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Institutional Expenditures and State Economic Factors Influencing 2012-2014 Public University Graduation Rates

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Institutional Expenditures and State Economic Factors Influencing 2012-2014 Public University Graduation Rates

A Dissertation Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Brian Todd Hester
August 2016

DEDICATION

The love and support from my wife Alice, parents Bud and Judy, and my in-laws Gus, Mary, and John, were invaluable throughout my PhD coursework and dissertation process. Much needed encouragement and support also came from my extended family, friends, and co-workers. Still, the biggest source of inspiration over the last four years has been my son, Nicholas. In May of 2011, my wife Alice and I found out she was pregnant with our first child. For many reasons, this alone was miraculous. As the months went by and my wife's pregnancy progressed, I worried, hoped, and prayed every day that our child would hang in there and make it through to delivery, and on January 12, 2012, he did. That same year I began the PhD program, and thoughts of his smiles and laughter carried me through many long days. Nicholas has been the source of so much joy and inspiration for our entire family, and this dissertation is dedicated to him, with hope that he continues his love of exploring and learning.

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Finally, as if the support of those above were not enough, I was blessed to have been embraced and nurtured by the "All-Star" dissertation committee: Drs. Terry Ishitani, Norma Mertz, India Lane, and Keith Carter. These four people each represent something forever special to me. I cannot thank you four enough, not only for the enormous amount of patience, time, and effort you gave on my behalf, but thank you as well for your shining examples of professionalism, veracity, compassion, and embodiment of the spirit of public higher education.

ABSTRACT

American higher education has seen public postsecondary funding sharply decline over the past couple of decades and has now fallen behind other countries in being the world leader in college degree production. Many U.S. states have begun to place more accountability on their public institutions to prove they are using appropriations as effectively and efficiently as possible. State financial support is increasingly being appropriated on the basis of performance – i.e. student outcomes, primarily measured by student graduation rates. The better an institution can use its financial resources to increase its graduation rates, the more state financial support it will likely receive. Yet, even as tracking graduation rates has grown in importance, linkages between graduation rates and institutional spending has not been extensively researched in public higher education.

The purpose of this study was to analyze the relationship between institutional expenditures and graduation rates in public higher education institutions – when accounting for both institutional and state level differences. Results of this research may inform methods for adjusting institutional expenses to optimally affect undergraduate student graduation rates. The study examined institutional and state economic characteristics during the first academic years of the 2012, 2013, and 2014 six-year graduating cohorts. Thus, 2006-2008 data were obtained from IPEDS for 560 public institutions, including the input variables of institutional expenditures, student enrollment demographics, ACT scores, and Carnegie classifications, as well as the study's dependent variable: 2012-2014 six-year graduation rates. State economic indicators of average

household income and unemployment rates for the 2006-2008 time frame were obtained from U.S. Bureau of Labor Statistics. Multilevel modeling regression statistics were used to find any significant effects on graduation rates from these institutional and state-level data.

The study revealed that instructional expenditures per student FTE had a significant effect on graduation rates, when controlling for other institutional and state level factors. Institutional characteristics, such as enrollment intensity, proportion of minority students, and ACT scores, had significant associations with graduation rates. To a lesser extent, state level economic factors were also found to have associations, particularly average household income, and, interestingly, higher education spending per capita.

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CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction

Funding for public postsecondary education has declined sharply over the past couple of decades, and the United States has now fallen behind other countries in overall college degree production (Powell, Gilleland, and Pearson, 2012; Webber and Ehrenberg, 2010). Many states – unable to provide the same level of financial support as in the last half of the twentieth century – have increased the accountability requirements on public institutions to prove these dwindling resources are used as effectively and efficiently as possible. State financial support of public colleges and universities is increasingly appropriated on the basis of performance, including student outcomes, such as retention and graduation rates, leading to direct competition between in-state institutions for dollars previously distributed according to student enrollment size. Institutions that can adapt to this change and align resource allocation to improve student outcomes are rewarded and better able to distinguish themselves.

The key stakeholders involved in the outcomes movement include: college students and their parents, college graduates and alumni, employers who hire college graduates, state and federal governments that collect tax revenue from companies and employed college graduates, and college faculty and administrators. How these stakeholders are both influencing and being affected by the increased outcomes accountability facing colleges and universities can be better understood by grouping them into three broad categories: *market*, *political*, and *academic*, as first conceived by

researcher Burton Clark (1983) and further refined by Joseph Burke (2005) and labeled "the Accountability Triangle".

The *market* corner of this triangle consists of college students, parents, and businesses and any other consumer of services offered by colleges and universities. The *political* corner of the triangle represents "state priorities" and characterizes the public needs for higher education services. This group consists of state and federal government officials as well as civic leaders outside government, for example, heads of humanitarian organizations like the Lumina or Gates Foundations. The *academic* corner is made up of the academic community, primarily faculty and administrators. While these three groups of stakeholders have distinct reasons for evaluating quality in public higher education, all share the same increasing interest in student outcomes as one of the primary measures of an institution's worth (Burke, 2005).

One of the key indicators of student outcomes is six-year graduation rates, and each of these three stakeholder groups view this indicator in unique ways. For example, six-year graduation rates are prominent components of: U.S. News and World Report's (USNWR) America's Best Colleges annual print and online ranking of colleges and universities; performance funding policies as found in a number of states; and the National Center for Educational Statistics (NCES) and its Integrated Postsecondary Education Data System (IPEDS) (Fombrun, 1996; Burke, 2005; McLendon, Hearn, and Deaton, 2006; Campbell 2015).

On the market side of this triangle, there is a very broad audience, essentially the public-at-large, with a wide spectrum of aptitude in interpreting college outcomes

accountability reporting. Thus, a simple, numerically ranked list of colleges, updated periodically, offers a quick and universally understood way to measure institutional outcomes. Publications such as U.S. News and World Report (USNWR) aim to satisfy this public demand for collegiate accountability and peer assessment in just such a way with its annual print and online ranked list of "America's Best Colleges."

The perceived reputation of a college based on its rank serves as a hopeful guarantee of quality to the prospective student and their parents (Fombrun, 1996). First-year retention rates and six-year graduation rates collectively represent the largest sub-score percentage (25%) of USNWR's rankings score (Gnolek, Falciano, and Kuncl, 2014). Without the benefit of an easy-to-compare measure such as USNWR's rankings, the public has difficulty evaluating the relative services of universities, and universities have a hard time trying to promote their product and relative merits over similar schools with similar products (Litten, 1986).

From the political corner of the triangle, mounting constituent requests for state government to hold public higher education accountable for its increasing use of tax dollars led to the design and practice of student *outcomes-based performance funding* – first implemented in Tennessee in 1979, and subsequently adopted in some form by more than half of all other states throughout the 1980s and 1990s (Dumont, 1980; Miao, 2012). In their original design, many forms of performance-based funding were too broadly defined and not structured to allow for different missions and student populations among public institutions (McLendon, Hearn, and Deaton, 2006; Miao, 2012). Schools inherently likely to have lower graduation rates due to their student populations were

being penalized; for example, community colleges and 4-year schools that drew students from low-income areas. Subsequently, many states revised or abandoned their original performance funding policies. More recently, though, performance funding has reemerged as metrics tailored to the college or university mission type and student population. These new performance funding models strive to reward schools based on performance measures benchmarked to similar institutions, as compared to prior models where institutions competed within a one-size-fits-all system (Harnisch, 2011; Miao, 2012; Rutherford and Rabovsky, 2014). Nonetheless, student outcomes such as graduation rates continue to be found within most of these new models and remain a focal point for state policy makers (McLendon, Hearn, and Deaton, 2006; Harnisch, 2011, Miao, 2012; Rutherford and Rabovsky, 2014).

Finally, in the academic corner, public higher education administrators are increasingly being tasked by their leaders and boards of trust to monitor and report on student outcome measures, particularly as these outcomes continue to hold such importance both publically, through the college ranking publications; and politically, within the state policy funding models.

Furthermore, it's the academic corner that bears the professional responsibility for generating, and improving, these student outcomes. When striving for higher outcomes, such as increasing graduation rates, knowledgeable judgments must be made to avoid any offsetting negative consequences to the student or school. Such pitfalls may include: students with only preferred academic backgrounds being accepted into college, lowering of a school's academic standards, and a deviation from broader missions of public higher

education such as community outreach, and student discovery and enlightenment (Ehrenberg, 2005; McLendon et al., 2006; Bogue and Johnson, 2010; Miao, 2012; Dougherty, Jones, Lahr, Natow, Pheatt, and Reddy, 2014). Informed decision making also applies to asset allocation. Shrinking state financial resources necessitate academic leaders use such limited resources most efficiently and effectively.

Yet even as the measures of student outcomes have grown in importance, linking these outcomes to public institutional spending has not been extensively researched. The few studies that have examined the linkage have been limited by their scope: including schools with wide ranging differences in sources of funding, enrollment size, missions, and types of degrees produced. Perhaps as a consequence of their latitude, these studies have yielded inconsistent results (Pike, Kuh, McCormick, Ethington, and Smart, 2011).

These inconsistences have occurred both within the same study as well as across studies. For example, Rock, Baird, and Linn (1972) did not find significant relationships between institutional expenditures and post-graduate income. Conversely, other studies have found significant relationships between expenditures and student outcomes (Astin 1993; Hayek 2001; Toutkoushian and Smart 2001; Smart, Ethington, Riggs, and Thompson 2002; Ryan 2004; Gansemer-Topf and Schuh 2006; Powell et al. 2012). To date, no studies have exclusively focused on public, four-year universities or investigated the influence of regional economies on graduation rates. As a result, no clear spending recommendations exist that provide public, four-year institutions the means to most efficiently allocate resources in ways most likely to improve graduation rates, as financial resources continue to decrease.

Statement of the Problem

Six-year graduation rates are a primary measure of success amongst the various groups of stakeholders in public higher education, including the public, the policymakers, and within the academic community itself. Increasing graduation rates directly benefit public colleges and universities with better scores in college ranking publications and to larger amounts of performance-based state funding revenue. In order to meet the increasing demand for optimal student graduation rates, public colleges and universities need a better understanding of how to allocate institutional expenditures for best effect on graduation rates. Yet, there exists an information vacuum regarding what effect directing public higher education expenditures will have on graduation rates.

Purpose of the Study

The purpose of this study is to analyze the relationship between institutional expenditures and graduation rates in public higher education institutions – when accounting for both institutional and state level differences.

Research Questions

This study sought answers to the following questions:

1. What are the associations between different types of higher education institution expenditures and graduation rates after controlling for institutional characteristics?

2. What are the associations between different types of higher education

institution expenditures and graduation rates after controlling for state level

variables?

3. What are the differences in effect levels between higher education institution

level factors and state level factors on graduation rates?

Summary of Methods and Procedures

In pursuit of further evidence for what, if any, correlations institutional

expenditures have with student outcomes, this study examined the most recent IPEDS

data for 560 public, 4 year universities. The proposed study explored only four-year

public institutions for three main reasons. First, this study is based on a framework that

incorporates the greater civic accountability that public colleges face over private

schools, with their reliance on public funding through state tax dollars. Second, looking

only at four year schools helps limits the range of disparate missions and organizational

models that naturally influence institutional characteristics. Two-year schools typically

place more emphasis on technical and vocational training, as well as preparing students to

transfer to four-year institutions, thus two-year institutions inherently would have much

different financial spending and student demographic characteristics than four year

schools share. Third, public and private universities have different federal accounting

systems they must follow when compiling annual financial reports, and these differences

could distort assumptions made about how consistent expenditure categories, such as

instruction, or research are reported between institutions. Public schools follow the

Governmental Accounting Standards Board (GASB) standards, while private schools use

the Financial Accounting Standards Board (FASB) standards. These two methods create differences in how certain revenue and expenses are reported, and therefore these differences would similarly potentially distort assumptions made about financial variables when conducting statistical analysis.

This study used as inputs the following institutional variables, averaged over the three academic years of 2006, 2007, and 2008: *instructional expenditures, research expenditures, academic support expenditures, student services expenditures*, and *institutional support expenditures,* as defined by IPEDS. These academic years represent the beginning semester (years) of the first time undergraduate students who will subsequently earn their bachelor's degrees by August of 2012, 2013, 2014 – that is, within six years of entering college. Additionally, institutional data were collected from IPEDS for the same academic year controlling for student ethnicity and gender headcounts. State economic variables, of *unemployment rate* and *average household income* were aggregated to four geographical regions and similarly examined for correlations with institution graduation rates. These input variables were examined for any effects on student graduation rates at the same institutions. The study's dependent variable was the average of 2012, 2013, and 2014 *6-year graduation rates* of the 2006 through 2008 entering freshmen cohorts.

Significance

The study attempts to mitigate inconsistent findings in previous research and attain more comprehensive and applicable information for budgetary allocation. When accounting for institutional characteristics and state economic factors, this research hopes

to provide a reliable means for adjusting institutional expenses to most positively affect undergraduate student graduation rates. Thus, the findings of this study will assist state policy makers when regulating university expenditure levels, particularly in states with performance funding policies that aim to establish spending targets for their publicly-funded colleges and universities.

Delimitations

The proposed study is delimited to public, four-year institutions, therefore these research findings may not be applicable to other sectors of colleges, such as private or two-year institutions.

Limitations

A primary limitation of the study could result from the fact that the data constituting institutional expenditures varies from institution to institution in how it is collected and reported (Pike et al., 2011). For example, one school may consider a different set of sources when collecting and reporting annual expenditures on student instruction than another school in the same study. IPEDS reporting definitions allow for these differences in institutional interpretations. Thus, these differences make it difficult to establish robust and consistent relationships between expenditures and outcomes (Pike et al., 2011).

Another limitation involving the use of IPEDS data is the variability within instructional and research expenditures categories, as reported by each institution. Specifically, departmental research expenditures that are not externally funded may be

reported by an institution within the IPEDS *instructional* expenditures category, whereas another institution may report this type of research expense within the *research expenditures* category (Webber and Ehrenberg, 2010). Such variability in expenditures reporting may diminish the strength and consistency of these research results.

Finally, only a small amount of the variance in student outcomes is likely to be explained by differences between institutions. Pascarella and Terenzini (1991, 2005) and Kuh, Kinzie, Cruce, Shoup, and Gonyea (2007) found the differences between students within each institution are much larger than differences among institutions (Pike et al., 2011). Other studies point out how institutional expenditures are only marginally related to student outcomes, where student-based characteristics such as test scores, grades, or family background interfere with any institutional effects being measured (Astin 1984, 1985; Kuh 2001, 2003; Webber and Ehrenberg, 2010). Therefore, caution is urged in the interpretation of any results from this research indicating statistically significant associations between institutional characteristics and student outcomes. Many of these associations – such as student demographics or test scores – may be more dependent on the characteristics of the individual students rather than features that an institution would have the ability to adjust, regardless of student make-up. However, institutional expenditures would be one example of a measurable characteristic that is largely independent of such potential student influences.

Organization of the Study

This study consists of five chapters. Chapter 1 has been organized to introduce the study and highlight the statement of the problem, the research questions, the purpose and

significance of the study, and the delimitations and limitations of the study, as well as to provide definitions of key terms used within the study. Chapter 2 outlines the foundational research and literature for this study. First, a review of literature associated with the conceptual frameworks will be given, followed by a review of previous research that bears significance to any study of higher educational spending and subsequent effects on student outcomes. Chapter 3 details the methods used in the study, encompassing the research design, population to be analyzed, data collection and analysis, and all steps taken to ensure validity and reliability. Chapter 4 details the findings of the analyses and addresses the study's research questions. Chapter 5 provides a commentary and summation of the analyses, particularly in relation to the general topic of higher education student outcomes and efficient and effective usage of higher educational resources, with recommendations and benchmark figures for higher education policymakers.

CHAPTER II

LITERATURE REVIEW

Introduction

The purpose of this study is to analyze the relationship between institutional expenditures and graduation rates in public higher education institutions – when accounting for both institutional and state level differences. This chapter presents a review of the research that has been conducted within the specific areas of public higher education spending and any relationships of this spending on student retention and graduation rates. This review is segmented into three sections. The first section begins with an overview of the reasons behind the increase in student outcomes accountability in public higher education over the last few decades – including a look at the stakeholders involved, incentives used to increase student outcomes accountability, potential disadvantages of outcomes-focused accountability, and how outcomes accountability aligns with the overall mission of public higher education in the United States. The next section offers a summary of relevant research on higher education expenditures and their relationships to student outcomes. The final section concludes with a look at the theoretical frameworks chosen for this study.

Increase in Student Outcomes Accountability

While an increase in the focus on student outcomes – namely student retention and graduation rates – in U.S. higher education accountability was clearly evident over the past ten years, the seeds of this movement were taking root over the roughly twenty-

year time period just prior; through the 1980s and 1990s. Researchers have suggested various causes and driving forces behind this movement. Consistent among these studies are three overarching causes behind the increased calls for student outcomes accountability: economic recessions; management practices adopted from the business sector; and changing state political characteristics (Burke and Minassians, 2002; Ewell and Jones, 2006; McLendon, Hearn, and Deaton, 2006; Kazin, Edwards, and Rothman, 2009; Zumeta, 2011).

Economic Recessions

During the 1980s and 1990s, at least two major economic downturns occurred in the overall U.S. economy. In turn, these financial hardships affected state budgets, motivating governors and state lawmakers to seek improvements in the efficiencies of all government agencies, including higher education (Burke, 2005; McLendon et al., 2006).

States most affected by economic recession were those states with lower levels of educational attainment per capita, relative to other states (McLendon et al., 2006). Subsequently, policymakers looked to education as a means to improve their state's economy. The rationale was that a more college-educated workforce would lead to increased employment and corporate investment that, in turn, would lead to greater state tax revenues (McLendon et al., 2006). Thus, public postsecondary institutions were viewed by policymakers in these states as the drivers of increasing the state's human capital, and in turn, the state's economic growth (Becker, 1964; Freeman, 1976; Manski and Wise, 1983; Volkwein, Szelest, Cabrera, and Napierski-Prancl, 1998; McLendon et al., 2006). As a result, these state legislatures were most likely to develop and adopt

performance-based funding policies in higher education, awarding more funding to schools with higher percentages of graduates (McLendon et al., 2006).

Management Practices Adopted from Business Sector

The economic downturn of the 1980s, combined with rapid growth in size and costs of higher education, resulted in public demands to legislatures to push colleges for better efficiency and measured proof of improving student outcomes (Ewell and Jones, 2006). As a result, a number of commission reports began calling for higher education reform, such as A Nation at Risk, published in 1983, which focused on inadequate skill levels of the U.S. workforce. This report emphasized inadequacies in all levels of American schooling (Zumeta, 2011).

One source of inspiration for lawmakers striving to meet the public call for accountability in higher education came from the private sector (Burke and Minassians, 2002). The recent economic recession brought public awareness and favorable attitudes toward business models measuring quality improvement and cost control, such as those found in successful Japanese automobile manufacturers like Honda and Toyota (Zumeta, 2011).

A similar emphasis on business metrics came during the early and mid-1990s in public sector management. Management based on performance outcomes, as opposed to traditional budget-based principles, was a primary message from Osborne and Gaebler's *Reinventing Government*. Attention to customer needs and output quality were highlights

of Hammer and Champy's popular *Reengineering the Corporation* (Burke and

Minassians, 2002).

State legislatures, governors, and coordinating boards readily embraced these

business management practices and subsequently implemented similar assessment

policies for higher education. Yet these policies were typically set up by lawmakers to

allow the college leaders themselves the control to determine how and what the policies

were measuring (Burke and Minassians, 2002). This autonomy was a move by state

government to show the public quick action in applying accountability policies, while

making colleges more likely to approve the mandated metrics by allowing them to be

self-regulated (Burke and Minassians, 2002).

Following state government's lead, through the 1980s and 1990s, all of the

regional accrediting agencies also moved from looking at traditional process indicators to

adopting student outcomes and effectiveness measures as criteria for college accreditation

(Bogue and Hall, 2003). The accreditation process had traditionally focused on

descriptive inputs from student entrance exam scores, number of books held in libraries,

faculty credentials, and campus governance processes (Burke and Minassians, 2002).

Ultimately, all six regional accrediting agencies would require educational outcomes for

accreditation (Burke and Minassians, 2002).

Changing State Political Characteristics

During this same time period, major changes were taking place in the

characteristics and political makeup of state policymakers that would further increase

focus on public higher education outcomes. Elected governing officials were embracing the rapid advances in information and technology, were becoming better educated, and also were increasingly being elected from within the ranks of the Republican party (McLendon et al., 2006; Kazin et al., 2009; Zumeta, 2011).

As compared to previous decades, the 1980s and 1990s state legislative bodies were much more professionalized, better educated, and had the technological means to analyze larger amounts of information in a shorter time period (McLendon et al., 2006; Zumeta, 2011). Along with the ability to take advantage of the analytical power from new technology tools such as desktop computers, an increasingly larger number of lawmakers and their supporting staff held college degrees. Readily available computer technology and educated staff support allowed for greater analysis of higher educational data, where college and university efficiency problems could be analyzed and solutions proposed (McLendon et al., 2006; Zumeta, 2011).

With such knowledge and tools, legislators were less inclined to be submissive to academic leaders and trustees than had been the case in the past (McLendon et al., 2006; Zumeta, 2011). Thus, legislators who had become frustrated with escalating costs of higher education now had the means and disposition to investigate deeper into the administrative processes of institutions (McLendon et al., 2006; Zumeta, 2011).

At the same time, many states were beginning to see a majority swing toward conservatism in the makeup of their legislative and executive government offices (Kazin et al., 2009). The 1980s were a decade in which many states saw growing public support of conservative values and a subsequent shift in political party rule from Democrats to

Republicans (Kazin et al., 2009). As a hallmark example of this shift, Ronald Reagan's

charm led him from his role governor of California to President of the United States

(Kazin et al., 2009). During his time as governor of California from the late 1960s

through mid-1970s, Reagan had pushed back against student protests on Vietnam and

calls for affirmative action, and thus he was a champion in the movement for closer

scrutiny of higher education and moving away from the traditional deference to higher

education academia by state government (Zumeta, 2011).

     This movement would play an important role in higher education, particularly

with regard to student outcomes. The higher the proportion of seats in a legislature that

were held by Republicans, the more likely a state would adopt higher education

performance policies (McLendon et al., 2006). Democratic strength, on the other hand,

had traditionally been associated with higher levels of state spending, including higher

levels of spending on education (McLendon et al., 2006). The Republican-led

legislatures, for the most part, had been linked with implementing more tax policies that

were seen as favorable to private businesses, and Republican legislatures were also more

often found to be distrustful of public bureaucracy and of holding government entities

more accountable regarding funding and purpose. As performance policies in higher

education align more closely with these bureaucratic suspicions and calls for

accountability, it was not surprising that Republican led legislatures would more often

implement such policies (McLendon et al., 2006).

     Finally, tuition costs during the 80's and 90's had been rising across the nation, in

both public and private schools. In search of cause for these cost increases, many state

lawmakers, particularly those following the traditional Republican philosophies, attributed rising tuition to bureaucratic inefficiencies (McLendon et al., 2006). As such, rising tuition charges further motivated these policymakers to push for performance-based accountability measures (McLendon et al., 2006).

Stakeholders Perspectives of Student Outcomes

The key stakeholders involved in the outcomes focus include college students and their parents; alumni; state and federal government; college governing boards and accrediting agencies; non-profit organizations focused on higher education outcomes; and employers who rely on college graduates to fill positions within their organizations and who provide income directly to individuals through salaries and indirectly through tax dollars. The impact of outcomes based accountability on these stakeholders can be better understood by grouping them into three broad categories: *academic; political; and corporate*; as originally conceived by researcher Burton Clark (1983), further refined by Joseph Burke (2005) and labeled "the Accountability Triangle".

As discussed, the political corner of the triangle represents "state priorities" and characterizes the public needs for higher education services. This group consists of state and federal government officials but also of civic leaders outside government, such as heads of humanitarian organizations like the Lumina or Gates Foundations. In the political corner, outcomes accountability measures are often used as a means for determining financial appropriation to public colleges (Ehrenberg, 2005; Dougherty, Jones, Lahr, Natow, Pheatt, and Reddy, 2014). The academic corner is made up of the academic community, primarily faculty and administrators. Here, student outcomes help

faculty in assessing student learning outcomes and provide college boards and administrators measures of performance as gauged by timely degree completion (McLendon et al., 2006; Maio, 2012) . The market corner contains all college students, parents, and businesses, as well as other clients of colleges and universities (Burke, 2005). Popular college ranking publications are a primary tool of the market corner in utilizing student outcomes such as graduation rates (McDonough, Antonio, and Horvat, 1996).

Incentives and Methods Used to Increase Focus on Outcomes Vs Enrollment

While a wide array of instruments, incentives, and methods have been used over the past decade in attempts to measure performance and efficiency of higher education institutions, only those primarily focused on student retention and six-year graduation rates are highlighted here.

Some of the more recent and prominent examples of outcomes focused accountability methods – created by both public and private agencies – are: performance funding policies found in a number of states; the College Affordability and Transparency Center and its "College Scorecard"; Education Trust and its "CollegeResults.org"; National Center for Educational Statistics (NCES) and its Integrated Postsecondary Education Data System (IPEDS); and U.S. News and World Report's (USNWR) America's Best Colleges annual print and online ranking of colleges and universities. These measures of output achievement were created for specific audiences, and they each serve a specific purpose to one or more of the three corners of the stakeholder accountability triangle (Burke, 2005; Campbell 2015). Each stakeholder group has its

distinctive reasons for using these incentives, as an example of a method from each corner will highlight.

Political - Performance Funding

Mounting constituent pressure for state government to hold public higher education accountable led to the design and practice of student outcomes-based performance funding. First implemented in Tennessee in 1979, the objective of these policies was to give authority to state legislatures to mandate higher education institutions collect and report student outcomes information as the basis for receiving state funding. A greater percentage of state appropriations was to flow to institutions with the highest measures of student outcomes; particularly student retention, graduation rates, and degrees awarded. In contrast, the customary method of higher education funding had been tied to enrollment levels – institutions with the most students were given the most money (Dumont, 1980; Miao, 2012).

The initial versions of these performance-based polices were ultimately found to be too generally defined; formulas were not structured to allow for the variety of missions and student populations found within state public institutions. Institutions were being penalized that were inherently likely to have lower graduation rates due to their student populations, such as community colleges and 4-year schools drawing students from low-income areas. Newer models of performance funding place a greater emphasis on progress indicators, such as course completion and credits earned. This has rewarded schools for demonstrating student progress versus having to achieve a one-size-fits-all benchmark figure (Harnisch, 2011; Miao, 2012; Rutherford and Rabovsky, 2014). Still,

overall cohort six-year graduation rates continue to be a chief indicator in many states' performance funding models (Harnisch, 2011; Miao, 2012; Rutherford and Rabovsky, 2014).

Market - Public Rankings

Student retention and graduation rates collectively represent the largest sub-score percentage (25%) of the analysis used for the U.S. News and World Report's (USNWR) America's Best Colleges rankings. As noted by Patricia McDonough in her 1998 study, "College Rankings: Democratized College Knowledge for Whom?", there is no surprise that in an age of instant access to information, there is a demand for quick and easy data to help students and parents determine a college's perceived quality and value (McDonough, Antonio, and Horvat, 1996).

Filling this need, a college's ranked score can be an easy way to judge its reputation and, right or wrong, its quality and value. This perceived reputation serves as a hopeful guarantee of quality to the prospective student and their parents (Fombrun, 1996). The college will, in turn, competitively market its perceived reputation to maximize its effect. Without the benefit of an easy-to-compare measure such as USNWR's rankings, the public has a difficult time trying to evaluate the relative services of universities, and the universities have a hard time trying to promote their product and their relative merits over other similar schools with similar products. Marketing research indicates that these types of published rankings help the public reduce the efforts spent in evaluating schools and help families feel more comfortable when ultimately narrowing admissions applications (Litten, 1986).

Academic – IPEDS National Datasets

While public rankings have a particular purpose and serve their intended audience, they do not typically provide specific data universities use to measure their performance over time and to benchmark against similar universities. Such trend and peer comparisons allow college administrators the evidence necessary to justify taking steps necessary to remain competitive for both student and state financial resources, as noted above. To this end, the Integrated Postsecondary Education Data System (IPEDS) provides an easily accessible and comprehensive means to retrieving institutional data. IPEDS is the primary postsecondary education data collection and public reporting service sponsored by the National Center for Education Statistics, a part of the Institute for Education Sciences within the United States Department of Education. Reporting annual IPEDS data, by means of annual surveys specific to enrollment, human resources, financial revenues and expenses, and student outcomes, is mandatory for all institutions that participate in any federal financial assistance program authorized by Title IV of the Higher Education Act of 1965 (Department of Education, 2015, National Center for Education Statistics, 2016).

Disadvantages of Outcomes-Focused Accountability

Disadvantages to Students

One frequently noted consequence of these efforts to incentivize student outcomes is that colleges may become less inclined to enroll students from disadvantaged backgrounds, as they would be perceived to be less likely to succeed in college and

graduate. This also lends itself to competition amongst schools for students perceived to have the best background for persisting and graduating. Public universities typically have a mission to provide education to a broad range of students from their states, and often the incentives focused on retention and graduation do not give credit for public schools taking a chance on these types of students (Ehrenberg, 2005; Dougherty et al., 2014).

Another way students may be hurt by these incentives is with the process that most graduation rates are calculated. Often these rates only include those students who had enrolled as first-time freshmen and graduated at the same school within six years. No credit is typically given to colleges for students who transfer to another school but still graduate within six years. Thus, if a school for whatever reason anticipated an applicant may intend to transfer at some point after enrolling, that student may not be accepted due to the potential hit to the school's graduation rate (Ehrenberg, 2005).

Both students and institutions may be disadvantaged from the potential effect that some researchers have noted – a reduction of academic standards. This unintended consequence of outcomes emphasis might arise if a school believed that a greater reward would come if more students were shown to graduate, even if that meant faculty were persuaded to grade more leniently or school personnel steering students into easier degree programs (Dougherty et al., 2014).

Disadvantages to Institutions

A prominent disadvantage to institutions with regard to performance funding is the unfairness for schools to compete for state dollars based on the same set of measures

when their missions and populations are naturally different. Pennsylvania and Tennessee have attempted to account for differences in students and missions per institutional types by weighting certain measures differently, and Ohio has used a different funding formula entirely for differing types of schools. Another institutional performance funding concern is the difficulty in anticipating state appropriations when budgeting. Some states have tried to address issue by either making gradual increases to the percent of funds based on performance, year by year, or by averaging the performance funding effects over multiple years. Some states have even built in a lag year between measuring and awarding dollars, to help prepare schools for expected increases or decreases in funding (McLendon et al., 2006; Maio, 2012).

Additionally, some research has shown that schools may concentrate so much on student outcomes that a resultant increase in spending on instruction prevents adequate funding to other areas relevant to mission. For example, Rabovsky found that some schools became so focused on outcomes that they began spending less on research related activities (Rabovsky, 2012). Depending on mission and institutional aspirations this may be an unintended and disadvantageous consequence for some schools.

Alignment with Mission and Spirit of Public Higher Education

Some researchers have contended that forcing institutions to compete with each other on the basis of retention and graduation rates leads to a one-size-fits-all type of monolithic mission for colleges and universities. This outcomes emphasis results in a "mission creep" away from the intended purpose for establishing certain types of institutions in the first place. Community and technical colleges serve a certain type of

student and fulfill a certain mission in higher education versus the missions of liberal arts colleges or research universities. Performance funding may reward retention and graduation rates, but fail to credit schools for "other important purposes of higher education such as personal discovery, civic awareness and responsibility, the pursuit of social justice, and search for new and basic truths" (Bogue and Johnson, 2010). Such rankings as USNWR make an effort to separate types of colleges from each other, but the ranking criteria (graduation rates) are still fundamentally the same in each group, and so subtle differences in student populations and unique college missions are still not being accounted for when ranking a school higher or lower than another (Burke, 2005).

Finally, the primary mission of higher education may be viewed differently from the academic, political, and market perspectives; only from the political viewpoint do efficient student outcomes align well with the perceived mission of higher education. Based on survey results from a 2010 study, Dr. Grady Bogue and colleagues found that: political leaders largely see the college mission as one to contribute to economic and workforce development – which student retention and graduation rates could adequately measure; academic leaders see the mission as more linked with encouraging student discovery; and corporate leaders (market) tend to see college missions more wholly – as a combination of economic development and student discovery, or even less quantifiable, as an "unimpeded search for truth" (Bogue and Johnson, 2010).

Relevant Research Related to This Study

Prior studies have shown inconsistent results with regard to relationships between institutional expenditures and student outcomes. These inconsistences have occurred both

within the same study as well as between similar studies. For example, Rock, Baird, and Linn, (1972) did not find a significant relationship between institutional expenditures post-graduate income. However, others studies have found significant relationships between expenditures and student outcomes (Astin 1993; Hayek 2001; Toutkoushian and Smart 2001; Smart et al. 2002; Ryan 2004; Gansemer-Topf and Schuh 2006; Powell et al. 2012).

One reason for the contradictory findings may be due to the fact that the data constituting institutional expenditures varies from institution to institution in how it is collected and reported (Pike et al., 2011). For example, one school may consider a different set of sources when collecting and reporting annual expenditures on student instruction than another school in the same study. IPEDS reporting definitions allow for these differences in institutional interpretations. Thus, these differences make it difficult to establish robust and consistent relationships between expenditures and outcomes (Pike et al., 2011).

Another reason for these inconsistent results in linking institutional spending to student outcomes is that only a small level of the variance in student outcomes can be explained by any differences between institutions versus differences between students. Pascarella and Terenzini (1991, 2005) and Kuh, Kinzie, Cruce, Shoup, and Gonyea (2007) studies reflect that the differences between students within each institution are much larger than differences between the institutions (Pike et al., 2011). Other studies point out how institutional expenditures are only marginally related to student outcomes, where student-based characteristics such as test scores, grades, or family background

interfere with any institutional effects being measured (Astin 1984, 1985; Kuh 2001, 2003; Webber and Ehrenberg, 2010).

Titus (2006) used institutional expenditures data as controls to adjust for specific student and institutional characteristics while looking for statistically significant effects on student college completion. Using IPEDS data, institutional expenditures were collected from 400 public and private 4-year institutions for the fiscal year of 1996. The independent institution level variables from IPEDS included: student peer group characteristics (i.e. percent female, racial/ethnic diversity, and average SES of full-time freshmen attending each institution), structural-demographic characteristics (i.e. public vs private, enrollment size, and average SAT of full-time freshmen attending each institution), as well as revenues and expenses measures. Specifically, the revenues and expenses measures included: percent of revenues from tuition, state appropriations, grants and contracts, endowments; and percent of expenditures on instruction, research, administration, student services, grants and scholarships, and percent of total expenditures per full-time equivalent (FTE) student. The dependent variable in this study was completion of a bachelor's degree within six years after first enrolling at the same college or university. As with my study, multilevel modeling was used for regression analysis, due to the student data nested within institutions. The independent variables were entered sequentially in the multilevel analyses in conceptually-related blocks, with only the statistically significant variables from the preceding step retained in the subsequent step. The analyses showed that college degree completion was positively influenced by college academic performance, degree major certainty, campus residence,

and student involvement and negatively influenced by being a member of an underrepresented minority group, unmet financial need, and working more than a certain number of hours per week (Titus, 2006). Notably, this study chose to combine all institutional expenditures when dividing by student FTE into one independent aggregated variable for their statistical analyses. Yet, some research has shown variances of expenditures per student FTE effects on graduation rates when choosing to separate expenditures by expense categories such as instruction, research, academic support, and student services then dividing each by student FTE and creating separate variables prior to their analyses (Ryan, 2004; Webber and Ehrenberg, 2010). My study attempted to avoid statistical inaccuracy of using a combined expenditure per student FTE variable but instead examined effects of specific types of expenditures per student FTE independently.

In a study that did measure expenditures per student FTE as separate expenditure types, Ryan (2004) found that four-year college retention and graduation rates were significantly influenced by instruction expenditures per student FTE as well as by academic support expenditures per FTE, but institutional support per FTE and student services expenses per FTE were found to be insignificant on those two student outcomes. Ryan used IPEDS data for the discrete multiple independent variables: instruction; academic support; student services; and institutional support; but further augmented these by dividing them each by the schools' full-time equivalent student enrollment, also from IPEDS data (Ryan, 2004). Ryan chose to include both public and private institutions in his study, however my study focused only on public four-year colleges to help remove

any inherent differences found in financial reporting and overall missions between public versus private institution types.

Conversely, Webber and Ehrenberg (2010) concluded that instructional-oriented institutional expenditures per student FTE have virtually no effect on student graduation and persistence, but one category of institutional expenditures per student FTE – student services – did show a marginal effect on student outcomes, primarily with institutions that have lower entrance test scores and higher Pell Grant expenditures per student relative to the institutions being studied (Webber and Ehrenberg, 2010). Similar to Ryan, Webber and Ehrenberg chose only to include 4-year institutions. However, Webber and Ehrenberg also included private four-year schools in their study sample, and they logarithmically transformed the expenditure variables to create more normally distributed data. The inclusion of private colleges and universities and skewness correction of the expenditure variables may have contributed for the different results as compared to Ryan's study (Webber and Ehrenberg, 2010). Again, by limiting my study to only public schools, I hope to add to the *expenditure effects on graduation rates* literature specific to this sector of higher education.

A recent study provides a model for adjusting institutional expenditure categories to improve student outcomes, including graduation rates, after controlling for certain institutional-level characteristics. "Expenditures, efficiency, and effectiveness in US undergraduate higher education: A national benchmark model", authored by Powell, Gilleland, and Pearson (2012) found that instructional expenditures were predictors for both efficiency measures, such as student-to-faculty ratios, as well as effectiveness

measures, such as retention and graduation rates. The model that Powell et al. employed in their study served as the theoretical basis for my study. The focal point of this model is that controlling for certain higher education institutional characteristics (i.e. enrollment size and Carnegie classification) and adjusting specific institutional expenditure categories (i.e. expenses on instruction, research, public service, academic support, and student services) can both independently predict an institution's degree of efficiency and effectiveness. Efficiency, as defined by this study, is measured collectively by class size, student-to-faculty ratios, faculty satisfaction and teaching load, and executive staff ratios variables; and effectiveness is likewise measured collectively by student retention and graduation rate variables. Their study sought to address the implications of state higher education funding cuts over the past quarter century by developing a model of the above inputs and outputs and resultant benchmarks to determine a public university's most efficient and effective use of dwindling financial resources; the analyses concluded that indeed expenditures and institutional characteristics predicted both efficiency and effectiveness (Powell et al. 2012). Yet, this study noted that it could be improved on by also examining other influences on graduation rates beyond institutional characteristics (Powell et al. 2012). To build upon Powell's study, my study adds regional unemployment rates and average household incomes as independent variables to determine any effects of these regional economic indicators on six-year graduation rates.

Several studies lend support to the notion that regional economic factors may affect college outcomes. McMillon (2004) observed that institutional degree programs that were not in sync with the employment demand of its region were directly correlated

to higher student loan default. Students were defaulting on loans at a higher rate in regions with high average unemployment than those in regions where the economy was stronger with more available job opportunities. Gross, Cekic, Hossler, and Hillman (2009) found that completing (graduating from) a postsecondary education program is the single strongest predictor of not defaulting on a student loan. If completion and student loan default are both linked to regional economic health, an institution may be disadvantaged when compared to an institution in a more favorable economic region.

Conceptual Frameworks

In addition to the efficiency and effectiveness model of Powell's noted above, my study would be based upon other conceptual frameworks as were followed in the related research noted above. One framework embraced is human capital theory, where variables are chosen on the basis of an individual's willingness to invest in educational training in return for higher financial compensation. Here, students chose to pursue a college degree only when the benefits of the degree are believed to outweigh the direct costs (e.g. tuition) and indirect costs (e.g. being a student instead of working and earning a present income) of said degree (Becker, 1964; Freeman, 1976; Manski and Wise, 1983; Volkwein, Szelest, Cabrera, and Napierski-Prancl, 1998). Also incorporated in this study is organizational theory, where leaders of an organization set and pursue work-related goals of efficiency and effectiveness (Argyris, 1973; Pfeffer, 1982; Webber and Rogers, 2014). Another, the revenue theory of costs, is assumed here to influence an institution's resource allocation, where the quest for greater prestige leads to spending all available resources, without limit (Bowen, 1980; Webber and Rogers, 2014). As previously

detailed, Burke's accountability triangle provided this study a theoretical basis for expectations of particular stakeholder effects from increased student outcomes accountability (Burke, 2005). Also followed was Vincent Tinto's integrated model of student retention. The basis for Powell's institutional effectiveness and efficiency model, Tinto's model supports the concept that students will persist and graduate in higher rates when the student's individual characteristics best match an institution's characteristics (Tinto, 1975, 1982).

Summary

As this review has highlighted, the increasing importance of student retention and graduation rates to public higher education stakeholders is requiring college administrators and state policy makers to best align dwindling financial resources to have the greatest effect on these student outcomes. The better a state-funded higher education institution can align its resource usage to improve student outcomes, the greater percent of state money it will continue to be rewarded with and the greater its ability to distinguish itself amongst its stakeholders. Yet, public institution leaders and administrators are being tasked with improving student retention and graduation rates with diminishing financial resources and without the benefit of well-defined spending guidelines for achieving these improvements. To best utilize available resources in order to meet the increasing demand for optimal student outcomes, institutions need a clearer understanding of how institutional expenditures affect student retention and graduation rates. The study herein should help provide university administrators and state

policymakers guidance for establishing categorical spending levels for their public

colleges and universities, after controlling for institutional and state level characteristics.

CHAPTER III

RESEARCH METHODOLOGY

Introduction

The purpose of this study was to analyze the relationship institutional expenditures have on graduation rates in public higher education institutions – when accounting for both institutional and state level differences. Specific to these intentions, this study seeks answers to the following questions:

1. What are the associations between different types of higher education institution expenditures and graduation rates after controlling for institutional characteristics?

2. What are the associations between different types of higher education institution expenditures and graduation rates after controlling for state level variables?

3. What are the differences in effect levels between higher education institution level factors and state level factors on graduation rates?

As an overview of the steps taken in accomplishing this study's purpose and in pursuit of the answers to the questions above, this chapter aims to: provide a detailed description of the research data sources to be accessed; give an introduction and summary of the research variables selected for evaluation; and provide general characterizations of

the specific types of data analyses conducted, including the primary statistical procedure employed in the study – multilevel modeling.

Data Sources

In pursuit of further evidence for the effects institutional expenditures have on student outcomes and finding an optimum level for such expenditures to student outcomes, this quantitative, non-experimental, correlational study examined financial expenditures of 560 public 4-year universities, adjusted by their institutional and state level characteristics, in relation to those universities six-year graduation rates. The input, mediating, and output variables used in the study came from data obtained from three sources: the Integrated Postsecondary Data System (IPEDS), the Bureau of Labor Statistics within the United States (U.S.) Department of Labor, and the National Center for Higher Education Management Systems (NCHEMS).

The Integrated Postsecondary Data System (IPEDS)

The historical roots of the Integrated Postsecondary Data System (IPEDS) extend all the way back to the foundation of the United States Department of Education. As such, collecting institutional higher education data in the United States has been conducted by various federal agencies in some form since the late 1860s. Beginning in 1867, the U.S. Department of Education was created for the purpose of "collecting such statistics and facts as shall show the condition and progress of education in the several States and territories, and of diffusing such information respecting the organization and management of schools and school systems, and methods of teaching, as shall aid the

people of the United States in the establishment and maintenance of efficient school systems, and otherwise promote the cause of education throughout the United States" (Fuller, 2011).

The National Center for Education Statistics (NCES) was established in 1974 as part of the Education Division of the U.S. Department of Health, Education, and Welfare for the purpose of collecting and providing statistics related to education in the United States. NCES was incorporated into the Office of Educational Research and Improvement with the establishment of the current U.S. Department of Education in 1979 (Fuller, 2011). In 1985, NCES developed and began phasing in the Integrated Postsecondary Data System, IPEDS, beginning with the 1985-86 "Institutional Characteristics" survey, with subsequent surveys introduced over the following two years including "Fall Enrollment", "Residence of First-Time Students", "Total Institutional Activity", "Degree Completions", "Finance", "Staff Salaries of Full-Time Instructional Faculty", and the "Enrollment in Occupationally Specific Programs (academic concentrations and majors)". The "Graduation Rates" survey was added in 1997-98, after the enactment of the Student Right-to-Know and Campus Security Act in 1990 (Fuller, 2011).

Amendments in 1992 to the Higher Education Act added a provision requiring the reporting of annual IPEDS data – by means of these surveys – to be mandatory for all institutions that participate in any federal financial assistance program as authorized by Title IV of the original Higher Education Act of 1965 (Fuller, 2011). Therefore, all higher education institutions wishing to receive federal financial dollars for student financial aid are subsequently completing and submitting to IPEDS these survey data

every year. The IPEDS Data Center online information retrieval website provides access to all of this historical institutional survey information and allows for bulk downloading any current and longitudinal IPEDS collected data. As a result, most public universities should have reported the selected years' IPEDS surveys and have the data publicly available for the variables chosen in this research.

U.S. Bureau of Labor Statistics

The United States Bureau of Labor was established in 1884 within the U.S. Department of Interior. It served as an independent department before being incorporated into the Department of Commerce and Labor in 1903. In 1913, the Bureau of Labor Statistics (BLS) was transferred to the newly created Department of Labor. In 1915, the BLS began conducting monthly nation-wide surveys on income and employment, which has carried on to today as the "Quarterly Census of Employment and Wages". By 1995, this employment and wage data was publicly available online at www.bls.gov. U.S. Bureau of Labor Statistics data for years of 2008 through 2014 provided mediating variables for average household income, unemployment rates to serve as a proxy for a state's financial health. These variables aggregated state data into four (U.S.) regions: "Northeast", "Midwest", "South", and "West", as defined by the U.S. Bureau of Labor Statistics.

The National Center for Higher Education Management Systems (NCHEMS)

The National Center for Higher Education Management Systems (NCHEMS) is a private nonprofit organization, established in 1969, for the purpose of providing

resources to help facilitate higher education research and policy making, according to

www.nchems.org. Public higher education expenditures per state data was obtained from

NCHMES website for the years of 2006, 2007, and 2008. These expenditures were

averaged over the three years and aggregated to the same U.S. regions as defined with the

U.S Bureau of Labor and Statistics data.

Variables

Data collected from IPEDS and the U.S. Bureau of Labor Statistics – for the

academic and calendar years of 2006 through 2014 – was used to represent: a.) this

study's input variables: instructional expenditures, research expenditures, public service

expenditures, academic support expenditures, and student services expenditures; b.) the

study's various mediating variables, detailed below; and c.) the study's dependent

variable – the three-year average of the six-year graduation rates of the 2006, 2007, and

2008 first time undergraduate student cohorts. Table 3.1 provides a complete list of the

variables to be used in this study.

Input Variables

This study used an average of 3 years IPEDS data - 2006, 2007, and 2008 – for

560 public institutions that will include data on institutional expenditures, student and

institutional characteristics and graduation rates. The four institutional expenditures

categories focused on in this study represent the five main input variables: "Instruction

Expenses per Student FTE", "Research Expenses per Student FTE", "Public Service

Expenses per Student FTE", "Academic Support Expenses per Student FTE", and

Table 3.1
Study Data Descriptive Statistics

Variable Label	Mean	Std Dev	Max	Min	Count	%
DEPENDENT VARIABLE						
Six-Year Graduation Rate	45.6%	18.0%	93.6%	5.0%		
INDEPENDENT VARIABLES						
Institution Level						
Race						
Asian	5.2%	9.4%	97.1%	0.0%		
Black	14.6%	22.1%	99.0%	0.0%		
Caucasian	62.9%	26.6%	98.1%	0.0%		
Hispanic	8.5%	13.5%	94.6%	0.0%		
Gender						
Female	53.9%	9.9%	94.5%	6.1%		
Male	46.1%	9.9%	93.9%	5.5%		
ACT 25th percentile score	19	2.6	28	9		
FTE/Headcount	85.1%	10.1%	100%	42.9%		
Instruction Expenses per Student FTE	$6,547	$3,410	$44,235	$2,350		
Research Expenses per Student FTE	$1,712	$3,641	$45,422	$0		
Public Service Expenses per Student FTE	$849	$1,266	$14,000	$0		
Academic Support Expenses per Student FTE	$1,642	$1,241	$13,223	$169		
Student Services Expenses per Student FTE	$1,315	$1,109	$19,270	$330		
Carnegie Classification						
Research					133	23.8%
Doctoral					27	4.8%
Masters					251	44.8%
Baccalaureate					106	18.9%
Carnegie - Other					43	7.7%
State Level						
U.S. Region (number of institutions)						
North East					103	18.4%
Midwest					135	24.1%
South					215	38.4%
West					107	19.1%
Average Household Income by State	$55,167	$8,003	$73,038	$40,481		
Average Unemployment Rate by State	4.9%	0.9%	7.4%	3.0%		
Average Public Higher Education Expenditures	$260	$36	$292	$190		

"Student Services Expenses per Student FTE" for 560 public universities as reported to IPEDS, averaged over the three years of 2006, 2007, and 2008. This averaging helped smooth any potential fluctuations in the data that may cause inaccurate statistical analyses results.

As defined by IPEDS, instructional expenses represent "expenses of the colleges, schools, departments, and other instructional divisions of the institution and expenses for departmental research and public service that are not separately budgeted. Includes general academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and regular, special, and extension sessions." Research expenses are defined by IPEDS as "expenses for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution." Public service expenses are defined as "expenses for activities established primarily to provide non-instructional services beneficial to individuals and groups external to the institution. Examples are conferences, institutes, general advisory service, reference bureaus, and similar services provided to particular sectors of the community." Academic support expenses are defined as "expenses of activities and services that support the institution's primary missions of instruction, research, and public service. This category includes the retention, preservation, and display of educational materials (for example, libraries, museums, and galleries); organized activities that provide support services to the academic functions of the institution (such as a demonstration school associated with a college of education or veterinary and dental

clinics if their primary purpose is to support the instructional program); media such as audiovisual services; academic administration (including academic deans but not department chairpersons); and formally organized and separately budgeted academic personnel development and course and curriculum development expenses." Finally, student services expenses are defined by IPEDs as "expenses for admissions, registrar activities, and activities whose primary purpose is to contribute to students emotional and physical well-being and to their intellectual, cultural, and social development outside the context of the formal instructional program. Examples include student activities, cultural events, student newspapers, intramural athletics, student organizations, supplemental instruction outside the normal administration, and student records." (National Center for Education Statistics, 2016). Each of these IPEDS expenditure variables have "student FTE" as the denominator in determining the expense per student ratio. IPEDS defines "student FTE" as "The full-time-equivalent (FTE) enrollment is the sum of the institutions' FTE undergraduate enrollment and FTE graduate enrollment (as calculated from or reported on the 12-month Enrollment component) plus the estimated FTE of first-professional students. Undergraduate and graduate FTE are estimated using 12-month instructional activity (credit and/or contact hours)" (National Center for Education Statistics, 2016).

Choosing the years of 2006, 2007, and 2008 - the beginning years of enrollment of the students who would potentially graduate within the six-year timeframe of the graduation rates being analyzed in this study – 2012, 2013, and 2014 – is an attempt to measure these institutional expenditure effects during the *first year of study*, when most

students make the decision to quit school and thus the year most influential on subsequent graduation rates. Much research has shown that student attrition is highest in the first year of college enrollment and lowers each year after (U. S. Department of Education, 1998, 2000; Kahn and Nauta, 2001; Tinto, 2012; Williams, 2015).

As indicated in Table 3.1, the mean of the 2006-2008 average instruction expenses per student FTE across the 560 public higher education institutions is $6,547; with a standard deviation of $3,410; and maximum and minimum values of $44,235 and $2,350 respectively. 2006-2008 average research expenses per student FTE have a mean of $1,712; standard deviation of $3,641; and maximum and minimum values of $45,422 and $0. 2006-2008 average public service expenses per student FTE have a mean of $849; standard deviation of $1,266; and maximum and minimum values of $14,000 and $0. 2006-2008 average academic support expenses per student FTE have a mean of $1,642; standard deviation of $1,241; and maximum and minimum values of $13,223 and $169. 2006-2008 average student services expenses per student FTE have a mean of $1,315; standard deviation of $1,109; and maximum and minimum values of $19,270 and $330.

Mediating Variables

Institution level mediating variables were selected based on their approximation to the control variables found within the frameworks adopted from prior research. These control or mediating variables included: Carnegie classification; the average of the 25th percentile of the ACT scores; the ratio of total undergraduate student FTE to headcount; the percentages of undergraduate students who were female, African American, Hispanic,

and Asian for the institution's entering first-year classes of 2006 through 2008. The gender and racial makeup of institutional enrollment were examined as a percentage versus the overall number of these subpopulations, as the percentages helped standardize any differences in overall enrollment sizes between each institution. The Carnegie classification served as a proxy to control for the size of the institutional focuses. For example, the Carnegie classification of doctoral institutions are prone to have higher levels of research expenditures in comparison to baccalaureate colleges.

As indicated in Table 3.1, the mean of the 2006-2008 average Asian enrollment percentage across the 560 public higher education institutions is 5.2%; with a standard deviation of 9.4%; and maximum and minimum values of 97.1% and 0% respectively. 2006-2008 average African American student enrollment percentage have a mean of 14.6%; standard deviation of 22.1%; and maximum and minimum values of 99.0% and 0%. 2006-2008 average Caucasian enrollment percentage have a mean of 62.9%; standard deviation of 26.6%; and maximum and minimum values of 98.1% and 0%. 2006-2008 average Hispanic enrollment percentage have a mean of 8.5%; standard deviation of 13.5%; and maximum and minimum values of 94.6% and 0%. 2006-2008 average female enrollment percentage have a mean of 53.9%; standard deviation of 9.9%; and maximum and minimum values of 94.5% and 6.1%. 2006-2008 average male enrollment percentage have a mean of 46.1%; standard deviation of 9.9%; and maximum and minimum values of 93.9% and 5.5%. These students had an average ACT 25th percentile score of 19 with a standard deviation of 2.6 and a maximum and minimum score of 28 and 9. The overall average undergraduate student FTE to headcount ratio was

85.1% with a standard deviation of 10.9% and maximum and minimum values of 100% and 42.94%. Of the 560 institutions, the Carnegie classification frequency counts were: 133 Research, 27 Doctoral, 251 Masters, 106 Baccalaureate, and 43 that were categorized with another Carnegie classification, such as a medical, engineering, law, or tribal college.

State economic mediating variables were selected based on prior research, as previously noted in Chapter II, where their potential influence on student outcomes was discussed. These consisted of average household income, unemployment rate, and higher education expenditures per capita for each U.S. state, for the 2006, 2007, 2008 calendar years – the years that would match the first years of enrollment for the 2012, 2013, and 2014 six-year graduates, respectively. Each of these variables was aggregated to four U.S. geographical regions, "North East", "Midwest", "South", and "West", as defined by the U.S. Bureau of Labor Statistics. These four U.S. regions have differing racial percentages of their overall populations, thus, similar to analyzing institutional enrollment by racial percentages, controlling for these differences in racial percentages by region may provide further strength to the study' statistical analyses.

The state average income variable was divided by one thousand for better interpretation of the statistical analyses. Without dividing the regional average income by 1000, the regression analyses would be based on one-dollar income changes and only deliver very small coefficients of predicted influence on the dependent variable – six-year graduation rates. After dividing the regional average income by 1000, the regression analyses should be able to show predicted effects on graduation rates by larger amounts

that would be easier to interpret and help provide the answers sought from the research questions.

As indicated in Table 3.1, of the state economic mediating variables chosen for the study, the mean of the 2011-2013 average household income by region variable is $53,472; with a standard deviation of $9,262; and maximum and minimum values of $66,905 and $43,196 respectively. 2012-2014 average unemployment rate by region have a mean of 9.0%; standard deviation of 0.8%; and maximum and minimum values of 9.7% and 7.5%. 2006-2008 average public higher education expenditures per capita have a mean of $260; standard deviation of $36; and maximum and minimum values of $292 and $190.

Dependent Variable

The dependent variable being studied is the three-year average of the 2006, 2007, and 2008 first time in college student 6-Year Graduation Rates by institution, as reported to IPEDS. As indicated in Table 3.1, the mean of the 2012-2014 six-year graduation rate across the 560 public higher education institutions is 45.6%; the standard deviation is 18.0%; and maximum and minimum values are 93.6% and 5.0%.

Data Analysis Methods

Data Integrity Procedures and Methodological Assumptions

Prior to conducting the inferential statistical analyses necessary to answer this study's purpose and questions, some preliminary analyses were performed to better understand the relationships between the underlying data and the variables created from

these data and ensure data integrity before performing inferential analyses. For data integrity, this study employs Statistical Package for the Social Sciences (SPSS) statistical software.

To ensure that three years' average of expenditures maintain stability over the 5-year enrollment timeframe, Spearman-rho correlation analysis was administered to identify any potential fluctuations in the expenditure variables beyond these first three years of enrollment.

In order to find what effects institutional expenditures have on graduation rates, after controlling for institutional and state level mediating predictors, this study used multilevel regression statistics that uses two regression steps for each level of analysis found in the data. In this study, institution level data is nested within state level data. The computation details on multilevel regression technique will be discussed in more detail in the next section of this chapter. Hierarchical Linear Modeling, known as HLM, is statistical software, developed by Stephen Raudenbush and Anthony Bryk , which was specifically designed to conduct multilevel analyses. This study employed HLM as its statistical software for multilevel analyses.

Multilevel modeling statistics have data assumptions that include: multicollinearity, normality, and outliers. Each of these data assumptions was tested as part of the preliminary analytical procedures conducted prior to the inferential analyses. Multicollinearity of data is determined when a correlation between two variables is considered high enough to potentially confuse any relationships found between those variables and the dependent variable (Huck, 2012). SPSS software allowed for testing

these study variables and provided a Variable Inflation Factor score of 5 or greater when multicollinearity exists. Any variables showing high multicollinearity would have been removed from further statistics.

The normality assumption is an indication of how a data sample to be studied is distributed from its average or mean (Huck, 2012). When a sample fits the normality assumption, it is considered to have an equal balance of units or scores distributed on either side of the population's mean (Huck, 2012). Normality for the dependent variable is of particular importance. Thus, normal assumption was tested for the dependent variable in the current study. If any forewarnings of departure from normality were found, data transformation would have been considered to improve the shape of the distribution.

The linear regression procedure in SPSS offers a diagnostic component to test multicollinearity across independent variables. There are two measures to determine the level of multicollinearity. These two measures include tolerance and variance inflation factor (VIF) values. A tolerance value below .20 is generally regarded as an indication of multicollinearity with at least one of the other independent variables, as this indicates that 80% of the variance of this particular variable is shared with another independent variable (O'Brien, 2007). The VIF value is another indicator of multicollinearity provided with the SPSS regression output, with any VIF value greater than 5 being an indicator for multicollinearity between variables (O'Brien, 2007).

Inferential Analysis Procedures

To answer this study's research questions, the current study employs multilevel regression analysis to find associations and effect level differences between institutional expenditures and state financial characteristics with regard to the outcome of public university graduation rates. The multilevel analysis results provided regression coefficients for each institutional expenditure and state economic indicator, which indicated the degree to which each of these predictor variables caused variation in six-year graduation rates.

The variables used for answering these questions included both higher education *institution level* data – including the various types of institutional expenditures and other institutional and student population demographic characteristics, as well as U.S. *state level* data – such as the average state unemployment rate and median state household income. As such, the scenario exists where some of the data to be analyzed is nested within data grouped at a more macro level. Specifically, higher education institution data are nested within each state and further nested within each of four U.S. regions.

If single equation linear regressions were used to find the percent of variance in graduation rates caused by theses institutional and state level predictor variables, standard errors for state level variables would be deflated which could result in Type I statistical errors – rejecting null hypotheses and giving false positive results. Thus, the standard errors must be adjusted for the state level data, and the two-step equations of HLM achieve this (Ethington, 1997; Raudenbush and Bryk, 2002; Perna and Titus, 2005). Further, disregarding that the data is nested and have different units of analysis

(institutions versus states) could lead to "aggregation bias" (Ethington, 1997; Raudenbush and Bryk, 2002; Perna and Titus, 2005). This aggregation bias leads to statistical errors attributed to the variations between unit level regression slopes versus the aggregated group average regression slope that may occur when using single equation regression to predict effects with multilevel data (Ethington, 1997; Raudenbush and Bryk, 2002; Perna and Titus, 2005). To illustrate, each of the 560 institutions included in this study have institutional characteristics unique to that institution. For example, one *institution* may have 10% Asian students, whereas another institution may have 25%. On the other hand, each *state* has a single unemployment rate that would be a shared value for each institution within that state (Ethington, 1997; Raudenbush and Bryk, 2002; Perna and Titus, 2005). A single equation analysis would equally weigh the 50 (one per each state) state level characteristics effects as it would the 560 institution level characteristics effects. Using only single equation regression for such differences in units of analysis would cause an overestimation of the state level data effects, as the sample size of 50 would be replaced with 560 to match the institution level characteristics. For these reasons, using multilevel regression is superior to a single equation regression when analyzing nested data.

The general multilevel regression model is represented by a Level-l model equation (1) in which the institution outcome (graduation rate) is considered a function of institution variables:

$$Y_{ij} = \beta_{0j} + \beta_{0j}X_{1ij} + \beta_{2j}X_{2ij} + ... + \beta_{Qj}X_{Qij} + r_{ij} \qquad (1)$$

where:

Y_{ij} is the graduation rate for institution i in state j;

X_{Qij} are the values on the institution level independent variables measured for institution i in state (or region) j;

β_{Qj} are the intercept and regression coefficients representing the effects of the institution level independent variables on the outcome in state (or region) j;

r_{ij} represents random error,

and the Level-2 model equation (2) where each Level-l coefficient is considered a function of group characteristics at the state level:

$$\beta_{0j} = \gamma_{q0} + \gamma_{q1}W_{1j} + \gamma_{q2}W_{2j} + ... + \gamma_{qs}W_{Sj} + u_{qj} \qquad (2)$$

where:

β_{0j} is the regression constant in state j;

W_{sj} are the values on the state (or region)-level variables measured for state (or region) j;

γ_{qs} are the regression coefficients representing the effects of the institution level variables on the within-institution relationships, β_{qj};

u_{qj} represents random error (Perna and Titus, 2005).

Independent variables are grouped together to create an order of entering in the regression equation. First, institution characteristics were grouped and entered into the equation. Secondly, the group of state factors were included in a second regression equation. The purpose of entering separate groups in such order is to observe incremental changes in variances by subsequent adding of each group. Grand mean centering is used to set the value of the intercept coefficients in the equations above. This is where the average (mean) of each coefficient predictor variable is made to represent the intercept – or where the graduation rate would be predicted to fall when the predictor variable is at

its average, neutral effect level (Ethington, 1997; Raudenbush and Bryk, 2002; Perna and Titus, 2005).

In order to rank the effect size of the statistically significant predictor variables, the standardized coefficients (S. Coeff) for each variable w calculated from the multilevel regression results, using the following equation (Hox, Moerbeek, and van de Schoot, 2010):

$$S.Coeff = \frac{U.Coeff \text{ x St. Dev. of Predictor Variable}}{St. Dev \text{ of Outcome Variable}} \tag{3}$$

where:
U. Coeff is the unstandardized coefficient for each predictor variable;
St. Dev is the standard deviation of the predictor or outcome variables.

Finally, in order to determine the percentage of the total variance (R^2) in graduation rates that are explained by the institutional level characteristics versus the percentage of the total variance in graduation rates as explained by the state level characteristic, the residual variances for each model above are entered into the equation (Hox, Moerbeek, and van de Schoot, 2010):

$$R^2 = \left(\frac{\sigma^2_{e|b} - \sigma^2_{e|m}}{\sigma^2_{e|b}} \right) \tag{4}$$

where $\sigma^2_{e|b}$ is the residual error variance for the intercept-only model - with no predictor variables, and $\sigma^2_{e|m}$ is the residual error variance for the comparison models, after introducing either the Model 1 predictor variables or Model 2 predictor variables.

The equation above provided both the percentage of variance in six-year graduation rates as explained by the Model 1 institutional level characteristics as well as the percentage of variance in graduation rates as explained by the Model 2 state level economic indicators.

Summary

This chapter has restated the purpose of the study and its research questions to provide context and introduction to the study's data sources and data analyses used. These data sources include: the Integrated Postsecondary Data System (IPEDS), the Bureau of Labor Statistics, and the National Center for Higher Education Management Systems (NCHEMS). From these sources, the input, mediating and dependent variables were collected. Obtained from IPEDS, the input variables included five types of institutional expenditures - instruction, research, public service, academic support, and student services - per student FTE enrollment and averaged over the 2006 through 2008 timeframe. Mediating variables at the institution level were also obtained from IPEDS and from the U.S. Bureau of Labor Statistics and NCHEMS for the regional mediating variables. Hierarchical linear regression provided the best statistical tool to find the answers to the research questions, as the data variables being analyzed were nested at two different levels: institutional data nested within each state and region. Chapter IV will provide the results of these data analyses.

CHAPTER IV

RESULTS

Introduction

The purpose of this study was to analyze the relationship institutional expenditures have with graduation rates in public higher education institutions – when accounting for both institutional and state level differences. Specific to these intentions, this study seeks answers to the following questions:

1. What are the associations between different types of higher education institution expenditures and graduation rates after controlling for institutional characteristics?

2. What are the associations between different types of higher education institution expenditures and graduation rates after controlling for state level variables?

3. What are the differences in effect levels between higher education institution level factors and state level factors on graduation rates?

This chapter details the findings of this study's data analyses used to answer the research questions above. The first section of the chapter explains the results of the preliminary and inferential analyses conducted to identify the relationships between public higher education institutional expenditures per student FTE by type – instruction, research, public service, academic support, and student services – and six-year graduation

rates. The second section of the chapter details the results of the HLM inferential analyses with regard to the effects of the institution level mediating factors of: race, gender, ACT scores, and Carnegie classification. The third section of the chapter explores the findings pertaining to the state economic factors: state higher education spending per capita, unemployment rate, and average household income.

Preliminary Data Analyses

Tests of the study variables for normality and multicollinearity revealed that the highest VIF number found was 3.44, indicating that none of the study variables showed any alarming signs of multicollinearity, and so none were removed from further statistical analyses. Prior to conducting the SPSS linear regression, mean imputation was used to supply 54 institutions with missing independent variable values. Additionally, the state average income variable values were each divided by one thousand for better interpretation of the regression results.

2006 – 2014 Expenditure Correlations

To ensure that each of the expenditure types maintained annual stability over the study's enrollment timeframe of 2006 through 2014, Spearman-rho correlation analysis was run using SPSS to identify any potential fluctuations in the expenditure amounts between each consecutive year of expenditure data.

Table 4.1 provides the SPSS results of the Spearman-rho correlation analysis for the 2006 through 2014 Instruction Expenditures per Student FTE variables. As detailed in the table, the instruction expenditures across all 560 institutions showed correlation

coefficients above .900, indicating they were highly correlated between each consecutive

year, without any significant fluctuations in instruction spending from year-to-year. The

2014 to 2013 instruction expenses had a correlation coefficient of .970. This indicated

that the instruction expenses in 2013 were 97 percent predictive of the 2014 expenses.

The correlations for any three consecutive years appear to be very similar to each other.

This suggests that all the expenditures remained stable across all of the institutions.

Looking at the first three years of the study timeframe, 2006 instruction expenses were

92.8 percent predictive of 2007 expenses, while 2007 expenses were 93.8 percent

predictive of 2008 instruction expenses. Because of this stability, there appeared

reasonable justification to use only the first three years (2006, 2007, and 2008) of

instruction expenditures to represent institutional spending on instruction over the entire

2006 through 2014 timeframe.

Table 4.1
Instruction Expenditures per FTE Correlations

				Spearman Correlation Coefficients of Instruction Expenditures per FTE Fiscal Years 2006 through 2014				

	2014	2013	2012	2011	2010	2009	2008	2007	2006
2014	1.000	.970**	.952**	.932**	.913**	.858**	.836**	.818**	.799**
2013	.970**	1.000	.968**	.948**	.923**	.875**	.857**	.831**	.827**
2012	.952**	.968**	1.000	.969**	.949**	.893**	.877**	.849**	.830**
2011	.932**	.948**	.969**	1.000	.967**	.907**	.885**	.854**	.842**
2010	.913**	.923**	.949**	.967**	1.000	.940**	.910**	.882**	.863**
2009	.858**	.875**	.893**	.907**	.940**	1.000	.967**	.927**	.906**
2008	.836**	.857**	.877**	.885**	.910**	.967**	1.000	.938**	.919**
2007	.818**	.831**	.849**	.854**	.882**	.927**	.938**	1.000	.928**
2006	.799**	.827**	.830**	.842**	.863**	.906**	.919**	.928**	1.000

**Correlation significant at the 0.01 level (2-tailed)

Table 4.2 gives SPSS results of the Spearman-rho correlation analysis for the

2006 through 2014 Research Expenditures per Student FTE variables. Similar to

instruction expenditures, research expenses were highly correlated between each

consecutive year, without any significant increases or decreases in research spending

from year-to-year. Looking at the first three years of the study timeframe, 2006 research

expenses were 98.8 percent predictive of 2007 expenses, while 2007 expenses were 98.4

percent predictive of 2008 instruction expenses. These high (above .900) correlation

coefficients remain very high – above .900 – across all successive years. Because of this

stability, there appeared reasonable justification to use only the first three years (2006,

2007, and 2008) of research expenditures to represent institutional spending on research

over the entire 2006 through 2014 timeframe.

Table 4.2
Research Expenditures per FTE Correlations

	Spearman Correlation Coefficients of Research Expenditures per FTE Fiscal Years 2006 through 2014								
	2014	2013	2012	2011	2010	2009	2008	2007	2006
2014	1.000	.987**	.980**	.970**	.959**	.954**	.941**	.936**	.933**
2013	.987**	1.000	.987**	.976**	.969**	.963**	.947**	.941**	.939**
2012	.980**	.987**	1.000	.989**	.980**	.972**	.957**	.952**	.950**
2011	.970**	.976**	.989**	1.000	.990**	.978**	.961**	.955**	.951**
2010	.959**	.969**	.980**	.990**	1.000	.987**	.967**	.959**	.952**
2009	.954**	.963**	.972**	.978**	.987**	1.000	.980**	.970**	.961**
2008	.941**	.947**	.957**	.961**	.967**	.980**	1.000	.984**	.974**
2007	.936**	.941**	.952**	.955**	.959**	.970**	.984**	1.000	.988**
2006	.933**	.939**	.950**	.951**	.952**	.961**	.974**	.988**	1.000

**Correlation significant at the 0.01 level (2-tailed)

Table 4.3 gives SPSS results of the Spearman-rho correlation analysis for the 2006 through 2014 Public Service Expenditures per Student FTE variables. Similar to the other expenditure types, public service expenses were highly correlated between each consecutive year, without any significant increases or decreases in public service spending from year-to-year. Looking at the first three years of the study timeframe, 2006 public service expenses were 98.8 percent predictive of 2007 expenses, while 2007 expenses were 98.4 percent predictive of 2008 instruction expenses. These high (above .900) correlation coefficients remain very high – above .900 – across all successive years. Because of this stability, there appeared reasonable justification to use only the first three years (2006, 2007, and 2008) of public service expenditures to represent institutional spending on public service over the entire 2006 through 2014 timeframe.

Table 4.3
Public Service Expenditures per FTE Correlations

	2014	2013	2012	2011	2009	2008	2007	2006
	Spearman Correlation Coefficients of Public Service Expenditures per FTE Fiscal Years 2006 through 2014							
2014	1.000	.989**	.981**	.975**	.958**	.913**	.926**	.889**
2013	.989**	1.000	.991**	.986**	.957**	.914**	.925**	.888**
2012	.981**	.991**	1.000	.990**	.959**	.918**	.925**	.889**
2011	.975**	.986**	.990**	1.000	.966**	.928**	.933**	.895**
2010	.960**	.969**	.973**	.984**	.974**	.934**	.934**	.898**
2009	.958**	.957**	.959**	.966**	1.000	.955**	.962**	.931**
2008	.913**	.914**	.918**	.928**	.955**	1.000	.959**	.929**
2007	.926**	.925**	.925**	.933**	.962**	.959**	1.000	.967**
2006	.889**	.888**	.889**	.895**	.931**	.929**	.967**	1.000

**Correlation significant at the 0.01 level (2-tailed)

Table 4.4 gives SPSS results of the Spearman-rho correlation analysis for the 2006 through 2014 Academic Support Expenditures per Student FTE variables. Similar to the other expenditure types, academic support expenses were highly correlated between each consecutive year, without any significant increases or decreases in academic support spending from year-to-year. Looking at the first three years of the study timeframe, 2006 academic support expenses were 98.8 percent predictive of 2007 expenses, while 2007 expenses were 98.4 percent predictive of 2008 instruction expenses. These high (above .900) correlation coefficients remain very high – above .900 – across all successive years. Because of this stability, there appeared reasonable justification to use only the first three years (2006, 2007, and 2008) of academic support expenditures to represent institutional spending on academic support over the entire 2006 through 2014 timeframe.

Table 4.4
Academic Support Expenditures per FTE Correlations

	2014	2013	2012	2011	2010	2009	2008	2007	2006
Spearman Correlation Coefficients of Academic Support Expenditures per FTE Fiscal Years 2006 through 2014									
2014	1.000	.977**	.962**	.950**	.830**	.689**	.736**	.827**	.798**
2013	.977**	1.000	.979**	.965**	.845**	.694**	.748**	.840**	.810**
2012	.962**	.979**	1.000	.980**	.864**	.698**	.760**	.849**	.825**
2011	.950**	.965**	.980**	1.000	.877**	.707**	.769**	.867**	.841**
2010	.830**	.845**	.864**	.877**	1.000	.829**	.893**	.799**	.750**
2009	.689**	.694**	.698**	.707**	.829**	1.000	.961**	.810**	.754**
2008	.736**	.748**	.760**	.769**	.893**	.961**	1.000	.854**	.789**
2007	.827**	.840**	.849**	.867**	.799**	.810**	.854**	1.000	.953**
2006	.798**	.810**	.825**	.841**	.750**	.754**	.789**	.953**	1.000

**Correlation significant at the 0.01 level (2-tailed)

Table 4.5 gives SPSS results of the Spearman-rho correlation analysis for the 2006 through 2014 Student Services Expenditures per Student FTE variables. Similar to the other expenditure types, student services expenses were highly correlated between each consecutive year, without any significant increases or decreases in student services spending from year-to-year. Looking at the first three years of the study timeframe, 2006 student services expenses were 98.8 percent predictive of 2007 expenses, while 2007 expenses were 98.4 percent predictive of 2008 instruction expenses. These high (above .900) correlation coefficients remain very high – above .900 – across all successive years. Because of this stability, there appeared reasonable justification to use only the first three years (2006, 2007, and 2008) of student services expenditures to represent institutional spending on student services over the entire 2006 through 2014 timeframe.

Table 4.5
Student Services Expenditures per FTE Correlations

	2014	2013	2012	2011	2010	2009	2008	2007	2006
Spearman Correlation Coefficients of Student Services Expenditures per FTE Fiscal Years 2006 through 2014									
2014	1.000	.979**	.953**	.946**	.918**	.929**	.888**	.907**	.860**
2013	.979**	1.000	.971**	.965**	.933**	.936**	.901**	.915**	.881**
2012	.953**	.971**	1.000	.987**	.944**	.942**	.916**	.930**	.898**
2011	.946**	.965**	.987**	1.000	.948**	.947**	.919**	.928**	.904**
2010	.918**	.933**	.944**	.948**	1.000	.948**	.927**	.919**	.941**
2009	.929**	.936**	.942**	.947**	.948**	1.000	.939**	.947**	.917**
2008	.888**	.901**	.916**	.919**	.927**	.939**	1.000	.928**	.938**
2007	.907**	.915**	.930**	.928**	.919**	.947**	.928**	1.000	.898**
2006	.860**	.881**	.898**	.904**	.941**	.917**	.938**	.898**	1.000

**Correlation significant at the 0.01 level (2-tailed)

Prior to conducting the inferential statistics, preliminary analyses were performed to ensure data integrity. Diagnostic testing of the independent variables was performed using SPSS software to look for any indications of non-normality or multicollinearity among the variables. No indications of non-normality or multicollinearity were found.

Multilevel Analyses

Table 4.6 on the following page gives the HLM software multilevel regression results. These results indicate how much percentage of variability in the dependent variable - 2012-2014 averaged six-year graduation rate – can be explained by each of the predictor variables included in this study. There were three equations or steps involved in the HLM multilevel analyses: the null model, Model 1 and Model 2. The null model calculated the variance in six-year graduation rates without including any of the institution level or state level predictor variable regression coefficients. Model 1 analysis included only the institution-level variable coefficients, and finally Model 2 included the regression coefficients derived from the Model 1 equation and added the state-level variable regression coefficients. The HLM null model results indicated that 79.9 percent of the overall variance in six-year graduation rates was collectively explained by the tested group of institutional-level variables, while 20.1 percent of the variance in graduation rates was associated with state-level characteristics.

The Model 1 equation included the addition of the institutional-level characteristics, and collectively explained 53.3% of the institution-level variance

Table 4.6
Multilevel Regression Results

Predictor Variable	Model 1			Model 2		
	U.Coeff	S.Coeff	Sig	U.Coeff	S.Coeff	Sig
Institution Level						
Instruction Exp per FTE	0.752	0.145	***	0.759	0.147	***
Research Exp per FTE	0.081			0.116		
Public Service Exp per FTE	-0.285			-0.144		
Academic Support Exp per FTE	0.571			0.509		
Student Services Exp per FTE	0.194			0.135		
Gender - Female	-0.017			-0.016		
Race – African American	-0.225	-0.285	***	-0.230	-0.290	***
Race - Hispanic	-0.074	-0.057	**	-0.063	-0.048	*
Race - Asian	0.072			0.080		
FTE/Headcount	0.596	0.338	***	0.588	0.334	***
ACT 25th Percentile Score	1.704	0.216	***	1.661	0.211	***
Carnegie - Doctoral	-5.251	-0.063	***	-5.219	-0.063	***
Carnegie - Masters	-6.071	-0.170	***	-6.059	-0.170	***
Carnegie - Baccalaureate	-10.173	-0.225	***	-10.118	-0.223	***
Carnegie - Other	-15.888	-0.203	***	-15.644	-0.200	***
State Level						
Higher Education Exp per Capita				-2.495	-0.091	*
Avg Household Income				0.253	0.112	*
Avg Unemployment Rate				0.667		
North East				5.065	0.111	*
Midwest				3.341		
South				7.485	0.205	***

$***p < .01, \quad **p < .05, \quad *p < .10$

associated with graduation rates in the null model (79.9%). Model 1 results in Table 4.6 show that of all tested expenditure categories, instruction expenditures per student FTE was the only one to have a significant effect on six-year graduation rates. Instruction expenditures had a p-value of .006 in Model 1 and .001 in Model 2, after the inclusion of the state-level factors. P-values of .05 or smaller are generally regarded as statistically significant. Looking at the unstandardized coefficients values (UCoeff) for instruction expenditures per student FTE in Table 4.6, it can be determined that every $1000 increase in instruction expenditures per student FTE was associated with a 0.75 percent increase in graduation rates.

The multilevel analyses revealed that the other institutional expenditures variables tested: research, public service, academic support, and student services did not have a significant effect on six-year graduation rates. Research expenses per student FTE had a p-value of .6 and .5 in Models 1 and 2 respectively. Public service spending had a p-values of 0.4 and .7. Academic support expenditures had a p-values of .3 and .7, and student services had a p-values of .7and .8. None of these p values were above the significance threshold of .1.

Institutional Influences on Graduation Rates

The multilevel analyses in Model 1 showed that some of the institutional predictor variables, when analyzed without including any of the state-level predictors, did have significant effects on six-year graduation rates. ACT 25th percentile scores had a significant, positive effect with p-values < .001 in both models, while African American and Hispanic students each had significant, negative effects. The percentage of African

American students had p-values less than .001 in both models, while the percentage of Hispanic students had p-values equal to or less than .01 in both models 1 and 2.

The unstandardized coefficients in Table 4.6 show that for both models, a roughly 1-point increase in ACT 25th percentile average score would result in six-year graduation rates increasing by nearly 2 (1.7) percentage points. Conversely, Table 4.6 showed that for every 1 percent point increase in the proportion of African American students enrolled, six-year graduation rate would decrease by .23 percentage points, and for every 1 percent point increase in Hispanic students enrolled, the graduation rate would decrease by roughly .07 percentage points in Model 1 and .06 in Model 2.

Each of the Carnegie classification levels tested had a statistically negative association with graduation rates. The Carnegie Research (both Research - Very High and Research – High) classification levels were left out of the multilevel regression equations to serve as reference variables for each of the other Carnegie classification levels tested. Model 1 analysis results revealed that Carnegie Doctoral level institutions had an unstandardized coefficient of -5.3, meaning that six-year graduation rates would be, on average, 5.3 percentage point lower in Doctoral-level institutions versus Research-level schools. The Carnegie Masters-level institutions had an unstandardized coefficient of -6.1, again suggesting that on average graduation rates would be roughly 6 percentage points lower in Masters-level schools than in Research-level institutions. Similarly, Carnegie levels of Baccalaureate and Other had unstandardized coefficients of -10.1 and -15.9, respectively, suggesting lower graduation rates at these institution levels of roughly 10 and 16 percentage points, relative to Research-level institutions.

The analyses revealed that the institutional-level predictor variables of Gender - female and the percentage of Asian students, did not appear to have a significant effect on six-year graduation rates. Gender – female had a p-values greater than .7, and the percentage of Asian students had p-values greater than .1 in both models.

Institutional and State Economic Influences on Graduation Rates

Model 2 was the second step equation of the multilevel regression analysis and it included both the institution level variable coefficients from Model 1 as well as the state economic predictor variables. The addition of the state economic indicator variables in Level 2 resulted in explaining 64.2% of the state-level variance with graduation rates in the null model (20.1%). Results in Table 4.6 indicate that the state-level variables of average household income, higher education expenditures per capita, as well as the location variables of North East and South regions all had statistically significant effects on graduation rates.

Average household income had a p-value of $< .06$ in Model 2, and the unstandardized coefficient for average household income was 0.25 indicating that for every $1000 increase in state average household unemployment, graduation rates would increase by a quarter of one percentage point.

Higher education expenditures per capita were found to have a negatively significant association with graduation rates. Higher education expenses per capita had a p-value of $< .07$ and an unstandardized coefficient of -2.49, meaning that for every $100 increase in state higher education expenditure dollars per capita, a public college or

university within that state would likely see a nearly 2.5 percentage point reduction in six-year graduation rate.

The state-level variable of average unemployment rate did not show a statistically significant association with graduation rates. State average unemployment rate had a p value of .5.

Table 4.6 further highlights that all of the institutional level predictors that were found to be significant in Model 1 maintained their significance in Model 2, even with the addition of the state-level variables, and their unstandardized coefficient values were virtually identical in both models.

Ranking of Significant Influences

Table 4.7 lists the significant variables from both Model 1 and Model 2 in descending order of their standardized coefficients, calculated using the equation (3) as detailed in Chapter 3. Because these standardized coefficients are based on standard deviations – as opposed to unstandardized coefficient values that are derived from the varying predictor variable scales – they are a more appropriate means of comparing the relative strength than are the unstandardized coefficients, with regard to association with graduation rate.

As shown in Table 4.7 below, student FTE to headcount ratio had the largest standardized coefficient with .338, and the strongest statistical association with graduation rates, followed by institutional characteristics of percentage of African American students, Carnegie classification of Baccalaureate, ACT 25th percentile scores,

Carnegie Other and Masters, and Instructional expenditures per student FTE. Being located in the South region was the strongest positively significant state-level factor, followed by average household income, being located in the North East region. Higher education expenditures per capita had the weakest significant association with graduation rates of all the variables tested, with a negative effect of -.091.

Table 4.7

Rank of Significant Influences - Standardized Coefficient Values

Predictor Variable	Model 1	Model 2
FTE/Headcount	0.338	0.334
Race – African American	-0.285	-0.290
Carnegie – Baccalaureate	-0.225	-0.223
ACT 25th Percentile Score	0.216	0.211
South Region		0.205
Carnegie - Other	-0.203	-0.200
Carnegie - Masters	-0.170	-0.170
2006-08 Instruction Expenditures per FTE	0.145	0.147
Average Household Income		0.112
North East Region		0.111
Higher Education Expenditures per Capita		-0.091
Carnegie - Doctoral	-0.063	-0.063
Race - Hispanic	-0.057	-0.048

Summary

This chapter provided the details of my study's data collection and analysis. The first section of the chapter outlined the results of the preliminary and inferential analyses conducted for the purpose of identifying the relationships between public higher

education institutional expenditures per student FTE by type – instruction, research, public service, academic support, and student services – and six-year graduation rates. The second section of the chapter provided the results of the multilevel analyses with regard to the effects of the institution-level mediating factors of: race, gender, ACT scores, and Carnegie classification. The third section of the chapter explored the analyses results pertaining to the state economic factors: state higher education spending per capita, unemployment rate, and average household income. The next chapter explores the implications of these results and provides recommendations with regard to adjusting higher education expenditure levels to improve graduation rates. These recommendations are directed to both higher education policy makers and administrators responsible for controlling expenditures as well as to future researchers in the area of public higher education finance and student outcomes.

CHAPTER V

DISCUSSION AND CONCLUSION

The increasing importance of student outcomes is requiring public higher education administrators and state policy makers to maximize dwindling financial resources to have the greatest effect on their student graduation rates. The better a state-funded higher education institution can align its resource usage to improve student outcomes, the greater percent of state money it will continue to be rewarded with and the greater its ability to distinguish itself amongst its many stakeholders. Yet, public higher education leaders and administrators are being tasked with improving student graduation rates with diminishing financial resources and without the benefit of well-defined spending guidelines. To best utilize available resources in order to meet the increasing demand for optimal student outcomes, institutions need a better comprehension of how institutional expenditures affect student graduation rates. After controlling for institutional characteristics and state economic indicators, this study investigated the associations between higher education expenditures and graduation rates to provide university administrators and state policymakers guidance for establishing benchmark or target spending amounts for their public colleges and universities, particularly in states with student outcomes-based performance policies that help determine higher education appropriations.

The purpose of this study was to analyze the relationship institutional expenditures have on graduation rates in public higher education institutions – when

accounting for both institutional and state level differences. Specific to these intentions, three research questions guided this study:

1. What are the associations between different types of higher education institution expenditures and graduation rates after controlling for institutional characteristics?

2. What are the associations between different types of higher education institution expenditures and graduation rates after controlling for state level variables?

3. What are the differences in effect levels between higher education institution level factors and state level factors on graduation rates?

Interpretations

Research Question 1: Interpretation of Institutional Effects

Instruction Expenditures. In answer to the first research question that sought associations between graduation rates and institutional expenditures when controlling for institutional level characteristics, the multilevel analyses indicated that increasing instruction expenditures by $1000 per student FTE would likely lead to a .75 percentage point increase in graduation rates. No significant association was found between research, academic support, public service, or student services expenses and graduation rate. These findings were in agreement with Ryan (2004), who similarly showed that institutional expenditures in instruction had a statistically positive association with graduation rates. However, Ryan also found significance between academic support expenses per student

FTE, while this study did not. Also, contrary to Webber and Ehrenberg's (2010) primary finding, this study found no significant effect between student services per student FTE and six-year graduations rates. Both Ryan's and Weber and Ehrenberg's studies included public and private institutions in their study, and that may have been one reason for the discrepancies between study results.

Carnegie Classification. The Carnegie classification variables had the largest unstandardized coefficients and largest apparent effects on graduation rates, when viewed independently of the other variables tested. As compared to the reference classification level, Research, each subsequent classification level had from 5 to 16 percentage point decreases in average graduation rate. Intuitively, these results point to the fact that the students best prepared to succeed in college are first filling the classrooms of Research level institutions, followed by Doctoral level, and on down to Baccalaureate and Other classifications. Even so, the use of the Carnegie classification variables for this study's purpose was as a means to control for overall institution enrollment size and fiscal budget size. Therefore, this study did not intend to directly investigate associations between Carnegie classification and graduation rates. Other research has found similar results, where, independent of other factors, Carnegie classifications also show prominent effects as predictors of graduation rates (Hamrick, Schuh, Shelley, and Mack, 2004; Engle and Theokas, 2010).

Beyond Carnegie classification, the undergraduate student FTE to headcount ratio and ACT 25th percentile scores had the most statistically significant and strongest effects on six-year graduation rates in public 4-year institutions. Also statistically significant, but

negatively, were associations between graduation rates and the proportion of African American or Hispanic students.

Enrollment Intensity. For each percentage point increase in undergraduate student FTE to headcount, graduation rates would increase by .60 percentage points. This ratio is determined by dividing the IPEDS variable for undergraduate student FTE by the total undergraduate student headcount. Undergraduate student FTE is calculated by IPEDS based on an institution's reported 12-month total credit hours of instruction count. This student FTE to headcount ratio, often referred to in prior college persistence research as "enrollment intensity" can be viewed as a measure of both student motivation as well as institutional resource efficiency (Stratton, 2007; Ishitani and McKitrick, 2016). As such, this study's statistically significant finding of enrollment intensity supports both human capital theory – where a student is motivated to take more classes to expedite degree attainment in pursuit of higher earnings, as well as Powell's Effectiveness and Efficiency framework – where a higher student FTE to actual overall headcount ratio suggests that an institution is more efficiently using its instruction dollars by having more of its students taking a full time load of coursework each semester (Stratton, 2007; Powell et al, 2012).

ACT Scores. Every 1-point increase in the average ACT 25th percentile scores are shown to be responsible for a nearly 2 percentage point increase in graduation rates. Much research investigating factors responsible for successful college completion have also found college entrance exams such as the ACT and SAT to be significant positive predictors in increasing graduation rates (Zhang, 2008; Webber and Ehrenberg, 2010).

Proportion of Minority Students. The racial profile of the institution and six-year graduation rates was also significant. This finding is supportive of many other studies looking at institutional characteristics' effects on graduation rates (Astin, 1993; Horn and Carroll, 2006; Titus, 2006; Webber and Ehrenberg, 2010), where the percent enrollment of minority students has an inverse effect on overall graduation rates. These studies largely attribute such associations with lower socioeconomic status (SES) found in minority student groups relative to Caucasians. These same studies further indicate that college preparation is often positively associated with SES, and that college preparation is a significant determinate of college completion (Astin, 1993; Horn and Carroll, 2006; Titus, 2006; Webber and Ehrenberg, 2010).

Research Questions 2 and 3: Interpretation of State Economic Effects

The second and third research questions sought associations between graduation rates and institutional expenditures when controlling for state level factors. The results from Model 2 of the multilevel analyses help answer these questions.

Geographic Region. The largest statistically significant effects on the state level were found when institutions were aggregated into the geographic regions. The South and North East regions were shown to be statistically significant with positive association to graduation rates, relative to the West region, which was selected as the reference category for this variable. The unstandardized coefficient value of the South region was 7.5, indicating that the average graduation rate was 7.5 percentage points higher than an institution found within the reference West region. Similarly, graduation rates within the

North East region were on average 5.1 percentage points higher than schools from the West region.

This finding was surprising, particularly regarding the large and positive effect of the South region on graduation rates. Because the overall six-year graduation rates in this region tend to lag behind other regions, this association bears further examination. To further explore this outcome, an average of the graduation rates in each region was measured as a post-hoc analysis, as well as the percentages of African American and Caucasian students within each region. The results of these descriptive measures, as shown in Table 4.8, show that the overall average six-year graduation rates in the South are lower than the graduation rates measured in the other three regions, when not controlling for any other variables. Additionally, the percentage of African American students in the South region is higher than in the other three regions. This implies that when not controlling for race, the graduation rates in the South are being counterbalanced by a higher proportion of African American students. Taken together with this study's finding that percent enrollment of African American students has a negative effect on overall graduation rates, the higher percentage of African American students found in the South may result in the mean graduation rate for the South region being lower than the mean graduation rates in the other regions. Many other reasons for these regional

differences in graduation rates could exist, and this finding is deserving of future

research.

Table 4.8
Graduation Rate and Percentage of African American Students by Region

Region	# of Inst.	Avg Grad Rate	% Af. Amer Students
North East	103	53.3%	9.8%
Midwest	135	46.6%	9.2%
South	215	44.1%	25.9%
West	107	46.6%	4.3%
Total U.S.	560	46.9%	14.5%

Average Household Income. Of the state economic indicators tested, only

average household income was shown to have a significant positive association with

graduation rates. For every $1000 increase in average household income, the six-year

graduation rate would increase by .37 percentage point.

This finding seems to be a reflection of human capital theory. The human capital

theory equation takes into account the "initial stock" of human capital in students (Perna,

2006). Students with larger personal financial resources and greater academic

preparation are theorized to bring with them larger amounts of human capital that offset

the costs of attending college. In other words, if a student comes from a relatively

wealthy, higher educated family background, that student is more likely to have stronger

scholastic preparation and the means to persist and graduate from college than a student coming from a poorer, less educated family background (Perna, 2006).

Higher Education Expenditures per Capita. Intuitively, one may be led to believe that a greater amount of state appropriation would bolster institutional outcomes. However, this study did not support this idea, at least not with respect to six-year graduation rates. Rather, a somewhat surprising, statistically significant – but negative – association was found between graduation rates and state higher education expenditures per capita. For every $100 increase in higher education spending per capita, graduation rates at public four-year colleges dropped by almost 2.5 percentage points. If increased state spending on higher education leads to lower tuition charges at public colleges, there could be some association between lower tuition and lower graduation rates. No other studies could be found that shared this result. This is an interesting finding, and one that should be explored in subsequent research.

No significant associations were found between state unemployment rates and graduation rates. While other research studies do show statistical associations between student loan default and state unemployment rates, at least from the analyses of this study, the same statistically significant relationship does not appear to exist between unemployment rates and six-year graduation rates in public intuitions (McMillon, 2004; Gross et al. 2009; Ishitani and McKitrick, 2016). As with higher education expenditures per capita, further research could better explore the relationship between state unemployment levels and college graduation rates. This may involve using different

institutional control variables than were used in this study, or using an entirely different dataset than IPEDS.

Implications

Implications for Academic Stakeholders

The study results suggest that investing more in instruction may lead to an improvement in graduation rates. Institutional investment in instruction largely translates into investing in more faculty. Faculty investment could include hiring more faculty, or paying higher salaries to attract the best talent, but also could include post-hire faculty training in teaching skills, student engagement, and other developmental activities that could increase overall student success and graduation rates. Hiring more faculty would also increase the student to faculty ratio, which, if student headcount remained unchanged, would increase enrollment intensity, which this study suggested had a strong positive association with graduation rates. While this finding is instructive, further investigation is needed to explore which particular components of instruction expenditures have the strongest associations with improving graduation rates.

IPEDS defines academic support expenditures to include all activities that support instruction, research, and public service, with examples given such as retention efforts, libraries, museums and galleries. One reason this study did not find academic support statistically significant could be due to the vagaries that result from such a broad IPEDS definition, allowing subcomponents to drastically vary from institution to institution. Also, there could be a large overlap with what one school classifies as instruction

expenditures and academic support as compared to another school. Since Ryan (2004) did find academic support expenditures to be statistically significant to graduation rates when looking at both public and private four-year institutions, another possible reason this study may not have found a statistically significant relationship could be that public institutions are not as consistent with regard to the successful execution of their academic support activities as their private counterparts.

The fact that this study did not find statistical significance in student services expenditures is consistent with Ryan (2004), but contradicts Webber and Ehrenberg's 2010 study. Webber and Ehrenberg found that student services did have a significantly positive association with graduation rates, particularly at schools with higher concentrations of lower-income students (Webber and Ehrenberg, 2010). Other studies such as Tinto (1975, 1982) and Powell et al (2012) have also suggested a statistical link between college persistence and completion to how well a student is integrated into an institution's social and academic environment. As noted by the IPEDS definition of the student services expenditures variable, student services include all activities "whose primary purpose is to contribute to students emotional and physical well-being and to their intellectual, cultural, and social development outside the context of the formal instructional program." While one could infer, based on these prior studies, that more institutional spending on student services leads to better student social and academic integration and subsequently to increased rates of persistence and graduation, in this study, the case may be that the schools tested may be funding student services activities that are not adequately targeting the student's most at risk of dropping out or, those

student service activities are not being executed effectively enough to show a significant difference in graduation rates. Moreover, unlike this study, each of the studies referenced above included private institutions in addition to public ones. Perhaps private institutions are doing better than their public counterparts with aligning their student services to promote student well-being, retention, and ultimately, graduation.

The results of this study reinforce the idea that schools should focus more social and academic support on minority students and those students with lower standardized test scores to raise overall cohort graduation rates, if not focus such efforts on the entire undergraduate population as a whole. One recent example of this is what SUNY Buffalo did with narrowing the graduation gap between minority and low-income students and the rest of the undergraduate population (Fain, 2016). All students were asked to make a pledge to graduate in four years. In addition to the pledge, the school invested in more student advising services - incoming students were given assessment and guidance to help decide on a major and career path in their first year. Students were then tracked to ensure that they were on an established major track by the time they had completed sixty credit hours. The result of these efforts by SUNY Buffalo led to an increase from a 35 percent four-year graduation rate to 55 percent in just ten years. The percentage of African American students who graduated within six years also increased by 20 percentage points over the same decade (Fain, 2016). The school's efforts in advising and guiding all students seemed to have been as successful for the typically lower graduating sub-populations, such as African American students, as it was for the entire cohort. The above is an example of both spending effectively to improve student outcomes, as well as

upholding the broader mission of a public university to provide college education to all,
versus just the select.

Implications for Political Stakeholders

The results of this study re-affirm prior research that indicate overall six-year
graduation rates of public colleges and universities could be improved by higher levels of
state appropriations that would enable increased spending on academic instruction per
student FTE. While higher levels of state appropriations would potentially enable
increased spending on academic instruction, the study results also suggest graduation
rates are negatively impacted by the proportion of African American students, Hispanic
students, and students with relatively low ACT scores. Thus, simply centering
performance funding formulas to adjust state appropriations to colleges based on overall
graduation rates may encourage schools to select more students deemed most likely to
graduate based on wealth, race, or standardized test scores. A recent report from the
Century Foundation (2016) suggests that centering appropriations on overall graduation
rates only serves to reward schools with already higher graduation rates based on their
percentage of affluent students while ignoring those schools with greater financial needs.
The report advises that to best improve student outcomes across all schools, performance
funding models should be structured to first meet the capacity constraints of every
college in its system and only then attempt assess performance (Hillman, 2016).

A noted drawback to performance funding is the unfairness for schools to
compete for state dollars based on the same set of measures when their missions and
populations are fundamentally different. To address this, Pennsylvania and Tennessee

have attempted to account for differences in students and missions per institutional types by weighting certain measures differently, and Ohio has used a different funding formula for differing types of schools. (McLendon, Hearn, & Deaton 2006; Maio 2012).

Policymakers should exercise caution when regarding the study's finding that higher education expenditures per capita were found to have a significant association with graduation rates. Even with trying to mediate or control with other variables, it is difficult to ascertain true cause and effect from these study results. More analysis should be conducted before making any policy decisions to increase or decrease state higher education expenditures based on the results of this study. Research that controlled for tuition revenues could be one way to help better determine how state appropriation revenues are associated with graduation rates.

Implications for Market Stakeholders

Similar to political stakeholders, the market stakeholders of public higher education – defined in this study as college students, parents, and businesses and any other consumer of services offered by colleges and universities – are also judging institutions based on six-year graduation rates. The results of this study imply that a public school willing to accept students from any race or with relatively low ACT scores is taking a chance that its U.S New ranking may be lower than schools choosing to be more selective in the students they admit.

 Currently there are seven categories that make up the measures USNWR uses to rank both public and private undergraduate colleges and universities, as identified in the

2015 edition of U.S.News & World Report's America's Best Colleges, "Best Colleges Ranking Criteria and Weights." These are: undergraduate academic reputation (peer assessment); graduation and retention rates; faculty resources (e.g. class size); student selectivity (e.g. average admissions test scores of incoming students); financial resources; alumni giving; and graduation rate performance. Of these, the categories with the highest percentage weight of the overall score are the undergraduate academic reputation category with 25%, and the graduation and retention rate with a weight of 20%. However, an additional weight of 5% is given for graduation rate performance, which is calculated by taking the difference between actual and predicted graduation rates. Therefore, graduation and retention rates collectively represent the largest component of the overall ranking, tied with undergraduate reputation, at 25% (Bettsinger, 2008; Ehrenberg, 2005).

As the current ranking methodology stands, public institutions wishing to increase or even maintain their US News ranking may be less inclined to enroll students from disadvantaged backgrounds, as they would potentially have lower admissions test scores and also be perceived to be less likely to graduate. This is unfortunate, for both the institutions and the students. Public universities typically have a mission to provide education to a broad range of students from their states, and currently USWNR rankings do not give any credit for public schools taking a chance on these types of students (Ehrenberg, 2005). Lacking that incentive though, expenditures to support minority student success are likely to pay off in reputation and graduation rate.

Implications for Future Research

The findings from this research present several opportunities for future research to explore when studying student outcomes or academic fiscal policy. Future research should further explore the relationship between enrollment intensity and graduation rates by looking at specifics such as numbers of courses taken per semester, specific majors, or perhaps other characteristics that differ between full-time and part-time students. As this is a measure of both student productivity as well as institutional efficiency, different study frameworks from future studies might include a wide variety of mediating variables that would better illuminate this relationship.

Many studies have found similar results for African American and Hispanic students, as well as students with low ACT scores, that is to say, a negative association with graduation rates. Still further research is needed to more closely examine specific characteristics of racial/ethnic minorities and those with low ACT score and their relationship to graduation rates. SES status may be an overriding factor that continues to cloud the connection between graduation rates and these types of students, so studies that find better ways to control for income and educational background may lead to better understanding in this area.

The differences in graduation rates by U.S. region was interesting and certainly merits further study. Even studies that merely replicated this finding would be helpful to the field of college completion and institutional effectiveness. Beyond that, much more could be investigated here, including the demographic make-up of each region, how the proportions of race aligns between overall regions and the institutions within the regions,

as well as similar relationships that exist between income and education level between regions and their institutions.

Future studies may help explain this study's surprising finding that higher education expenditures per capita would significantly negatively impact graduation rates. More study could better determine the reasons for this result, which could include controlling for associations between state higher education expenditures per capita and specific institution state appropriations and tuition revenues, public versus private sector institutions, or with student tuition charges. It's worth repeating that more research on this topic is warranted before making any policy decisions to increase or decrease state higher education expenditures based on this study's results.

Recommendations

Reflecting on this study's analyses and interpretations of those results, several recommendations can be made to the various stakeholders connected to public higher education and its student outcomes measure of six-year graduation rates. Starting with the academic stakeholders, institutional administrators should add the results of this study to other supportive research that advises to increase spending on faculty and student instruction to see the best returns on graduation rates. Academic administrators and decision makers should focus more social and academic support on minority students and

those students with lower standardized test scores to raise overall cohort graduation rates, if not focus such efforts on the entire undergraduate population as a whole.

Secondly, political stakeholders of public higher education – primarily state officials that govern and control policy for public higher education – should balance their demands and rewards for increasing graduation rates with allowances for public schools to maintain a mission of providing secondary education to all; including low SES, underprepared, and minority students. While performance funding based on overall graduation rate improvement may encourage schools to invest more resources into instruction and academic support, performance funding formulas that are designed to specifically provide credit for accepting and graduating the subgroups that are inherent to having lower levels of college success would be even more effective at providing both college access and completion support to the broadest base of a state's population.

Finally, the market stakeholders of public higher education – viewed in this study as consumers of college services – would gain a better understanding of which colleges were the ones following a mission to provide education to the broadest range of students versus the institutions that were selecting students on likeliness to graduate. For this to happen, ranking publications such as U.S. News should add components to their scoring system that credited schools for accepting and graduating at-risk students based on SES status or standardized test scores.

Conclusion

This study sought to answer what effects public higher education expenditures have on graduation rates, in association with institutional and state level differences, and found that instructional expenditures per student FTE had a significant positive effect on graduation rates, when controlling for other institutional and state level factors. Institutional characteristics, such as enrollment intensity, student racial make-up, and ACT scores, had the largest association with graduation rates. To a lesser extent, state level economic factors were found to have an association as well, particularly average household income, and, interestingly, higher education spending per capita. Further study in the areas of enrollment intensity, low SES and at-risk students, geographic regional differences, and state higher education spending have been suggested, and caution is urged in the interpretation of these results, particularly as they only give an indication of significant associations and do not attempt to give causation between graduation rates and any factors found to be significant.

It is the hope of this researcher that this study and its results will spur much more investigation into the role public higher institutional spending may play on increasing the number of students who begin and successfully complete their journey through college and earn their degree.

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VITA

Brian Todd Hester was born and raised in Knoxville, Tennessee. He graduated from Bearden High School in 1990. He earned a Bachelor's of Arts degree from the University of Tennessee, Knoxville in May of 1999, and later returned to UTK to earn a Master's of Business Administration degree in December of 2003. After working as a marketing director at a company in Oak Ridge, Tennessee from 2003 through 2005, Brian returned to the University of Tennessee, Knoxville and worked in the Athletic Department's business office from 2005 through 2008. From 2008 through 2013, Brian established and ran an internet-based computer hardware retail business that at its peak employed seven and averaged over $100,000 in monthly sales.

In 2010 Brian stepped away from the business and returned again to the University of Tennessee, this time to the UT System office of Institutional Research as a data research analyst. While working at UT, Brian began pursuit of the doctoral degree in Higher Education Administration in May of 2012. He is currently Assistant Director of Institutional Research for the University of Tennessee System. Brian, his wife Alice, and son Nicholas currently live in West Knoxville. They spend most of their free-time together, including reading, playing sports, gardening, and enjoying the many parks and nature areas around Knoxville and East Tennessee.