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# A Study of the Relationship Between Revenue Sources and Undergraduate Students' Graduation Rates at Public Research Universities

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A Study of the Relationship Between Revenue Sources and Undergraduate Students' Graduation Rates  
at Public Research Universities

A Dissertation

Submitted to the Graduate Faculty of the  
University of New Orleans  
in partial fulfillment of the  
requirements for the degree of

Doctor of Philosophy  
in  
Education Administration

by

Albertha H. Lawson

B.S. Johnson C. Smith University, 1981  
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May, 2011

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## Dedication

To my husband Huey, son Brian, and daughter Leisa, I dedicate this document. You all are truly the loves of my life. Thank you for traveling the dissertation road with me.

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The road to a successful dissertation is dotted with many parking places. I am thankful to each of those persons along the way who refused to let me park. For those who have yet to travel the sometime lonely path of dissertation research, I say to you, “Rest if you must, but do not quit.” I have been blessed with a host of positive family members, friends, and co-workers who have been very supportive. For this I am very grateful.

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next day was to be my second day of class in the program. Even though the Saturday class abruptly came to a close after only 3 hours as the city was evacuated and after I made what turned out to be a ten-hour drive back to Baton Rouge, the excitement was still there. However, on Monday, August 29, 2005, Katrina hit the city of New Orleans. In the weeks that followed, I was ready to give up on the program. I extend thanks to UNO, its faculty, staff, and administration for the miraculous work they did to keep the university open for class during the Fall of 2005. Had the semester been canceled, I would not be completing this dissertation now. Thank you, UNO, for accomplishing what was nothing short of a miracle in Fall 2005.

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## **Abstract**

The public's demand for accountability will have a significant impact on research universities' revenue resources in the future. Driving the demand is a perceived lack of institutional productivity. Undergraduate students' graduation rates represent one product of public research universities. States have already latched onto these rates as a measure of institutional performance; and as a result, states have provided a basis for public research universities to use the relationship between dollars invested in the institution and undergraduate students' graduation rates to respond to accountability issues. Current research provides little insight into this relationship. Research in this study uses concepts from the higher education production function, the resource dependency theory, and the Principal-Agent Model to investigate undergraduate students' four-year and six-year graduation rates as an institutional product. The research provides a greater degree of transparency into the relationship between dollars invested in public research universities and undergraduate students' graduation rates than has previously been shown. As a result of this relationship analysis, the research enables the development of a model for predicting undergraduate student graduation rates relative to dollars invested in the institution from different sources.

Key Words: Public Research University, Accountability, Undergraduate Graduation Rates, Higher Education Productivity, Principal Agent Model, Resource Dependency Theory

## Chapter One: Introduction to Research

Public research universities face some major issues when it comes to accountability. These include the lack of both measurements to evaluate supporters' return on dollars invested in the institutions and comprehensive data and analytical models to improve institutional transparency. These deficiencies have led to public distrust and a demand for public research universities to become answerable to those who support them. The Spellings Report (2006) concluded that there are inadequate transparency and accountability tools for measuring institutional performance. The report also explained that these tools are becoming more and more necessary in order to maintain public trust in higher education. Since the report in 2006 several initiatives have taken place in higher education to address transparency and accountability. For example, the Voluntary System of Accountability (VSA) developed in 2007 by a committed group of university leaders. This initiative by public 4-year universities was developed to supply clear, accessible, and comparable information on undergraduate student success measures. Other initiatives include the Committee on Measures of Student Success (CMSS), Achieving the Dream, Complete College American/Complete to compete, Gates Foundation Outcome Measures and most recently the Voluntary Framework of Accountability (VFA).

Fisher (2006) posits that America's complex postsecondary education system does not have comprehensive strategies to provide either adequate internal accountability systems or effective public information. Leveille (2006) explains that, when higher education accountability became a prominent issue in the 1990s, the concept was expanded to include productivity performance indicators. Although graduation rates represent only one of these indicators, in this research they serve as the public research universities' measure of choice in the development of a

response to the public's demand for accountability. Graduation rates serve as an excellent productivity indicator since states have already begun to use them as a productivity measure in performance-based funding (Layzell, 2001; McKeown, 1996).

### *Understanding Higher Education Accountability*

Accountability in higher education can have many meanings and can be measured in different ways using one or all of several indicators. Given the strong tradition of state support for and control over public research universities, these institutions have no choice but to take a proactive role in first defining higher education accountability at the institutional level (Carey, 2004) and then providing clear and precise measures to demonstrate the institutions' accountability to taxpayers. Carey further explains that few institutions voluntarily provide and publicize performance statistics in ways that are readily available and easy for laypersons to understand.

Throw (1996) defines accountability as the obligation to report to others, to explain, and to respond to questions about the use of revenue resources. For the purposes of this research, accountability is defined as the display of comprehensive, statistically sound information that provides supporters with a clear understanding of the relationship between appropriated dollars invested in the institution, tuition and fees dollars invested in the institution, and undergraduate students' four-year and six-year graduation rates. The goal of this study was to identify relationships between dollars invested in the institution by financial investors who contribute dollars in the form of either state appropriations or tuition and fees and undergraduate students' four-year and six-year graduation rates. These relationships were then used to enable the development of a model for predicting undergraduate students' graduation rates based on dollars invested in public research universities.



Many authors have explored the relationship between higher education expenditures and undergraduate students' graduation rates in response to questions of institutional productivity and financial issues (Johnson, 1978; Paulsen, 2001; Johnstone, 2001; Titus, 2006, 2009; Wellman et al., 2008). However, none specifically connected graduation rates to the number of dollars invested in public research universities by their greatest supporters, taxpayers. Research in this study began to make this connection by first providing clear definitions of graduation rates, state appropriations, tuition and fees, and institutions' total revenue resources. Then, it identified relationships between the revenue from state appropriated dollars and tuition and fees dollars invested in public research universities and undergraduate students' graduation rates.

Finally, this research concluded with an investigation of the impact of changes in the amount of state appropriations and tuition and fees dollars on four-year and six-year graduation rates. State appropriations and tuition and fees, on average, make up over 75% of the public research universities' revenue sources (Wellman et al., 2008). Given this percentage of the institutions' total revenue resources, it is important to develop effective strategies for responding to the public's accountability demands.

### *Graduation Rates*

Graduation rates in this study were based on a specific cohort group entering a select group of public research universities. More specifically, for the purposes of this study, graduation rates were defined as the rate required for disclosure and/or reporting purposes under the Student Right to Know Act (Integrated Postsecondary Education Data System (IPEDS)). IPEDS calculates this rate as the total number of completers within 150% of normal time (defined as four years) divided by the size of the revised adjusted cohort group. The adjusted cohort group allows for the deletion from the group of students who left the institution for one of the following reasons: death or total and permanent disability; service in the armed forces

(including those called to active duty); service with a foreign aid service of the federal government, such as the Peace Corps; or service on official church missions. The adjusted cohort group used in this study followed the IPEDS definition by taking a specific group of students defined for tracking purposes and making any necessary adjustment to the group based on the IPEDS definition of “adjusted cohort.”

More specifically, in this research, graduation rates were defined by first-time, full-time, degree/certificate-seeking students (FTFT) who complete a bachelor’s degree within six years of the Fall semester start date of their matriculation at the institution. The dependent variables in this study were defined by four-year (4GR) and six-year (6GR) graduation rates. Therefore, as defined by IPEDS, they were calculated based on the total number of individuals from a specific cohort of full-time, first-time, degree/certificate-seeking undergraduates (FTFT) who complete a bachelor’s degree within 150% of normal time divided by the size of the entire cohort of full-time, first-time, degree/certificate-seeking undergraduates minus any allowable exclusions (the adjusted cohort).

### *Revenue Resources*

Revenue resources in this study are based on the IPEDS definition of higher education institutions’ revenue resources. IPEDS defines revenue for these institutions as the following: inflow of financial resource investments or other enhancement of net assets (or fund balances); settlements of its liabilities by delivering or producing goods, rendering services, or other activities that contribute to the institution's ongoing major or central operations; a combination of both. Revenue sources may include revenues from tuition and fees, appropriations, auxiliary enterprises, and contributions from other non-exchange transactions. Public research universities who implemented the Governmental Accounting Standards Board (GASB) Statement Number

34/35 are the sample institutions used to collect data all data in this study. The sample is limited to these institutions to ensure consistency in revenue data across institutions.

### *Objectives*

In theory, revenue invested in public research universities is expected to produce an educated workforce by graduating students with bachelor's degrees (*Institute for Higher Education Policy*, 2005; McKeown, 1996; Kelley, 2009). The examination of the relationship between dollars invested in the institutions and undergraduate students' graduation rates in this research study speaks directly to this expectation. The objective of this research was to use correlation analysis to develop relationships between public research universities' total revenue, state appropriations, and tuition and fees and undergraduate students' four-year and six-year graduation rates in response to public demands for accountability. Use of correlation analysis enabled the development of a statistically sound graduation rates projection model that added additional transparency and significance to public research universities' response to accountability questions.

This use of correlations between dollars invested in the institutions and undergraduate students' graduation rates to develop a statistically sound undergraduate student four-year and six-year graduation rates model is supported by Titus (2009). Titus' research has already demonstrated that there is a significant relationship between the production of bachelor's degrees and the dollar amount of higher education financial resources. Research in this study went beyond Titus' findings and provided investors in public research universities with a more transparent picture of returns on funds invested in the institution. It focused only on dollars invested in public research universities at the institution and their productivity defined as four-year and six-year graduation rates.

### *Problem Statement*

Student graduation rates are viewed as a significant product of higher education institutions (Tinto, 1993; Turner, 2004). The problem facing public research universities is that taxpayers and other supporters of these institutions see little or no comprehensive and/or understandable evidence of relationships between dollars invested in these institutions and student graduation rates. In addition, when discussing graduation rates as a measure of institutional productivity, little to no consideration is usually given to geographic location or the degree of urbanization of the institution. Since one or both of these variables could skew the outcome of the analysis, in this study it was necessary to control for them by holding them constant. While graduation rates represent only one measure of return on dollars invested in public research universities, they potentially provide the most transparent example for the public to understand. A perceived lack of information on these rates has begun to erode financial investors' (taxpayers, parents, students, donors) confidence in public research universities and, thus, weaken the base of public support for the institutions' financial resources.

### *Justification*

The lack of comprehensive information that provides taxpayers with quantifiable data and statistics has resulted in an all-time-high demand for accountability (Daigle & Cuocco, 2002; Spellings Report, 2006). Both critics and supporters of public research universities want evidence that tax dollars invested in these institutions are producing significant returns. They want the institutions to go beyond the rhetoric of accountability and actually provide measurable data to show that they are achieving their core mission of educating and graduating undergraduate students (Vedder, 2008). The study of the correlations between four-year undergraduate student graduation rates, six-year undergraduate student graduation rates, state appropriated dollars invested in the institution, and tuition and fees dollars invested in the

institution provides public research universities with a way that currently does not exist to address public accountability demands and provide measurable facts.

The gap between the information released by public research universities and the information the public demands has weakened public opinions of research universities, and these institutions can no longer afford to ignore this gap. Additional loss of trust and confidence in these institutions could prove detrimental to the institutions' financial stability. This research has helped to reverse that trend by narrowing that gap.

Economic motivation is driving states to redefine their support for colleges and universities by pressuring institutions to become more accountable, more efficient, and more productive in their use of publicly generated dollars (Alexander, 2000). This economic motivation has impacted higher education operation at the state level, and it has impacted postsecondary education classrooms. Stark and Lattuca (1997) found that critics and reformers heavily emphasized educational purpose and content. As the nation struggles with heavy public debt and a burdensome financial commitment to ensure student access to postsecondary education, public attention is now being directed to students enrolled in public research universities. According to Stark and Lattuca, Republican administrations from 1981 to 1992 began to decentralize higher education. One strategy the public used to deal with decentralization was to question higher education institutions' effectiveness and raise questions of accountability. These questions have now become a major concern of those who invest dollars in public research universities.

The public agenda for higher education accountability calls for the establishment of college and university performance measures that will allow for the tracking of metrics, such as student graduation rates, against financial investments (Leveille, 2006). State and federal

policymakers have already latched on to graduation rates as a key accountability indicator (Russell, 2009). This attachment alone provides significant justification for research conducted at the institutional level in order to provide taxpayers with a statistically sound analysis of the correlation between undergraduate students' four-year and six-year graduation rates, state appropriated dollars invested in the institution, and tuition and fees dollars invested in the institution.

The accountability demanded by taxpayers, parents, and students made the research reported here indispensable. If colleges resist the call for accountability and transparency, they risk losing institutional autonomy (Vedder, 2008). Vedder explains that the public and its political representatives are getting impatient. And when the public's and its political representatives' anger passes some threshold, the politicians will probably act; and colleges will not like the imposed solutions, which would no doubt include a loss of institutional autonomy.

### *Conceptual Framework*

Research in this study is informed by the work of Haptonstahl (2009), Johnson (1978), Toutkoushian (2001), Titus (2006, 2009), and Zhang (2008). Haptonstahl's use of the Principal-Agent theory to model the relationship between an information-advantaged Agent and a Principal able to issue a contract ultimatum served as the basis for the conceptual framework for this study. Johnson's, Toutkoushian's, Titus's, and Zhang's research was used to inform and support the application of the Principal-Agent theory as a viable approach in responding to public accountability demands.

Johnson (1978), Titus (2006, 2009), and Zhang (2008) used the theory of the firm concept to investigate the relationship between higher education finance and the production of bachelor's degrees. However, none investigated the relationship between public research universities' revenue resources and undergraduate students' graduation rates in response to

accountability. A more detailed discussion of Johnson, Titus and Zhang's research is found in Chapter 2. Findings in this literature supported both the description of public research universities as analogous to firms and using the Principal-Agent model in this study.

The natural starting place for modeling the economic behavior of colleges and universities is the theory of the firm (Toutkoushian, 2001). Toutkoushian pointed out a number of similarities between postsecondary education and for-profit firms that have led to the application of the theory of the firm concept to academic institutions. The primary similarity Toutkoushian identified that was used in this research is that both firms and public research universities operate much like machines with inputs and outputs. This similarity, with specific focus on the Principal-Agent model, served as the primary theoretical basis for developing a statistically sound undergraduate students' four-year and six-year graduation rates model and for establishing correlations between state appropriations, tuition and fees, and these graduation rates in response to public accountability demands.

The theory of the firm includes a number of economic theories that are used to describe the organization's behavior and its relationship to the market (Paulsen & Smart, 2001). This research drew from these theories, using the Principal-Agent model to explain the relationship between dollars invested in public research universities (input) and undergraduate students' graduation rates (output). With economic theory as a foundation for the establishment of the relationship between state appropriations and tuition and fees dollars invested in public research universities on the one hand and undergraduate students' four-year and six-year graduation rates on the other, the research has provided a statistically sound strategy by which to respond to public demands for accountability using the Resource Dependency theory as an interpretative

lens. The Resource dependency theory contends that organizations are influenced by external agents that provide support in the form of money or other asset (Pfeffer & Salancik, 2003).

### *Hypothesis and Research Question*

Research in this study investigated the following question: *Is there a relationship between taxpayers' dollars invested in public research universities and the production of bachelor's degrees (graduation rates)?* Specifically, it sought to respond to the following sub-questions:

1. Is there a relationship between public research universities' total revenue resources and undergraduate students' four-year and six-year graduation rates?
2. Is there a relationship between tuition and fees dollars invested in public research universities and undergraduate students' four-year and six-year graduation rates?
3. Is there a relationship between state appropriated dollars invested in public research universities and undergraduate students' four-year and six-year graduation rates?
4. Can the relationship between revenue resources and undergraduate students' four-year and six-year graduation rates be further explained by urbanization and regional differences?

Answers to questions one through four provided definitive responses to issues surrounding accountability. This study hypothesized that there is a direct correlation between taxpayers' dollars invested in public research universities and their undergraduate students' four-year and six-year graduation rates and that this relationship might be influenced by region and level of research activity. Johnstone (2001) observed that the most important part of the total revenue resources devoted to public research universities is provided by taxpayers.

### *Summary*

Previous research has raised awareness of higher education finance (Hauptman, 2001; Johnstone, 1995; Mckeown, 1996; Paulsen & Smart, 2001; Toutkoutshian, 2001). The literature



has already shown that student graduation rates are impacted by higher education financial operations (Johnson, 1978; Layzell, 2001; Orr, 2005; Ryan, 2004; Titus, 2006, 2009). Since the early 1990s, supporters of higher education institutions, especially taxpayers who invest dollars in public research institutions, have increasingly called for these institutions to become more accountable by providing more data, analysis, and information that explain return on dollars invested in these institutions (Alexandrer, 2000; Daigle, 2002; Grantham, 1999; Leveille, 2006; Mckeown, 1996; Orr, 2005; Throw, 1996; The Spelling Report, 2006).

Research conducted in this study has advanced higher education finance literature. It has advanced graduation rates literature and provided public research universities with a statistical basis on which to address issues surrounding higher education accountability. Even more importantly, the conceptual framework outlined in this study serves as an excellent statistical basis for future researchers. It informs higher education leadership, policymakers, and taxpayers.

## Chapter Two: Review of the Literature

An investigation of the history of dollars invested in public research universities and of what these institutions have produced in return was used to bring better understanding of ways for public research universities to respond to current public demands for accountability. The development of a trend that has focused attention on the relationship between undergraduate students' four-year and six-year graduation rates as a significant product of public research universities was an important factor in helping to shape the research conducted in this study. Many have expressed concerns that state and institutional policies and practices appear to be in a period in which substantial changes are taking place without the benefit of thorough analysis and adequate basis for policy formation (Paulsen & Smart, 2001). Inquiry into university policymakers' responses to public accountability demands was used to understand these changes better and to inform and help shape the conceptual framework of this study.

Special attention was given to literature that discusses how policymakers draw relationships between undergraduate students' graduation rates, state appropriated dollars, and other dollars invested in the institution at the state level. The higher education production function literature, theory of the firm literature, the Resource Dependency Theory and the Principal-Agent Model literature provided the foundation for the research's conceptual framework. Frames were used to improve understanding of the public demands for accountability being made of research universities. At the conclusion of this chapter, the significance of the literature reviewed here is summarized to make clear how this research provided a way for public research universities to respond to such demands.

### *Public Support for Higher Education*

This section discusses public support for higher education. It provides an historical look at dollars invested in public research universities. It then investigates how the environment has influenced public support for these institutions. Most importantly, literature reviewed in this section brings understanding of how the public views research universities and has placed demands on these institutions throughout history

### *History of dollars invested in public research universities*

The current demand for public research universities to find measurable outputs to account for dollars invested in the institution is certainly not new. Historically, less attention was given to accountability because the return on dollars invested in these institutions was either pre-defined by the state legislature or magnified by events of the times. One example is the Morrill Act, originally introduced as the land-grant bill in 1857 (NASULGC, 2008) and enacted in 1862. Resources were invested in research universities to foster a program of education suited to the needs of the agricultural and industrial classes. Because of the scarcity of such programs at the time, any newly created programs constituted a return on dollars invested in these institutions.

Prior to the Morrill Act, higher education was not widely available to many agricultural and technical workers. The passing of the Morrill Act reflected a growing demand for highly trained agricultural and technical workers. Graduating agricultural and technical workers provided a response to public accountability demands following the enactment of the Morrill Act. Similar to the demands that resulted in the creation of the first Morrill Act in 1862, new demands are currently being placed on public research universities. Just as earlier demands provided the institutions with the opportunity to demonstrate accountability by relating dollars invested in the institutions to program outputs, current demands have provided these institutions

with the opportunity to relate dollars invested in the institutions from different sources to undergraduate students' four-year and six-year student graduation rates.

Breneman and Finney (2001) analyzed the most significant shifts in revenue resources for higher education with an emphasis on the economic recession in the early 1990s. They described the financial support for higher education as vast by any measure. Higher education's share of the Gross Domestic Product (GDP) was reported by Breneman and Finney to be nearly 3 percent in 1995; and, even during the recession of the early 1990s, this percentage increased. It is significant that this percentage would increase during a time of economic decline. In the current environment of economic decline, this does not seem to be the case; and, unless public research universities can demonstrate significant productivity, they may be in for a very rough financial future. According to Breneman and Finney, it is important to examine financial trends in higher education to better understand the institutions' financial operation.

The dramatic rise in public higher education tuition levels since 1980 is closely linked to the parallel expansion of student loans to pay for education (Breneman & Finney, 1998). This rise has also resulted in public questions of what products are being produced in return for loan dollars invested in the institutions. Breneman and Finney concluded that changes in the financing of higher education in the 1990s shifted the burden of paying for higher education from the state to individuals. The rapidly increasing cost of higher education coupled with this shift has focused more attention on public research universities' accountability issues.

State and federal governments have changed the way they finance higher education over time. This change has brought with it increasing demands on public research universities. St. John and Paulsen (2001) observed that the emphasis placed on funding public research universities and students changed as politicians and voters responded to new beliefs. As they

reviewed the national discourse of higher education revenue sources, three challenges were found to be of particular importance: development, productivity, and investment.

St. John and Paulsen's (2001) research revealed that both market forces that emerged in the 1990s and a change in the labor market have influenced public higher education demands. The movement toward a new market approach brought new conservative political ideology to argue in favor of cutting back on a public-investment-dominated higher education policy at the turn of the century. The drift toward decreasing public investment supports the need for strategies to respond to public accountability demands. These demands are also supported by a decrease in taxpayer-funded support (legislative allocations from general funds) and a corresponding increase in individual support (through tuition and fees dollars). In other words, a change in the relative weight of various stakeholders has made understanding the relationship between investment and public research universities productivity even more important.

The transformation of public universities' characteristics provides significant understanding to reforms in the institutions' funding. Historically the institutions were defined as a single community of masters and students. Currently, the public research university is a whole series of communities and activities held together by a common name and related purposes. Since the 1930s, public universities have changed profoundly. They have moved in the direction of the social evolution of which they are a part. And perhaps it is the quest to meet every demand of society that has resulted in what is perceived as their becoming what one could describe as a "service station" for the public. This perception that institutions engage in inconsequential activities, as opposed to significant productivity, has led to distrust and questions of accountability (Kerr, 1995).

Public research universities engaged in “incredible absurdities,” and “a host of inconsequential things” (Kerr, 1995, p. 4). As a result of this engagement, according to Kerr, the universities have needlessly cheapened, vulgarized, and mechanized themselves. And worst of all, Kerr explained, the universities have become “service stations” for the general public. The universities now find themselves subjected to more public demands while trying to respond to the needs of the public.

Federal interest in public research universities dates back to 1787, and American universities have been shaped by public demands. Just as institutions were held accountable for endowment dollars invested in them following the Northwest Ordinance of 1785, contemporary public research universities are being held accountable for current dollars invested in these institutions (Berdahl, 2009). Berdahl explains that research universities are essential public goods providing a comparative advantage for the United States. He further explain that these institutions are delicate and can easily decline if treated with neglect or not understood as essential to the future strength of the nation. Undergraduate student graduation rates provide one way for the university to explain its crucial position to society using an institutional product that is perhaps easiest to understand.

#### *Current dollars invested in public research universities*

The current pattern of public research universities is to rely more and more on revenue sources other than the government or taxpayers (Johnstone, 1998). According to Johnstone, these institutions are relying more on income from parents and students, through tuition, and from philanthropists and other donors. Need-based grants are expected to continue to be a source of institutions’ financial resources to help ensure their accessibility to students. Johnstone posits that the institutions’ patterns of revenue sources are inextricably connected with institutional

missions and the prevailing teaching-learning paradigms. The mission of research universities is intricately connected to research, with the mission of educating students being tangled within this mission. This entanglement makes it most important that public research universities connect dollars going into the institutions to the production of students who have successfully completed degrees.

Johnstone (1998) speculated that states would continue to withdraw more dollars from public research universities, thereby placing an even greater burden on parents and students. Current conditions of higher education funding have confirmed this to be true. The possibility of any shift in the institutions' revenue sources directs attention to the determination of productivity associated with revenue dollars invested. Johnstone further explained that the changing higher education paradigm has significantly shifted the sharing of costs among parents, students, and taxpayers. This shift has made satisfying the demands of these groups of individuals very important to the financial stability of public research universities.

Public research universities' revenue per student is up (Wellman et al., 2008). Wellman et al. found that public research universities' tuition and fees have grown faster than state and local appropriations, which have not kept pace with enrollment and inflation. Tuition and fees alone were found to make up between 24 and 34 percent of public research universities' total revenue resources. The biggest cause for concern, and perhaps the driving force behind current public demands for accountability, is the significant increase in what Wellman et al. call the tuition and fees "Sticker Price," the full posted tuition and fees before financial aid or discounts (p. 21).

Historically the lion's share of general subsidies at public research universities has come from state appropriations. This increase in sticker prices has directed attention to state appropriations and tuition and fees dollars invested in public research universities. Persons who

invest these dollars are looking to the institution for justification of investment returns. In the past, investors only needed to look to the environment for such returns as an increasing number of well-educated agricultural workers or as technological advances that helped to win a war. Currently, public research universities must do more to develop strategies that show financial investors what they are getting for dollars invested in the institution. These strategies are necessary to replace public speculation with a more positive perception of the institutions and to help restore trust.

*Influence of the environment on public demands and public research universities*

Stark and Lattuca (1997) posit that since 1984 there have been insistent demands for reform accompanied by increasing attention to accountability for college students' success. They noticed that reformers have heavily emphasized educational purpose and content. They also described the reform era as predictable in light of the historical context. Student activists in the late 1960s caused curriculum requirements to be loosened or abolished. These changes resulted in a call for tightened quality control and more prescriptive requirements.

According to Stark and Lattuca (1997), external forces converged in the 1980s to produce corrective changes to restore balance in other aspects of higher education such as that between universities' finances and students' success rates. Several conditions influenced the accountability debate. Among them was an increase in international competition. Competition among nations almost always stimulates educational reform. In addition to competition for technological advances during wartime, the influence of Sputnik in the 1950s placed new public demands on higher education. The United States' perceived decline in economic competitiveness in the 1980s, along with embarrassingly low test scores for American children in comparison



with those of Japanese children, added to demands for more rigorous standards in public education at all levels, and particularly in publicly funded higher education.

World War II is credited as being the circumstance that led to a dramatic transformation and expansion of research universities (Clough, 1995). Clough found that, during the war years, the government and many universities joined together to fund and create new technology. Developed primarily by research universities, this technology helped the United States win the war and pull itself out of a depression. During the war years, the technology developed by research universities represented a tangible return on dollars invested in these institutions.

After World War II, the 1944 G.I. Bill of Rights resulted in a transformative piece of legislation, both for the American socio-economic landscape and the field of U.S. higher education. The Bill allowed servicemen returning home from the battlefields of World War II to enroll in higher education with scholarships to cover the cost of studying at the institution of their choice. Millions of veterans in the latter half of the 20th century benefited from the passage of this bill, and public research universities saw a surge in enrollment because of it. By the early years of the 21st century, government-sponsored benefits for military personnel had become less comprehensive. In addition, the educational needs of veterans had changed considerably in the wake of rising tuition costs, increased costs of living, and modern market trends (Learning House, 2008). In 2007, a new G.I. Bill was introduced to Congress.

The new G.I. Bill was designed to help those who have given so much to our country, often including repeated combat tours. It was introduced by Senator Jim Webb of Virginia as the “21st Century G.I. Bill” in January 2007. Webb, himself a Vietnam veteran, used military benefits to finance his education at Georgetown Law School in the 1970s. The earlier bill, he

explained in a speech before the Senate, "...helped spark economic growth and expansion for a whole generation of Americans...The bill I introduce today likely will have similar benefits."

The purpose of the new G.I. Bill was to help ensure that military personnel and recent veterans will have access to enough funds to enroll in the most expensive public college in their state, as well as matching funds from the government for any aid provided by private colleges beyond the aforementioned amount. (Learning House, 2008).

As the needs of society have changed over time, so have the demands for public research universities to find new ways to illustrate the return on dollars invested in them (Clough, 1995). This research posits that showing the relationship between dollars invested in public research universities from different sources and undergraduate students' four-year and six-year graduation rates provides an excellent way for these institutions to respond to demands for accountability. Clough's (1995) research showed that in the 1960s, 1970s, and 1980s the National Science Foundation (NSF) and mission agencies such as military and defense establishments provided research universities with a significant amount of funding for scientific and technical research. In addition, as these research missions grew, research universities were also expected to expand their role in society in other venues. These institutions found themselves providing society with entertainment through performing arts centers and developing high-quality intercollegiate sports programs.

Clough (1995) hypothesized from the history of these universities that they are the victims of their own success and willingness to satisfy so many of society's demands. As public expectations of research universities have increased, so have concerns about how those expectations are being met. Therefore, it is now necessary for public research universities to be able to link dollars invested in them to success in graduating students with bachelor's degrees.

Perhaps the demand for public research universities' accountability began as early as 1960, when the institutions' outputs were overshadowed by enrollment growth and what the public perceived as institutional success. According to Clough (1995), however, American higher education leaders and constituencies reported that by the 1990s there was significant change in attitudes toward public research universities. Although many still held them in high regard, others were beginning to criticize them sharply. At a time when the institutions faced a significant number of issues regarding the rising cost of higher education and its mission, there was a steadily intensifying drumbeat for accountability in financial and productivity matters.

Thelin (2004) made an intriguing comparison between American public research universities in 1960 and 1970. The general circumstances, including strengths and weaknesses, were remarkably similar in both years but had different consequences and public responses. During both decades, the federal government repeatedly emphasized higher education affordability and choice. Thelin also found that an abundance of resources accompanied by overcrowding as well as prestige coupled with a proliferation of activities spanned both decades. By the 1970s, research universities, like many other higher education institutions, had become clumsy and had faltered in juggling their priorities. As a result, the institutions began to pay a heavy price in distrust among constituencies and a loss of confidence within the institutions themselves and among their supporters.

Federal funding agencies, especially those aligned with classified research and Department of Defense projects, were among the first to bail out on funding research institutions (Thelin, 2004). The loss of lucrative "soft money" funding created long-term concerns about dependable funding resources. Thelin's research also demonstrated that one characteristic of research universities could be defined as their being somewhat chaotic and competitive in their

quest for funding and prestige. The change in sponsored research patterns and priorities had altered business as usual.

### *Higher Education Accountability*

This section explores one aspect of the change that is an ever-present factor in higher education—the changing accountability agenda for public research universities. It explores the impact of changes in both the educational, political and social/cultural environments along with higher education policies and how these changes have influenced public demands for accountability. It investigated the issues behind accountability demands and their significance to public research universities' financial operations.

#### *The changing accountability agenda for public research universities*

Public research universities can always expect changes in public demands. The evolution of public research universities since World War II represents an important era in the institutions' history. These institutions have helped to fuel the nation's economic development, social mobility, intellectual, cultural, and political life (Bowen et al., 2009). Like many other researchers, Bowen et al. credit the G. I. Bill with providing public research universities with funding through increased enrollment. However, World II veterans disappeared from the campus almost as quickly as they had arrived. It was the high post-war birth rate that captured public attention. In 1965, funding to public research universities received a breakthrough with the passage of the Higher Education Act, the first need-based federal program of student scholarships and loans. This Act resulted in opening the door of opportunity for many students who might not otherwise have been able to attend college.

According to Bowen et al. (2009), the expansion reflected a broad post-Sputnik public consensus that public research universities are a public good, intellectually connected to the nation's economic growth, national security, and commitment to opportunity. In this sense,

public consensus had defined the institution's accountability during this era, distracting any attention that might have been directed to undergraduate students' four-year and six-year graduation rates. During this time, public research universities got more public money. With this public money came more public control, and with public control came more public demands for the institutions to account for public dollars invested.

*A question of justification, funding, and public demands*

Presidents and deans began to find themselves in the more competitive position of having to scramble for funds and to explain and even justify their institutions. Thelin (2004) posits that after World War II universities in the United States were hard-pressed to identify a central, cohesive mission. This situation resulted in the development of even more distrust and speculations about research universities' financial operations. Research shows that higher education in the 1970s was a huge enterprise but also a troubled giant (Thelin, 2004). Central to the problem was a lower confidence level both within the ranks of higher education and among institutions' supporters. A primary cause of the loss of confidence was a lack of systematic analytical information about higher education institutions to assist in explaining and defining the institutions' goals and mission to critics and constituencies. The 1970s provided the first indication of the need for public research universities to both define accountability and establish comprehensive models that related dollars invested in the institutions to tangible outputs such as undergraduate students' graduation rates.

A group led by Clark Kerr, former president of the University of California, was among the first to publish a series of reports on the condition and character of higher education institutions in the United States in response to the decline in public trust and confidence in the academy (Kerr, 1991). To help restore confidence, advocates for research universities began

pointing out that these institutions were a bargain for taxpayers and the federal government. Research universities were linked to the economy. Research implied that failure to invest in funding for programs, instrumentation, and so on represented a futile economy (Kerr, 1992; Thelin, 2004).

According to Winton (1999) cited in Titus (2009), among higher education institutions, the level of financial resources is a function of both commercial and donated income that includes state appropriations. Commercial income includes tuition, while donated income includes endowments and state appropriations. These donations of state tax dollars have given the public a reason to place demands on public institutions. Paulsen (2001) speculates that, when market-based mechanisms fail to allocate resources efficiently, states intervene with policies. These policies have left public research universities with no choice but to pay strict attention to how state dollars invested in the institutions are being spent. It is more important than ever that these institutions demonstrate to parents and supporters the relationship between resources invested in colleges and universities and undergraduate students' graduation rates. Because of criticism surrounding graduation rates, accountability has become a major issue facing public research universities (Alexander, 2000).

Funding public research universities is a combined effort of federal, state, and local governments (Paulsen & Smart, 2001). A connection between funding from these sources and institutional performance is crucial in the current environment. This connection is especially crucial to state and local funding agencies. These agencies have such a strong interest in this connection that many states are now linking institutional funding to institutions' budgets (Johnstone, 1998; Mullin, 2007; Hancock, 2008; Fonte, 2009). The next section of this review explores one way in which different states have linked state funding to research universities'

undergraduate student graduation rates. This link served as a motivation for the research in this proposed study.

*Public demands and the question of accountability at the state level*

Mullin and Honeyman (2007) found that by 1950 Texas, California, Indiana, and Oklahoma were using formulas for budgeting or resource allocation and that, by 1964, 16 states were using formulas. In 1973 and 1992 the number had increased to 25 states and 33 states respectively (*MGT of America*, 2001, as cited in Mullin & Honeyman, 2007). Mullin and Honeyman's research included a survey of funding systems in 48 states. Their findings were organized into three categories: (a) no formula funding; (b) responsive funding with the costs of education, equalized funding, and option funding subcategories; and (c) functional component funding with generalized funding and tiered funding subcategories. For the purposes of this review, the focus is on those states that have formula funding models that incorporate a student performance component. Student performance was found not to be a focus of Mullin and Honeyman's (2007) research. This finding helps to validate the need for additional research in the area of the relationship between formula funding and student performance.

Public research universities' funding varies based on specified performance measures in states' formula funding. In performance-based budgeting, the budget varies according to the performance of the university in some prior period. Formulas are often used to calculate the allocated budget based on indicators. These indicators can be defined as student graduation rates, student retention, number of graduates, research funding, etc. This type of budgeting typically requires little or no state intervention.

A cursory look at higher education reforms during the past ten years indicates that two new policy instruments have become the preferred levers of change: steering and coordinating

the framework of higher education through funding allocations and demanding performance information as a means of quality assurance (Orr, 2005, p. 32). Performance measures have become such an integral part of higher education funding that the timing is excellent to investigate the relationship between public research universities' revenue resources and undergraduate students' four-year and six-year graduation rates. Government uses performance-based funding models to help steer research universities in the right direction. Leszczensky et al. (2004) as cited in Orr (2005) found that new funding models emphasized performance in an attempt to gain leverage over certain behaviors on the part of the universities. They concluded that these models exercised a steering function or quality management function. They also argued that models of quality assurance are used to illuminate the performance of universities and that their function is to map university activity for transparency. This argument supports the need for the research proposed in this study in order to provide a more transparent connection between dollars invested in the institution and undergraduate students' graduation rates.

Orr (2005) raised two crucial questions. The first piques interest in the relationship between funding methods and quality assurance. The research concluded that in a system of output-oriented funding, the university is made responsible for the number of graduates for which it is publicly funded. And, because the university is exposed to the risk that a negative relative performance will result in a reduction in public funding, the university must be given responsibility to set the conditions in such a way as to optimize performance. One cannot help but wonder if the conditions set by the university disguise the true quality of the institution. In addition, Orr concluded that the state can justify a right to control the quality of the resulting quantitative performance and to assure that any changes in learning conditions are not deleterious to the students.



The second question raised by Orr (2005) relates methods of quality assurance to enhanced information provided via funding method and bureaucracy. The research concluded that it is not necessary to assess whether universities are meeting customers' demands; it is more appropriate to assess the long-term effects of funding on the quality of higher education performance. In response to this question, Orr recommends a system of quality audits that involves an external assessment of the university's efforts to meet its own goals. Pure systems of funding or quality assurance that use only one funding method and one system of quality assurance are practically non-existent (Orr, 2005).

The National Center for Public Policy and Higher Education (NCHEMS, 2007) suggests that the most potent weapon in the policy arsenal can be structured to create powerful incentives to improve student graduation rate. NCHEMS reported that mechanisms through which state general funds are appropriated to colleges and universities almost always include enrollment levels as one important incentive factor. The current incentive structure encourages universities to raise as much revenue as possible, within certain limits, and spend all that is raised. NCHEMS found that for institutions to make their operations more efficient, financial incentives must be linked to the pursuit or achievement of productivity improvements such as student graduation rates.

*Public demands and the question of accountability at public research universities*

Public research university accountability can have many definitions and come in many forms, as noted in Chapter I. In this research, accountability is defined as public research universities' display of comprehensive information that links resources and undergraduate students' four-year and six-year graduation rates. Carey (2004) posits that there are at least two essential elements of any successful higher education accountability system. The first is public

information. Interestingly, no research was found to provide comprehensive information linking funding resources and graduation rates. The second essential element of accountability suggested by Carey is a plan with concrete goals for improvement. Carey stressed the importance of investing in more information, concluding that graduation rate statistics give us important information about success in higher education and that they are a useful point at which to begin the process of studying how best to hold institutions accountable for their performance.

The Center for Studies in Higher Education defines accountability as the public agenda for trust and cultural change (Leveille, 2006). According to Leveille, increased accountability issues associated with higher education became a prominent issue in the 1980s. Public research universities are still faced with many of these accountability issues today. Scarce funding and a lack of trust in the institutions have only served to make these issues worse and have resulted in an even greater call for public research universities to be more accountable to supporters and funding agencies.

Throw (1996) conducted a study of trust, markets, and accountability in higher education in the United States compared to Europe. Throw defined accountability as the obligation to report to others, to explain, to justify, and to answer questions about how resources have been used and to what effect. In this study “others” were defined as legislators, parents, students, and supporters of public research universities. Throw further explained that the fundamental questions with respect to accountability are as follows: who is to be held accountable and for what, to whom, through what means, and with what consequences.

Throw (1996) found different forms of accountability in higher education that varied with circumstances. For example, in the United States, where the federal government is not the major direct player in the system, formal accountability to society has largely been through

accreditation. In Europe, formal accountability was found to be strong and direct and to be discharged in part through quality assessments of research linked directly to funding. Throw found that, in Europe, government mandates in many forms have shown that the government's trust has been withdrawn from higher education as a result of a perceived lack of accountability. This review of published research on accountability in higher education shows that much work remains to be done on the relationship between trust and accountability.

The dissemination of information was found to be a resounding theme in higher education accountability literature. Throw's (1996) conclusions put it very succinctly: Information dissemination regarding public purposes through multiple means, including reports and other presentations, demonstrates to the legislature and citizens of each state that state's higher education institutions' commitment to accountability and their desire to be accountable. Information dissemination also demonstrates higher education institutions' interest in contributing not only to the individual but also to the state and their desire to be accountable to various constituencies that surround and influence higher education.

It was not until the 1990s that accountability issues were expanded to include productivity and various areas of institutional effectiveness. Leveille (2006) explained that in 1994 about one-third of the states had some form of performance indicators in place. Many of the performance systems that were put in place were mandated by state legislatures or statewide higher education coordinating boards. The performance systems placed pressure on higher education institutions to accept "the business model." This acceptance of the business model served as a basis for the analysis that was used in this study.

Leveille (2006) stated that "accountability is the current *lingua franca* of higher education" (p. 8). According to Leveille, the process of accountability requires communication,

negotiation, compromise, and transparency to proceed effectively in the absence of common ground. Leveille's research found that accurate and relevant data analysis can make the difference between validated decision-making and a merely gut-level reaction regarding public policy and resource allocation. This research advanced this finding to develop accurate and relevant data on which public research leaders can base sound decisions. Most importantly, the research provided a means by which to validate Leveille's findings.

Leveille (2006) also concluded that higher education institutions need to be good stewards of the financial resources provided to them. As the recipients of large amounts of public funding and private investment, higher education institutions are accountable to their respective stakeholders. Accountability to respective public research universities' stakeholders in this sense implies the availability of information that is both analytical and transparent in nature and is open to public scrutiny.

This research advanced Leveille's findings by adding a transparent layer of information about public research universities that responds directly to public scrutiny. Communication is a key to successful accountability, and information is a key to successful communication. The research has increased the body of public research universities' information needed to communicate effectively in an environment of increased accountability.

#### *The issues behind public demands for accountability*

Several factors led to the growing demand for accountability in higher education. Grantham (1999) listed Reaganomics as one of these. Grantham described Reaganomics as the general effort by the Reagan administration to reduce federal domestic spending, primarily for education and social programs. The second factor was described as the concurrent "devolution" of responsibility for education to the states at a time when they were in the midst of an economic

recession due to increasing international economic competition, high unemployment, demographic and technological changes, reductions in federal aid, and revenue shortfalls. The third, and perhaps the most talked about, factor associated with accountability was the skyrocketing costs of higher education. A major concern was that the cost of higher education increased much faster than inflation. Supporters were demanding to see what this increase in cost was producing.

Grantham (1999) noted that leaders of higher education institutions have long argued before legislatures that investments in higher education would pay off in an array of public benefits. This study advanced the argument to provide concrete evidence of how funding invested in public research universities actually pays off. In the past, policymakers have found this argument appealing and have acted on it with funding. Grantham posits that if universities are to continue receiving positive funding responses from policymakers, then more information is needed to inform policymakers of institutional productivity.

Policymakers view funding allocated to public research universities as a contract as well as an investment and are holding these institutions to it. They want proof of returns on funding allocated to public research universities. This research provided proof by connecting funding to undergraduate students' graduation rates. Grantham (1999) concluded that a great number of voices have been heard and published on the issue of accountability in higher education and that higher education institutions will do well to remember what the late Winston Churchill once said: "we must take change by the hand, or it will take us by the throat."

The American Federation of Teachers (2005) concluded that elected officials who set higher education policies, taxpayers who fund higher education, and students who attend classes deserve a clear understanding of what they get for their education dollars. Most institutions

struggle with where to begin the accountability process. Included in the AFT's guidelines that colleges and universities should follow when addressing accountability issues is a call for clear communication.

Daigle and Cuocco (2002) found that, as a rule, neither performance-based budgeting nor any other single approach has the power to dramatically increase institutional accountability and that multiple accountability strategies must be employed. This research added a different dimension to the accountability discussion. Daigle and Cuocco failed to identify specific accountability strategies with proven success. Research in this study linked Daigle and Cuocco's study to a specific strategy that public research universities can use to address accountability questions.

The face of accountability has changed, and a new economic motivation is driving states to pressure public research universities to become more accountable (Alexander, 2000). According to Alexander, state governments are placing an increasing burden on higher education to play a pivotal role in transforming the existing low-wage economic structure into high performance, technology-based economies. The public sees that one way of accomplishing this goal is to graduate undergraduate students enrolled in the institution. Public demands for productivity are ever increasing. The public is placing greater expectations on the institutions, and they must be obliged to examine themselves using such strategies as the one outlined in this research or they will be examined by others.

Alexander (2000) concluded that in looking for ways to measure greater productivity and performance, governments are reflecting a more utilitarian view of higher education. From the utilitarian perspective, economic values are supreme; and the quantification of fiscal resources is the true measure of value. Alexander further implied that if public research universities are

unable to define and demonstrate educational objectives and achievements in utilitarian terms, they will have limited success in meeting public demands for accountability. In the utilitarian environment that Alexander discusses, it is inevitable that government will seek greater accountability as well as question undergraduate students' graduation rates. Key to this research is the idea that "there ought to be a degree of friction deriving from the critical spirit that is central to academic intellect" (p. 428). This friction should lead public research universities to develop strategies such as the one developed in this research to respond to accountability.

*What is the link between public research universities and accountability?*

Johnstone's (2005) study of the higher education reform agenda in finance and management strongly implies that matters of student graduation rates cannot be divorced from this agenda. The research found that the principal higher education productivity problem lies not so much with excessive costs as with insufficient productivity. The higher education reform agenda was found to emphasize strongly that linking funding to graduation rates is one way to respond to higher education accountability concerns.

Productivity can be a dreaded word in higher education when it comes to accountability. The topic of performance relative to funding (i.e. productivity, student graduation rates) is one of the most strained conversations in postsecondary education (Kelley, 2009). Kelley explains that the most difficult barrier to conducting sound productivity analysis in postsecondary education is a lack of available data on finance and the production of degrees. Unlike this research which focused on revenue resources and degree production (i.e. graduation rates), Kelley's research focused on institutional costs and degree production.

Similar to this research, Kelley's (2009) research used graduation rates to measure institutional performance. Kelley defined, as another measure of performance, credentials

awarded as a percentage of students enrolled. This variable is a measure of output relative to the number of students pursuing credentials. However, Kelley explained that graduation rates are by far the most commonly used measure of institutional productivity. The research reported in this dissertation used graduation rates as a productivity measure in a way not done in prior research by relating them to revenue resources and then using this relationship to respond to public accountability demands.

Kelley (2009) concluded that the analysis should serve more as a prototype than a definitive body of work because of the brevity of the report. Kelley also concluded that, when trying to gauge productivity in postsecondary education, the complexities of the enterprise and the lack of publicly available data and information have created a maze that has never been completely navigated. Like Kelley's research, this research does not reach the finish line, but it certainly goes beyond other research in response to questions of accountability and transparency. This research certainly has fewer twists and turns and has provided a new dimension to higher education accountability research.

Birnbaum (1992) defined productivity as a ratio between inputs and outputs. He explained that productivity improves when increases of output are achieved per unit of input. However, he found very little data related to higher education productivity. According to Birnbaum, there are two major aspects to understanding the concept of productivity in higher education: political and cognitive. The political aspect involves the selection, interpretation, importance, and measurement of input and output variables. The difficulty is that weighting these variables in productivity is subject to different interpretations based on the values of the observer. As a result, the calculation of productivity is an inherently political act. Birnbaum described the second aspect of productivity as cognitive. He explained that the number of



variables involved in determining productivity is so large and the interaction among them so uncertain that it is impossible to calculate total productivity. The present research focused directly on one of the cognitive aspects of productivity (i.e. graduation rates) and spoke indirectly to the political aspect of productivity in selecting and interpreting significant higher education accountability through measurable input and output variables.

Most research in the area of student performance has roots in work done by great researchers who have focused on student attrition and retention and student choice and social issues that may cause the student to drop out (Astin, 1975; Bean, 1990; Spady, 1971; Tinto, 1975). In recent years, researchers have done more to link higher education revenue resources to undergraduate students' graduation rates (Johnstone, 1992; Paulsen, 2001; Titus, 2009; Toutkoushian, 2009).

Higher education research in the area of revenue resources and undergraduate students' graduation rates alone has done little to lessen the demand for public research universities to become accountable. It is up to public research universities to provide a definitive measure of accountability in terms of undergraduate students' four-year and six-year graduation rates and to develop strategies to respond to public demands for accountability. Recent graduation rate trends at public research universities show that too few students who enter four-year institutions graduate (Carey, 2004). Carey found that only 63% of students who enter four-year colleges and universities graduate within six years. His findings were even more astounding for African Americans and Latinos. The six-year graduation rates for these two groups were found to be 46% and 47% respectively. White Americans had a six-year graduation rate of 67%. Low-income students graduate at a rate of 54% while high-income students graduate at a rate of 77% within six years.

The American Association of State Colleges and Universities (2009) concluded that conventions pertaining to graduation rate reporting were not likely to disappear in the foreseeable future. Student graduation rates are expected to remain a contentious issue for some time in the future. According to the AASCU, the challenge is to find ways, such as the one developed in this study, to maximize the utility of the graduation rate metric while minimizing the potentially detrimental or unforeseen consequences. Among the Association's recommendations for improvement are data systems and analysis. In its conclusion, AASCU stressed a continuation of the development and effective utilization of disaggregated graduation rates and multiple measures that offer meaningful comparisons.

#### *Graduation Rates as One Measure of Higher Education Productivity*

Graduation rates have been recognized at the state level as a significant productivity measure (Layzell, 2001). Literature reviewed in this section seeks to bring better understanding to graduation rates as a measure of productivity at the institutional level. It also seeks to explain why graduation rates provide the most recognizable and understandable productivity measure used in this research in response to accountability demands.

#### *Graduation rates as a public research university accountability measure*

State-level policymakers have been monitoring the performance of publicly funded institutions of higher education since the 1980s (Layzell, 2001). Layzell explained that, in the last few years, budgetary constraints together with policymakers' on-going interest in accountability and program-based budgeting have resulted in performance-based budgeting. As a result, more public college and universities' allocated funds are based on their achievement of previously established goals, objectives, and outcomes.

Layzell (2001) explored the importance of keeping an analysis of financial resources and student outcomes both numeric and "measurable" while addressing the less tangible but equally

important aspects of finance and performance. Layzell explained that quantitative measurement may be more comfortable and familiar to policymakers and constituents, but will provide only a one-dimensional view. The research implied that a well-balanced system will include both quantitative and qualitative analysis. “Performance-based budgeting is the logical extension of a system of performance indicators; and it connects accountability, performance, and funding levels.” (Layzell, 2001, p. 202).

Higher education accountability and transparency issues have resulted in more attention being paid to higher education funding policies nationwide (Johnstone, 1998). Johnstone found that as a result of the growth and diversification of higher education, universities’ policymakers are progressively implementing policies to supplement governmental revenue allocations to higher education by raising tuition. Policies are also trending toward encouraging institutions to seek additional funding from the private sector. Accountability is an issue on most higher education agendas. As a result, colleges and universities are under growing pressure to cut costs, measure and report on performance, and compete ever so strenuously for financial resources (*The Futures Project*, 2005).

Higher education funding policies have been attacked in recent years largely because of increasing tuition prices (AASU, 2008). According to AASU, the mantra for greater accountability is evident at both the state and federal levels. AASU reported that most public four-year public institutions are responding to calls for transparency and accountability with self-imposed, voluntary reporting systems aimed at shedding more light on spending practices and key student outcomes such as graduation rates. Previous responses to such calls have done little to either educate public research universities’ supporters or provide a comprehensive understanding of investment returns on financial resources inputs. The U. S. Secretary of

Education commissioned a study on the Future of Higher Education and the reauthorization of the Higher Education Opportunity Act that has brought new awareness to public research universities' revenue resources and productivity. The underlying basis of the commission was the need for accountability and transparency at all levels of higher education operations (The Spellings Report, 2006).

*Graduation rates as a public research university productivity measure*

Lowry (2000) used data for 428 individual institutions in all 50 states to investigate government funding and tuition and fees at public universities. He posited that relatively little research explains revenues from state government and students at individual public universities. Lowry concluded that state government allocations and net tuition and fees revenue at public universities depend on political as well economic factors.

Lowry (2000) also concluded that since public universities in states that have few governing boards are better at attracting funds than those in states that have many boards, state government funding depends on the ability of public universities to lobby effectively for themselves. Accountability and transparency are major keys to these institutions' ability to lobby successfully. Lowry also found that state government funding for specific campuses depends on outputs supplied by each campus. It is this output that is of interest to supporters of higher education.

Research in the area of student performance and budgeting at research universities is important because the modern world of tertiary education is undergoing enormous reforms. Based on Johnstone's (1998) research, characteristics of finance and management reforms may be characterized as listed below:

1. expansion and diversification of enrollments, participation rates, and number and types of institutions;
2. fiscal pressure as measured in low and declining per-student expenditures and as seen in overcrowding, low-paid faculty, lack of student equipment or libraries, and dilapidated physical plants;
3. ascendance of market orientation and solutions, and the search for non-governmental revenue;
4. demand for greater accountability on the part of institutions, faculty, and on behalf of students, employers, and those who pay; and
5. demand for greater quality and efficiency, which includes more rigor, more relevance, and more learning.

Categories summarized as 2, 4, and 5 support a greater need to investigate the relationship between higher education funding and student graduation rates. Higher education orientation to the market in recent years has raised many questions regarding this connection.

Johnstone (1998) explained that higher education has many of the characteristics of private goods amenable to the forces of the market. For example, it exhibits conditions of rivalry (limited supply), excludability (often reversible for a price), and rejection (not demanded by all). He further explained that a greater reliance on market signals brings a shift in decision-making power not only from government but also from higher education institutions. This signal is also present from faculty to the consumer or client. The consumer may be the student, businesses, or the general public.

Titus (2006) investigated the influence of the financial context of institutions on student persistence at four-year colleges and universities. His research found that many states use budget

allocations to link institutional accountability by using graduation rates or retention rates as indicators of student performance. Even though public funding has declined in recent years, policymakers still attempt to link public funding to student performance. According to Titus, policymakers have been looking for ways to strengthen this link for some time.

Titus' (2006) research resulted in two findings that are crucial to the present research. First, using resource dependency theory, he found that after taking student-level variables and other institution-level variables into account, the average chance-of-student-persistence rate is dependent upon the extent to which an institution relies on tuition as a source of revenue. This finding implies that there may be some significance in the relationship between the distribution of revenue resources across core revenue resource components and graduation rates. Second, Titus' research suggested that the average chance of persistence is dependent not only on the level of institutional expenditures but also on institutional expenditure patterns. Research in this study extended Titus' research beyond higher education expenditures to higher education funding sources.

Astin (1993) as cited in Zhang (2008) pointed out that more than half the variations in student success come from key inputs in higher education. However, among the key inputs such as students themselves, graduation rates remain the most popular measure of student performance. These rates have continued to capture the attention of policymakers in light of questions regarding institutional accountability in recent discussions. The attention given to accountability in the current environment makes any information that would clarify, give transparency to, and link higher education financial inputs and undergraduate students' graduation rates a valuable commodity.

Zhang (2008) used panel data to examine the link between state funding and graduation rates at four-year public institutions. The examination found evidence of a positive relationship between state funding and college graduation rates. Zhang found that a 10 percent increase in state appropriations per FTE student at four-year public institutions is associated with approximately a 0.64 percentage point increase in graduation rates when holding one factor constant. This research advanced Zhang's research in the investigation of undergraduate students' graduation rates and core revenue resource allocations to the institution level of public research universities.

Waggaman (2001) implied that research institutions have not turned a deaf ear to issues surrounding accountability and student success. However, such factors as mandates in costs arising from changing economic conditions and threats to financial solvency or profitability as well as changes in governmental social policies have all played a role in how these institutions respond to questions regarding accountability. Waggaman further explained that many cost pressures are related to faculty salaries: inflation, competitiveness with the salaries of other professions, faculty shortage, higher salaries for new faculty, demands for reduced workloads, increased costs of fringe benefits, and others, such as cost of a spouse. While Waggaman's research provided appropriate reasons for the need for public research universities to seek increases in the institutions' revenue streams, it also sparked issues surrounding public accountability demands.

*The link between graduation rates, public demands, and accountability*

Economics was used in this research to understand the link between graduation rates, public demands, and accountability. A key to understanding how public research universities' economics can be used to respond to accountability is found in Johnson (1978). Johnson offered

the paradigm of the student as an economic entity analogous to the profit-maximizing firm in microeconomic theory. While this paradigm provided a basis for the present research, it must be noted that clear definitions of inputs and outputs in higher education are difficult to ascertain. The production function of higher education is ambiguous, and confusion often surrounds the definitions of inputs and outputs. Similar to Alexander's use of the theory of the firm to evaluate higher education inputs and outputs, the research reported in this dissertation uses the theory of the firm concept to evaluate dollars invested (inputs) and public research universities' undergraduate four-year and six-year graduation rates (outputs).

The theory of the firm is used to examine the behavior of public research universities' total revenue resources, state appropriations, and tuition and fees dollars and undergraduate students' four-year and six-year graduation rates. Toutkoushian (2001) posits that the natural place for modeling the production of colleges and universities is the theory of the firm. This theory is a collection of economic theories of organizational behavior. According to Toutkoushian, these theories apply to public research universities because the behavior of these institutions is similar to that of for-profit firms. This similarity of behavior allows this research to use the theory of the firm in its theoretical framework. For example, public research universities use inputs (state appropriations, tuition and fees, other revenue resources) to produce four-year and six-year graduation rates.

Application of the theory of the firm was significant for this research because it allowed the research to bring understanding to the question of dollars invested in public research universities and the possible reasons why this investment has changed over time. Toutkoushian (2001) concluded that on the revenue side, the unprecedented bull market of the late 1990s might have benefited postsecondary education institutions as states realized higher tax



revenues from capital gains and passed some along to higher education. Since Toutkoushian's initial research, higher education revenue sources have changed. With this change has come a significant increase in public demands for public research universities to become more accountable.

Paulsen (2001) posited that the overall supply of higher education might be influenced by either subsidies to colleges and universities or the cost of higher education. He further noted that the concept used to explain the supply behavior of higher education institutions originated from the microeconomic theory of the firm. Using Paulsen's assumption of the model of rational investment decision-making proposed by human capital theorists, the present research assumed that in order to make sensible investment decisions, taxpayers, students, parents, and others who invest dollars in public research universities calculate whether or not to invest dollars in the institution based on its four-year and six-year graduation rates.

A goal of microeconomics is to analyze the market mechanisms that establish costs amongst goods and services and allocations of limited resources amongst alternative uses (Paulsen, 2001). "With regard to higher education institutions, the higher education production function describes the relationship between optimal outputs, such as college degrees awarded, and the optimal mix of input such as students, faculty and staff as well as physical and financial capital" (Hopkins & Massey, 1981) as cited in (Titus, 2009, p.443).

### *Theories and Application*

This section discusses several theories that have informed this research. It begins with a discussion of literature that supports the use of the Principal-Agent model as the basis for the theoretical framework of this proposed study. The section concludes with a discussion of frames to help guide and shape the use of economic theory in developing a strategy to respond to public accountability demands.

*Public research universities analogous to a firm*

Titus' (2009) research demonstrated that the production of bachelor's degrees is a function of selected revenue resources impacted by state higher education policies such as tuition, state appropriations to higher education, and financial aid provided to students using the higher education production function. The hypothesis set forth in this study drew from Titus' findings that the production of bachelor's degrees is related to certain financial aspects of state higher education policies. Titus' findings provided implications that revenue resources impact undergraduate student graduation rates at the state level. This research investigated these implications by moving Titus' research from the state level to the institutional level.

Researchers have used several methods to evaluate the relationship between higher education finance and student performance (Johnson, 1978; Titus, 2006, 2009; Zhang 2008). None were found to link student performance and graduation rates at public research universities in response to questions about accountability in a comprehensive, clear, and precise way that is accessible to public research universities' supporters. Johnson examined the role of students in the higher education production function. Her research brought awareness of the student as an economic entity into the paradigm in developing a notion of the university as analogous to the profit-maximizing firm in microeconomic theories of the firm. Johnson's research supports the use of the Principal-Agent model as a theoretical basis for examining public research universities revenue resources as an input and undergraduate student graduation rates as a production output in response to public accountability demands.

In the current research, revenue resources were viewed as the raw materials that enter the universities in one mode and leave the institution in the improved output mode defined by undergraduate students' four-year and six-year graduation rates. This view differs somewhat

from Johnson's (1978) view of students as a principal "raw material" of institutions of higher education entering the institution in one state of knowledge and leaving it in another. This research expanded Johnson's work in higher education by treating both state appropriations and tuition and fees dollars as inputs and undergraduate students' four-year and six-year graduation rates as outputs.

*The theory of the firm*

The theory of the firm allows this research to draw from economic theories to develop a strategy to respond to public accountability demands. The theory consists of a number of economic theories that will be used to help explain the nature of public research universities, including their existence, their behavior, and their relationship with the public who invest dollars in the institutions. As mentioned in Chapter 1, the natural starting place for modeling the economic behavior of colleges and universities is the theory of the firm (Toutkoushian, 2001). A key element of the theory of the firm is the development of relational contracts between the principal and agent. This research argued that a key element in the theory of the public research universities' economics was the development of a comprehensive relationship between state appropriations and tuition and fees dollars on the one hand and undergraduate students' four-year and six-year graduation rates on the other.

Baker et al. (2001) examined relational contracts and the theory of the firm. Their research implied that understanding the role of policymakers who design and implement the relational contracts between the public and the institutions that underpin informal organizational processes is essential to understanding public research universities. Historical events such as World War II and the development of new technologies have played a significant role in how policymakers have shaped these contracts in the past. Baker et al. found evidence that suggests

that changing a relational contract is harder still: leadership must end one relational contract but preserve enough credibility to begin another, and the new contract they seek to begin often looks suspiciously like renegeing on the old one they seek to end. The need for public research universities to develop a strategy to maintain public trust and confidence in any contract between them and their funding sources is most significant to the institutions' financial stability.

### *Higher education production function*

The higher education production function is the economics of higher education theory that allowed this research to transform inputs (state appropriations, tuition and fees dollars) into outputs (undergraduate students' four-year and six-year graduation rates). In order to clarify the existing confusion in higher education between inputs and outputs and to offer aid in understanding the complex issues of productivity, this dissertation offers a paradigm of state appropriations and tuition and fees dollars invested in public research universities as an economic entity analogous to the profit-maximizing firm in microeconomic theory.

Titus (2006) used the concepts of the higher education production function and the Principal-Agent model of the state. His research used a concept that originated from the microeconomic theory of the firm to explain the behavior of higher education institutions. In contrast to overall demand, the overall supply of higher education may be influenced by subsidies to colleges and universities (Paulsen, 2001, as cited in Titus, 2006). Applying this concept, the research used the higher education production function to describe the relationship between public demand for optimal outputs such as undergraduate students' four-year and six-year graduation rates and the dollars invested in public research universities from supporters in the form of state appropriations and tuition and fees.

Titus' (2006) research drew on the theory of organizational behavior introduced by Bolman and Deal (2003) to understand student performance in higher education better. In addition, Titus used the resource dependency theory and Bean's (1990) organizational theory to investigate the relationship between higher education finance and student performance. Using the resource dependency theory, Titus found that, on average, successful student performance is dependent upon the extent to which institutions rely on tuition as a source of revenue. This research applied Titus' investigation of student performance specifically to public research universities.

#### *Resource dependency theory*

Resource-dependency is a theory of organization(s) that seeks to explain organizational and inter-organizational behavior in terms of those critical resources that an organization must have in order to survive and function (Johnson, 1995). This theory provides one of many ways to view public research universities' behavior. In this research, crucial resources were defined as state appropriations and tuition and fees dollars. Employing the resource dependency theory, this research offered public research universities one strategy to explain the institutions' behavior. This strategy is necessary in the current environment where public demand for accountability is leading the discussion of most higher education agendas.

The first principle of the resource dependency theory is that organizational decision makers seek to ensure the continued survival of the organization (Pfeffer & Salancik, 1978; Thompson, 1967, as cited in Johnson, 1995). This research posits that public research universities must respond to public accountability demands if they are to secure the state appropriations and tuition and fees dollars necessary for continued survival. According to Johnson, the resource dependency theory focuses on the following: resources, the flow or

exchange of resources between organizations, those dependencies and power differentials created as a result of unequal resource exchange, the constraining effects such dependence has on organizational action, and the efforts by organizational leaders to manage dependence. Public research universities' dependence on state appropriations and tuition and fees dollars has placed them in the crucial position of having to develop strategies to respond to public accountability demands.

Organizational success in resource dependency theory (RDT) is defined as organizations maximizing their power (Pfeffer, 1981). RDT characterizes the links among organizations as a set of power relations based on exchange resources. RDT proposes that public research universities lacking in essential resources will seek to establish relationships with taxpayers, parent, students and other supporters in order to obtain needed resources. Medcof (2001) posits that organizations attempt to alter their dependence relationships by minimizing their own dependence or by increasing the dependence of other organizations on them. Within this perspective, organizations are viewed as coalitions aligning their structure and patterns of behaviors to acquire and maintain needed external resources. Research in this study provided public research universities with a mechanism by which to first define the institutions' accountability and then respond to public demands for it by aligning students' 6-year graduation rates with state appropriated and tuition and fees dollars.

Research in this study posited that acquiring the external resources needed by the institutions comes by illustrating to the public that the institutions are fulfilling a contractual agreement between the institutions and its financial investors. This hypothesis differs from Medcof's position that RDT is most successful when decreasing the institution's dependence on

others and/or by increasing other's dependency on it that is, modifying an organization's power with other organizations.

Based on RDT assumptions, research in this study assumed that

- because institutions are comprised of internal and external coalitions which emerged from social exchanges that are formed to influence and control behavior, an alignment of state appropriated dollars, tuition and fees dollars invested in public research universities and undergraduate students' 6-year graduation rates were needed to bring better understanding to both coalitions; and
- taxpayers, parents, and students possess dollars essential to the institutions' survival. Because public research universities have not adequately responded to this group's accountability demands, these institutions are now faced with an increased amount of uncertainty in resource acquisition from an already fragile financial environment.

The resource dependency theory tells us that institutions are assumed to work toward two related objectives: acquiring control over resources that minimize their dependence on other organizations and acquiring control over resources that maximize the dependence of other organizations on themselves (Pfeffer, 1981). These objectives can affect the exchange between institutions, thereby affecting an institution's power. The power construct is a central theme of the biggest threat facing public research universities if they fail to respond to public demands for accountability.

Public research universities are expected to lose autonomy if they fail to respond to public demands for accountability. A shift in the power structure of public research universities has already occurred with the development of university systems. States are using formula

funding models to impose even more restrictions on public funding to these institutions. Viewing this construct as it exists in RDT was used to generate and support the use of the Principal-Agent theory to develop a strategy that public research universities can use to respond to public demands for accountability.

Those who provide resources to public research universities have two means of general control over the institutions: 1) determining whether the institutions get the resources they need, and 2) determining whether the institutions can use the resources in the way they want to use them (Pfeffer, 1981). Currently, taxpayers, state legislators, parents, and students who provide financial resources to public research universities are using the power of having the resource to demand accountability. The only real string attached to financial resources at the present time appears to be accountability demands. However, if public research universities fail to respond to these demands in a way that the layperson can understand, there could be no limits to the number of future strings that may be attached to the institutions' financial resources.

The natural starting place for modeling the economic behavior of colleges and universities is the theory of the firm (Toutkoushian, 2001). Toutkoushian pointed out a number of similarities between postsecondary education and for-profit firms that have led to the application of the theory of the firm concept to academic institutions. Therefore, this concept served as the primary theoretical basis for developing a statistically sound undergraduate students' four-year and six-year graduation rates model and for establishing correlations between state appropriations, tuition and fees, and undergraduate students' four-year and six-year graduation rates model in response to public accountability demands.



### *The principal-agent model*

The Principal-Agent (PA) theory is used to model the relationship between an information-advantaged Agent and a Principal able to issue a contract (Haptonstahl, 2009). Coupled with the higher education production function, the Principal-Agent model provided the conceptual framework for this study. For the purpose of this research, PA was used to model the behavior of public research universities' investors (agents, taxpayers, parents, etc.) and the production behavior (four-year and six-year graduation rates) of the principal public research universities.

The PA model works well when the agent is an expert at making necessary decisions, but does not work well when the interests of the principal and the agent differ substantially (Investors.com, 2010). According to Haptonstahl (2009), a contract is used to specify the terms of the principal-agent relationship. For the purposes of this study, the relationship was assumed to be understood when the institution accepted investors' dollars for the purposes of teaching and graduating students.

Public research university finance itself has led to the development of new applications of economic concept and theories (St. John & Paulsen, 2001). It is probably safe to conclude that these concepts and theories would not have arisen without the demands that the environment has placed on the institution throughout history. Just as historical environmental demands have resulted in the development of new theories and concepts, current environmental demands-have driven the theory and concepts set forth in this research. The next section reframes public research universities' financial operations and their response to public demands to bring understanding to how this research has responded to present-day accountability demands.

*Using Frames to Guide and Shape Research Universities' Response to Accountability*

St. John & Paulsen (2001) explained that various perspectives or frames guide the thinking of those who shape public policy in higher education. According to them, in a structural model, policymakers would emphasize regulation and control, including rigid systems of accountability. In a human resource frame, policymakers would emphasize students. In a political frame, policymakers would emphasize strategic adaptation to the changing environments, including the introduction of incentives into the environment. In a symbolic frame, policymakers would be more concerned about the symbolic meaning of new strategies in building coalitions. (p. 559)

*Accountability response from the perspective of the structural, political, resources, and symbolic frames*

Research in this study argued that through the structural, political, human resources, and symbolic frames the relationship between public research universities' revenue resources and undergraduate students' four-year and six-year graduation rates provided one strategy to respond to public accountability demands. The frame concept employs usable knowledge (Bolman & Deal, 2003). According to Bolman and Deal's structural frame, public research universities perform specialized work and sequential tasks under close supervision. This supervision may come from state lawmakers, but most recently it appears to come from public demands. The structural frame provides the blueprint for the public's pattern of expectations in a stable environment that is rule oriented.

Public research universities are designed to fit the circumstances of the environment in the structural frame. It is this design that makes it necessary for public research universities to relate dollars invested in the institution to undergraduate students' four-year and six-year

graduation rates. The institution can regain public trust by designing strategies that demonstrate productivity. The structural frame assumes that public research universities exist to achieve established goals and objectives. The institutions must first define these goals as undergraduate students' four-year and six-year graduation rates and then demonstrate clearly that they are achieving this goal. The institution will increase its efficiency not by adhering to the "service station" perception but by focusing on specialized divisions of productivity such as student graduation rates as a performance measure.

Through the human resources frame, conflicts arise (Bolman & Deal, 2003). Public research universities exist to serve human needs, and in the current environment these have been primarily defined by the fit between the institutions and the services they provide to mankind. Throughout history the environment has helped shape public need. It is time for public research universities to take a more proactive role in defining and explaining to the public their services in ways that are understandable and measurable. This research defined one service as student graduation rates. If the institution fails, the relationship between public demands and the institution's product will be poor and thus will further erode public trust in the university. If this happens, either the public, the university, or both will suffer. The university stands to suffer more because of the financial impact. The human resources frame stresses the relationship between people and organizations. The present research stressed the relationship between persons who invest dollars in the institution and the institution's production in terms of undergraduate students' four-year and six-year graduation rates.

The focus of the political frame is not on resolution of conflict, but on strategy and tactics (Bolman & Deal, 2003). In this frame, public research universities are "screaming" arenas with scarce financial resources available under a watchful public eye. It is this watchful eye that

makes it imperative for public research universities to develop a strategy that links public dollars invested in the institution to undergraduate students' four-year and six-year graduation rates. Bargaining and negotiation are key factors in this political frame. Demonstrating a positive relationship between public research universities' revenue resources and undergraduate students' four-year and six-year graduation rates will erase some public speculations and provide the institution with a bargaining tool.

Historically, the environment has helped to shape the culture of public research universities. Symbols embody and express an institution's culture (Bolman & Deal, 2003). The interwoven pattern of beliefs, values, practices, and artifacts that defines public universities has been heavily influenced by the environment and public demands. The events of time, such as the enactment of the Morrill Act, World War II, and the cold-war era have defined and responded to demands for public research universities' accountability throughout history. In the current environment, these institutions have no choice but to define and respond to public demands for accountability or someone else will respond for them in ways that may not be favorable to the institution. Undergraduate students' graduation rates provide one measurable symbol of the institution's productivity. The present research argued that the development of the relationship between revenue resources and undergraduate students' four-year and six-year graduation rates provides one strategy to respond to public accountability issues.

### *Summary*

The literature shows that critics want public research universities to be more accountable but also to go beyond the rhetoric of accountability and actually measure whether or not they are achieving their core mission of educating undergraduates (Vedder, 2008). The literature also implies that there are no secrets to the successful management of investment funds (Morrell, 2001). As explained by Morrell, sound principles and practices for effective investment

management include clearly defined success in terms of the objectives. States, students, parents, and supporters of public research universities provide a revenue stream to public research universities to support the needs of the state and students.

Currently, the demands for public research universities to provide evidence of a return on dollars invested in these institutions are higher than ever. If public research universities are to attract funding, they must devise a financial strategy capable of meeting the institution's needs for income and growth in principal at the lowest possible risk. This research has provided public research universities with at least one framework in which to devise a much needed financial strategy to respond to critics. Critics want to see public research universities' production. They want to see a return on dollars invested in these institutions. The higher education production function and the theory of the firm have allowed this research to provide critics with a clear picture of the relationship between revenue resources invested in public research universities (input) and public research universities' undergraduate student graduation rates (output, i.e. production).

## Chapter Three: Methodology

### *Method*

Graduation rates are a significant measure of productivity (Alexander, 2000). This analysis established relationships between public research universities' total revenue resources, state appropriations, and tuition and fees on the one hand and undergraduate students' four-year and six-year graduation rates on the other using correlation analysis. The relationships were also used to develop a students' graduation rate projection model essential to public research universities' strategic planning processes and to respond to the following question: *Is there a relationship between taxpayers' dollars invested in public research universities and the production of bachelor's degrees (graduation rates)?* Answers to the following sub-questions further amplified the findings.

1. Is there a relationship between public research universities' total revenue resources and undergraduate students' four-year and six-year graduation rates?
2. Is there a relationship between tuition and fees dollars invested in public research universities and undergraduate students' four-year and six-year graduation rates?
3. Is there a relationship between state appropriated dollars invested in public research universities and undergraduate students' four-year and six-year graduation rates?
4. Can the relationship between revenue resources and undergraduate students' four-year and six-year graduation rates be further explained by urbanization and regional differences?

Public research universities have come under scrutiny in recent years because of a lack of comprehensive data and information (The Spelling Report, 2006; Vedder, 2008). Responses to the above questions may replace legislators', supporters', and constituents' intuitive

assumptions about dollars invested in the institution. In response to accountability and transparency concerns, states have already related revenue to student graduation rates as a measure of productivity through the use of formula funding (Alexander, 2000; Daigle & Cuocco, 2002; Fonte, 2009). Analysis in this research has advanced states' strategies of relating revenue to student graduation rates in response to accountability to the institutional level. See Table 1 for a detailed summary of variables used in this analysis.

### *Sampling*

The sample data for this study were collected from the National Center for Education Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS) database. The sample included all public research universities in the United States with Carnegie classifications: "Research (Very high research activities)," and "Research (High research activities)." A purposeful sampling using the IPEDS Data Center features was used to select the participating institutions because the focus of the research in this study as specific to public universities with significant research. The IPEDS institutional characteristics indicators feature was used to select public research universities meeting the defined Carnegie classifications. Using the institutional characteristics reported to IPEDS by the respective universities to select the participating institutions helped to ensure that institutions included in the sample all had similar research activities. It also eliminated any bias on the part of the researcher in the selection of institutions.

Data in this research consisted of each sample institution's full-time equivalent (FTE) student enrollment, total revenue resources, state appropriations, tuition and fees, and four-year and six-year graduation rates for the most recent ten years available. Data included in the sample for any public research university that does not report according to GASB34/35 were deleted from the sample. Every effort was made to ensure the accuracy of data included in the analysis.

### *Variables*

From the sample data, a number of dependent, independent, and control variables were constructed relating public research universities' total revenue resources, state appropriations, and tuition and fees dollars to undergraduate students' four-year and six-year graduation rates.

### *Definitions*

The following terms and abbreviations are used throughout the remainder of this dissertation:

- FTFT: a cohort of first time, full time degree/certificate-seeking undergraduates who complete a bachelor's degree within 150% of normal time (or within six years of the Fall semester start date) of their matriculation at the institution.
- Adjusted cohort group (revised bachelor's cohort): a revision of the original FTFT cohort based on deletion from the cohort as allowed by IPEDS of those students who left the institution for one of the following reasons: death or total and permanent disability; service in the armed forces (including those called to active duty); service with a foreign aid service of the federal government, such as the Peace Corps; or service on official church missions.

Public research universities' productivity and financial indicators are defined as follows:

- Full-Time Equivalent (FTE) Student: FTE student enrollment as calculated by IPEDS is based on the credit and/or contact hours reported by the institution on the IPEDS 12-month enrollment (E12) component of the institution's calendar system as reported on the Institutional Characteristic (IC) component.
- Total Revenue: Total revenues are based on financial data reported to IPEDS using the Governmental Accounting Standard Board (GASB) 34/35. This indicator includes the



dollars received by public research universities from all sources. It includes research dollars, federal dollars, state appropriation, tuition and fees, grants and any other type of revenue received by the institution.

- **Tuition and Fees:** Using GASB 34/35, IPEDS defines tuition and fees revenue as revenue from all tuition and fees assessed against students (net of refunds and discounts and allowances) for educational purposes. If tuition or fees are remitted to the state as an offset to the state appropriation, the total of such tuition or fees is deducted from the total state appropriation and added to the total for tuition and fees.
- **State Appropriation:** State appropriations are dollar amounts received by the institution through acts of a state legislative body, except grants and contracts and capital appropriations. Funds reported in this category are for meeting current operating expenses, not for specific projects or programs.

#### *Dependent variables*

The dependent variables for this study were four-year graduation rate (4GR) and six-year graduation (6GR) rates. The dependent variables are defined as follows:

- **Four-year Undergraduate Students' Graduation Rates (4GR):** the total number of students completing a bachelor's degree or equivalent within four years (one hundred percent of normal time) divided by the revised bachelor's sub-cohort minus allowable exclusions. In the graduation rate survey (GRS) component of IPEDS, the bachelor's sub-cohort included a cohort of students who were seeking a bachelor's or equivalent degree upon entry.

- Six-Year Undergraduate Students' Graduation Rates (6GR): the total number of students completing a bachelor's degree or equivalent within six years (one hundred fifty percent of normal time) divided by the revised bachelor's sub-cohort minus allowable exclusions.

*Independent variables*

The independent variables were total revenue per FTE (TR), state appropriations per FTE (SA), tuition and fees per FTE (TF). Using the financial indicators defined in Table 1, the independent variables in this study were as follows:

- TR (Total revenue resources per FTE) – equal the average total annual institutional revenue dollars invested in the university over the expected normal four-year matriculation period of the first-time full-time (FTFT) cohort group divided by the institution's FTE student enrollment.
- SA (State appropriations per FTE)– equal the average annual appropriations dollars invested in the university over the expected normal four-year matriculation period of the FTFT cohort group divided by the institution's FTE student enrollment.
- TF (Tuition and fees dollars per FTE) – equal the average annual tuition and fees dollars invested in the university over the expected normal four-year matriculation period of the FTFT cohort group divided by the institution's FTE student enrollment.

The independent variables TR, SA and TF were calculated using a four-year-averaged dollar amount invested in the institution in relation to the FTE student enrollment to get a better representation of the cost of enrolling and graduating one student within the normal four-year timeframe. Using this ratio brings the cost of educating a student to a unit level across all sample institutions. It helps to guard against institutional bias due to size and regional economic factors that can skew the outcome of the analysis. Also note that sample institutions do not include US

service schools and institutions located in outlying areas. The analysis focused primarily on the overall relationship between total revenue resources, state appropriations, and tuition and fees dollar and undergraduate students' four-year and six-year graduation rates.

### *Control variables*

Control variables also referred to as peripheral variables were constructed to help explain the variations in the relationship between undergraduate students' graduation rates and revenue resources among research universities. These control variables include research level, urban university, non-urban university, and geographic location. The control variables were defined as follows:

- RL (Research Level) is defined by Carnegie and is classified in this research as one of either of the following:
  - Level 1- Research (Very high research activity)
  - Level 2- Research (High research activity)
- UU (Urban university) was classified by degree of urbanization based on the IPEDS code representing urban city (City/suburb/rural) by population size of the institution's location. According to IPEDS, the urban-centric locale code was assigned through a methodology developed by the U.S. Census Bureau's Population Division in 2005. IPEDS uses the following codes to classify the degree of urbanicity:
  - 11 City: Large
  - 12 City: Midsize
  - 13 City: Small
  - 21 Suburb: Large
  - 22 Suburb: Midsize

- 23 Suburb: Small
- 31 Town: Fringe
- 32 Town: Distant
- 33 Town: Remote
- 41 Rural: Fringe
- 42 Rural: Distant
- GR (Geographic Region) – the geographic region classification only includes institutions in the United States. These regions are as follows:
  - New England (CT, ME, MA, NH, RI, VT)
  - Mid East (DE, DC, MD, NJ, NY, PA)
  - Great Lakes (IL, IN, MI, OH, WI)
  - Plains (IA, KS, MN, MO, NE, ND, SD)
  - Southeast (AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, WV)
  - Rocky Mountains (CO, ID, MT, UT, WY)
  - Far West (AK, CA, HI, NV, OR, WA)

### *Theoretical Framework*

The Principal-Agent model and the higher education production function were used to develop the conceptual framework for this study. Principal-Agent (PA) theory has been used for years to model the relationship between an information-advantaged Agent and a Principal able to issue a contract ultimatum (Haptonstahl, 2009). Research in this study implemented PA theory as a strategy for responding to public demands for accountability. The research used PA to test for competing behaviors between taxpayer dollars (state appropriation per FTE) and institutional productivity (four-year and six-year student graduation rates). PA was also used to test for competing behavioral relationships between public higher education research institutions' state

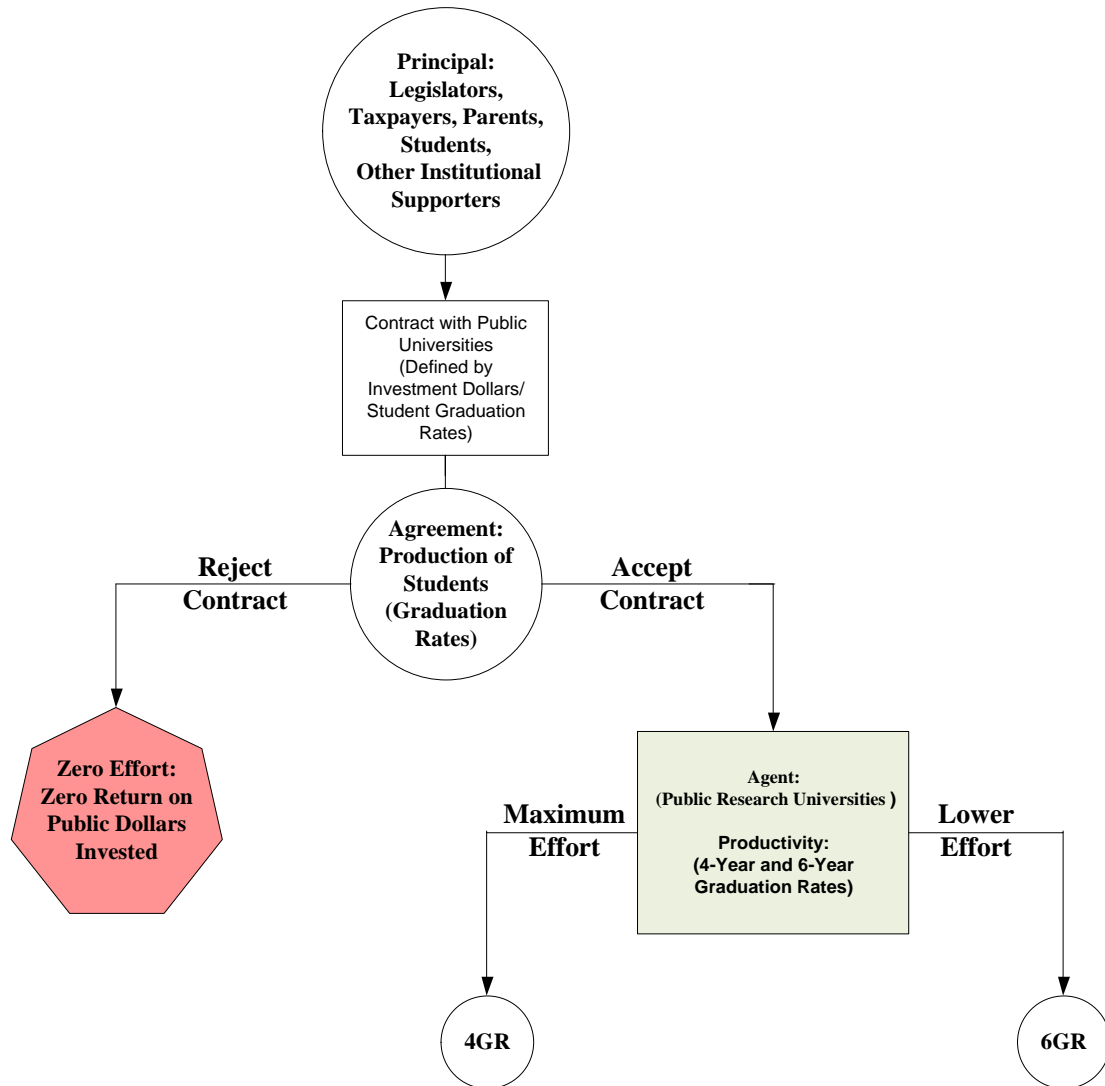
appropriation dollars per FTE and tuition and fees dollars per FTE invested in public research universities and undergraduate student four-year and six-year graduation rates. PA in the research was set up as a theoretical model, not as a probability model, because the purpose of the research was to establish relationships between the independent and dependent variables only.

The higher education production function allowed this research to use the Principal-Agent model to transform total revenue dollars per FTE, state appropriation dollars per FTE, and tuition and fee dollars per FTE into public research universities' four-year and six-year graduation rates. Taxpayers, parents, and students have employed public research universities to educate and graduate students within a normal timeframe. This timeframe is defined by undergraduate students' graduating within four or six years. Accountability proponents assert that once public research universities undertake the task of enrolling a cohort group, they can either fail or succeed, with success being defined as graduating the cohort. Using this logic, students will succeed or fail with uncertain probability, not zero or one probability. It is this uncertain probability that has led to public assumptions regarding return on public dollars invested in the institutions.

Since legislators, policymakers, parents, and taxpayers cannot observe effort put forth by the institutions to produce four-year and six-year graduation rates, the accountability contract between this group and the institutions depends on strategies that define institutional productivity in a succinct but comprehensive way. Similar to Haptonstahl's (2009) basic Principal-Agent game, this researcher has proposed in Figure 3.1 a conceptual framework describing the relationship between state appropriations and tuition and fees dollars and undergraduate students' four-year and six-year graduation rates in response to demands for public research universities' accountability.

In this framework, a contract is entered into by the agent (defined as public research universities) with the principals (defined as legislators, taxpayers, parents, students, and other institutional supporters) to produce graduation rates. The assumption in this framework is that the contract becomes binding when the principals invest dollars in public research universities to educate and graduate students. Public demands for institutions to become more accountable for dollars invested in higher education helps to validate this assumption. The university fulfills its contract with the principals when students graduate within six years of the fall semester in which they enter the institution. The approach outlined in Figure 3.1 illustrates one strategic conceptual approach to the public's demands for accountability.

Figure 3.1. A Theory of Public Research Universities Accountability  
*Correlating State Appropriations, Tuition and Fees Dollars and Undergraduate Student Graduation Rates  
in Response to Public Demands for Accountability*



Another strategy using the Principal-Agent model would be to make use of straightforward analysis by maximum-likelihood or Bayesian method. However, since this research is was succinctly informed by theory, the concept outlined in Figure 3.1 provided the best strategic approach for establishing relationships between public research universities' revenue sources and undergraduate students' graduation rates in response to demands for

accountability. The theoretical model of Principal-Agent theory also allowed for predictors such as total revenue, state appropriations, and tuitions and fees dollars to be used to project four-year and six-year graduation rates.

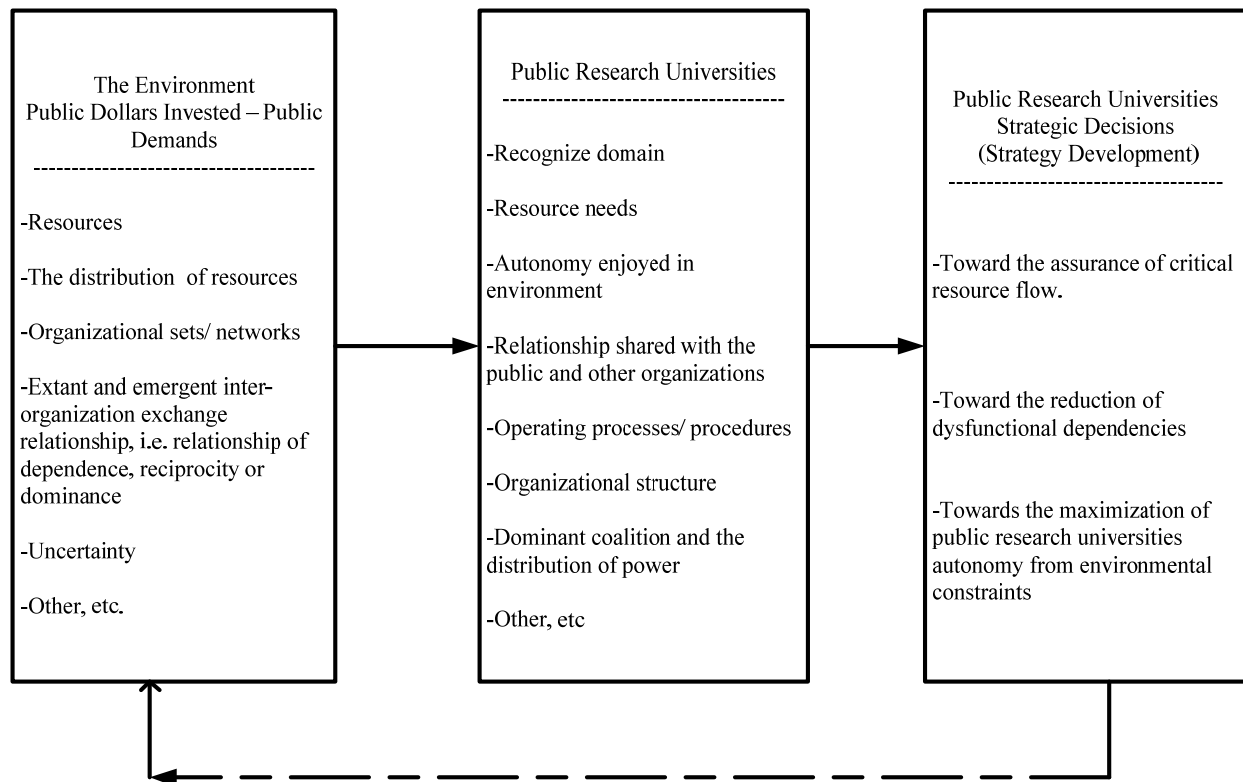
The framework in Figure 3.2 was used to explain the significance of using the conceptual framework proposed in Figure 3.1 to add clarity to the relationship between state appropriations and tuition and fees dollars and undergraduate students' four-year and six-year graduation rates. It is important to note that this conceptual framework gave no consideration to the role that the students might play in their own graduation rate success. Because the focus of public demand for accountability is primarily on the institution and its productivity, it was necessary to focus attention totally on the relationship between dollars invested in the institutions and graduation rate as a productivity measure.

However, it should be noted that student effort should not be taken lightly when investigating graduation rates as a measure of student success. It is arguably among the most important input to investigating higher education's educational standards, but student effort has little relevance in the development of a statistically sound response to the lack of public research universities' transparency and productivity measures.

Financial resources are crucial to public research universities' survival. The institutions' dependence on financial resources from taxpayers via state appropriated dollars and on parents and students via tuition and fees dollars was not taken lightly in this research. The Resource Dependency Theory (RDT) was used to bring additional understanding to public research universities' dependence on financial resources from state appropriations and tuition and fees dollars invested in the institutions. Figure 3.2 borrows from Johnson's (1995) conceptual framework.



**Figure 3.2. The Use of the Logic of the Resource Dependency Theory to Understand the Significance of Using the Principal – Agent (PA) Theory to Develop a Strategy to Respond to Public Demand for Accountability.**  
*Adopted from (Johnson, 1995)*



According to Johnson, the resource dependency theory focuses on the flow or exchange of resources between public research universities, taxpayers, students, parents, and other supporters of the institution. The fact that universities need to acquire resources is what has led to the development of the exchange relationships defined in Figure 3.1 between the institutions and the public through dollars invested (input) and undergraduate students' four-year and six-year graduation rates (output). The conceptual framework strategies in Figures 1 and 2 are not an exhaustive approach to a response to public demands for accountability and resource dependency respectively. Together these frameworks provide just one logical approach to the development of a response to higher education accountability.

Johnson (1995) classifies strategies used to address the relationships between resource dependencies into one of two categories: buffering and bridging. In this research, buffering and bridging function together to defend, define, and redefine public research universities' productivity in response to public demands by reducing uncertainty surrounding at least one institutional productivity measure. The resource dependency theory brings understanding to the context in which the Principal-Agent model is being used to develop a strategy to respond to public accountability demands.

*Analysis*

Data analysis in this research used quantitative methods similar to the analyses of Toutkoushian & Smart (2001) and Zhang (2008). Each research question was analyzed as outlined in Table 3.1. Multiple regression served as the primary analytical technique for analyzing sample data in this research.

Table 3.1. Research Questions and Analytical Techniques	
Research Question	Analytical Techniques
Research Questions 1, 2, 3, and 4	Quantitative analysis is all about quantifying relationships between variables (Creswell, 2003; Hopkins, 2000). A quantitative approach was used to respond to all research questions. The questions were analyzed using both descriptive and inferential statistics.
Research Questions 1, 2, 3, and 4	<b>Preliminary Analysis:</b> The preliminary analysis consisted of the construction of scatter plots. Scatter plots of the defined dependent variables (4GR and 6GR) and the defined independent variables (TR, SA, and TF) were constructed to test the assumptions of normality, homoscedasticity and linearity. Standard multiple regression can only accurately estimate the relationship between dependent and independent variables if the relationships are linear in nature (Pedhazur, 1997). Scatter plots allowed the researcher to visually inspect the data for the assumption of linearity.

Table 3.1 Continued

<p>Research Questions 1, 2, 3, and 4</p>	<p>Analytical Technique 1:                  Descriptive statistics were used in the initial phase of the analysis to describe the basic features of the sample variables. These statistics included means and standard deviations. Bar charts were used to add clarity and understanding to how revenue resources and undergraduate students' four-year and six-year graduation rates differ by level of urbanization, by research level, and across geographic regions.</p>
<p>Research questions 1, 2 and 3</p>	<p>Analytical Technique 2:                  Along with multiple regression comes an overall test of significance, and a "multiple R" (Neter &amp; Wasserman, 1974). The <i>R</i> value represented the actual value of <i>r</i> for the measured independent variables (TF and SA) against the predicted dependent variables (4GR and 6GR). <i>r</i> as the correlation coefficient and its relationship to straight-line regression analysis was used to assess the relationship between revenue resources (TR, SA, and TF) and undergraduate student graduation rates (4GR and GR). The correlations coefficient not only provided a measure of how dollars invested in public research universities in the form of state appropriations and tuition and fees relate to undergraduate students' four-year and six-year graduation rates but also had the property that relates it to straight line regression. This property allowed the analysis to respond to public accountability demands based on a statistically sound foundation. For example, the correlation coefficient, which this study refers to as <i>r</i> is interpretable as an index of association between dollars invested in the institution (TR, SA, and TF) and undergraduate students' graduation rates (4GR and 6GR).</p> <p>The range of <i>r</i> is between -1 and 1. The more positive <i>r</i> is, the more positive the relationship between dollars invested in the institution and graduation rates. The more negative <i>r</i> is, the more negative the relationship between dollars invested in the institution and graduation rates. If <i>r</i> is close to zero, then there is little to no relationship between dollars invested in the institution and undergraduate student graduation rates.</p>

Table 3.1. Continued

<p>Research question 4</p>	<p>Analytical Techniques 3:  Regression analysis served three purposes: (1) description, (2) control, and (3) prediction (Neter &amp; Wasserman, 1974). Its general purpose is to learn more about the relationship between several independent or predictor variables and a dependent or criterion variable. In this study, multiple regression analysis was used to assess the impact of the institution's research level (RL), the geographic region (GR) and the degree of urbanization (UU) on the relationship between revenue resources and undergraduate students' graduation rates. According to Neter and Wasserman, multiple regression allows the analysis to determine which of the independent variables (TR, TF and SA) are important and which are not for describing or predicting the dependent variables (4GR and 6GR). It would also allow the analysis to control for the institution's level of research, regional effects, and the impact of urbanization of the institution.</p> <p>Since this study investigated the impact of TF and SA simultaneously on each institutional productivity measure (4GR and 6GR) the model for this analysis was</p> $Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + e_i$ $Y_j = \beta_0 + \beta_1 X_{j1} + \beta_2 X_{j2} + e_j$ <p><math>Y_i</math> denoted the four-year graduation rates' response in the <math>i</math>th trial and <math>X_{i1}</math> and <math>X_{i2}</math> were the values of the independent variables TF and SA.</p> <p><math>Y_j</math> denoted the four-year and six-year graduation rates' response in the <math>j</math>th trial and <math>X_{i1}</math> and <math>X_{i2}</math> were the values of the independent variables TF and SA.</p>
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Zhang measured the level of state funding at public institutions by state appropriations per FTE. The present study used state appropriation per FTE as a measure of taxpayers' dollars invested in public research universities. The current study differs from Zhang's method of

calculating FTE students by using the IPEDS calculated FTE values. Zhang calculated FTE students by adding the number of full-time students and one-third of the number of part-time students at the institution. Data on total revenue, state appropriations, and tuition and fees are available from the IPEDS survey. Like Zhang's, this research used data from the IPEDS survey. Similar to Zhang, FTE student enrollment data was used to equalize the average of four years of revenue dollars invested in public research universities across institutions to better simulate the cost of educating one student within the normal four-year timeframe. The research used dollars invested in the universities in the form of state appropriations and tuition and fees per FTE to investigate the relationship between student graduation rates and higher education finances. Zhang's study only used state appropriations dollars in its analysis.

Descriptive statistics provide taxpayers, parents, and students who invest in public research universities with comprehensive data and information that are easily understandable through the use of graphs and scatter plots. Means and standard deviations provided the simplest form of statistical measures that are most understandable across all groups that have a financial stake in the institution. Effect statistics such as correlation coefficients were used to illustrate to persons who invested dollars in public research universities the relationship between those dollars invested in the institutions and the institutions' productivity measure defined as undergraduate students' graduation rates. This relationship provided one measure in response to public demand for accountability. It was also used to respond to the lack of comprehensive measures and transparency in public research universities' data system.

Multiple regression allowed this research to characterize the relationship between the independent and dependent variables in the sense of determining direction and strength of association (Kleinbaum, 1978). It also allowed this research to develop a prediction model to

describe the impact of changes in state appropriations per FTE and tuition and fees per FTE on undergraduate students' four-year and six-year graduation rates.

### *Assumptions*

Zhang (2008) assumed the financial environment to which the cohort was exposed should be characterized by relevant state appropriations because a student's college life is a multiyear experience. More precisely, Zhang assumed the cost of enrolling and graduating a student is expected to occur within a four-year time frame. This research shared this assumption and used the average annual total revenue, average annual state appropriations, and average annual tuition and fees dollar amounts invested in the institutions over the normal expected time of four years it should take a student to graduate. Because of this assumption, Zhang used state appropriations relative to the first four years a cohort was enrolled in school. This research shared Zhang's assumption and used four-year average total revenue, state appropriations, and tuition and fees data relative to the cohort's four years.

Research in this study assumed that the relationship between the independent variables and dependent variables is linear. Scatter plots were used to test the validity of the linearity assumption. While the assumption of linearity could virtually not be proven, the assumption had little to no negative impact on the outcome since regression procedures are not greatly impacted by minor deviations from this assumption (Achen, 1992; Allison, 1999; Pedhazur, 1997). Using scatter plots provided a statistically sound validation of the linearity assumptions. More details of the tests are found in Chapter 4. The analysis assumed that the residual effects between revenue resources variables (TR, SA, and TF) and undergraduate students' graduation rates variables (4GR and 6GR) were normally distributed. It also assumed that the differences in this residual effect over time would approach zero. The research assumed any variations in error across the independent and dependent variables would be the same. Homoscedasticity and reliability of

variables were assumed in the use of multiple regression in this study. Because of the reliability assumption, with each independent variable added to the regression equation, the effects of less than perfect reliability on the strength of the relationship become more complex and the results of the analysis more questionable; therefore, caution was taken as each independent variable is was added to the model.

### *Limitations*

The conceptual framework in this study used the analogy of public research universities as a firm. Using the theory of the firm analogy in assessing outputs at public research universities resulted in some limitations. When applying a business model such as the theory of the firm to public research universities, it was assumed that these institutions were trying to maximize their profits. While colleges and universities produce multiple outputs in the area of teaching, research, and public services, this study was limited to a single productivity measure, student graduation rates.

Using the Principal-Agent Model Theory limited this research to available information. For example, on one side are the buyers (legislators, taxpayers, parents, and students); on the other side are the sellers, public research universities. Both the buyers and the sellers have access to information; and, in most cases, the information that exists between the buyers and the institutions is either unclear or difficult to understand and/or interpret. Therefore, in such an imperfect environment, caution should be taken when generalizing the results.

This research used revenue data aggregated at the institutional level. Revenue resources aggregated at the institutional level may mask important differences in the institutions' missions, programmatic emphases, and other important aspects of the respective sample institutions. This research did not take into account possible changes over time in the quality of bachelor's degrees

awarded by public research universities. For example, it is likely that student learning outcomes at public research universities may have changed over time, and this change may have influenced student graduation rates. Couple this example with the current research and the groundwork is laid for additional studies in the area of student performance and finance to determine even more causes and effects of student outcomes.

This study was also limited in some ways by the use of IPEDS to collect sample data. The variables were limited to IPEDS definitions. Because the proposed sample participants were predefined as public research universities meeting specified Carnegie classifications, caution was needed when using results of the study to draw general conclusions about all higher education institutions. The use of a purposeful sampling technique further limited the research. It may have raised some questions regarding sampling bias. To avoid bias, all sample institutions were selected based on the Carnegie classification “Research (Very high research activity)” and “Research (High, research activity)” and therefore eliminated any bias on the part of the researcher as to which institutions should be included in the sample.

This study used correlation and regression to assess the relationship between bachelor’s degrees awarded at public research universities and core revenue resources. The major conceptual limitation of all regression techniques is that one can only ascertain *relationships*, but never be sure about underlying *causal* mechanisms (Kleinbaum & Kupper, 1978).

Caution should always be taken when using state appropriation and tuition and fees in any analysis of public research universities. Not all states have local funding. Tuition and fees data for states with local funding may be artificially deflated since these states are advantaged because this funding often serves to help lower tuition. College in states that do not have this funding are more reliant on state funding and tuition.



## *Conclusion*

A significant part of the predicament facing public research universities is a lack of evidence demonstrating the relationship between state appropriations and tuition and fees dollars and undergraduate students' graduation rates. Taxpayers, parents, and students are now demanding evidence of productivity represented by these variables in return for dollars invested in the institutions. Constituents of public institutions are asking for data and analysis that show the return on resources invested in these institutions (Carey, 2004; Russell, 2009; Titus, 2009). Russell concluded that a challenge to colleges and universities is to find ways to maximize the utility of graduation rate metrics while minimizing potentially detrimental consequences. Research in this study provided one strategy that will respond to Russell's conclusion. The significance of this research is essential to public research universities' restoration of public trust in them.

## Chapter Four: Findings

Similar to Zhang's (2008) findings of a direct link between state funding and graduation rates at 4-year public institutions using IPEDS finance data, research in this study found evidence of a relationship between tuition and fees, state appropriations, and total revenue dollars invested in public research universities and undergraduate students' 4-year and 6-year graduation rates using IPEDS finance data. When examining dollars invested in the institutions across certain factors such as geographic locations, urban-centric locale, and system or corporate affiliations, the data showed evidence of a direct relationship between dollars invested in the institutions and undergraduate students' graduation rates. The range in differences across these factors was noted to help understand the differences between variables' characteristics that could have had an effect on the outcome of this study. Because the relationship found between multiple independent and dependent variables, multiple regression analysis was used to bring additional understanding to the significance of the relationships.

Chapter 4 summarizes the analysis of data and presents the study's research findings. It begins with a summary of descriptive statistics to bring better understanding to the independent and dependent variables included in the research analysis. Descriptive statistics are used to illustrate the distribution of values on each variable. An investigation of the assumptions was conducted to help ensure the validity of the study. Descriptive statistics were also used to test the assumptions used in the application of multiple regression as a viable analytical model. This test included the construction of scatterplots, histograms, and bar charts, which allowed the assumptions to be tested visually. The use of multiple regression led to the development of at least one statistically sound public research universities' prediction model for 4-year and 6-year

graduation rates using the independent and dependent variables outlined in Chapter 3. Chapter 4 concludes with a discussion of limitations imposed by the data and implication for additional research.

### *Descriptive Statistics*

141 public institutions in the United States were found that met the Carnegie classifications “Research (Very high research activity)” or “Research (High research activity)” using information from the IPEDS Data Center. Before addressing the central questions of the relationships between undergraduate students’ graduation rates and tuition and fees, state appropriations, and total revenue from all sources, the data were checked for outliers. The investigation found 10 of the 141 institutions that either did not report finance data according to General Accounting Standard Board (GASB 34/35) principles or had a significant amount of missing data. These 10 institutions were deleted from the sample to help ensure consistency in data across institutions, leaving a total of 131 institutions that were actually included in this study.

Data collection from IPEDS was designed to collect additional data for the purpose of describing and comparing certain control variables for each institution such as geographic location, degree of urbanization, system or corporate affiliation, and land-grant status. For the purpose of this analysis, these control variables are referred to as peripheral data. Not all peripheral data included in the descriptive analysis are used in the inferential statistical analysis. The goal of collecting the peripheral data was simply to bring better understanding to the analysis. More specifically, its purpose was to determine whether or not other factors might further influence the relationships between the dependent and independent variables.

Reliability is the degree to which a test consistently measures whatever it is measuring (Gay, 1996). Both the Statistical Package for Social Science (SPSS) and Microsoft Excel

produced evidence of a direct relationship between dollars invested in public research universities and undergraduate students' graduation rates. Looking first at variables' characteristics that could have influenced the outcome of the overall relationship between the independent and dependent variables, the independent variables' characteristics were investigated while controlling for geographic region and urban-centric locale.

Table 4.1 shows the characteristics of the independent and dependent variables across geographic locations. The average tuition and fees dollars invested in public research universities across geographic regions ranged from \$5,910 to \$9,751 per FTE student. State appropriations ranged from \$6,247 to \$13, 220 per FTE. When controlling for urban-centric locale, less variation was found in the ranges of both tuition and fees dollars per FTE and state appropriated dollars per FTE invested in public research universities than was found in the total revenue per FTE invested in the institutions. This finding was not surprising given the many different types of dollars ranging from research to corporate investment dollars that could make up the institution's total revenue. Across urban-centric locales, tuition and fees dollars invested in the institutions ranged from \$5,167 to \$10,059 per FTE student, and state appropriated dollars ranged from \$6,876 to \$11,435 per FTE.

Figure 4.1 provides more detail of dollars invested in public research universities across geographic regions. As shown in Figure 4.1, public research universities in the mid-east region receive more state appropriated dollars than do institutions in other regions of the United States. Microsoft Excel was used to calculate the correlation coefficient  $r$  shown in Table 4.1. The results of  $r$  equal .44 and .70 when looking at the relationship between the regional average state appropriated dollars invested in public research universities and regional average undergraduate students' graduation rates. This strongly supports Zhang's (2008) finding of a direct link between

state funding and graduation rates at 4-year public institutions. It also supports Titus's (2009) finding that the production of bachelor's degrees is influenced by state appropriations.

Table 4.1 6-YR Graduation Rate by Geographic Region				
<i>Average 6-Year Graduation Rates (GR), Tuition and Fees (TF), State Appropriations (SA) and Total Revenue Dollars Invested in Public Research University by Geographic Region and Calculated Correlation Between Independent and Dependent Variables</i>				
	6-GR	TF	SA	TR
Region 1 New England CT ME MA NH RI VT	67.7	\$9,751	\$8,222	\$36,310
Region 2 Mid East DE DC MD NJ NY PA	67.4	\$6,640	\$13,220	\$39,750
Region 3 Great Lakes Chaleur IL IN MI OH WI	58.7	\$8,835	\$7,043	\$39,591
Region 4 Plains IA KS MN MO NE ND SD	55.2	\$6,753	\$8,258	\$32,626
Region 5 Southeast AL AR FL GA KY LA MS NC SC TN VA WV	58.4	\$6,031	\$9,720	\$38,069
Region 6 Southwest AZ NM OK TX	53.3	\$5,910	\$7,797	\$31,026
Region 7 Rocky Mountains CO ID MT UT WY	53.7	\$7,049	\$6,247	\$41,787
Region 8 Far West AK CA HI NV OR WA	67.2	\$6,966	\$11,129	\$52,995
Correlation Coefficient r		0.44	0.70	0.52

Because of the variation noted across regions, the findings in this research go beyond Zhang's and Titus's findings and raise questions regarding the relationship between dollars invested in 4-year public higher education institutions and undergraduate students' graduation

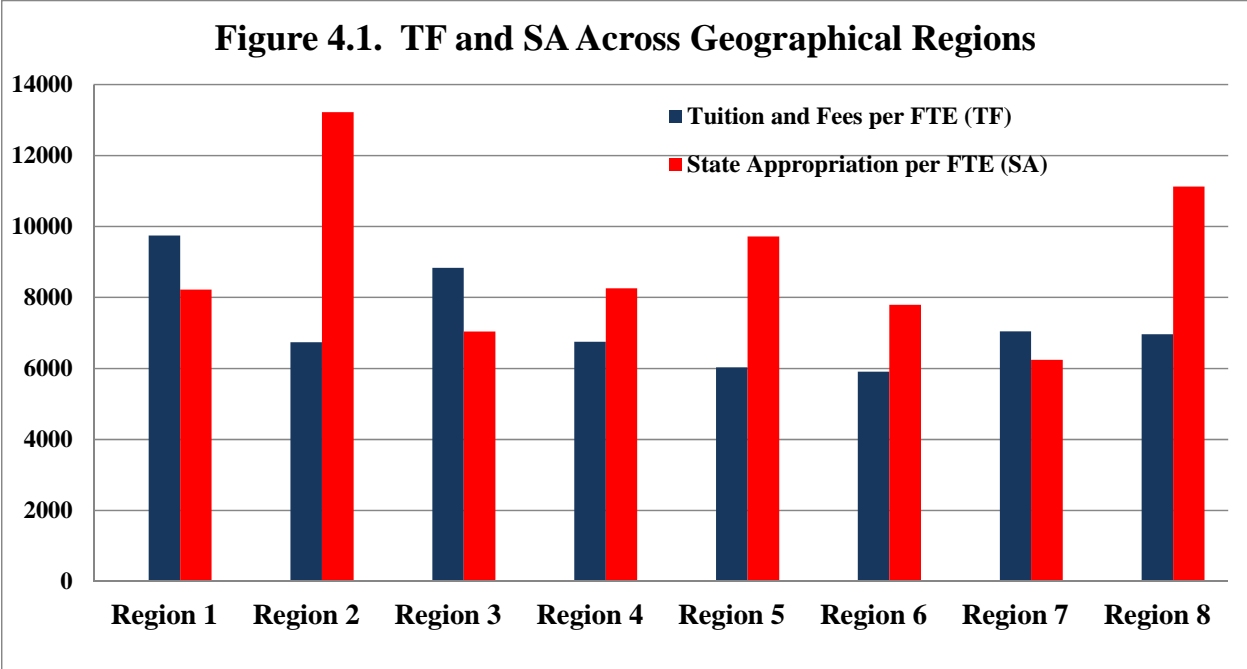
rates within regions. What, if any, effect do regional differences have on the relationship between dollars invested in the institutions and undergraduate students' graduation rates?

Table 4.2 shows the correlation when using 4-year student graduation rates as the independent variable. To better inform this study, the correlation and an investigation of the relationship between 4-year graduation rates and the average dollars per FTE student invested in the universities across geographic regions were also conducted. The results of this investigation are shown in Table 4.2. Because the 4-year and 6-year graduation rates are highly autocorrelated, the analysis focused primarily on the relationship between 6-year graduation rates and dollars invested in the universities. However, tables and graphs were developed using both 4-year and 6-year graduation rates for informational purposes and to better inform the researcher about the characteristics of each variable used in this study.

The relationships shown in these tables were later taken into consideration when conducting the multiple regression analysis. A clear understanding of the characteristics of variables that may influence the dependent variables 4-Year and 6-Year graduation rates helps to serve as a segue to the multiple regression analysis used in this study. Later in this chapter multiple regression provides a more in-depth look at the independent variables tuition and fees, state appropriation, region and urbanization on the dependent variable graduation rates. This analysis was used not only to develop graduation rates prediction models but also to provide evidence that additional research is needed to better understand the influence of the independent variables on the dependent variables.

Table 4.2 4-YR Graduation Rate by Geographic Region				
<i>Average 4-Year Graduation Rates (GR), Tuition and Fees (TF), State Appropriations (SA) and Total Revenue Dollars Invested in Public Research University by Geographic Region and Correlation Between Independent and Dependent Variables</i>				
	4-GR	TF	SA	TR
Region 1 New England CT ME MA NH RI VT	48.0	\$9,751	\$8,222	\$36,310
Region 2 Mid East DE DC MD NJ NY PA	45.4	\$6,640	\$13,220	\$39,750
Region 3 Great Lakes Chaleur IL IN MI OH WI	33.1	\$8,835	\$7,043	\$39,591
Region 4 Plains IA KS MN MO NE ND SD	26.0	\$6,753	\$8,258	\$32,626
Region 5 Southeast AL AR FL GA KY LA MS NC SC TN VA WV	32.6	\$6,031	\$9,720	\$38,069
Region 6 Southwest AZ NM OK TX	25.0	\$5,910	\$7,797	\$31,026
Region 7 Rocky Mountains CO ID MT UT WY	25.7	\$7,049	\$6,247	\$41,787
Region 8 Far West AK CA HI NV OR WA	39.5	\$6,966	\$11,129	\$52,995
R-value (Correlation with 4GR)		0.54	0.62	0.35

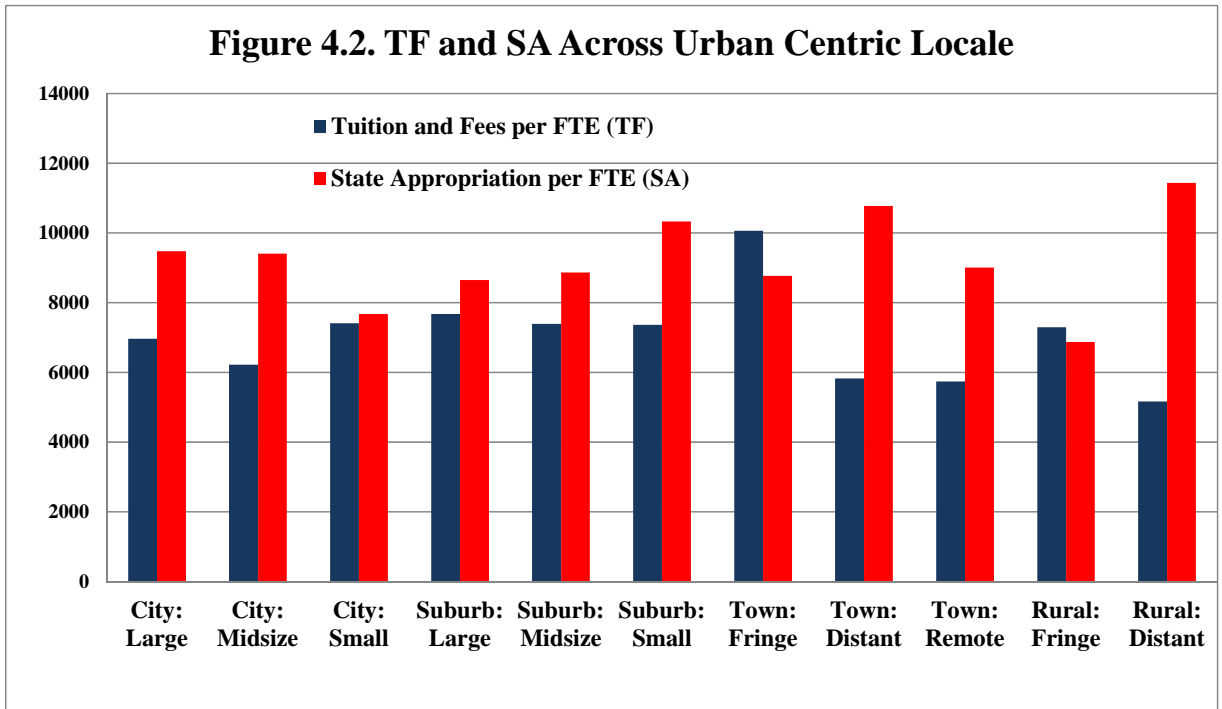
Figure 4.1 further explains the characteristics of the variables used in this research across geographic regions. It shows that institutions in New England (Region 1) receive more tuition and fees dollars than do other public research universities in the United States. Figure 4.1 also shows the tuition and fees and state appropriated dollars per FTE invested in the institutions across regions.



The differential findings in the values of variables across regions supported the need to bring each variable to a unit level so as not to bias the results of the study because of the effects of size and regional economic factors.

Figure 4.2 provides a more detailed look at state appropriations and tuition and fees dollars invested in public research universities across urban centric locales. It shows that more state appropriation dollars per FTE were invested in “Rural: Distant” locales than other urban centric locales. More tuition and fees dollars per FTE were invested in public research universities in “Town: Fringe” locales. The differences illustrated in Figure 4.2 in dollars invested in public research universities across urban centric locales provide the first indication that these locales could have a significant impact on the number of dollars invested in the institutions from different sources.





Tables 4.3 and 4.4 provide more detail of dollars invested in public research universities across urban centric locales. As already seen in Tables 4.1 and 4.2, public research universities in the mid-east (Region 2) received more state appropriated dollars than did institutions in other regions of the United States. The degree of urbanization is another factor that could have biased the outcome of the study. Tables 4.3 and 4.4 showed that both the independent and dependent variables vary across urban location.

Table 4.3

*Dollars invested in Public Research Universities and 6-Year Graduation Rates  
Differences Across Urban-Centric Locales*

	6-Year Graduation Rates per FTE	Tuition and Fees per FTE	State Appropriation per FTE	Total Revenue per FTE
City: Large	53.8	\$6,963	\$9,477	\$45,853
City: Midsize	58.0	\$6,221	\$9,404	\$40,665
City: Small	60.5	\$7,412	\$7,676	\$32,813
Suburb: Large	63.6	\$7,680	\$8,652	\$36,839
Suburb: Midsize	77.0	\$7,388	\$8,867	\$33,040
Suburb: Small	63.4	\$7,364	\$10,778	\$53,877
Town: Fringe	72.6	\$10,059	\$8,768	\$33,432
Town: Distant	61.3	\$5,825	\$10,778	\$33,690
Town: Remote	56.9	\$5,742	\$9,009	\$30,215
Rural: Fringe	60.7	\$7,295	\$6,876	\$30,493
Rural: Distant	58.0	\$5,167	\$11,435	\$35,976
Correlation Coefficient r		0.63	-0.17	-0.21

Table 4.4

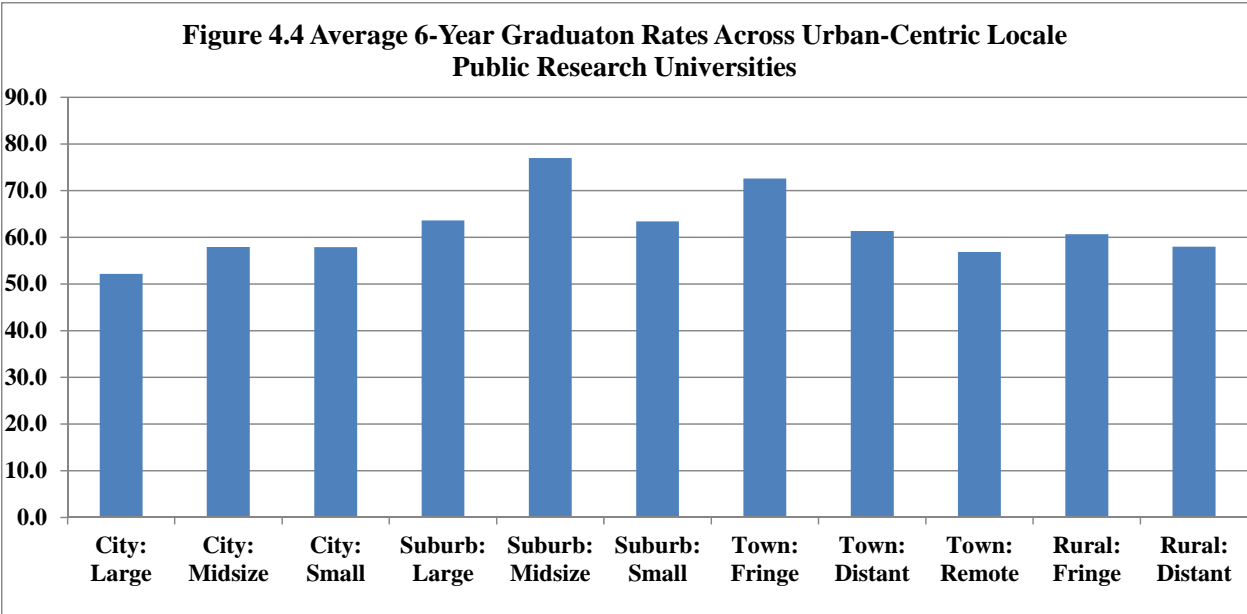
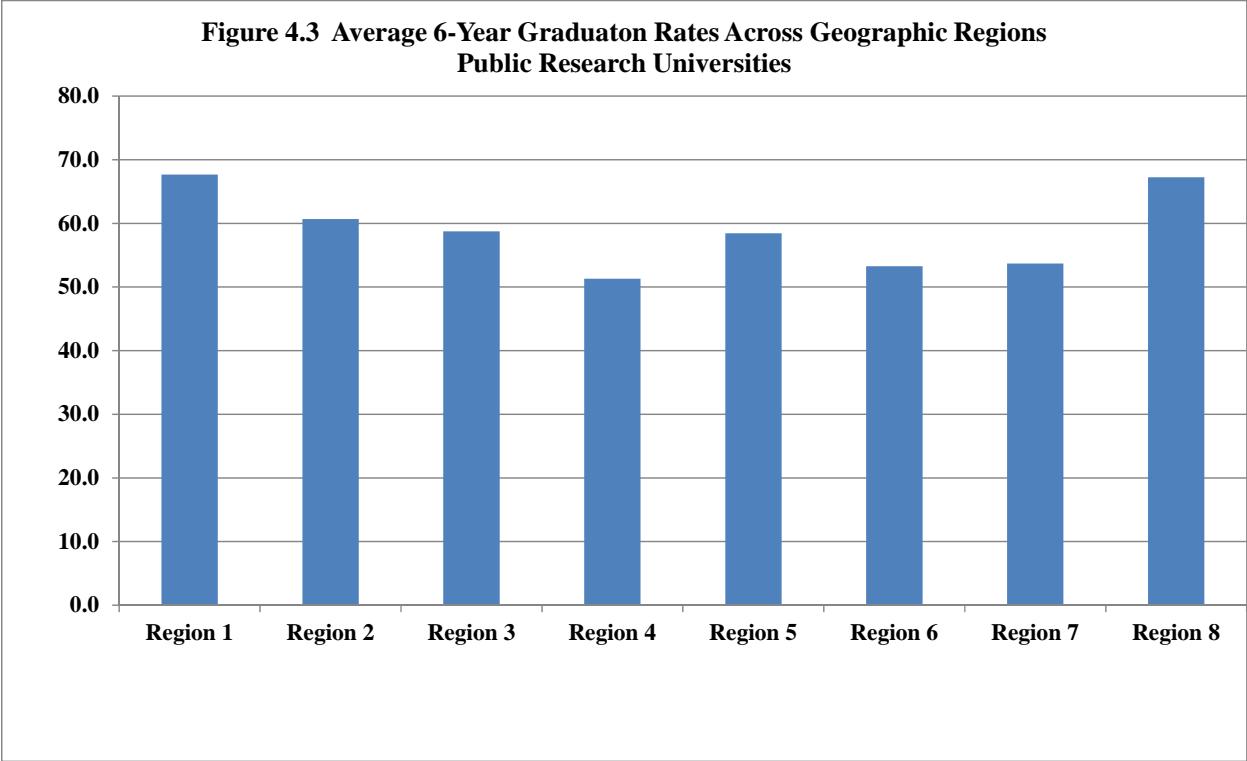
*Dollars invested in Public Research Universities and 4-Year Graduation Rates  
Differences Across Urban-Centric Locales*

	4-Year Graduation Rates per FTE	Tuition and Fees per FTE	State Appropriation per FTE	Total Revenue per FTE
City: Large	25.6	\$6,963	\$9,477	\$45,853
City: Midsize	31.7	\$6,221	\$9,404	\$40,665
City: Small	35.2	\$7,412	\$7,676	\$32,813
Suburb: Large	41.0	\$7,680	\$8,652	\$36,839
Suburb: Midsize	51.3	\$7,388	\$8,867	\$33,040
Suburb: Small	39.6	\$7,364	\$10,778	\$53,877
Town: Fringe	51.8	\$10,059	\$8,768	\$33,432
Town: Distant	29.7	\$5,825	\$10,778	\$33,690
Town: Remote	22.9	\$5,742	\$9,009	\$30,215
Rural: Fringe	35.3	\$7,295	\$6,876	\$30,493
Rural: Distant	33.0	\$5,167	\$11,435	\$35,976
Correlation Coefficient r		0.75	-0.21	-0.07

### *Descriptive Statistics Findings*

The positive correlation found between graduation rates and tuition and fees nationwide could be used to enhance Bean's (1980) student attrition model. Bean did not consider tuition and fees as a factor because of the relatively low tuition at the time. Instead, Bean focused on the interaction process of students in a single institution and postulated that institution-level constructs, including student development, instrumental communication, integration, and campus organizations had positive influences on undergraduate students' success. A key element of undergraduate student success is measured by graduation rates (Education Trust, 2004; Layzell, 2001). The positive correlation found between tuition and fees and undergraduate students' graduation rates suggest that the greater the individual investment the higher the motivation is to graduate.

Students attending colleges in large cities were found to have the lowest average 6-year graduation rates. The lowest average 4-year graduation rates were among students attending public research universities in remote towns and large cities. These findings add some credibility to Tinto's (1993) theoretical model of the study of suicide and departure from higher education. Tinto's model implied that students interact with the college environment, which has two systems; the academic system and the social system. Assuming that a college's social system is enhanced by its location, a rural environment could offer less of a social system to students in this environment. This thought provides an excellent basis for future research in the area of student attrition and success. Students attending college in rural areas are less likely to have as much social interaction with the community and surrounding area as do those students attending college in a larger town or city. Therefore, Tinto's theory is not only supported by research in this study, but also the question has been raised as to what impact urbanization has on undergraduate students' graduation rates. See Figures 4.3 and 4.4.



The per-student dollar amount of tuition and fees invested in the institutions ranged from a minimum of \$5,167 at institutions located in “Rural: Distant” locales to a maximum of \$10,059 at institutions located in “Town: Fringe” locales. The 6-year graduation rates ranged from an average of 53.8% in “City: Large” urban locales to an average of 77% at public research

universities in “Suburb: Large” urban locales (Tables 4.3 and 4.4). Tables 4.3 and 4.4 reveal the findings that students who attend college in areas categorized Region 1 (New England) and Region 8 (Far West) that are classified as Suburb: Midsize and Town: Fringe have better graduation rates. These findings provided the first indication that responses to the research questions addressed in this study needed to be strategically analyzed and that caution should be taken when generalizing the results of this study to all public research universities.

Some public research universities included in the analysis were found to be a part of university systems; others were not. Since university system policies could impact tuition policies; and, since states’ policies may be influenced differently by the presence of a university system, it was necessary to investigate the variable characteristics by institutional university system affiliation. 100 of the universities included in this study indicated that they are affiliated with a university system or corporate entity while 31 indicated that they are not so affiliated.

The average 4-year and 6-year graduation rates of public research universities affiliated with a system was found to equal 58%, a total of 5% less than those of institutions not affiliated with a university system or corporate entity. In addition, the average total revenue dollars per FTE invested in public research universities not affiliated with a system or corporate entity exceeded the average total revenue dollars per FTE of those institutions affiliated with a system or corporate entity by \$1,996. It costs students, on average, \$1,967 more in tuition and fees to attend a non-system-affiliated public research university. This additional cost may be associated with another finding in the analysis. The analysis found that states invested on average \$945 per FTE less in non-system-affiliated research universities. See Table 4.5 for more detail.

System or Corporate Entity Affiliation	Number of Universities	Average 4-Year Graduation Rate (4GR)	Average 6-Year Graduation Rate (6GR)	Average Tuition and Fees per FTE	Average State Appropriations per FTE	Average Total Revenue per FTE (TR)
Yes	100	32	58	6,534	9,198	38,775
No	31	37	63	8,501	8,253	40,741

This research did not explore the impact of a system's ability to successfully lobby state policymakers and institutional supporters for funding. The difference in average state appropriated dollars invested in system-affiliated and non-system-affiliated public research universities certainly raises some questions surrounding factors associated with public research universities' ability to attract funding from difference sources.

50 of the research universities included in the study were classified as land grant and 81 were not. The fact that policies allowed for some funding associated with the land-grant designation made it necessary to investigate the average differences in graduation rates and funding for land-grant and non-land-grant universities. The study found that 4-year and 6-year graduation rates at public research universities that are land-grant institutions are 36% and 64% respectively. Non-land-grant institutions' 4-year and 6-year graduation rates were found to equal 31% and 56% respectively. See Table 4.6.

Land Grant	Number of Universities	Average 4-Year Graduation Rate (4GR)	Average 6-Year Graduation Rate (6GR)	Average Tuition and Fees per FTE	Average State Appropriations per FTE	Average Total Revenue per FTE (TR)
Yes	50	36	64	7,132	10,516	41,031
No	81	31	56	6,917	8,023	38,135

As expected, dollars per FTE invested in land-grant public research universities exceeded those invested in non-land-grant public research universities across all funding categories outlined in this study. Coupled with the fact that 4-year and 6-year graduation rates at land-grant public research universities exceeded 4-year and 6-year graduation rates at non-land-grant institutions by 5 and 8 percentage points respectively, it is not unreasonable to assume some relationship between dollars invested in the institutions and graduation rates. This finding also implies the need for additional research to better understand the relationships between dollars invested in universities and student graduation rates at different types of universities.

#### *Test of Assumptions*

An exploratory data analysis resulted in findings that the data met the assumptions of homoscedasticity, linearity, and normality. Linearity was tested using graphs and plots shown in Appendix B. The plots showed some degree of linearity, which can clearly be seen in Figure 4.5 and 4.6. A visual investigation was used to test the assumptions.

The scatter plots in Figure 4.5 were also used to test for homoscedasticity. The assumption of homoscedasticity is that the residuals are approximately the same for all values of the dependent variables. Eyeballing the plots showed data that are fairly homoscedastic. In fact the plots showed data that meet the assumption of homoscedasticity and linearity. The data also

showed signs of normality, being randomly scattered about the mean. In addition, the assumption of normality was tested using the construction of histograms and PPlots. See Figure 4.7.

Blom's proportion estimation formula was also used to test for normality. Ranks were assigned to the mean of ties. Blom's estimation resulted in the following calculations:

- For variable @4GR ...
  - Normal distribution parameters estimated: location = 33.10687 and scale = 17.070105
- For variable @6GR ...
  - Normal distribution parameters estimated: location = 59.40458 and scale = 15.425642
- For variable TF ...
  - Normal distribution parameters estimated: location = 6999.182 and scale = 2476.9469
- For variable SA ...
  - Normal distribution parameters estimated: location = 8974.1692 and scale = 3991.7398
- For variable TR ...
  - Normal distribution parameters estimated: location = 39240.184 and scale = 23569.808

Based on Blom's estimations and eyeballing both the plots and histograms, it was concluded that the assumption of normality was true.



Figure 4.5 Test of Homoscedasticity and Linearity (Scatter Plots)

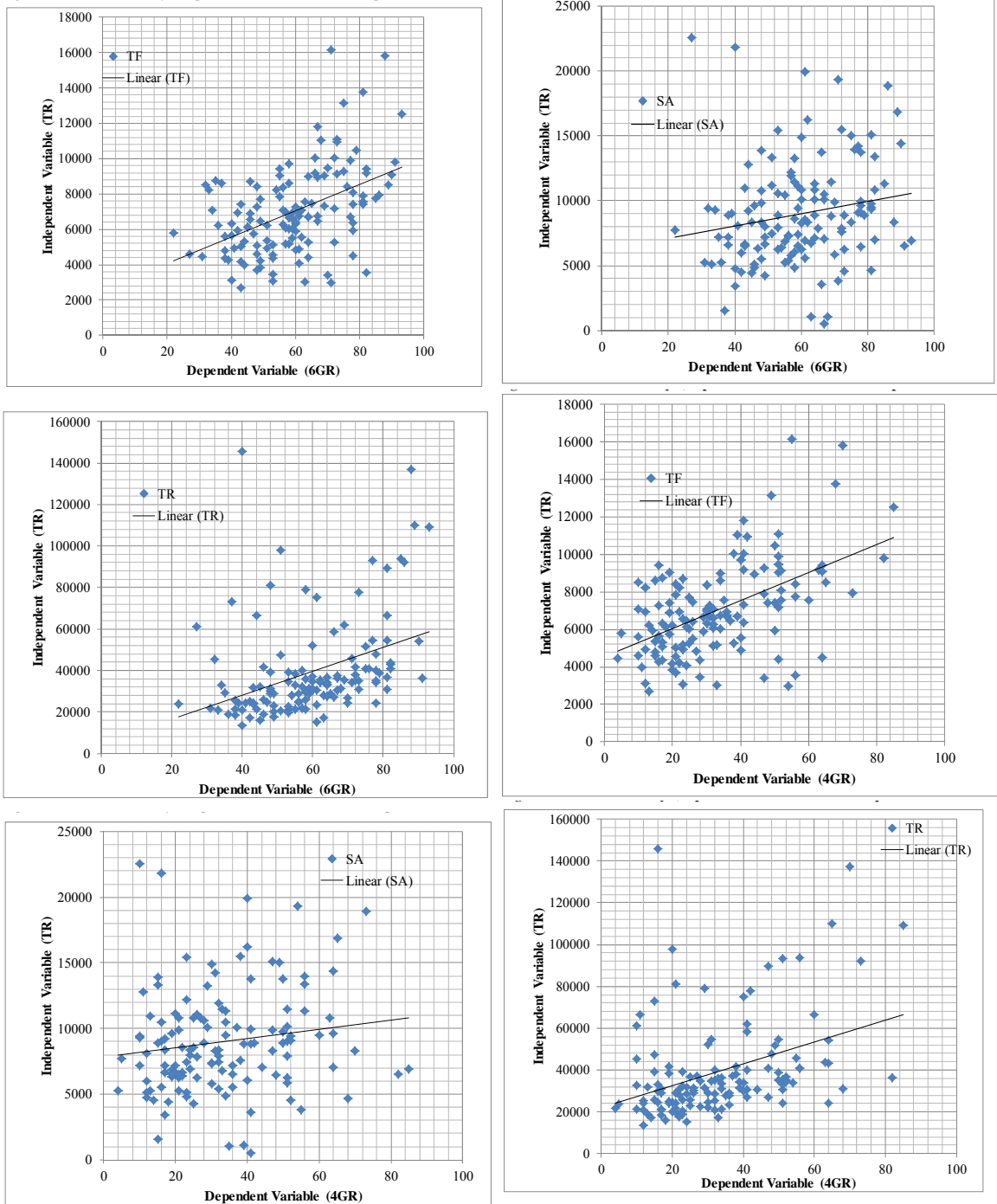


Figure 4.6 Test of Linearity (PPlots)

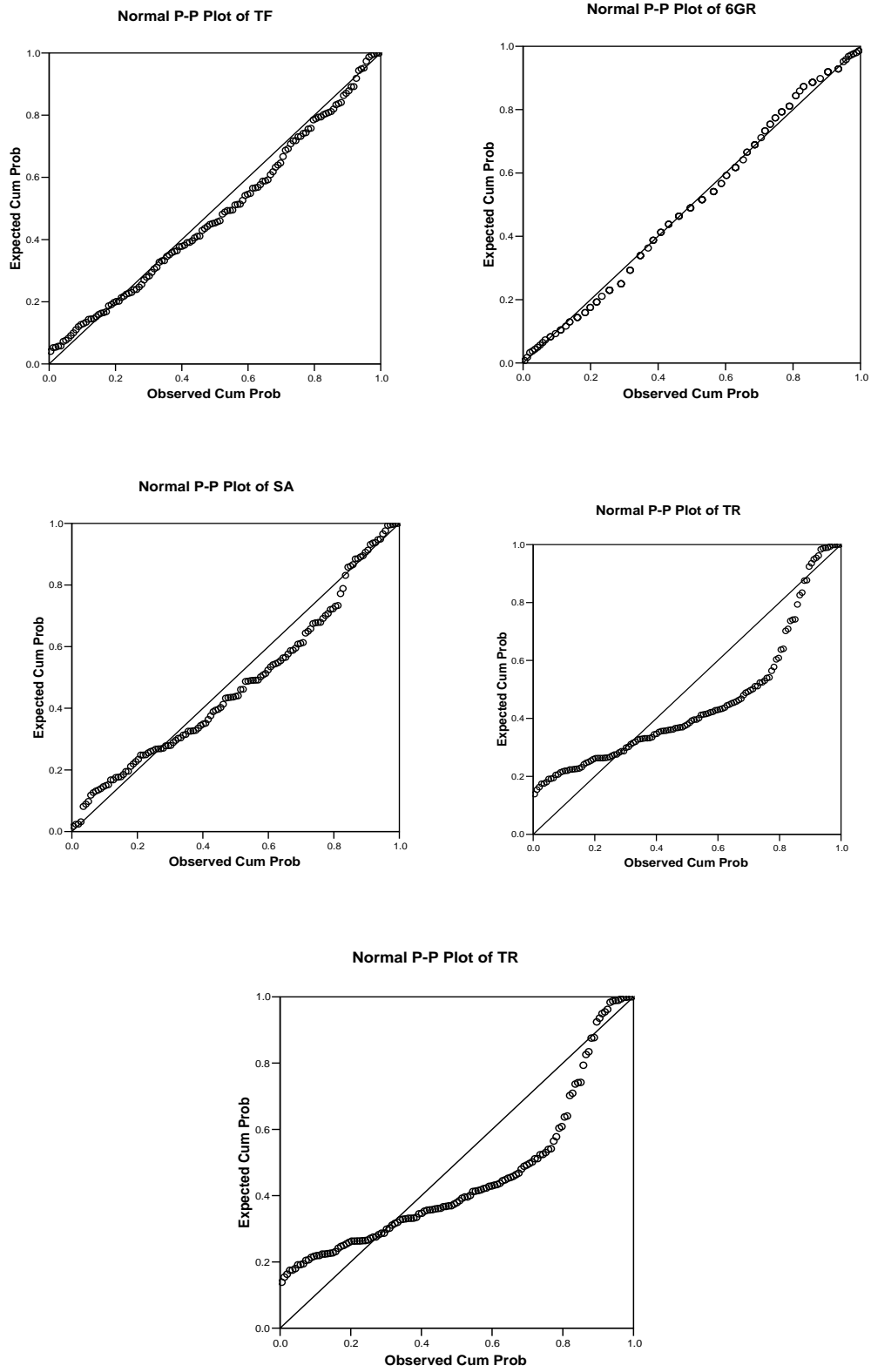
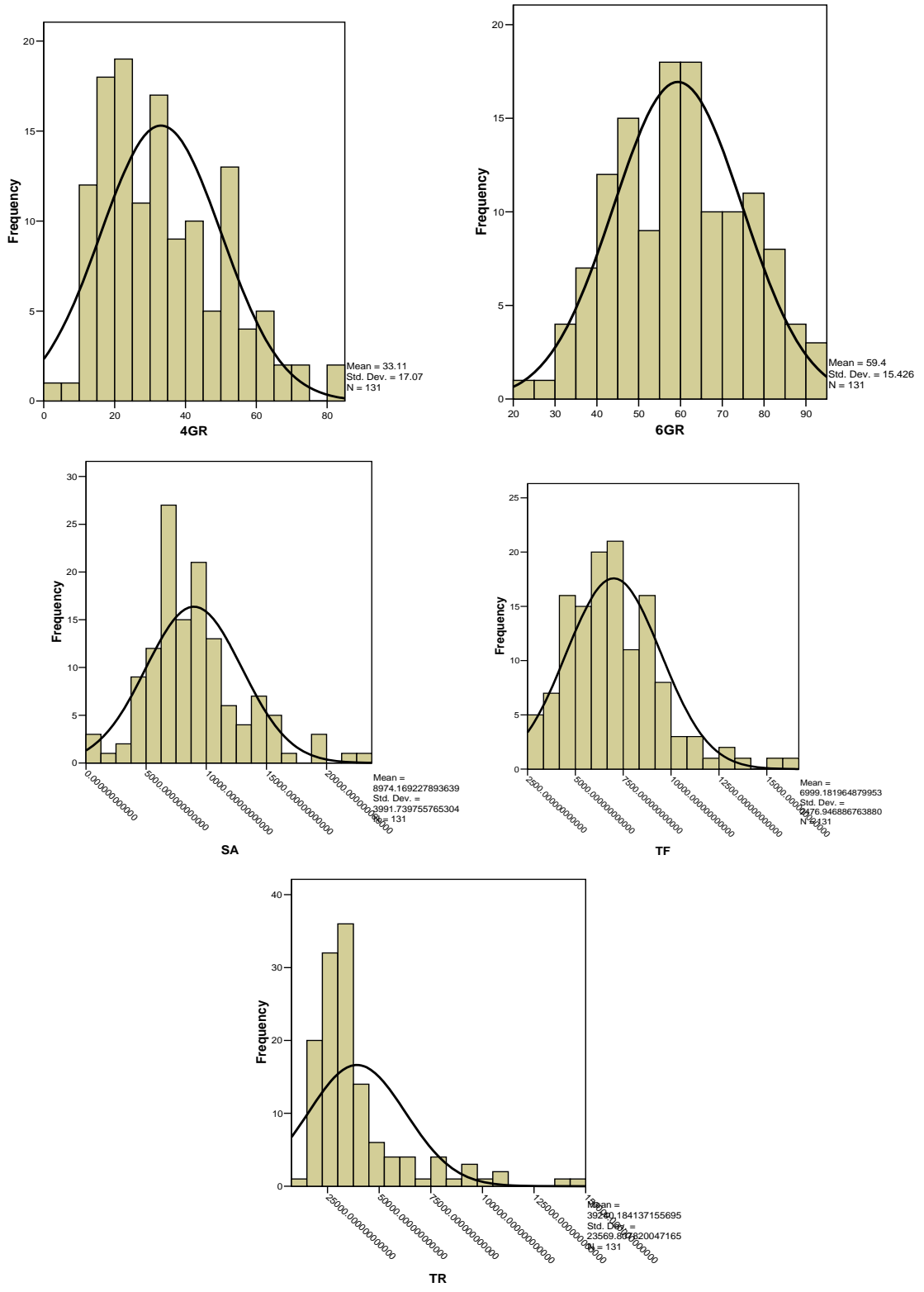


Figure 4.7 Test of Normality (Histograms)



### *Response to Research Questions*

The primary research question asks if there is a relationship between taxpayers' dollars invested in public research universities and the production of bachelor's degrees (graduation rates). A response to this primary question is found in the response to the sub-questions outlined below. Pearson correlation was used to respond to the research questions. The results of Pearson correlation calculations are shown in Table 4.7. Using Pearson's two-tailed test showed, as expected, that as the average state appropriation dollars per FTE student have decreased, tuition and fees dollars per FTE students at public research universities have increased. This implication was found to be significant at the .01 level. See Table 4.7 for more detail. Additional Pearson's correlations are shown in Table 4.10. Calculations in this table include the variables "Region" and "Urban."

Other researchers have also found this trend to be true (Wellman, 2008, 2008; Desrochers & Lenihan, 2009). Findings in the current research supported financial trends in higher education found by previous researchers. As early as in the 1990s, Breneman & Finney (2001) observed that the landscape of higher education finance was changing. They concluded that as state appropriations to higher education institutions declined tuition and fees would increase. Findings in this research have given credibility to Breneman and Finney's prediction.

Table 4.7						
Correlation Between 4-Year and 6-Year Graduation Rates and Dollars Invested in Public Research Universities						
		4GR	6GR	TF	SA	TR
4GR	Pearson Correlation	1	.930**	.515**	0.149	.379**
	Sig. (2-tailed)		.000	.000	.089	.000
	N	131	131	131	131	131
6GR	Pearson Correlation	.930**	1	.467**	.186*	.377**
	Sig. (2-tailed)	.000			.033	.000
	N	131	131	131	131	131
TF	Pearson Correlation	.515**	.467**	1	-.256**	.340**
	Sig. (2-tailed)	.000	.000		.003	.000
	N	131	131	131	131	131
SA	Pearson Correlation	.149	.186*	-.256**	1	.500**
	Sig. (2-tailed)	.089	.033	.003		.000
	N	131	131	131	131	131
TR	Pearson Correlation	.379**	.377**	.340**		1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	131	131	131	131	131
**Correlation is significant at the .01 level (2-tailed)						
*Correlation is significant at the .05 level (2-tailed)						

*Research Question 1. Is there a relationship between public research universities' revenue resources and undergraduate students' four-year and six-year graduation rates?*

As shown in Table 4.7, the relationship between public research universities' total revenue resources and undergraduate students' 4-year and 6-year graduation rates was found to be significant at the .01 level ( $r=.379$ ,  $r=.377$  respectively,  $p=.000$ ). This finding supported earlier findings when investigating variables and institutional characteristics using descriptive statistics. Across all characteristics, using descriptive statistics, the data implied some degree of correlation, most of which pointed in a positive direction. In response to research question 1, this study demonstrates that there is a moderate relationship between undergraduate students' graduation rates and total revenue dollars invested in public research universities. In response to

research question 1, this study found a moderate positive relationship between total dollars invested in public research universities and undergraduate student's graduation rates.

*Research Question 2. Is there a relationship between tuition and fees dollars invested in public research universities and undergraduate students' four-year and six-year graduation rates?*

The relationship between tuition and fees dollars invested in public research universities and 4-year and 6-year graduation rates was also found to be significant at the .01 level ( $r = .515$  for 4GR and  $r = .467$  for 6GR with  $p = 0.000$ ). Refer to Table 4.7 for detail of these findings. Later in this chapter, an explanation of these relationships is seen in the multiple regression analysis.

*Research Question 3. Is there a relationship between state appropriated dollars invested in public research universities and undergraduate students' four-year and six-year graduation rates?*

As shown in Table 4.7, the relationship between state appropriated dollars invested in public research universities and 6-year graduation rates was found to be moderately significant at the .05 level ( $r = .186$ ,  $p = .033$  for 6GR). The relationship between state appropriated dollars and 4-year graduation rates was not found to be significant. The fact that state appropriated dollars invested in public research universities and tuition and fees dollars have a significant negative correlation at the .01 level may contribute to the lesser significance of the relationship between 4-year graduation rates and state appropriated dollars invested in the universities. The negative correlation implies that as state appropriated dollars invested in public research universities increase, tuition and fees dollars invested in the institutions decrease and that as tuition and fees dollars invested in the institutions increase, state appropriated dollars invested in the institutions decrease. In response to research question 3, this study found a significant positive relationship,

albeit slight, between state appropriated dollars invested in public research universities and undergraduate student's 6-year graduation rates.

*Research Question 4. Can the relationship between revenue resources and undergraduate students' four-year and six-year graduation rates be further explained by urbanization and regional differences?*

The average undergraduate students' graduation rates across urban centric locales ranged from 53.8 to 77.0 (Table 4.8) (Table 4.9). The average undergraduate students' graduation rates across geographic regions ranged from 51.3 to 67.7. Before investigating the roles of the variables "Urban" and "Region" Table 4.10 shows their relationship to the dependent variables and independent variables already used in this research.

Table 4.8	
6-Year Graduation Rate by Urban-Centric Locale	
Locale	Average 6-Year Graduation Rates
City: Large	53.8
City: Midsize	58.0
City: Small	57.9
Suburb: Large	63.6
Suburb: Midsize	77.0
Suburb: Small	63.4
Town: Fringe	72.6
Town: Distant	61.3
Town: Remote	56.9
Rural: Fringe	60.7
Rural: Distant	58.0

Table 4.9	
6-Year Graduation Rate by Geographic Region	
Geographic Region	Average 6-Year Graduation Rates
Region 1 New England CT ME MA NH RI VT	67.7
Region 2 Mid East DE DC MD NJ NY PA	60.7
Region 3 Great Lakes IL IN MI OH WI	58.7
Region 4 Plains IA KS MN MO NE ND SD	51.3
Region 5 Southeast AL AR FL GA KY LA MS NC SC TN VA WV	58.4
Region 6 Southwest AZ NM OK TX	53.3
Region 7 Rocky Mountains CO ID MT UT WY	53.7
Region 8 Far West AK CA HI NV OR WA	67.2

In Table 4.10, the results of Pearson's Correlation indicate a moderate relationship between 6-year graduation rates and urbanization ( $r = .154$ ,  $p = .040$ ). Region and 6-year graduation rates were not found to be related ( $r = -.035$ ,  $p = .344$ ). It has already been found in Table 4.7 that undergraduate students' graduation rates are related to the variables TF and SA. Because of multicollinearity between 4-year and 6-year graduation rates, only 6-year graduation rates were included in the correlation analysis including the variables region and urban. The Pearson's correlations shown in Table 4.10 support the argument that tuition and fees and state



appropriated dollars alone may not provide the most accurate predictors of undergraduate students' graduation rates.

Table 4.10							
Analysis of the Impact of Region and Urban Centric Locale on Public Research Universities Undergraduate 6-Year Students Graduation Rates Using Pearson's Correlation Coefficient (N=131)							
		6GR	Region	Urban	TF	SA	TR
Pearson Correlation	6GR	1.00	-.035	.154	.467	.186	.377
	Region	-.035	1.00	-.140	-.253	.039	.127
	Urban	.154	-.140	1.00	.058	-.039	-.130
	TF	.467	-.253	.058	1.00	-.256	.340
	SA	.186	.039	-.039	-.256	1.00	.504
	TR	.377	.127	-.130	.340	.507	1.00
Sig. (1-tailed)	6GR	.	.344	<b>.040</b>	<b>.000</b>	<b>.017</b>	<b>.000</b>
	Region	.344	.	.055	<b>.002</b>	.329	.074
	Urban	<b>.040</b>	.055	.	.254	.328	.070
	TF	<b>.000</b>	<b>.002</b>	.254	.	<b>.002</b>	<b>.000</b>
	SA	<b>.017</b>	.329	.328	<b>.002</b>	.	<b>.000</b>
	TR	<b>.000</b>	.074	.070	<b>.000</b>	<b>.000</b>	.

Multiple regression is used in the next section to investigate the relationships found in Tables 4.7 and 4.10 in more detail.

*Prediction Models*

The multiple regression analysis using only TF and SA as the independent variables is shown in Table 4.11. Using Pearson correlation, it has already been shown that the correlations between tuition and fees dollars and both 4-year and 6-year graduation rates were significant at the 0.01 level (Table 4.7). The correlation between state appropriated dollars invested in public research universities and 6-year graduation rates was significant at the 0.05 level (2-tailed). The correlations between total revenue invested in public research universities and both 4-year and 6-

year graduation rates were significant at the 0.05 level (2-tailed). Similar to the correlation calculations using Microsoft Excel, Pearson correlation showed some degree of linear relationship between the independent and dependent variables.

Interestingly, using the multiple regression inferential statistics, only tuition and fees and state appropriated dollars invested in public research universities were found to be significant predictors of undergraduate students' 4-year and 6-year graduation rates. See Tables 4.11 and 4.12. Urbanization was found to have some influence on public research universities graduation rates but was not considered in the initial model in Table 4.11 since the primary focus of this study was initially the relationship between dollars invested in the institutions and undergraduate students' graduation rates.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	24.938	5.201		4.795	.000
TF	.003	.001	.527	5.743	.000
SA	.001	.000	.297	2.966	.004
TR	.000	.000	.047	.453	.651

Based on the results in Table 4.11, one prediction model for 6-year graduation rates is as follows:

$$6GR = 24.938 + .003X_{1i} + .001X_{2i}$$

where  $X_{1i}$  and  $X_{2i}$  equal the average tuition and fees and state appropriated dollars invested in public research universities. This research assumed that students enter public research universities with an expected graduation date of four years from the time at which they first matriculate. Given this assumption, the cost of the students' education was based on an average four-year dollar amount. Therefore, when comparing six-year graduation rates to a four-year

average dollar amount, questions may be raised about losses between the students' fourth and sixth years of matriculation. These questions open the door for future research and analysis.

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	-5.990	5.617		-1.066	.288
TF	.004	.001	.568	6.338	<b>.000</b>
SA	.001	.000	.269	2.754	<b>.007</b>
TR	.000	.000	.049	.488	.627

Based on the results presented in Table 4.12, one prediction model for 4-year undergraduate graduation rates is as follows:

$$4GR = .004X_1 + .001X_2$$

where  $X_{1i}$  and  $X_{2i}$  equal the average tuition and fees and state appropriated dollars invested in public research universities.

Total revenue was found not to be a significant predictor of public research universities' 4-year and 6-year graduation rates. There could be several reasons for this finding. Included in public research total revenue are a variety of investment dollars from various sources including tuition and fees and state appropriated dollars. However, unlike tuition and fees dollars and state appropriated dollars that are invested in public research universities with a focus on educating students, other resources such as land-grant dollars may have more of an economic development focus or simply a research focus.

Given the variation found in undergraduate students' graduation rates across region and urban centric locations, these variables were included in the multiple regression analysis in search of more refined prediction models for graduation rates. Including these variables in the

regression analysis, region was found not to be a significant predictor of either 4-year or 6-year undergraduate students' graduation rates. See Tables 4.13 and 4.14. Urbanization was found to be a significant predictor of undergraduate students' 6-year graduation rates.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	24.084	4.833		4.984	<b>.000</b>
TF	.003	.000	.550	7.289	<b>.000</b>
SA	.001	.000	.327	4.326	<b>.000</b>
2 (Constant)	13.767	6.609		2.083	<b>.039</b>
TF	.004	.000	.573	7.459	<b>.000</b>
SA	.001	.000	.334	4.484	<b>.000</b>
Region	.938	.598	.117	1.567	.120
Urban	.260	.126	.150	2.064	<b>.041</b>

With the introduction of the variables Region and Urban to the multiple regression analysis a more refined prediction model for 6-year undergraduate students' graduation would include the effects of urban location on the rates. See below for one possible model.

$$6GR = 13.767 + .004X_{1i} + .001X_{2i} + .260X_{3i}$$

where  $X_{1i}$  equals the average tuition and fees invested in the institutions,  $X_{2i}$  equals the average state appropriated dollars invested in the institutions, and  $X_{3i}$  equals urban centric location.

Table 4.14					
4-Year Graduation Rates Prediction Model with Region and Urban Centric Locales Included					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-6.983	5.220		-1.338	.183
TF	.004	.001	.592	8.034	<b>.000</b>
SA	.001	.000	.300	4.074	<b>.000</b>
2 (Constant)	-12.473	7.224		-1.727	.087
TF	.004	.001	.593	7.816	<b>.000</b>
SA	.001	.000	.304	4.139	<b>.000</b>
Region	.249	.654	.028	.381	.704
Urban	.233	.138	.121	1.693	.093

While the variable “Urban” was found to be a significant predictor of 6-year undergraduate students’ graduation rates, it was not found to be a significant predictor of 4-year undergraduate students’ graduation rates. See Table 4.14. Including the variables “Region” and “Urban” in the multiple regression analysis had no impact on the 4-year undergraduate students’ graduation rates prediction model. When introducing these variables to the regression analysis the prediction model for 4-year undergraduate students’ graduation rates was again found to be

$$4GR = .004X_1 + .001X_2$$

The regression analysis again raises questions regarding additional factors that could influence undergraduate students’ graduation rates and funding. Additional research is needed to better understand public research universities revenue resources and undergraduate students’ graduation rates.

### *Summary*

Chapter 4 provides significant evidence of the relationship between tuition and fees dollars and state appropriated dollars invested in public research universities and undergraduate students' 4-year and 6-year graduation rates at these institutions. It supports arguments derived from Ryan (2004) and Titus (2006) that undergraduate students' graduation rates are related to higher education finances. Analysis in this chapter provokes some interesting thoughts regarding the impact of the dependent variables "Region" and "Urban" on public research universities' undergraduate student graduation rates. How do these variables impact undergraduate graduation rates? What are the significant impacts of these variables on graduation rates and revenue resources across urban centric locations? To what degree does urbanization influence public research universities' funding and undergraduate students' graduation rates?

## Chapter Five: Conclusions

### *Discussion and Analysis*

Other research analyses have established relationships between higher education finance and undergraduate students' graduation rates, between higher education expenditures and the production of bachelor's degrees (Ryan, 2004; Titus, 2009; Zhang, 2008). However, none have provided the level of detail or transparency that the research in this study provides. This study extends Ryan's, Titus's, and Zhang's research beyond the walls of the scholarly audience to both scholars and laypersons who are the primary financial investors in public research universities. Focusing on tuition and fees dollars and state appropriated dollars invested in public research makes the research in this study more valuable to investors of these dollars than is previous research in the areas of higher education finance and higher education policy.

The comprehensive understanding of the relationship between undergraduate students' graduation rates and tuition and fees, between these graduation rates and state appropriated dollars, and between undergraduate students' graduation rates and total revenue dollars invested in public research universities is long overdue. As mentioned in Chapter I, The Spelling Report (2006) concluded that there are inadequate transparency and accountability tools for measuring public research universities' performance. Undergraduate students' graduation rates are one performance measure, and this research has provided one tool by which to begin the process of assessing graduation rates as they relate to dollars invested in public research universities.

Public demands for higher education accountability have reached an all-time high. Vedder (2008) postulated that financial investors in public research universities want the institutions to go beyond the rhetoric of accountability and actually provide measurable data to

show that they are achieving the mission of educating and graduating undergraduate students. The clarity and transparency of undergraduate students' graduation rates as one measure brought forth by findings in this research study could not have come at a better time. Public trust in higher education is quickly approaching an historically low level. State appropriated dollars have declined significantly in recent years, and this trend is expected to continue over the next few years. Public research universities are at risk of losing autonomy if they do not respond to the demands for accountability.

The strong relationship found between undergraduate students' graduation rates and tuition and fees dollars invested in the institutions and between undergraduate students' graduation rates and state appropriated dollars invested in the institutions brought understanding to the emphasis that Russell (2009) placed on the fact that states have already latched on to graduation rates as a key accountability measure. It has validated the significance of the universities' dependence on financial resources coming from tuition and fees and from state appropriated dollars.

The universal aspect of accountability enables public research universities to deliver education to the students they enroll in return for resources on which the institutions depend for survival. As demonstrated in the conceptual framework of this research, once the institution agrees to enroll a student and accepts dollars in the form of tuition and fees, a reasonable expected return on this investment is graduation. Findings in this research have demonstrated that the public research universities are in part responsible for the undergraduate students' graduation rates because of the contract created when the institution admits the student. And, this contract is validated when the institution accepts resources in form of tuition and fees and state appropriated dollars. Because there are many other factors that contribute to student's



success, such as socio-economic status, this research only begins to address who or what is truly responsible for public research universities' undergraduate graduation rates.

State policies provide additional evidence that public research universities are in part accountable for the institutions' undergraduate students' graduation rates. Many states have turned to performance-based funding, using graduation rates as a key performance indicator. Research in this study has provided evidence that perhaps states are on track when linking funding to graduation rates as a key performance indicator. At the very least, research in this study has added another level of discussion to the conversation.

Resource dependency theory contends that public research universities are influenced by those who invest dollars in the institutions in the form of both state appropriated and tuition and fees dollars. This influence has come in the form of public demands for accountability. The degree to which these demands for accountability will impact the institutions in the future depends on the degree to which the institutions can successfully address the perceived lack of transparency and analysis needed to fill the current lack of knowledge of return on dollars invested in the institution. Tuition and fees dollars and state appropriated dollars exchanged and the criticality of these funds to the functions of the institution served as the basis for the use of the Principal Agent theory in this research. Using this framework, the relationship between tuition and fees and state appropriated dollars and undergraduate students' graduation rates places some degree of accountability on the institutions.

Similar to Titus's (2006) use of national data and descriptive statistics to bring understanding to the influence of financial context on the chance of college completion for low socioeconomic students at four-year colleges and universities, research in this study has used national data to bring understanding to the relationship between undergraduate students'

graduation rates and the dollars invested in the institution. Also, consistent with the findings of other researchers (Titus, 2009; Zhang 2008), this research has found evidence that undergraduate students' graduation rates are influenced to some degree by financial resources.

This finding has further validated the conceptual framework used in this research by providing evidence that dollars invested in public research universities in the form of both state appropriated dollars and tuition and fees dollars yield a return on investments in the form of undergraduate students' graduation rates. And, it therefore provides at least one tangible piece of evidence which these institutions could use to respond to public demands for accountability. Findings in this research also provide a much needed level of transparency, data, and analysis that have been found to be lacking and have caused an increase in public demand for accountability. The fact that the relationship between these variables is positive could serve to erase public doubt.

Resource dependency theory provided a key concept that allowed this study to use the relationship between public research universities' financial resources and undergraduate students' graduation rates as a tool to respond questions of accountability. The theory explained the organizational and inter-organizational behavior of research universities in terms of those crucial resources that the organizations must have in order to survive and function. Findings in this study connected those crucial resources to undergraduate students' graduation rates.

Issues surrounding the relationship between public research universities undergraduate students' graduation rates, the institutions' revenue sources and accountability have threatened these institutions' autonomy for years. The principal agency theory and resource dependency theory are two pillars upon which to understand higher education autonomy and threats posed to it by public demands for accountability. Agency theory is one of the most widely used theories

to explain organizational relationships (O'Donnell, 2000). The use of the agency theory provided a framework for investigating the relationship between revenue sources and undergraduate students' graduation rates. Because of the significant relationship found in this research between undergraduate graduation rates and tuition and fees and state appropriated dollars, more scrutiny of and threat to higher education institutions' autonomy is likely to continue for some time in the future.

The relationships as demonstrated by public research universities' dependency on both tuition and fees and state appropriated dollars invested in the institutions supported the use of multiple regression in the investigation of the relationship between undergraduate students' graduation rates and tuition and fees, state appropriations, and total revenue. The shift from state appropriated dollars to the institutions' increased dependence on tuition and fees dollars has served as a major factor in public demands for accountability (Wellman, Desrochers, & Lenihan, 2008). Given the significant relationship between both tuition and fees dollars and state appropriated dollars invested in the institutions and undergraduate students' graduation rates, it was necessary to include both variables in the regression analysis.

### *Implications*

Both federal and state policymakers have latched onto undergraduate students' graduation rates as a key accountability measure (Russell, 2009). This research has brought to the forefront the realization that it is not enough for policymakers simply to latch onto these rates as a performance measure, but rather to understand the significance of investing dollars into public research universities to help ensure that students graduate in a timely manner. Policies such as formula funding have taken center stage in recent years as a way to link dollars invested in research universities to student performance (Layzell, 2001; McKeown, 1996). However, research in this study implies that public research universities cannot rely on formula funding

alone to respond to the public demands for accountability. These institutions must do a better job of educating those who invest dollars in the institution about the return on their investments. They must make clear to public financial investors the correlation between dollars invested in the institution and undergraduate student graduation rates.

Public research universities must provide more data with statistically sound analysis that demonstrates the value of dollars invested in the institution to student graduation rates. If these institutions do not take a more pro-active role in defining and demonstrating accountability, regaining public trust could come at a much higher price tag than previously expected. Loss of autonomy will not be the only thing that the institutions will have to fear. Many public research universities that are not already a part of a university system may face organizational restructuring that could place them in a university system.

While research in this study is very thought provoking, it is clear that additional research is needed to better understand the relationship between undergraduate graduation rates and revenue and this relationship's impact on public demands for accountability. Across urban-centric locales, 6-year graduation rates and tuition and fees dollars invested in the institutions were found to be positively correlated. This finding further raises questions about the impact of subsidies on the supply of higher education given the strong positive relationship between tuition and fees and graduation rates. It also provides evidence that additional research should be conducted to provide clarity to these relationships. It also provides a basis from which to begin further research into the impact of urbanization on public research universities' funding as well as on the impact of urbanization on undergraduate students' graduation rates.

The average 4-year and 6-year undergraduate students' graduation rates and state appropriated dollars invested in public research universities was found to be higher at public

research universities with the land-grant designation. Because additional funding is typically associated with the land-grant designation, again these findings support Paulsen's (2001) research. However, because the current findings are based on an analysis that is only descriptive in nature, additional research is necessary to reach a more definitive conclusion.

Because the average 4-year and 6-year graduation rates at public research universities not affiliated with a system or corporate entity were higher than the average 4-year and 6-year graduation rates of universities affiliated with a system or corporate entity, this research raises questions about university management and policies. In addition to this finding, more tuition and fees dollars, state appropriated dollars, and total revenue dollars per FTE were found to be invested in public research universities affiliated with a system or corporate entity. Coupling this with the fact that these institutions had lower 4-year and 6-year graduation rates certainly raises additional policy questions.

#### *Policy Implication*

The significant relationship found in this research between state appropriated dollars, tuition and fees dollars, and undergraduate students' graduation rates at public research universities may suggest that public interest in the institutions' performance is unlikely to decrease anytime soon. In fact, it may very well serve to elevate this interest to even higher levels. The institutions have already experienced additional policies and mandates associated with new accountability and performance measures imposed on the institutions in recent years. For example, the president signed into law the Higher Education Act (HEA) calling for more transparency. Increased accountability has been echoed throughout higher education since the signing of this law.

The relationship between taxpayers' dollars invested in public research universities, tuition and fees dollars invested in public research universities and undergraduate students' graduation rates could benefit the institutions by sending the message that more dollars invested in the institution could equate to higher undergraduate students' graduation rates. Since the cost of college is among the most perennial issues shaping higher education policy, the implication that higher tuition equates to higher undergraduate students' graduation rates warrants further study.

The results shown in these tables alone are not definitive. But, at a time when both state and public colleges are looking to balance the rising cost of education between state dollars and tuitions and fees and at the same time hold colleges more accountable for student performance, these results imply the need to rethink who is truly responsible for undergraduate students' graduations rates. The results in Tables 4.3 and 4.4 also imply the need for more research to assess factors that influence undergraduate students' graduation rates. They imply that perhaps more compacts between states and their respective tuition-setting authorities are needed to strike a healthy balance between state appropriated dollars and tuition and fees dollars invested in public research universities.

### *Practice Implication*

Research in this study has implications for public research universities' quality assurance as well as their commitment to accountability. Transparency and a lack of comprehensive data have been among the top issues on the higher education agenda in recent years. Since the Spelling Report in 2006, several initiatives have taken place to address higher education accountability. Greater accountability is evident at both the state and national level. States are requiring, if not mandating, more transparency. For example, at the close of the 2010 legislative

session, Governor Bobby Jindal signed HB 1171, the “Louisiana Granting Resources and Autonomy for Diplomas Act,” (LA GRAD Act). This Act outlines performance expectations and incentives at colleges and universities in Louisiana that are required if public colleges in the state are to increase student performance. An added benefit to the colleges for meeting performance requirements outlined in the Act is the granting of more autonomy.

Nationally, states have responded to the call for accountability and transparency. Several states have joined The Complete College America Alliance. This alliance has committed to setting substantial goals, measuring progress uniformly, sharing their results publicly, and reinventing higher education in order to smooth paths to completion. While this alliance is working to build consensus for change at both the state and national levels and to ensure that new programs and policies build on the best knowledge of what works in higher education, research in this study implies that the alliance must also be cognizant of dollars needed to improve undergraduate students’ graduation rates.

The higher education public research universities have also responded to demands for greater transparency and accountability with self-imposed, voluntary reporting systems aimed at shedding more light on undergraduate students’ graduation rates and other institutional performances. This response came in the form of the Voluntary System of Accountability (VSA) in 2007. The initiation of VSA was a joint effort between the American Association of State Colleges and Universities (AASCU) and the National Association of State Land Grant Colleges (NASULGC). Research in this study implied that dollars invested in public research universities may play as significant a role in the group’s efforts to improve undergraduate student’s graduation rates as does transparency.

### *Research Implication*

Several forces have combined to force national and statewide requirements on systems for higher education. None have had more impact than the rising cost of higher education (Wellman, Desrochers, & Lenihan, 2008). As Wellman, Desrochers and Lenihan note, tuition and fees have increased significantly over the past ten years. However, the findings of the present study indicate that more research is needed to better understand the impact of these increases on public research universities' undergraduate students' graduation rates. More research is needed to assess the impact of state appropriated dollars invested in public research universities on undergraduate students' graduation rates.

### *Recommendations for Future Research*

This research presents the first comprehensive study of the relationship between dollars invested in public research universities and undergraduate students' graduation rates in response to public demands for accountability. It has provided one model by which to project and analyze undergraduate students' 4-year and 6-year graduation rates. The research in this study has provided leadership, policymakers, and supporters of the institutions with a greater degree of transparency regarding the significance of state dollars and other funds invested in the universities. Most importantly, it gives supporters of the institutions one tangible tool by which to evaluate and assess return on dollars invested in public research universities.

An investigation of the characteristics of variables was conducted using descriptive statistics in addition to correlation and multiple regression. However, it is important to note that it is difficult to reach a definitive conclusion about the impact of public research universities' urban locales on the correlation between graduation rates and revenue dollars invested in public research universities based simply on descriptive statistics. A categorical data analysis statistical



model such as Chi Square could give more definitive results when investigating differences in 4-year and 6-year graduation rates across geographical regions and urban-centric locales. Chi Square could also be used to further investigate the differences in revenue resources across regions and urban-centric locales. See Tables 4.8 and 4.9 for specific 6-year graduation rates and revenue resource differences across urban-centric locales and geographic regions. A categorical data analysis is strongly recommended, but consideration should also be given to development of multivariate models to more comprehensively assess influences on graduation rates.

Reviewing the characteristics of the public research universities and variables included in this research brought attention to the study's weakness. As a result of the descriptive analysis, it is recommended that researchers consider other factors that may be at play when investigating dollars invested in public research universities and undergraduate students' graduation rates. For example, this research gave no attention to student demographics. Students' socio-economic status has also been found to influence graduation rates (Astin, 1993; Bean, 1990; Paulsen & Smart, 2001). Research in this study did not consider the influence of socio-economic status on the outcome of the analysis. In addition, other factors such as high school grade point average (GPA) and standardized test scores and how they may influence graduation rates were not considered in this study. Additional research is needed to assess more fully the impact of the variables used in this study.

More research in the area of the relationship between public research universities undergraduate students' graduation rates and both state appropriated and tuition and fees dollars invested in the institutions is needed. Many states have prematurely turned to formula funding as a response to accountability. Based on statistics in Tables 4.8 and 4.9 it is recommended that states consider adding both urban centric locales and geographic locations as factors to

performance based funding models. An incomplete understanding of the issues surrounding undergraduate students' performance could lead to ineffective formula funding models that do not work. These models could do more to negatively impact the success of students who need help the most. A multivariate analysis of urban centric locales and geographic regions while holding undergraduate students' graduation rates constant is recommended to better assess the impact of these factors. The recommended multivariate analysis should be used to better understand and the levels of accountability in the context of the institution and its environment.

#### *A Proposition*

The relationship found between state appropriations and tuition and fees dollars invested in public research universities and undergraduate students' 4-year and 6-year graduation rates has resulted in a proposition of public research universities' accountability that states, "When taxpayers, parents, and students invest dollars in public research universities, the institutions are in part accountable for the students entering the universities' 4-year and 6-year graduations." Because of the significant relationship between these variables and the contract that is entered into between the Agent (*the institution*) and the Principals (*taxpayers, parents and students*), when the institutions accept dollars from these investors, they become in-part accountable for the investors expected return on their investments. Despite the responsibility assumed by these institutions, public research universities are only partially accountable for undergraduate student graduations.

There are many other factors that can impact the students' graduation rates such as the students' socio-economic status, the students' college-readiness upon entering the university and the students' ability to integrate into the college's social environment (Bean, 1990; Tinto, 1993). Similar to Titus' (2006) finding that student persistence is positively related to the amount of revenue generated from tuition and fees, this research revealed that tuition and fees are positively

related to undergraduate student's graduation rates. These results have policies implications which attempt to link tuition and fees policies to successful undergraduate student's graduation rates.

The fact that public research universities urban centric locale was found to be significantly related to undergraduate students' 4-year and 6-year graduation rates provides additional evidence that these institutions are only partially accountable for these rates. The response to public demands for higher education institutions accountability set forth in this research has resulted in a window of opportunities that have long been ignored, leaving it up to the public to both define the institutions' accountability and validate it. Although the proposition does not provide exact measures, it has resulted from this research and has brought to the forefront a degree of transparency that adds clarity and better understanding to what happens to dollars invested in these institutions. It has resulted in a statistically sound basis on which to conduct further research in the area of higher education accountability and finance.

### *Conclusions*

As public demands for higher education accountability continue to lead the agenda of many higher education discussions, so will the demand for additional research and analysis that illustrate returns on dollars invested in public research universities. Research in this study has provided one tool by which to respond to public demands for accountability. Much research remains to be done in this area if public research universities are to regain public trust. Funding has already been linked to accountability (Colbeck, 2002; Layzell, 2001). Because of this link, research in this study and future research in the area are most significant to public research universities' financial stability.

Findings in Chapter 4 provide a solid statistical basis for future university finance and student success research. The findings provide a strong start to responding to a lack of

comprehensive data and analysis of dollars invested in public research universities and undergraduate students' graduation rates. They provide the public with an overall view of the topic and an understanding that tuition and fees and state appropriated dollars invested in public research universities have a significant relationship to undergraduate graduation rates.

More importantly, the results of the analysis support the conceptual framework set forth in this study. Similar to Haptonstahl's (2009) use of the Principal-Agent theory to model the relationship between an information-advantaged Agent and a Principal able to issue a contract ultimatum, the relationship found between dollars invested in public research universities by their financial supporters and undergraduate students' graduation rates is a basis for the public to issue a contract to these institutions and expect results. As indicated in the conceptual framework, the information-informed Agents are public research universities. The Principals issuing the contracts are public supporters of the institutions who invest dollars in the institutions. The contract is for these institutions to produce a return on those dollars invested in the institutions in the form of undergraduate student graduation rates.

Financial investors are demanding more transparency and data and analysis that demonstrate the value of dollars invested in the institutions. They are asking to see a return on these investments. Public demand for accountability is unlikely to go away in the near future. The results of this research have provided public research universities with a significant starting point from which to build a statistically sound response to future demands for accountability.

Because of the significant relationship found in this study between dollars invested in public research universities and undergraduate students' graduation rates, additional questions have been raised about how states and universities respond to accountability. A new level of performance-based funding models awareness has been raised. This awareness poses a dilemma

for policy policymakers. While much has been done at both the state and institution levels to address higher education accountability, research in this study adds yet another area for policymakers to ponder and find solutions for. Because incomplete information leads to performance models that do not work, policymakers can no longer afford to ignore the impact of factors such as urban centric locale and geographic locations in response to higher education accountability.

Similar to the Voluntary System of Accountability, designed by public 4-year universities to supply clear, accessible, and comparable information on undergraduate student performance, and the Voluntary Framework of Accountability, the first national system of accountability specifically for community colleges, research in this study has brought to the forefront the need for policymakers to address accountability at levels that are more institution and/or mission specific.

As decision makers assess higher education in terms of state priorities for public funding, research in this study has provided them with a basis on which to cautiously assess the shift toward the "user-pay" philosophy in higher education accountability models and policies. The impact of this shift has been in question in recent years. Research in this study has provoked thought as to how this shift has helped to shape the response to the whole higher education accountability agenda. It has also provoked thought as to how much emphasis should be placed on tuition and fees versus state appropriation when it comes to defining higher education accountability. How much emphasis should be placed on institutional mission when it comes to defining higher education accountability? And finally, the research has brought clarity to the importance of a complete understanding of factors driving undergraduate students' graduation

rates. Such a complete understanding is essential to successfully addressing questions regarding public research universities' accountability.

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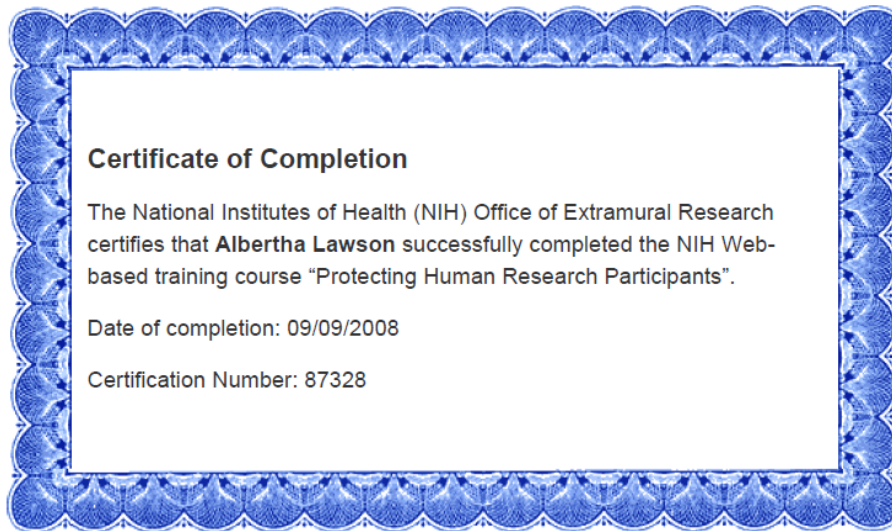
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## Appendix A Protecting Human Subject Certificate of Completion





## Appendix B IRB Exemption Letter

### **University Committee for the Protection of Human Subjects in Research University of New Orleans**

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*Campus Correspondence*

Principal Investigator: Marietta Del Favero  
Co-Investigator: Albertha H. Lawson  
Date: June 14, 2010  
Protocol Title: "A study of the relationship between revenue resources and undergraduate students"  
IRB#: 01June10

The IRB has deemed that the research and procedures described in this protocol application are exempt from federal regulations under 45 CFR 46.101 category 4 due to the fact that the research will involve the collection or study of existing data.

Exempt protocols do not have an expiration date; however, if there are any changes made to this protocol that may cause it to be no longer exempt from CFR 46, the IRB requires another standard application from the investigator(s) which should provide the same information that is in this application with changes that may have changed the exempt status.

If an adverse, unforeseen event occurs (e.g., physical, social, or emotional harm), you are required to inform the IRB as soon as possible after the event.

Best wishes on your project.  
Sincerely,

Robert D. Laird, Chair  
UNO Committee for the Protection of Human Subjects in Research

## Vita

Albertha Hilton Lawson currently serves as the Assistant Vice President of Institutional Research and Statistical Analysis for the Louisiana Community and Technical College System in Baton Rouge, Louisiana. Prior to serving in her current position, she spent over 12 years with the Louisiana State University System as the Director of Institutional Research and Statistical Analysis. She has worked in corporate America as an actuarial analyst and has spent time in higher education classrooms as an instructor of mathematics. Her experiences in postsecondary education and the opportunity to serve as a trainer for the Integrated Postsecondary Education Data System (IPEDS) have inspired the writing of this dissertation.