long Beach	CA	10.9%	11.7% *	9.7%	46.3%	47.8%	46.8%	B	U
California State University-Los Angeles	CA	9.4%	10.6%	9.6%	31.9%	34.8%	31.3%	U	U
California State University-Monterey Bay	CA	10.0%	9.6%	11.8%	32.4%	35.6%	36.1%	U	U
California State University-Northridge	CA	8.7%	9.2%	9.0%	36.5% +	40.0%	40.5% ++	U	I
California State University-Sacramento	CA	9.1%	8.7%	9.7%	40.8%	42.1%	42.4%	U	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
California State University-San Bernardino	CA	10.0%	12.4%	10.0%	42.2%	44.3% **	38.3%	U	B
California State University-Stanislaus	CA	21.5%	20.0%	18.6%	51.7%	50.1%	51.6%	U	U
Humboldt State University	CA	11.9%	12.2%	11.2%	44.9%	44.2%	41.5%	U	U
San Diego State University	CA	13.9% ++	17.4% +	19.9% +++	53.0% +++	58.3%	56.4% +	I	I
San Francisco State University	CA	9.4%	11.0%	11.5%	40.3%	42.4%	44.2% +	U	I
San Jose State University	CA	7.1%	6.7%	7.2%	40.9%	41.4%	42.0%	U	U
Sonoma State University	CA	19.1%	22.2%	25.3% ++	48.2%	50.8%	55.5% ++	I	I
University of California-Berkeley	CA	58.3% +	61.2%	60.9%	87.1%	88.9%	88.1%	B	U
University of California-Davis	CA	42.1%	42.7%	42.6%	80.1%	80.9%	79.1%	U	U
University of California-Irvine	CA	42.3% +++	51.2%	51.4% +++	80.0%	79.4%	79.6%	I	U
University of California-Los Angeles	CA	56.7% +	59.3% +++	66.2% +++	87.4% +	89.3%	90.0% +++	I	I
University of California-Riverside	CA	37.8%	36.6%	38.2%	65.3%	63.6%	65.9%	U	U
University of California-San Diego	CA	53.7%	53.1% +	56.4%	84.6%	85.9%	84.3%	B	U
University of California-Santa Barbara	CA	45.3%	47.0% +	49.9% +++	78.7%	78.5%	79.9%	I	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
University of California-Santa Cruz	CA	48.6%	47.7%	45.7%	70.1%	69.6%	68.3%	U	U
Colorado School of Mines	CO	38.7%	40.1%	41.2%	67.0%	68.4%	67.2%	U	U
Colorado State University	CO	34.3%	34.5%	34.9%	63.0%	63.8%	62.3%	U	U
Colorado State University-Pueblo	CO	12.4%	15.8%	18.1% +	34.7%	31.0%	36.3%	I	U
University of Colorado at Boulder	CO	38.0%	38.4%	40.6% +	66.2%	65.6%	67.4%	I	U
University of Colorado at Colorado Springs	CO	15.2% ++	22.6%	21.8% ++	39.3%	42.1%	40.6%	I	U
University of Colorado Denver	CO	15.9%	13.8%	12.8%	41.8%	35.7%	39.0%	U	U
University of Northern Colorado	CO	25.7%	28.6%	29.6% +	45.8%	49.1%	48.4%	I	U
Central Connecticut State University	CT	11.2%	10.8%	13.4%	40.1%	40.4%	44.3%	U	U
Eastern Connecticut State University	CT	24.9%	22.6% ++	29.7%	42.9%	47.7%	48.3%	B	U
Southern Connecticut State University	CT	12.0%	10.5%	9.4%	35.7%	34.1%	37.6%	U	U
University of Connecticut	CT	49.8% +	53.4%	54.1% ++	71.7%	73.8%	74.6% +	I	I
Western Connecticut State University	CT	10.1%	12.8%	13.3%	34.4%	36.7%	37.9%	U	U
Delaware State University	DE	20.9%	22.7% **	15.6% *	35.1%	37.9%	37.3%	D	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
University of Delaware	DE	62.4%	60.2% ++	63.9%	76.4%	75.6%	77.5%	B	U
Albany State University	GA	14.2%	12.3% ++	18.8%	44.4%	42.3%	41.4%	B	U
Armstrong Atlantic State University	GA	5.9%	4.8%	7.2%	21.6%	21.9%	24.5%	U	U
Augusta State University	GA	5.2%	5.8%	7.0%	20.7%	22.8%	24.3%	U	U
Columbus State University	GA	8.1%	11.6%	11.2%	28.2%	33.8%	32.3%	U	U
Fort Valley State University	GA	8.9%	14.0%	14.7% +	25.1% ++	36.0%	32.4%	I	B
Georgia College & State University	GA	20.9%	23.0%	23.1%	44.3%	40.9%	46.4%	U	U
Georgia Institute of Technology-Main Campus	GA	28.7% +++	33.9%	33.1% ++	76.1%	77.0%	77.7%	I	U
Georgia Southern University	GA	11.8%	13.3% ++	16.5% +++	40.9%	43.0%	45.1% ++	I	I
Georgia State University	GA	13.7%	14.7%	16.7% +	40.2%	41.4% +++	47.2% +++	I	I
Kennesaw State University	GA	8.3%	7.4%	7.7%	32.1%	27.9% +	32.6%	U	B
North Georgia College & State University	GA	22.3% +++	32.3% **	23.7%	45.0%	51.2%	47.8%	E	U
Savannah State University	GA	6.4%	9.5%	13.2% +	27.8%	31.4% +	40.5% ++	I	I
University of Georgia	GA	42.5% +	45.4%	47.9% +++	73.2%	75.3%	77.0% +++	I	I
University of West Georgia	GA	9.0%	11.3%	12.5% ++	31.9%	34.5%	36.8% +	I	I

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
Valdosta State University	GA	18.1%	18.0%	17.5%	41.0%	42.0%	41.1%	U	U
University of Hawaii at Hilo	HI	10.7%	10.8%	13.3%	30.6%	31.5%	36.3%	U	U
University of Hawaii at Manoa	HI	11.5%	11.2% +	14.7% +	51.1%	51.1%	54.8%	I	U
Iowa State University	IA	31.4%	31.3%	31.9%	68.0%	65.9%	65.8%	U	U
University of Iowa	IA	37.9%	39.5%	39.6%	66.1%	65.5%	65.9%	U	U
University of Northern Iowa	IA	33.6%	33.9%	32.4%	65.0%	67.1%	65.2%	U	U
Boise State University	ID	5.6%	5.8%	6.2%	27.7% *	23.7%	26.0%	U	B
Idaho State University	ID	4.1%	5.4%	3.6%	21.3% ++	26.9% ***	19.9%	U	E
University of Idaho	ID	21.8%	19.9%	20.7%	57.4%	54.4%	53.0% *	U	D
Chicago State University	IL	2.0%	2.9%	4.1%	15.8%	18.0%	16.2%	U	U
Eastern Illinois University	IL	32.6%	31.5%	31.1%	60.6%	60.5%	60.3%	U	U
Illinois State University	IL	35.0%	37.0%	39.5% +++	63.3%	64.2%	65.2%	I	U
Northeastern Illinois University	IL	2.3%	2.8%	2.2%	16.9%	18.5%	18.7%	U	U
Northern Illinois University	IL	25.4%	22.9% +	26.0%	53.3% ***	48.3% ++	52.3%	B	E
Southern Illinois University Carbondale	IL	19.3%	20.7% +	24.0% +++	41.4%	41.8% +	45.7% ++	I	I
Southern Illinois University Edwardsville	IL	18.6%	21.7%	21.1%	44.8%	45.8%	44.8%	U	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
University of Illinois at Chicago	IL	19.8%	21.3%	22.4%	49.8%	50.5%	50.0%	U	U
University of Illinois at Urbana-Champaign	IL	60.3%	61.0%	62.6% +	82.9%	81.7%	81.9%	I	U
Western Illinois University	IL	32.1%	31.6%	33.2%	55.4%	55.6%	56.6%	U	U
Ball State University	IN	27.0%	29.4%	30.1% +	54.2% +	57.4%	57.7% +	I	I
Indiana State University	IN	18.1%	19.5%	20.5%	39.3%	40.7%	41.2%	U	U
Indiana University-Bloomington	IN	48.7%	50.3%	50.3%	71.7%	71.6%	71.9%	U	U
Indiana University-Purdue University-Fort Wayne	IN	4.1%	4.0%	5.3%	18.3%	22.0%	23.1% +	U	I
Indiana University-Purdue University-Indianapolis	IN	7.3%	7.6%	9.3%	25.9%	27.4% +	31.5% +++	U	I
Indiana University-South Bend	IN	6.3%	3.6%	5.8%	25.4%	25.3%	26.5%	U	U
Indiana University-Southeast	IN	7.6%	8.2%	7.9%	30.0%	28.8%	29.0%	U	U
Purdue University-Calumet Campus	IN	4.3%	3.9%	4.3%	20.6%	22.8%	19.9%	U	U
Purdue University-Main Campus	IN	32.3% +++	36.9%	36.5% +++	66.4% +++	70.2%	69.1% ++	I	I
Purdue University-North Central Campus	IN	1.9%	3.5%	1.6%	11.8%	13.4%	13.0%	U	U
University of Southern Indiana	IN	12.4%	14.7%	12.8%	33.2%	32.8%	30.7%	U	U

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
Emporia State University	KS	22.7%	24.6%	22.2%	44.4%	44.5%	45.2%	U	U
Fort Hays State University	KS	23.2% ++	30.4% ***	21.2%	48.6%	49.0%	47.8%	E	U
Kansas State University	KS	22.0%	24.4%	24.9% +	55.7% +	59.0%	58.3%	I	B
Pittsburg State University	KS	41.9%	43.8%	45.1%	50.7%	50.2%	51.0%	U	U
University of Kansas	KS	30.5%	31.1%	31.5%	59.3%	59.0%	59.7%	U	U
Washburn University	KS	25.4%	19.8%	19.4%	61.2%	53.6%	47.1% ***	U	D
Wichita State University	KS	15.1%	13.7%	17.3%	37.0%	35.5% ++	42.0%	U	B
Eastern Kentucky University	KY	12.3% **	9.1% +	11.6%	36.6%	34.6% +	38.9%	E	B
Morehead State University	KY	16.2%	16.0%	14.7%	42.2%	42.9%	41.1%	U	U
Murray State University	KY	37.7%	38.7% **	32.6% *	57.0%	56.0%	50.7% *	D	D
Northern Kentucky University	KY	3.1% +++	10.3%	8.7% +++	41.0%	40.1% ***	31.8% ***	I	D
University of Kentucky	KY	28.9%	30.0%	30.4%	59.8%	59.0%	61.1%	U	U
University of Louisville	KY	12.6%	14.3%	15.9% ++	36.8% +	40.7%	43.7% +++	I	I
Western Kentucky University	KY	26.8% +	30.3%	30.7% +	45.5% +	49.2%	49.3% +	I	I
Grambling State University	LA	12.8% +++	20.2% ***	10.7%	37.0%	38.8% ***	30.4% *	E	D
Louisiana State University and Agricultural & Mechanical College	LA	24.4%	24.2%	24.6%	56.8%	57.3%	58.4%	U	U

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
Louisiana State University-Shreveport	LA	9.5%	13.3%	9.1%	17.2%	21.8%	26.0% ++	U	I
Louisiana Tech University	LA	27.9%	27.6%	28.1%	48.9%	49.1%	48.0%	U	U
McNeese State University	LA	10.8%	10.5%	11.8%	32.7%	34.2%	34.4%	U	U
Nicholls State University	LA	9.7%	8.7%	11.3%	26.0%	25.8%	29.8%	U	U
Northwestern State University of Louisiana	LA	12.1%	13.5% +	17.4% +++	30.5%	32.8% +	37.9% +++	I	I
Southeastern Louisiana University	LA	7.5%	8.0%	10.1% ++	26.0%	29.0%	32.3% +++	I	I
Southern University and A & M College	LA	6.7% ***	0.1% +++	6.4%	26.6%	27.8%	29.8%	E	U
University of Louisiana at Lafayette	LA	12.6%	13.8%	14.0%	38.7%	40.4%	41.0%	U	U
University of Louisiana at Monroe	LA	9.2%	9.7%	11.1%	28.0%	28.4%	31.1%	U	U
University of New Orleans	LA	5.5%	6.6%	7.0%	23.9%	24.5%	24.0%	U	U
Bridgewater State College	MA	19.3%	23.3%	22.4%	47.8%	50.6%	47.8%	U	U
Fitchburg State College	MA	21.2%	26.6%	22.5%	54.8%	51.6%	47.4%	U	U
Framingham State College	MA	23.3%	25.0%	22.5%	42.0% +	50.2% *	42.8%	U	E
Salem State College	MA	14.6%	14.0%	11.5%	39.9%	39.8%	37.3%	U	U

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
University of Massachusetts Amherst	MA	45.5%	47.9%	49.3% ++	65.7%	65.7%	66.7%	I	U
University of Massachusetts-Boston	MA	15.2%	15.3%	10.9%	35.0%	35.8%	33.1%	U	U
University of Massachusetts-Dartmouth	MA	27.9%	27.9%	27.0%	50.7%	48.2%	46.7%	U	U
University of Massachusetts-Lowell	MA	24.6% +	30.0%	27.8%	45.9%	46.0%	43.8%	B	U
Westfield State College	MA	37.7%	42.4%	38.4%	52.7%	56.2%	55.6%	U	U
Worcester State College	MA	22.9%	17.0%	21.0%	43.5%	36.9%	39.9%	U	U
Bowie State University	MD	13.1%	13.0%	15.0%	37.6%	36.8%	36.5%	U	U
Coppin State University	MD	8.8%	4.8%	6.7%	20.2%	18.2%	18.9%	U	U
Frostburg State University	MD	17.7%	19.4%	22.1%	47.0%	47.0%	51.1%	U	U
Morgan State University	MD	18.1%	18.4%	15.3%	41.8%	40.4%	37.7%	U	U
Salisbury University	MD	52.2%	52.0% *	45.4% *	69.0%	69.9%	67.9%	D	U
St Mary's College of Maryland	MD	63.8%	69.9%	75.3% ++	72.1% +	80.3%	82.7% ++	I	I
Towson University	MD	29.0%	31.8% +	35.7% +++	56.3% +++	63.6%	66.4% +++	I	I
University of Maryland Eastern Shore	MD	25.5% *	19.0%	21.9%	41.8% **	33.6%	37.3%	B	B

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
University of Maryland-Baltimore County	MD	29.9%	27.7% +++	34.6% +	57.6%	56.1%	60.5%	I	U
University of Maryland-College Park	MD	50.2% +++	54.5% ++	58.4% +++	76.5% +	79.1%	79.9% +++	I	I
University of Maine	ME	28.3% ++	33.7%	32.0%	52.7% ++	58.7%	59.0% ++	B	I
University of Maine at Farmington	ME	41.9%	37.1%	36.3%	66.4%	61.1%	61.6%	U	U
University of Southern Maine	ME	12.2%	9.7%	10.3%	34.2%	31.3%	34.0%	U	U
Central Michigan University	MI	20.7%	21.2%	19.5%	55.4%	57.3%	57.2%	U	U
Eastern Michigan University	MI	10.8%	12.3%	10.5%	37.9%	39.9%	38.8%	U	U
Ferris State University	MI	15.3%	13.9%	15.3%	34.1%	32.3%	37.2%	U	U
Grand Valley State University	MI	20.3%	19.4%	19.1%	52.7%	51.5%	52.4%	U	U
Lake Superior State University	MI	17.6%	19.2%	19.9%	39.9%	43.4%	37.6%	U	U
Michigan State University	MI	40.8% ++	43.7%	43.5% ++	73.9%	74.1%	74.3%	I	U
Michigan Technological University	MI	23.5%	25.7%	24.2%	58.9%	60.9%	63.5%	U	U
Northern Michigan University	MI	2.3% +++	17.1%	18.1% +++	34.6% +++	47.0%	47.9% +++	I	I
Oakland University	MI	13.2%	12.8%	14.3%	44.8%	44.3%	44.3%	U	U
Saginaw Valley State University	MI	8.0%	6.5% ++	10.2%	36.2%	33.6%	36.1%	B	U

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
University of Michigan-Ann Arbor	MI	69.7%	70.4%	70.4%	86.5%	86.9%	88.3% +	U	I
University of Michigan-Dearborn	MI	12.8%	16.0%	13.7%	48.4%	50.0%	52.9%	U	U
University of Michigan-Flint	MI	10.0%	11.1%	9.8%	37.0%	35.1%	34.8%	U	U
Wayne State University	MI	6.8% +++	12.8%	12.6% +++	33.1%	36.0%	32.4%	I	U
Western Michigan University	MI	20.1%	19.5%	18.8%	54.4%	54.1%	53.6%	U	U
Bemidji State University	MN	16.5% +++	28.2% ***	3.4% ***	47.3%	45.5%	50.3%	E	U
Minnesota State University-Mankato	MN	18.0%	18.8%	18.5%	48.9%	47.8%	49.9%	U	U
Minnesota State University-Moorhead	MN	18.1%	16.1%	18.4%	42.3%	42.1%	45.1%	U	U
Saint Cloud State University	MN	16.2% +	19.3%	17.6%	46.4%	46.0%	45.2%	B	U
Southwest Minnesota State University	MN	17.8%	20.3%	20.8%	37.6%	40.2%	43.3%	U	U
University of Minnesota-Duluth	MN	20.8% +	24.3%	23.5%	47.7%	51.2%	49.6%	B	U
University of Minnesota-Morris	MN	38.4%	39.8%	43.5%	54.5%	57.2%	57.4%	U	U
University of Minnesota-Twin Cities	MN	31.9%	32.5% +++	36.9% +++	60.7%	60.7% +	63.4% +	I	I
Winona State University	MN	4.2% +++	26.5%	25.9% +++	51.9%	54.3%	53.4%	I	U

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
Lincoln University	MO	8.9%	10.3%	9.8%	28.8%	26.1%	22.0%	U	U
Missouri Southern State University	MO	13.8%	17.6%	16.1%	32.2%	35.0%	32.5%	U	U
Missouri State University	MO	23.4%	24.6%	26.8% [+]	50.2%	51.9%	54.8% [++]	I	I
Missouri University of Science and Technology	MO	16.5%	21.3%	20.8%	64.4%	63.1%	60.9%	U	U
Missouri Western State University	MO	11.5%	10.0%	13.0%	29.7%	26.3%	29.7%	U	U
Northwest Missouri State University	MO	25.3% [++]	31.3%	27.6%	54.4%	55.7%	52.1%	B	U
Southeast Missouri State University	MO	23.0%	26.0%	23.7%	50.8%	49.3%	50.9%	U	U
Truman State University	MO	41.1%	38.5% [+++]	45.7% [+]	65.7%	67.2%	69.9% [+]	I	I
University of Central Missouri	MO	22.6%	26.2% ***	19.2%	49.9%	50.1%	47.7%	B	U
University of Missouri-Columbia	MO	37.9%	39.7%	41.0% [+]	66.0% [+]	68.9%	67.2%	I	B
University of Missouri-Kansas City	MO	16.4%	17.4%	14.4%	45.7%	45.3%	42.5%	U	U
University of Missouri-St Louis	MO	22.6%	20.1%	18.6%	42.9%	42.3%	43.3%	U	U
Alcorn State University	MS	23.6%	21.9%	19.6%	43.7%	45.3%	43.2%	U	U
Delta State University	MS	23.4%	24.1%	17.9%	48.7%	47.3%	44.9%	U	U
Jackson State University	MS	15.1%	14.3%	16.6%	37.5%	35.1%	36.3%	U	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
Mississippi State University	MS	24.9%	27.1%	26.5%	55.8%	57.9%	58.2%	U	U
University of Mississippi Main Campus	MS	34.3%	33.1% ***	18.9% ***	56.2%	55.5%	53.3%	D	U
University of Southern Mississippi	MS	22.7%	24.0%	21.3%	46.0%	45.8%	47.6%	U	U
Montana State University	MT	18.7%	19.3%	17.0%	46.5%	49.6%	47.7%	U	U
Montana State University-Billings	MT	8.9%	9.0%	9.3%	22.3%	27.6%	28.8% +	U	I
The University of Montana	MT	20.3%	19.7%	18.6%	43.9%	42.3%	40.8%	U	U
Appalachian State University	NC	35.4%	34.3%	37.2%	64.0%	61.7%	62.6%	U	U
East Carolina University	NC	25.3%	27.6%	25.5%	54.4%	56.4%	54.5%	U	U
Fayetteville State University	NC	24.4% ***	14.2%	15.7% ***	42.3%	37.0%	35.8% *	D	D
North Carolina A & State University	NC	22.7%	19.3%	20.1%	39.5%	38.0%	41.4%	U	U
North Carolina Central University	NC	22.9%	22.5%	22.8%	45.0%	49.4%	48.5%	U	U
North Carolina State University at Raleigh	NC	35.6%	37.0%	36.9%	70.6%	70.2%	69.7%	U	U
University of North Carolina at Asheville	NC	28.1%	31.0%	33.4%	53.3%	53.4%	54.3%	U	U
University of North Carolina at Chapel Hill	NC	70.5%	71.2%	70.9%	83.8%	83.9%	82.6%	U	U
University of North Carolina at Charlotte	NC	23.5%	25.8%	26.4%	48.7%	49.8%	50.7%	U	U

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
University of North Carolina at Greensboro	NC	28.3%	29.8%	26.9%	51.0%	52.1%	49.8%	U	U
University of North Carolina at Pembroke	NC	18.7%	20.1% *	14.5%	34.9%	37.6%	33.9%	B	U
University of North Carolina-Wilmington	NC	40.8%	42.8%	41.6%	63.5%	65.1%	64.9%	U	U
Western Carolina University	NC	22.7%	24.6%	22.6%	47.4%	46.7%	47.5%	U	U
Winston-Salem State University	NC	21.6%	19.4%	20.2%	47.9%	44.1%	45.1%	U	U
Minot State University	ND	9.3%	13.5%	11.0%	29.2%	27.2%	31.0%	U	U
North Dakota State University-Main Campus	ND	19.7%	17.5%	14.2% **	55.5%	51.1%	46.8% ***	D	D
University of North Dakota	ND	22.6%	21.5%	22.1%	56.1%	53.5%	53.8%	U	U
Chadron State College	NE	26.0%	20.8%	21.4%	46.9%	45.2%	44.8%	U	U
University of Nebraska at Kearney	NE	20.5% *	16.0% +	20.5%	55.2%	51.7% +	57.7%	E	B
University of Nebraska at Omaha	NE	10.2%	10.3%	10.7%	37.4%	39.9%	41.0%	U	U
University of Nebraska-Lincoln	NE	22.5%	22.9%	22.6%	63.4%	62.2%	63.4%	U	U
Wayne State College	NE	22.8%	27.0%	23.7%	42.2% ++	52.0%	46.1%	U	B
Keene State College	NH	25.9%	26.0%	30.1%	53.5%	53.7%	57.2%	U	U
Plymouth State University	NH	27.6%	26.7%	31.2%	48.9% ++	56.5%	52.9%	U	B

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
University of New Hampshire-Main Campus	NH	53.3%	54.6% +	58.8% +++	73.1%	73.8%	73.5%	I	U
Kean University	NJ	16.1%	15.7%	17.3%	45.0%	44.2%	42.4%	U	U
Montclair State University	NJ	23.4%	26.5%	26.9%	58.3%	59.3%	61.2%	U	U
New Jersey City University	NJ	9.0%	7.0%	8.0%	38.1%	32.2%	31.3% *	U	D
New Jersey Institute of Technology	NJ	17.9%	19.0%	14.4%	54.2%	54.5%	51.1%	U	U
Ramapo College of New Jersey	NJ	38.1%	44.3%	48.2% ++	57.1% ++	66.2%	64.6% +	I	I
Rowan University	NJ	39.0%	42.2%	39.0%	62.2%	67.0%	63.8%	U	U
Rutgers University-New Brunswick	NJ	42.5% +++	47.3%	47.6% +++	71.3%	73.1%	73.1%	I	U
The College of New Jersey	NJ	64.3%	66.3%	67.7%	82.7%	85.9%	83.4%	U	U
The Richard Stockton College of New Jersey	NJ	36.0%	40.7%	44.6% ++	61.8%	63.5%	67.8%	I	U
William Paterson University of New Jersey	NJ	16.0%	16.2%	14.8%	48.1%	51.4%	47.2%	U	U
Eastern New Mexico University-Main Campus	NM	9.8%	7.9%	9.5%	34.9%	28.6%	32.2%	U	U
New Mexico State University-Main Campus	NM	12.3%	12.1%	12.2%	41.7% **	36.7% +++	44.9%	U	E
University of New Mexico-Main Campus	NM	10.2%	12.0%	11.8%	40.7%	42.4%	43.8%	U	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
University of Nevada-Las Vegas	NV	13.7%	11.3%	13.4%	40.6%	39.2%	40.6%	U	U
University of Nevada-Reno	NV	16.4%	15.2%	13.7%	51.7%	48.8%	46.3% **	U	D
CUNY Bernard M Baruch College	NY	27.5%	27.1% ++	32.8% ++	58.7%	56.8%	59.8%	I	U
CUNY Brooklyn College	NY	17.0%	17.7%	20.7%	39.4%	44.3%	46.8% ++	U	I
CUNY City College	NY	5.8% *	3.2% +++	7.7%	34.8%	30.3% +	36.2%	E	B
CUNY Hunter College	NY	9.7%	10.8%	12.5% +	36.7%	37.5%	35.9%	I	U
CUNY John Jay College Criminal Justice	NY	13.3%	17.1%	19.4% ++	35.7% +	42.3%	42.1% +	I	I
CUNY Lehman College	NY	7.3%	8.3%	12.0% +	33.9%	30.3%	33.6%	I	U
CUNY Queens College	NY	22.8%	23.4%	27.0%	50.5%	52.6%	52.7%	U	U
CUNY York College	NY	7.3%	6.3%	7.5%	30.1%	23.6%	27.6%	U	U
Stony Brook University	NY	38.0%	38.1%	39.2%	58.8%	58.6%	59.3%	U	U
SUNY at Albany	NY	48.7%	51.0%	50.2%	61.6%	63.3%	63.9%	U	U
SUNY at Binghamton	NY	65.9% **	60.5%	62.3% *	76.8%	78.0%	77.2%	D	U
SUNY at Buffalo	NY	34.7%	36.2%	39.0% ++	58.8%	60.8%	61.3%	I	U
SUNY at Fredonia	NY	48.9%	48.4%	47.6%	62.7%	62.4%	62.4%	U	U
SUNY at Geneseo	NY	63.8%	61.5%	63.3%	78.7%	79.5%	79.1%	U	U
SUNY College at Brockport	NY	32.7%	31.9%	34.1%	55.3%	56.2%	58.5%	U	U
SUNY College at Buffalo	NY	15.2%	14.8%	14.7%	38.5% +	43.7%	43.1%	U	B

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
SUNY College at Cortland	NY	36.5% *	31.6%	35.4%	56.1%	56.1%	57.0%	B	U
SUNY College at New Paltz	NY	35.2%	32.4%	36.7%	63.4%	58.7% ++	65.5%	U	B
SUNY College at Oneonta	NY	34.8%	36.2%	40.5% +	50.7%	54.5%	58.7% +++	I	I
SUNY College at Oswego	NY	33.3%	32.1%	31.7%	54.3%	52.0%	53.9%	U	U
SUNY College at Plattsburgh	NY	32.1%	30.4%	34.8%	52.9%	51.0%	55.0%	U	U
SUNY College at Purchase	NY	34.1%	34.1%	36.8%	46.3%	47.2%	51.0%	U	U
SUNY-Potsdam	NY	24.5%	27.9%	31.7% ++	44.4%	48.3%	50.5%	I	U
Bowling Green State University-Main Campus	OH	33.2%	34.4%	32.7%	59.8%	59.7% *	56.8% *	U	D
Central State University	OH	15.6%	12.7%	8.3% **	29.6%	27.1%	20.9% *	D	D
Cleveland State University	OH	10.9%	11.0%	9.4%	29.6%	30.6%	31.2%	U	U
Kent State University-Kent Campus	OH	19.2%	21.0% +++	31.3% +++	45.9%	46.6% ++	51.0% ++	I	I
Miami University-Oxford	OH	65.5%	67.6%	67.0%	80.1%	81.3%	80.0%	U	U
Ohio State University-Main Campus	OH	34.9% +++	39.1%	40.0% +++	68.2% ++	71.1%	71.4% +++	I	I
Ohio University-Main Campus	OH	45.8%	47.2%	48.1%	70.9%	71.3%	70.3%	U	U
University of Akron Main Campus	OH	10.2% +	12.8%	11.0%	35.0%	37.3% *	33.9%	B	B

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
University of Cincinnati-Main Campus	OH	16.2% +	19.1%	18.4%	49.0%	51.9%	51.7%	B	U
University of Toledo-Main Campus	OH	12.9% +++	17.3% +++	21.6% +++	41.7%	44.3%	44.5%	I	U
Wright State University-Main Campus	OH	16.5%	19.0%	17.6%	40.6%	42.8%	43.0%	U	U
Youngstown State University	OH	13.3%	12.5%	13.3%	37.3%	36.7%	36.8%	U	U
Cameron University	OK	11.4%	14.6%	11.6%	24.3% +	31.8% *	24.5%	U	E
East Central University	OK	13.5%	11.9%	13.8%	34.8%	34.0%	35.2%	U	U
Northeastern State University	OK	11.1%	11.8%	10.4%	31.5%	32.9%	31.4%	U	U
Oklahoma State University-Main Campus	OK	25.2%	27.3%	26.9%	59.2%	59.0%	57.6%	U	U
Southeastern Oklahoma State University	OK	11.7%	10.6%	13.0%	28.8%	30.8%	32.1%	U	U
Southwestern Oklahoma State University	OK	15.0%	16.7%	15.1%	35.7%	36.0%	33.5%	U	U
University of Central Oklahoma	OK	12.2%	12.3%	10.6%	34.8%	33.8%	31.0%	U	U
University of Oklahoma Norman Campus	OK	19.3% +++	23.8%	24.7% +++	54.9%	57.5% +	60.7% +++	I	I
Oregon State University	OR	30.6%	29.0%	29.7%	61.1%	59.8%	60.8%	U	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
Portland State University	OR	13.2%	14.5%	12.6%	34.7%	37.2%	35.0%	U	U
Southern Oregon University	OR	18.0%	19.1%	19.6%	40.1%	37.6%	35.4%	U	U
University of Oregon	OR	38.0%	38.8%	40.8%	63.0%	63.4%	65.3%	U	U
Western Oregon University	OR	18.3%	21.3%	17.8%	44.5%	43.2%	45.5%	U	U
Bloomsburg University of Pennsylvania	PA	37.6%	41.5%	38.4%	62.8%	63.4%	61.5%	U	U
California University of Pennsylvania	PA	18.5% +	24.3%	27.0% +++	45.2%	50.3%	49.7%	I	U
Clarion University of Pennsylvania	PA	23.6%	26.3%	25.3%	50.4%	52.5%	50.5%	U	U
East Stroudsburg University of Pennsylvania	PA	19.3%	22.0%	26.7% +++	48.8%	52.3%	51.5%	I	U
Edinboro University of Pennsylvania	PA	18.6% ++	23.5%	23.4% ++	49.4%	49.1%	46.7%	I	U
Indiana University of Pennsylvania-Main Campus	PA	22.6%	22.5% ++	26.2% +	47.0%	49.1%	51.1% +	I	I
Kutztown University of Pennsylvania	PA	24.1%	27.6%	29.1% ++	51.4%	52.1%	54.6%	I	U
Lincoln University of Pennsylvania	PA	28.2% **	17.6%	21.4%	40.4%	38.5%	37.6%	B	U
Lock Haven University of Pennsylvania	PA	25.3%	29.0%	31.2% +	52.4%	53.0%	50.8%	I	U
Mansfield University of Pennsylvania	PA	30.4%	29.8%	32.6%	51.2%	48.4%	47.9%	U	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
Millersville University of Pennsylvania	PA	34.3%	36.7% +	41.8% +++	62.1%	63.3%	67.4% +	I	I
Pennsylvania State University-Main Campus	PA	54.1%	55.7% +	58.2% +++	84.2%	84.9%	84.0%	I	U
Shippensburg University of Pennsylvania	PA	41.7%	44.7%	46.2% +	63.3%	63.0%	65.3%	I	U
Slippery Rock University of Pennsylvania	PA	25.7%	27.6%	28.8%	51.8%	51.8%	53.0%	U	U
Temple University	PA	27.5%	29.5%	30.7% +	57.3%	58.5%	59.4%	I	U
University of Pittsburgh-Pittsburgh Campus	PA	46.3% +++	51.8%	54.6% +++	69.6% ++	73.3%	75.1% +++	I	I
West Chester University of Pennsylvania	PA	26.0% ++	31.3%	34.5% +++	59.4%	59.1% +	63.7% +	I	I
Rhode Island College	RI	15.6%	14.9%	13.7%	44.1%	44.9%	45.0%	U	U
University of Rhode Island	RI	36.4%	39.8%	38.3%	55.8%	56.9%	57.5%	U	U
Citadel Military College of South Carolina	SC	55.0% +	62.4%	59.2%	64.7%	71.3%	65.2%	B	U
Clemson University	SC	43.9%	44.0%	46.1%	75.1%	75.1% +	78.3% +	U	I
Coastal Carolina University	SC	21.3%	20.0%	22.8%	42.9%	42.2%	43.9%	U	U
College of Charleston	SC	41.1%	42.1%	44.1%	57.5%	60.6%	59.5%	U	U

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
Francis Marion University	SC	18.2%	15.8%	20.0%	37.4%	38.2%	42.3%	U	U
Lander University	SC	21.7%	17.3% +	24.2%	48.4% *	40.7%	46.5%	B	B
South Carolina State University	SC	21.0% ++	29.8% **	22.0%	46.8% +	53.9% **	45.4%	E	E
University of South Carolina-Aiken	SC	21.2%	21.4%	22.7%	43.4%	41.0%	40.9%	U	U
University of South Carolina-Columbia	SC	41.3%	39.9%	40.4%	64.9%	62.7%	62.8%	U	U
University of South Carolina-Upstate	SC	16.2%	17.7%	18.8%	40.0%	36.0%	38.2%	U	U
Winthrop University	SC	32.7%	32.9%	31.4%	59.8%	58.1%	58.3%	U	U
Black Hills State University	SD	11.5%	10.2%	11.7%	22.1%	23.8%	22.3%	U	U
South Dakota School of Mines and Technology	SD	12.0%	11.0%	9.3%	40.5%	43.8%	39.1%	U	U
South Dakota State University	SD	24.1%	23.6%	22.3%	54.5%	53.8%	54.0%	U	U
University of South Dakota	SD	20.9%	22.7%	22.5%	46.4%	49.3%	47.2%	U	U
Austin Peay State University	TN	9.4%	12.0%	8.7%	31.5%	32.0% *	26.6%	U	B
East Tennessee State University	TN	15.1%	16.8%	17.5%	39.1%	39.6%	38.4%	U	U
Middle Tennessee State University	TN	23.1%	24.7%	26.6% +	40.2%	42.4%	43.5% +	I	I
Tennessee State University	TN	27.0% **	21.7%	22.1% *	44.2%	39.7%	40.2%	D	U
Tennessee Technological University	TN	5.7% +++	18.5%	17.8% +++	45.1%	48.6% *	43.5%	I	B

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
The University of Tennessee	TN	28.7%	30.6%	29.4%	57.2% +	60.1%	57.8%	U	B
The University of Tennessee at Chattanooga	TN	23.6%	25.2%	24.3%	45.4%	45.1%	41.9%	U	U
The University of Tennessee-Martin	TN	18.9%	20.8%	17.7%	40.2%	42.7%	43.9%	U	U
University of Memphis	TN	17.6%	18.0%	18.4%	33.3%	33.5%	34.3%	U	U
Angelo State University	TX	15.8%	16.5%	17.4%	36.1%	32.6%	33.4%	U	U
Lamar University	TX	16.1%	17.9%	19.5%	31.5%	32.5%	35.6%	U	U
Midwestern State University	TX	9.2%	9.2%	10.4%	31.6%	28.5%	29.6%	U	U
Prairie View A & M University	TX	11.7%	13.3%	13.2%	31.3% ++	37.6%	37.7% ++	U	I
Stephen F Austin State University	TX	15.0%	16.7%	16.4%	35.1% +	38.6%	38.7% +	U	I
Tarleton State University	TX	18.6%	21.1%	16.1%	45.1%	45.9% **	36.5% **	U	D
Texas A & M University	TX	35.4%	36.5%	38.4% ++	77.3%	76.6%	77.7%	I	U
Texas A & M University-Commerce	TX	15.8%	17.0%	17.6%	34.3%	34.6%	37.7%	U	U
Texas A & M University-Corpus Christi	TX	18.4%	19.9%	16.4%	37.3%	40.3%	35.2%	U	U
Texas A & M University-Kingsville	TX	7.2%	9.6%	8.0%	28.4%	32.1%	30.2%	U	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
Texas State University-San Marcos	TX	20.6%	20.6%	22.4%	52.1%	52.7%	54.8%	U	U
Texas Tech University	TX	23.1%	25.1% +	27.8% +++	54.8%	55.7%	56.2%	I	U
Texas Woman's University	TX	12.8% ++	21.2%	22.5% +++	35.4%	39.4%	40.8%	I	U
The University of Texas at Arlington	TX	15.3%	14.2%	14.7%	39.5%	41.7% *	37.2%	U	B
The University of Texas at Austin	TX	41.7% +++	45.6%	47.0% +++	75.1% +	77.0%	77.5% ++	I	I
The University of Texas at Dallas	TX	29.9%	31.0%	30.9%	55.9%	54.6%	55.5%	U	U
The University of Texas at El Paso	TX	4.8%	4.2%	4.1%	27.7%	28.9%	28.8%	U	U
The University of Texas at San Antonio	TX	6.3%	7.0%	7.2%	30.2%	28.3%	29.7%	U	U
The University of Texas-Pan American	TX	8.4% +	10.8%	9.7%	29.6%	32.9%	32.8%	B	U
University of Houston	TX	9.9% +	12.0%	12.6% ++	40.3%	42.3%	42.7%	I	U
University of Houston-Downtown	TX	1.4%	2.0%	2.2%	11.8%	15.4%	15.5%	U	U
University of North Texas	TX	15.3% +	18.1%	16.6%	43.4%	45.0%	44.3%	B	U
West Texas A & M University	TX	12.8%	14.0%	14.4%	33.4%	38.2%	37.4%	U	U
Southern Utah University	UT	17.6%	20.9%	21.4%	31.3% ++	42.2%	42.3% +++	U	I
University of Utah	UT	15.4% +++	21.3%	20.8% +++	43.1%	46.2% +++	56.0% +++	I	I

University Name	State	4-Year Graduation Rates 2005	4-Year Graduation Rates 2006	4-Year Graduation Rates 2007	6-Year Graduation Rates 2005	6-Year Graduation Rates 2006	6-Year Graduation Rates 2007	4-Year Rate Stability	6-Year Rate Stability
Utah State University	UT	21.0%	21.9%	20.3%	47.0%	47.6%	44.6%	U	U
Weber State University	UT	14.0%	11.4% ***	5.3% ***	38.2%	37.9%	39.8%	D	U
Christopher Newport University	VA	18.3% +++	26.2%	30.5% +++	44.8% +	50.6%	51.5% +	I	I
College of William and Mary	VA	81.0%	83.0%	83.9%	90.8%	91.1%	91.5%	U	U
George Mason University	VA	26.3% ++	31.0%	30.5% ++	52.9%	55.7%	58.3% ++	I	I
James Madison University	VA	62.1%	64.8%	64.8%	79.7%	79.8%	81.2%	U	U
Longwood University	VA	48.0%	46.0%	46.0%	61.7%	65.5%	63.6%	U	U
Norfolk State University	VA	11.5%	12.1%	11.5%	29.2%	29.6%	30.8%	U	U
Old Dominion University	VA	21.8%	22.8%	22.6%	48.4%	49.1%	48.5%	U	U
Radford University	VA	36.9%	34.8%	35.9%	51.3% ++	56.3%	56.2% +	U	I
University of Mary Washington	VA	69.9%	71.2%	67.9%	76.3%	77.1%	75.7%	U	U
University of Virginia-Main Campus	VA	84.3%	82.7%	84.2%	92.6%	92.0%	93.2%	U	U
Virginia Commonwealth University	VA	20.7%	19.6%	20.4%	42.8%	44.8%	46.7% +	U	I
Virginia Polytechnic Institute and State University	VA	47.2% +++	51.7%	50.6% ++	76.3% ++	79.2%	77.5%	I	B
Virginia State University	VA	19.7%	21.1%	23.2%	40.7%	42.6%	42.2%	U	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
Castleton State College	VT	25.8%	23.0%	22.5%	40.2%	37.7%	37.8%	U	U
University of Vermont	VT	48.6%	52.2%	55.7% +++	65.1%	67.0% ++	71.6% +++	I	I
Central Washington University	WA	20.8% +	25.6%	28.0% +++	51.6%	49.7% +	55.5%	I	B
Eastern Washington University	WA	15.3% ++	20.9%	21.7% +++	47.8%	48.2%	46.9%	I	U
The Evergreen State College	WA	41.7%	44.4%	44.8%	55.7%	56.8%	58.5%	U	U
University of Washington-Seattle Campus	WA	45.8%	47.7%	48.3% +	74.3%	74.9%	75.4%	I	U
Washington State University	WA	32.2%	32.5%	33.1%	63.2%	60.2%	62.9%	U	U
Western Washington University	WA	30.0%	29.4%	29.1%	64.8%	64.3%	66.8%	U	U
University of Wisconsin-Eau Claire	WI	19.1%	19.4%	18.4%	58.8%	59.1%	59.7%	U	U
University of Wisconsin-Green Bay	WI	18.7%	23.3%	24.7% ++	47.2% +	53.3%	53.5% +	I	I
University of Wisconsin-La Crosse	WI	24.2%	26.1%	27.8%	63.8%	62.2%	65.9%	U	U
University of Wisconsin-Madison	WI	41.0% +++	44.4%	45.6% +++	76.7%	77.8%	79.0% ++	I	I
University of Wisconsin-Milwaukee	WI	13.2%	14.8%	14.7%	41.9%	42.7%	41.2%	U	U
University of Wisconsin-Oshkosh	WI	15.5%	14.5%	13.7%	48.0%	47.1%	45.7%	U	U

University Name	State	4-Year Graduation Rates			6-Year Graduation Rates			4-Year Rate Stability	6-Year Rate Stability
		2005	2006	2007	2005	2006	2007		
University of Wisconsin-Parkside	WI	9.6%	11.0%	9.8%	28.0%	30.4%	32.1%	U	U
University of Wisconsin-Platteville	WI	13.5%	13.5%	16.9%	51.8%	48.2%	53.2%	U	U
University of Wisconsin-River Falls	WI	25.1%	23.6%	23.9%	56.0%	54.4%	52.0%	U	U
University of Wisconsin-Stevens Point	WI	19.1%	21.9%	19.7%	57.7%	58.6%	58.8%	U	U
University of Wisconsin-Stout	WI	14.0%	14.9%	16.0%	48.0%	48.2%	52.9% +	U	I
University of Wisconsin-Whitewater	WI	19.0%	20.6%	20.4%	50.0%	51.8%	53.1%	U	U
University of Wyoming	WY	29.5%	25.7%	26.2%	57.6%	55.7%	56.9%	U	U

Note: When symbol is positioned to the right of the 2005 %, it indicates a statistically significant change from 2005 to 2006.
When symbol is positioned to the right of the 2006 %, it indicates a statistically significant change from 2006 to 2007.
When symbol is positioned to the right of the 2007 %, it indicates a statistically significant change from 2005 to 2007.
+ = Significant increase at the .05 level.
++ = Significant increase at the .01 level.
+++ = Significant increase at the .001 level.
* = Significant decrease at the .05 level.
** = Significant decrease at the .01 level.
*** = Significant decrease at the .001 level.

Stability Categories
U = Unchanged
I = Increased
D = Decreased
B = Bounced (temporary change)
E = Erratic

Appendix C: State Accountability Mechanisms - Fall 2001

	State-Level Plan		Performance Programs		
State	Source	Completion	Reporting	Budgeting	Funding
AK	None	N/A	Mandate	None	None
AL	None	N/A	Vol	Mandate	None
AR	None	N/A	None	None	Mandate
AZ	Coord	No	Mandate	None	None
CA	Coord	No	Mandate	Vol	None
CO	Coord	Yes	Mandate	None	Mandate
CT	Coord	Yes	Mandate	Mandate	Mandate
DE	None	N/A	None	None	None
GA	Gov	Yes	Mandate	Mandate	None
HI	Gov	No	Mandate	Mandate	None
IA	Gov	No	None	Mandate	None
ID	Coord	Yes	Mandate	Mandate	Vol
IL	Coord	Yes	None	Vol	None
IN	None	N/A	None	None	None
KS	Coord	No	Mandate	Vol	Mandate
KY	Coord	No	Mandate	None	None
LA	Coord	Yes+Tg	Mandate	Mandate	Vol
MA	None	N/A	Mandate	None	None
MD	Coord	No	Mandate	Vol	None
ME	None	N/A	Vol	Mandate	None
MI	None	N/A	Mandate	Vol	None
MN	None	N/A	Mandate	None	None
MO	Coord	No	Vol	Vol	Vol
MS	Gov	Yes	Mandate	Mandate	None
MT	Gov	Yes	None	None	None
NC	Coord	No	Mandate	Mandate	None
ND	Coord	No	Mandate	None	None
NE	Coord	Yes	None	Vol	None
NH	None	N/A	None	None	None
NJ	Coord	Yes	Mandate	None	Vol
NM	None	N/A	Vol	Mandate	None
NV	None	N/A	None	Vol	None

	State-Level Plan		Performance Programs		
State	Source	Completion	Reporting	Budgeting	Funding
NY	Coord	Yes	None	None	Vol [a]
OH	Coord	No	Vol	None	Mandate
OK	Coord	No	None	Vol	None
OR	Gov	Yes	Vol	Vol	Vol
PA	None	N/A	Vol	None	Vol [a]
RI	Coord	No	Vol	None	None
SC	Coord	No	Mandate	None	Mandate
SD	Gov	No	Vol	None	Vol
TN	Coord	Yes+Tg	Vol	None	Vol
TX	Coord	Yes+Tg	Mandate	Mandate	Mandate
UT	Gov	No	Mandate	Vol	None
VA	Coord	No	Mandate	Vol	None
VT	None	N/A	None	None	None
WA	Coord	No	Mandate	Mandate	None
WI	None	N/A	Vol	Vol	None
WY	None	N/A	Mandate	None	None

State-Level Plan Sources: Gov = Statewide Governing Board, Coord = State-level Coordinating Board or Commission, None = No State-level Higher Education Plan.

State-Level Plan Completion: Yes = Plan included a focus on college completion, Yes+Tg = Plan included focus on college completion, plus set targeted completion rates, No = Plan, but no focus on college completion, N/A = No State-level Higher Education Plan.

State Performance Programs: Mandate = Program mandated by state law or regulation, Vol = Program implemented voluntarily by higher education systems, without legislation, None = No program.

a - Performance funding programs were only used for the state university systems in New York and Pennsylvania.