

COLLEGE IMPACT: A QUANTITATIVE STUDY OF INSTITUTIONAL
PREDICTORS OF COMPLETION RATES AT FOUR-YEAR PRIVATE
INSTITUTIONS

by

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DEDICATION

In dedication to my son, Grant. This dissertation was a sacrifice for us both.

May you always find the courage to push forward and achieve your goals. I love you.

TABLE OF CONTENTS

	Page
DEDICATION	iv
LIST OF TABLES	viii
LIST OF FIGURES	vii
LIST OF APPENDICES.....	ix
ABSTRACT.....	xi
CHAPTER	
1. INTRODUCTION TO THE STUDY	1
Problem Statement.....	8
Purpose.....	8
Background of the Study	9
Research Question	10
Conceptual Framework.....	10
Significance of the Study	11
Procedures.....	12
Limitations and Delimitations.....	12
Definition of Terms.....	14
Summary	18
2. REVIEW OF THE LITERATURE.....	19
Conceptual Frameworks Explaining Outcomes.....	21
Between-College Effects Conceptual Framework.....	27
Structural and Demographical Factors and Graduation Rates.....	29
Institutional Grants, Merit Aid, and Graduation Rates	36

TABLE OF CONTENTS (Continued)

CHAPTER	Page
Institutional Resources, Expenditures, and Graduation Rates	45
Institutional Quality and Graduation Rates.....	55
Multiple Factor Studies Exploring Graduation Rates.....	58
Summary	60
3. METHODOLOGY	62
Rationale for Research Study.....	63
Research Question and Hypothesis.....	65
Research Design.....	65
Population and Sample	66
Data Collection	67
Variables	69
Independent Variables	71
Dependent Variable.....	75
Control Variables	76
Institutional Review Board Approval	76
Data Analysis	76
Reporting Results.....	78
Summary.....	79
4. DATA ANALYSIS	80
Preparing Data for Analysis	80
Two-Step Clustering Analysis.....	86
Discriminant Analysis	89
One-Way Analysis of Variance (ANOVA).....	95
Linear Regression Analysis.....	105
Findings	110
5. DISCUSSION, IMPLICATIONS, AND FUTURE RESEARCH	112
Summary of Study.....	113
Summary of Findings	114
Discussion of Findings	117

TABLE OF CONTENTS (Continued)

CHAPTER	Page
Conclusion.....	120
Implications	121
Recommendations for Further Research	12
Summary	122
REFERENCES	125
APPENDICES	140

LIST OF TABLES

Table	Page
1. Summary of Variables.....	71
2. Correlation among normalized independent variables.....	82
3. Kaiser-Meyer-Oikin Measure of Sampling Adequacy and Bartlett's Test of Sphericity	83
4. Correlations of Variables with Components after Estimating Missing Data	84
5. Median z score cluster comparison	88
6. Group Statistics in Discriminant Analysis	90
7. Tests of Equality of Group Means	91
8. Summary of Canonical Discriminant Functions	93
9. Standardized Canonical Discriminant Function Coefficients	94
10. Canonical Discriminant Function Coefficients.....	95
11. Descriptive statistics for one way ANOVA and Test of Homogeneity of Variances.....	97
12. ANOVA Table	100
13. Linear Regression Model Cluster One.....	104
14. Linear Regression Model Cluster Two	107
15. Linear Regression Model Cluster Three	109

LIST OF FIGURES

Figure	Page
1. Astin's Theory of Student Involvement.....	22
2. Conceptual Model of College Impact on Student Outcomes.....	26
3. Conceptual Model of College Effects.....	28
4. Predictor importance for cluster inclusion.....	87

LIST OF APPENDICES

Appendix	Page
A. Copyright Permissions	141
B. Mercer IRB Exception	145

ABSTRACT

LORI WRIGHT CROMWELL
COLLEGE IMPACT: A QUANTITATIVE STUDY OF INSTITUTIONAL
PREDICTORS OF COMPLETION RATES AT FOUR-YEAR PRIVATE
INSTITUTIONS
Under the direction of EDWARD BOUIE, Ed.D.

The unique tension caused by the interdependent relationship between access, affordability, and sustainability adds an additional level of complexity for administrators in balancing societal educational needs, economic realities, and institutional success. Trends suggest postsecondary six-year degree completion remains stagnant despite most full time students receive some form of student aid. Despite higher education institutions spending more money competing for enrolled students, delay in the successful completion of program requirements remains a challenge and a priority across most institutions.

This study targets persistent problems of college completion in the United States by examining the predictive role of institutionally controlled factors on institutional quality as defined by completion rates. Using the Integrated Postsecondary Education Data System (IPEDS), the sample included institutions with Carnegie classifications

as four-year, private, non-profit colleges. Degree-granting with full-time, first-time undergraduate students, and eligible to participate in federal student aid programs were also considered.

The study included 509 institutions (n=509), 35 independent variables including structural, institutional allocations, and institutional resources, dependent variable graduation rate, and control variables percent of Pell grant and the total amount of Pell grant awarded with data ranging from 1996-97 to the 2015-16 academic years.

Descriptive statistics, two-step cluster analysis, principal components analysis, along with multiple regression analysis was used to determine which, if any, institutional factors selected as independent variables significantly predict graduation rates.

The study confirmed differences exist between clusters. As a result, linear regression analysis was used to ultimately determine for institutions included in cluster one institutional components are not predictive of six-year graduation rates. Resources per capita seem to matter for this group, although not predictive of six-year graduation rates. Likewise, institutional component resources per capita did significantly predict graduation rates for institutions in cluster two and three. As a result, the findings of the study largely support college impact literature theorized conceptually in the between-college framework detailed by previous research models of student involvement. These models and study suggest student characteristics and experiences in the college/institutional environment influences those outcomes.

CHAPTER 1

INTRODUCTION

College and university presidents consider the increasing cost of higher education, providing access to a new generation of students, and maintaining and improving educational quality as challenges facing higher education institutions in future decades (Immerwahr, Johnson, Gasbarra, National Center for Public Policy and Higher Education, and Public Agenda, 2008). Sustainability, critically important to institutional longevity, ensures the ability to meet current needs without compromising the ability to educate future generations (NACUBO, 2017). The unique tension caused by the interdependent relationship between access, affordability, and sustainability adds an additional level of complexity for administrators in balancing social needs and economic realities with institutional success (Immerwahr et al., 2008). As a result, discussions continue surrounding postsecondary affordability and accountability. Institutions are being held responsible for meeting an ever growing population of competing goals (Rutherford, 2016).

By 2023, the United States will enter a period of stagnation with the number of high school graduates plateauing around 3.4 million, after a 15 year period of steady increases (Bransberger and Michelau, 2016). This period of stagnation is also accompanied by a shift in student demographics with an increase in students of color

completing public high schools during the same period (Bransberger and Michelau, 2016). The number of Hispanic high school graduates is projected to increase by 50%, Asian/Pacific Islander by 30%, and African American is expected to decline 6% from 2014 in 2025 (Bransberger and Michelau, 2016). With an overall shift in student demographics, postsecondary enrollment has also leveled having reached a high in 2011-12 (National Center for Educational Statistics, 2016; The College Board, 2016a).

During the fall of 2015 and 2016, many institutions reported declines in both their first-time freshman and total enrollments; which 68% of financial officers surveyed attribute to increasing price sensitivity (National Association of College and University Business Officers, 2015, 2016). As the number of students enrolling in higher education institutions stabilizes, tuition costs have increased significantly and exceeded the rate of inflation (Ehrenberg, 2012; The College Board, 2015, 2016a). During this same period, family income after inflation has remained relatively stagnant, resulting in a steady increase in family financial need to pay for college (Hossler and Kalsbeek, 2013). Consequently, the number of students applying for and receiving student aid continues to rise (National Association of College and University Business Officers, 2015, 2016; National Association of Student Financial Aid Administrators, 2017). With a third of students relying on parental income along with a third on grants and scholarships as a source of funding for college, institutions are under more pressure to respond to the price sensitivity of students and families (Hossler and Kalsbeek, 2013; Sallie Mae, 2016).

Historically as the net price a student pays declines, the likelihood of enrollment tends to increase, leaving enrollment targets vulnerable in competitive pricing strategies

as institutions compete for a limited number of academically qualified students (S. Dynarski and Scott-Clayton, 2013; Scott-Clayton, 2015). In 2016-17, the average net price for a four-year public institution was \$900 more than in 2015-16, yet \$5,480 more than in 1996-97 (The College Board, 2016a). Likewise, net price at private institutions has increased \$1,760 over 2015-16, yet \$6,060 more than in 1996-97 (The College Board, 2016a). Overall, institutional pricing strategies should be strategically designed to ensure sustainability for students through degree completion and increased tuition revenue (Scott-Clayton, 2015). As a result, it is imperative that financial leaders understand net price influences student enrollment, persistence defined by continued enrollment, and completion decisions for institutions in the U. S.

As families are increasingly unable and unwilling to pay high tuition bills, institutions have moved to discount tuition through institutional scholarships in an effort to boost enrollment in a competitive market particularly when substantial tuition increases are no longer possible (LeBlanc, 2014; Seltzer, 2017a). To reduce the financial burden of families in 2015-16, institutions spent approximately 55 million dollars in institutional funded financial aid (National Association of College and University Business Officers, 2016; The College Board, 2016b). Institutional student aid strategies are often used to meet students' ability to pay, institution's enrollment, and financial revenue goals. Institutional aid policies are primarily focused on the student, but are central to an institution's long-term financial strength, ability to retain revenue generating students, and advance student success (Baum, 2010; Deegan and Deegan Jr., 2014; National Association of College and University Business Officers, 2016).

In 2016, institutional aid to students totaled 23% of total funding sources; 17% higher than state grants, and 8% higher than federal Pell Grants (The College Board, 2016b). Public and private institutions have increased student aid expense by 9% over the past ten years, which represents a higher percentage than at any other time in the past twenty years (The College Board, 2016b). Not only is the level of institutional investment in student aid important to student success, but how those investments are allocated is critical to overall effectiveness. In 2011-12, institutionally funded grants covered 17-20% of four year public tuition and fees for the three lower family income quartiles and 42-47% of four year private tuition and fees; a twenty-year low for public institutions, yet a twenty year high for private institutions (The College Board, 2016a). The 88% increase in total student aid over ten years, combined with stagnant graduation rates has led college administrators and policymakers to question the casual impact and overall effectiveness of student aid on enrollment and completion rates; particularly for low-income students (Baum, 2010; Goldrick-Rab, Kelchen, Harris, and Benson, 2016; Riegg, 2008; The College Board, 2016b).

Large investments in institutionally funded student aid through the use of tuition discounting also has financial implications for a number of colleges and universities, considering a vast majority of the student aid comes from tuition revenue (Ehrenberg, 2012; National Association of College and University Business Officers, 2015, 2016). The tuition discount rate, the ratio of student aid to gross tuition revenue is used as a key financial indicator of the institution's revenue generation ability. Although, higher education institutions with smaller endowments typically use operating revenue to

discount tuition, a vast majority of institutions across various endowment levels report operating income as the primary source of funding for discounts (Ehrenberg, 2012; National Association of College and University Business Officers, 2016). Trends in tuition discounts have increased to unsustainable levels and led to much slower growth in net tuition revenue for four year institutions during the past decade (Davis, Green-Derry, and Jones, 2013; Hossler and Kalsbeek, 2013; National Association of College and University Business Officers, 2015, 2016). Overly aggressive discounting strategies funded from operating revenue also have the potential to decrease existing operating revenue and ultimately disrupt the institution's ability to provide foundations of academic support designed to aid student success. As a result, institutions become more tuition-dependent resulting in an increasing focus on quantifying the benefits of retaining revenue generating students through degree completion (Day, 2007; Deegan and Deegan Jr., 2014; Titus, 2006c).

Despite higher education institutions spending more money competing for enrolled students, overall attrition or delay in successful completion of program requirements remains a challenge and a priority across most institutions with mounting pressure to improve graduation rates (N. Johnson, 2012; LeBlanc, 2014; Mulvenon and Robinson, 2014; Selingo, 2012). Furthermore, without considering other factors in student departure, aid recipients are less likely to depart than non-recipients (J. Gross, 2015). Enrollment managers now realize aid strategies are easily replicated, have become implemented across institution types, value, and competitive advantage specific of an institution are diminished and institutional funded student aid becomes merely a

of an institution are diminished and institutional funded student aid becomes merely a single factor in the overall institutional commitment to student success (Hossler and Kalsbeek, 2013). As a result, strategic enrollment management requires institutions to manage a difficult balancing act of resources and outcomes (Hossler and Kalsbeek, 2013).

Accountability for higher education institutions emerged in the 1990's in part to enhance institutional autonomy and overall performance (Shin, 2010). Designed to motivate institutions to improve student success, the new emphasis on accountability focused on student outcomes rather than institutional resource inputs. With historical attention focused on the effects of student aid on retention, significant interest in understanding the effect on persistence, which is traditionally measured two ways: retention of students from freshman to sophomores and graduation rates (Hamrick, Schuh, and Shelley, 2004; Schneider and Kelly, 2012).

Postsecondary educational attainment has yet to accomplish the rapid advancements expected in completion rates with accountability measures for higher education institutions. Trends suggest most institutions graduate just over half of their student population; therefore, realizing about half of the potential revenue (Bailey and Xu, 2012; The College Board, 2012). One-third of students who enter postsecondary education institutions do not earn a degree, yet there has been little focus given to the cost of attrition from the lost credits that do not equate to degree completion (N. Johnson, 2012). According to U. S. Census from 2011, 43.1 percent of Americans ages 25-34 hold a college degree, an increase of two percentage points from the 2009 census (The

College Board, 2012). Despite years of minimal increases in attainment, postsecondary degree completion is expected to increase ten percent between 2012–13 and 2024–25 (National Center for Education Statistics, 2016). Although overall increases in completion rates are expected, differences will more than likely be attributed to institutional factors influenced by access and affordability (Shapiro et al., 2016). How institutional factors influence students to completion remains critically important when considering sustainable environments which foster student success (Hamrick et al., 2004).

Empirical research suggests a number of strategies for improving retention and graduation rates although classic theory maintains student characteristics and social systems are primary factors which influence persistence (Tinto, 1993). As such, experiences which promote intellectual and social integration into college communities are more likely to strengthen student commitment and support completion (R. Chen, 2012; Rhee, 2008). To fully understand the impact on student outcomes requires separating student-level factors from college factors (Goodman, Hurwitz, and Smith, 2017).

The institution's ability to adjust to the diverse conditions and needs of the student body is critically important to persistence and completion ("A framework for retention", 2003). A growing body of research suggests institutional variables also significantly contribute to completion rates as well as propose differences in performance outcomes outside of student characteristics are generally attributed to the institution itself (Bailey and Xu, 2012; Berger and Milem, 2000; Hamrick et al., 2004; T.

L. Johnson, 2014; Titus, 2004a; Walker II, 2016). However, little is known about what combination of institutional factors contributes to conditions that support increased completion rates.

Problem Statement

Trends suggest postsecondary six-year degree completion (59.4%) remains stagnant despite (83.3%) of full time students receiving some form of student aid (Ginder, Kelly-Reid, and Mann, 2017a; Hughes, 2012; National Association of College and University Business Officers, 2016; NCES, 2017; Selingo, 2012; The College Board, 2016a). Empirical evidence supports shared accountability in completion rates whereas student attrition is a product of inputs from both the student and the institution (Astin, 1984; Bailey and Xu, 2012; Berger and Milem, 2000; Pascarella and Terenzini, 2005). As a result, there is a need to understand if institutional investments in factors of access, affordability, and quality are predictive of institutional completion rates (Pascarella and Terenzini, 2005; Paul Attewell, Scott Heil, and Liza Reisel, 2011; Titus, 2006).

Purpose

The study targets the persistent problem of college completion in the United States. This study investigates potential impact on colleges and universities by examining the predictive role of institutionally controlled factors of structural characteristics, institutional expenditures, institutionally funded student aid, institutional resources, and selectivity have on institutional quality as defined by completion rates. Completion rates have potential long-term effects on enrollment, ranking, and external resource opportunities and are critical in evaluating the overall success of an institution.

Background of the Study

Historically, a significant interest in understanding the fundamental elements of student success exist. Variations of organizational theory introduced opportunities to understand how college and universities affect student outcomes. Despite traditional organizational theories, these variations typically ignore the student and college impact studies while also ignoring institutional factors (Berger and Milem, 2000). Astin (1984) developed a framework for understanding college and the influence on students considering college as an interconnected relationship between inputs, the environment, and outcomes. Pascarella and Terenzini (2005) expanded this framework to further account for the influence of multiple factors of the institutional environment, by separating institutional influence as experience or characteristics.

Between-college effects help isolate differences in outcomes that may be explainable by institutional conditions and organizational characteristics once student precollege influence is controlled (Mayhew et al., 2016; Ro, Terenzini, and Yin, 2013). Empirical research suggests elements of structural, demographic, resources, allocations, institutionally funded student aid, and quality factors may have a relationship with graduation rate at four-year institutions (Alon, 2005; R. Chen, 2012; Franke, 2012; Goodman et al., 2017; Hamrick et al., 2004; Rhee, 2008; Ro et al., 2013; Shin, 2010; Titus, 2006c; Webber and Ehrenberg, 2010). Because of increased pressure by lawmakers on institutions to increase graduation rates, it is important to understand which institutional variables have direct effects and which are interceding (Attewell, Heil, and Reisel, 2011).

Research Question

This study aims to answer the following question.

- Are institutional factors, such as structural characteristics, institutional expenditures, institutional resources, institutionally funded student aid, and institutional selectivity predictive of six-year graduation rates at four-year institutions?

Conceptual Framework

Pascarella and Terenzini (2005) established a college effects framework originally developed from the earlier works of Gurin (1971), Nucci and Pascarella (1987), and Pascarella (1985). In part, their efforts attempt to determine if “discernible differences in student outcomes are attributable to the characteristics of the particular institution” (Pascarella and Terenzini, 2005, p. 9). Pascarella and Terenzini’s work on differential impacts between institutions supports the need for a deeper understanding of the relationships between operational and financial decisions that affect student persistence through completion.

Mayhew et al., (2016) expanded the college affects framework by building on the 1990’s between-factors studies focused on state policies, system structures, institutional control, size, quality, along with gender and racial composition as potential factors that influence educational attainment. The 2016 framework utilizes Astin’s (1984) student involvement framework as a guide and focused on studying the institution in three components: inputs, environment, and outcomes. Astin contends outcomes are influenced by student inputs and the educational environment. Through this lens, this

study will explore the influence of institutional factors reflective of the environment on six-year completion rates.

Significance of the Study

This study builds upon emerging literature focusing on specific types of institutional factors that influence graduation rates. As the public debate regarding the increased cost of higher education continues, trends in tuition discounting, (i. e., a process in which institutions offset published tuition with institutional scholarships) will also continue in an effort to meet enrollment goals, compete for academically superior students, and respond to the affordability concerns of families with increased price sensitivity. With graduation rates frequently used as measures of effectiveness and quality, it is critical college and universities understand the relationship between institutional factors along with how those factors interact with institutional characteristics in an effort to create and sustain environments that foster student success.

This research will contribute to the current body of literature by investigating a combination of institutional factors and behavior such as tuition discounting investments and the influence on graduation rates as a sustainability initiative. Higher education governing boards and administrative leadership at higher education institutions could utilize the results of this study to make policy changes in student support in conjunction with characteristic adjustments at the institutional level that will support an increase in degree productivity, revenue growth, and impact institutional quality.

Procedures

The study will determine which, if any combination of institutional factors of access, affordability, and sustainability are predictive of six-year graduation rates. The sample will consist of four-year, non-profit institutions eligible to participate in federal student aid programs as identified by the Carnegie Classification system. Four-year, non-profit institutions were chosen primarily because students attending a four-year institution is a significant predictor of persistence through degree completion (Mayhew et al., 2016).

This study utilized data collected using the Integrated Postsecondary Education Data System (IPEDS), an online database maintained and authorized by the National Center for Education Statistics (NCES). Descriptive statistics were used to analyze the data and make inferences about relationships between institutional factors and graduation rates. Additionally, two-step cluster analysis, principal components analysis, and multiple regression analysis was used to determine which, if any, of the institutional factors selected as independent variables significantly predict graduation rates.

Limitations and Delimitations

Most of the literature surrounding postsecondary persistence examines student level contributions to institutional completion rates. Given the extensive literature on student persistence, this research design focused on institutional level dynamics. Removing the impact of student characteristics creates a unique opportunity to examine persistence through a different viewpoint. However, while the absence of individual student characteristics creates a unique opportunity for this study, data analysis at the institutional

level is a limitation because of the unique contribution of the student body. To mitigate the limitations imposed from the use of institutional level data, the study controlled for student characteristics by including an indicator of social economic status in the regression equation.

An additional limitation to the study was the utilization of secondary data. This study utilized the Integrated Postsecondary Education Data System (IPEDS); therefore, limiting the availability of variables in the dataset. The data are self-reported by institutions which potentially threatens validity at a level in which the researcher has no control. By utilizing secondary data, the study also made assumptions regarding relationships among variables without direct involvement in the development of the data which could lead to misinterpretation of association. The researcher's plan to mitigate the limitation included choosing publicly utilized final released data in accordance to examining and verifying data downloads numerous times.

A third limitation of the study was the potential changes in institutional policies and practices resulting from the use of historical data. Student aid, institutional quality, and budget allocation practices change with institutional goals and may not reflect current practice (s). The researcher partially mitigated the limitation by utilizing the most recent retroactive publicly archived dataset.

Delimitations account for the characteristics which limit the boundaries of the population, sample, and focus of the study (Simon, 2011). This study is restricted to Carnegie classified, nonprofit, postsecondary four-year institutions only; selected as the most consistent criteria impacting college attainment (Mayhew et al., 2016).

Furthermore, students who successfully transfer to four-year institutions are as likely to complete college as similar students at four-year institutions (Mayhew et al., 2016). As a result, the researcher's decision to only include four-year institutions removes the impact of the complexity of transfers systems on student performance. This, in turn, has a significant influence on differences in completion rates among classifications (Mayhew et al., 2016).

Finally, the data is limited to institutions who are eligible to participate in federal student aid programs authorized under the Higher Education Act. The researcher's decision to include only Title IV eligible institutions ensure availability of data for accredited institutions authorized under Section 153 of the Education Sciences Reform Act of 2002 (P. L. 107-279) and consistency in enrollment reporting, academic calendar, accounting practices, and standards for degrees conferred.

Definition of Terms

Graduation Rate – For the purpose of this study, six-year graduation rate – bachelor's degree within 150% of normal time will serve as the proxy variable for graduation rate. 6-year graduation rate – bachelor's degree within 150% of normal time will include the number of students from the adjusted bachelor's degree-seeking cohort, who completed a bachelor's degree within 150 percent of normal time (6-years) divided by the adjusted cohort, which is the revised cohort minus exclusions as reported by the institution as of 150 percent of normal time. (6-years) (IPEDS, 2017). Graduation rates are required for disclosure and/or reporting purposes under Student Right-to-Know Act.

Institutional Expenditures – The proxy variables for institutional expenditures include institutional commitments in student services, instructional services, and institutional and academic support (IPEDS, 2017). For the purpose of this study, student services will include “admissions, registrar offices, and services whose primary purpose is to contribute to the student’s emotional and physical well-being, intellectual, cultural, and social development outside the context of the formal instructional program” (U.S. Department of Education, 2017, p. 26). Units include Student Services Administration, Social and Cultural Development, Counseling and Career Guidance, Financial Aid Administration, Student Admissions, Student Records, Student Health Services (IPEDS, 2017). Academic services include services directly related to the daily operations of educating students directly such as faculty salaries and support (IPEDS, 2017). In this study, institutional support include day-to-day “operational support of the institution, with expenses in general administrative services, central executive-level activities concerned with management and long-range planning, legal and fiscal operations, space management, employee personnel and records, logistical services such as purchasing and printing, and public relations and development, and information technology” expenses related to institutional support activities (U.S. Department of Education, 2017, p. 15). Academic support represents support services for the institution’s primary missions: instruction, research, and public service (e. g. Libraries, Museums and Galleries, Educational Media Services, Academic Computing Services, Ancillary Support, Academic Administration, Academic Personnel Development, Course and Curriculum Development) (IPEDS, 2017).

Institutionally Funded Student Aid – Institutional scholarships and fellowships will serve as the proxy for institutionally funded student aid. Institutional scholarships and fellowships will include student financial aid “granted and funded by the institution and/or individual departments within the institution, (i.e., instruction, research, public service) that may contribute indirectly to the enhancement of these programs. Includes scholarships targeted to certain individuals (e.g., based on state of residence, major field of study, athletic team participation) for which the institution designates the recipient” (U.S. Department of Education, 2017, p. 14).

Institutional Resources –Institutional resources include human, financial, technical, facilities, and other resources necessary to achieve an institution’s mission and goals (Hamrick et al., 2004). In this study, endowment assets and tuition revenue serve as proxy variables for resources. Endowment assets are considered “gross investments of endowment funds, term endowment funds, and funds functioning as endowment for the institution and any of its foundations and other affiliated organizations” (U.S. Department of Education, 2017, p. 9). Tuition revenue represents the inflow of funds resulting from the “amount of money charged to students for instructional services, and may be charged per term, per course, or per credit ” (U.S. Department of Education, 2017, p. 27)

Institutional Selectivity –Selectivity, percent of undergraduate students awarded Pell grants and student-to-faculty ration serve as proxies on behalf of institutional selectivity. Selectivity presents an institutional ratio used to measure competitive admission criteria, Selectivity presents an institutional ratio used to measure competitive admission criteria, low admittance rates, and the prestige garnered from achievements of their alumni

(Barron's Index, 2017). Percent of eligible undergraduates awarded Pell grant represents the population of students with federal demonstrated financial need to help meet education expenses. Student-to-faculty ratio will be derived from the ratio of FTE students to FTE instructional staff, (i. e., students divided by staff) (IPEDS, 2017).

Structural Characteristics – The proxy variables for structural characteristics include institutional control (public or private), Carnegie classification (Baccalaureate, Doctoral/Research), and student demographics (gender and racial identity) (R. Chen, 2012). Institutional control is considered a “classification of whether an institution is operated by publicly elected or appointed officials (public control) or by privately elected or appointed officials and derives its major source of funds from private sources (private control)” (U.S. Department of Education, 2017, p. 7). Carnegie classification will be used as a “classification coding structure developed by the Andrew W. Carnegie Foundation for the Advancement of Teaching. The Carnegie classification categorizes institutions as: Doctoral/Research Universities (Extensive/ Intensive), Master's Colleges and Universities I and II, Baccalaureate Colleges-Liberal Arts, Baccalaureate Colleges-General, Baccalaureate/Associate's Colleges, Associate's Colleges, Specialized Institutions, and Tribal Colleges and Universities” (IPEDS, 2017, p. 6). Gender will be defined as a socially constructed definition of women and men. Racial identify will be utilized to describe groups to which individuals belong, identify with, or belong in the eyes of the community. The category does not denote scientific definitions, are self-reported, and are used to categorize U. S. citizens, resident aliens, and other eligible non-citizens (IPEDS, 2017).

Summary

College and universities continue to face a wide variety of difficult challenges including changing demographics, increased sensitivity to tuition costs, and challenges with student attrition. With graduation rates used as indicators of academic quality or the effect of attending an institution on outcomes, institutions have shifted focus from enrollment to retention and outcomes as institutional success strategies. Empirical evidence suggests student attrition is a product of inputs from elements of both the student and the institution (Bailey and Xu, 2012; Berger and Milem, 2000; Pascarella and Terenzini, 2005). Furthermore, college and universities need to critically understand the relationship between institutional factors as well as how those factors interact with institutional characteristics in an effort to create and sustain environments which foster student success. As a result, a need exists to understand what, if any, institutional factors are predictive of institutional completion rates (Pascarella and Terenzini, 2005; Paul Attewell, Scott Heil, and Liza Reisel, 2011; Titus, 2006).

This research contributes to the college affect knowledge base by investigating a combination of institutional factors and behaviors such as tuition discounting investments and the influence on graduation rates as a sustainability initiative. Higher education governing boards and administrative leadership could potentially utilize the results of this study to make policy changes in student support or characteristic adjustments at the institutional level that will support an increase in degree productivity, revenue growth, and ensure institutional sustainability.

CHAPTER 2

REVIEW OF THE LITERATURE

Degree attainment measured by college graduation rates tell an important story about the educational experience at an institution and is often used as an overall measure of college performance (Bailey and Xu, 2012). The higher education accountability movement has refocused efforts from traditional measures of inputs and processes to outcomes of institutional activities (Shin, 2010). Using graduation rates as a measure of performance often satisfies the need for accountability at the institutional level, and therefore provides substantial information to institutions, students, and policymakers which can be widely measured and utilized across multiple organizations (Bailey and Xu, 2012). Critics of outcome-based accountability measures debate the likelihood of variations in student outcomes being informative regarding potential institutional influence on student success. However, research suggests variations in outcomes could also reflect differences in the students who attend specific institutions as well as differences in resources, and as a result may be a poor indicator of academic quality (Bailey and Xu, 2012; Executive Office of the President of the United States, 2017). The research literature related to measuring the potential institutional impact on student outcomes indicates widespread challenges regarding accurately estimating the school's contribution to student success (Executive Office of the President of the United States, 2017).

Most importantly, omitted variables that are important determinants of outcomes may hinder the ability to control for differences in the types of students that enroll (Bailey and Xu, 2012; Executive Office of the President of the United States, 2017). Despite widespread adoption of graduation rates as an indicator of institutional quality and also used to allocate research funds to institutions, the effectiveness of accountability measures on institutional completion rates has been questioned (Shin, 2010). While Martinez and Nilson (2006) identify influence to some degree, research suggests more often performance-based accountability regulation and measures are not successful in promoting institutional performance (Huisman and Currie, 2004; Shin, 2010; Volkwein and Tandberg, 2008). Umbricht, Fernandez, and Ortagus (2015) argue rewarding institutions with higher graduation rates may lead to a negative system of enrollment incentives, which ultimately disrupts equity standards. Although accountability measures may prove unsuccessful in influencing graduation rates, the ineffectiveness are considerably more closely related to the inability to design the components of accountability reform for higher education institutions (Shin, 2010).

Traditional studies focused on measuring college and university educational quality utilized various methods, including individual-level models of casual impact, school level peer matching, and aggregate school level (Executive Office of the President of the United States, 2017). Studies using individual-level models of casual impact are used to control for the influence of the student, while the school level peer matching models groups specific institutions to compare outcomes within groups. (Executive Office of the President of the United States, 2017). The most widely used method for

evaluating college outcomes utilizes aggregate institutional-level averaged data, and largely assumes student characteristics are uncorrelated with the institution in which students enroll (Executive Office of the President of the United States, 2017). In an effort to address challenges of traditional studies examining the institutional influence on graduation rates, researchers suggest developing models to adjust for student characteristics as well as institutional level resources (Bailey and Xu, 2012). Researchers have raised questions concerning different techniques used to measure performance which creates different results, and do not assist policymakers and administrators in understanding if outcomes are related to a better-prepared student or the institution's practice that influences student outcomes (Bailey and Xu, 2012; Scott, Bailey, and Kienzl, 2006). As such, the argument for utilizing input-adjusted graduation rates has gained attention with higher education researchers interested in understanding the institutional influence on student outcomes (Bailey and Xu, 2012).

Conceptual Frameworks Explaining Outcomes

Most research in college attainment conceptually focuses specifically on the academic ability of the student. Additionally, more well-known studies examine the student context further by focusing on the social and academic integration of the student within the institution and preventing factors that trigger student departure (Tinto, 1975, 1993). As a result, Tinto (2008) also identifies institutional commitment as a condition for success specifically for low-income students. However, as the evolution of literature surrounding college impact continues, an equal amount of focus has been placed on understanding how institutional factors influence completion rates,

(Berger and Milem, 2000; Tinto, 2008; Titus, 2004b; Walker II, 2016). As such, college impact research is viewed through several conceptual frameworks, which look at varying degrees of institutional, student, or combinations of influence on overall college attainment.

Most college impact research is conceptually developed with roots within the student attrition frameworks (Titus, 2004b). In as early as 1984, Astin established a theory which provides a framework for understanding how college affects students (Astin, 1984). Astin's Theory of Student Involvement discusses the level of student physical and emotional energy that a student applies to the educational experience which interacts with institutional environmental characteristics and potentially influences persistence (Astin, 1984).



Figure 1. Astin's Theory of Student Involvement. The model considers the physical and psychological effort and engagement a student devotes to the academic experience critical to student outcomes. Adapted from "How college affects students: 21st century evidence that higher education works", by M. J. Mayhew, A. N. Rockenbach, N. A. Bowman, T. A. D. Seifert, G. C. Wolniak, E. T. Pascarella, and P. T. Terenzini, 2016, p. 2. Copyright 2016 by Wiley.

Figure 1 represents an example of a graphical representation of Astin's framework focusing on the relationship between inputs, environments, and outputs, and does not address the input-output relationship (Astin, 1984). Inputs represent a continuum of policies and programs at the institutional level, whereas outputs represent different types of achievement measures (Astin, 1984). The theory makes two assumptions that are important to the college impact literature; achievement is related to the quantity of involvement, and the effectiveness of any policy is related to the increase in student involvement related to the policy (Astin, 1984). Based upon Astin's pedagogy, student involvement explains how educational programs and policies translate into student achievement which could be used to design more effective learning environments (Astin, 1984).

Astin theorizes student involvement to explain how educational environments influence student outcomes whereas Berger and Milem (2000) conceptualize the student experience as the critical link between organizational behavior, characteristics, and student outcomes. As an extension of traditional models, Berger and Milem include student and institutional characteristics that are independent of one another. The Berger and Milem (2000) model of institutional impact was designed to explain how organizational characteristics and behavior affect the types of students who attend specific institutions, which influence social interactions and perceptual aspects of the student experience, and ultimately directly affect student outcomes.

Student characteristics are an essential component of most college impact frameworks, notably because different types of students attend different institutions

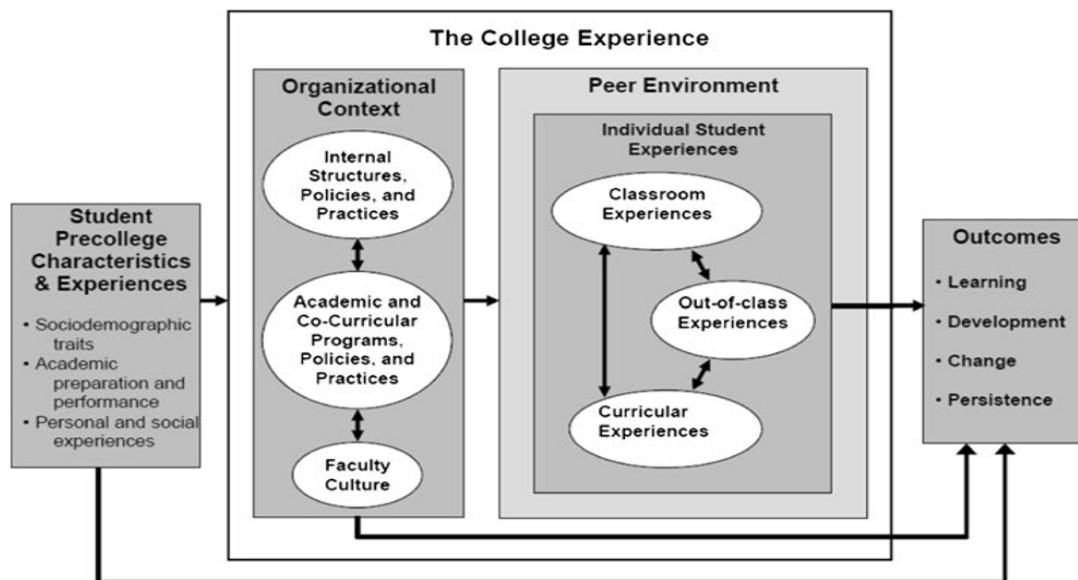
which indirectly impact outcomes (Astin, 1977; Berger and Milem, 2000; Pascarella and Terenzini, 1991; Ro et al., 2013). As a result, it is critical to know as much about the student population as possible; including factors of gender, race/ethnicity, family income, SAT scores, and area of study (Berger and Milem, 2000). Much of the literature on student outcomes confirms student characteristics are important to college impact. However, institutional characteristics and behavior are an equally important aspect of influencing student outcomes (Berger and Milem, 2000).

Structural and demographic characteristics such as student body size, selectivity, control, and location of an institution tell an important story of the students, mission, and values, and influence campus environments for students (Astin, 1977). Structural and demographic factors of institutions also affect student involvement in academic and social sub-systems, which also support Astin's (1984) framework that utilizes student involvement as a driver for student outcomes, and connects the concepts of social and academic experiences to the notion of social and academic integration (Berger and Milem, 2000; Titus, 2004b). According to Berger and Milem (2000), organizational behavior is defined as "the daily patterns of functioning and decision making within an organization" (Berger and Milem, 2000, p. 274). Consequently, the interaction effect of organizational behavior at institutions, structural and demographic characteristics, and student characteristics provide a source of influence on the peer groups on campus.

Additionally, the model asserts student experience can be measured by both behaviors and perceptions of social, academic, and functional aspects of the environment (Titus, 2004b). Central to the model, behavioral and perceptual experiences

have the most effect on outcomes and factors that measure student experience and are critical to the framework. While Berger and Milem (2000) provide a theoretically sound framework, it remains largely untested (Cragg, 2009; Titus, 2004b). As a result, critics note the model is relatively abstract and provides limited actionable guidance to administrators regarding focus areas to likely increase educational effectiveness at institutions (Ro et al., 2013).

Although similar in nature with the components of Berger and Milem (2000), and having roots in multiple disciplines, the model avoids the traditional conceptual isolation found in research on college effects (Terenzini and Reason, 2005). Terenzini and Reason (2005) propose much clearer and specific components of organizational behavior, which is significantly more proximal to the influence of student experience and therefore outcomes. The proposed factors are those in which institutions have some programmatic or policy control in shaping student persistence (Terenzini and Reason, 2005). As such, the institutional effect is more a function of what an institution does, more than who they are (Terenzini and Reason, 2005).



*Figure 2. Conceptual Model of College Impact on Student Outcomes. Adapted from "Between-college effects on students reconsidered", by H. K. Ro, P.T. Terenzini, A. C. Yin, 2013, *Research in Higher Education*, 47(2), p. 149-, p. 6. Copyright 2013 by Springer Nature.*

Figure 2 displays a representation of the Terenzini and Reason (2005) college impact model attempting to identify aspects of an institution's internal organizational features such as structures, curricular configurations, budgetary and staffing issues, policies related to course sizes, and faculty classification which indirectly shape student's experiences (Terenzini and Reason, 2005). Under this model, organizational context exists in three relative domains: internal structures practices and policies, academic and co-curricular programs, policies, and practices; and the faculty culture (Terenzini and Reason, 2005).

Credited as targeting a more practical based application of institutional effectiveness for administrators, the model suggests specific components representative of internal operations have potentially greater analytical power in between-college effects analysis (Ro et al., 2013).

Between-College Effects Conceptual Framework

Pascarella and Terenzini (2005) offer a slightly different focused framework aimed at examining whether the kinds of institutions students attend affect educational attainment (see Figure 3). Utilizing Astin (1984) as a conceptual idea, the model compartmentalizes the educational environment into segments to examine the relationship between student outcomes (Mayhew et al., 2016). Characterized as “between college” effects, institutional factors such as control, type, selectivity, budget allocations, expenditures, and state allocations provide evidence in determining differential effects between institutions (Mayhew et al., 2016; Pascarella and Terenzini, 2005). Between-college effects attempts to explain how these categories of institutional factors work together to explain college and its effect on students (Mayhew et al., 2016). Despite institutional factors being of primary interest in the “between-college” effects model, student precollege characteristics must be controlled to minimize the selection effects, and students with varying levels of academic ability enroll in different kinds of institutions (Ro et al., 2013).

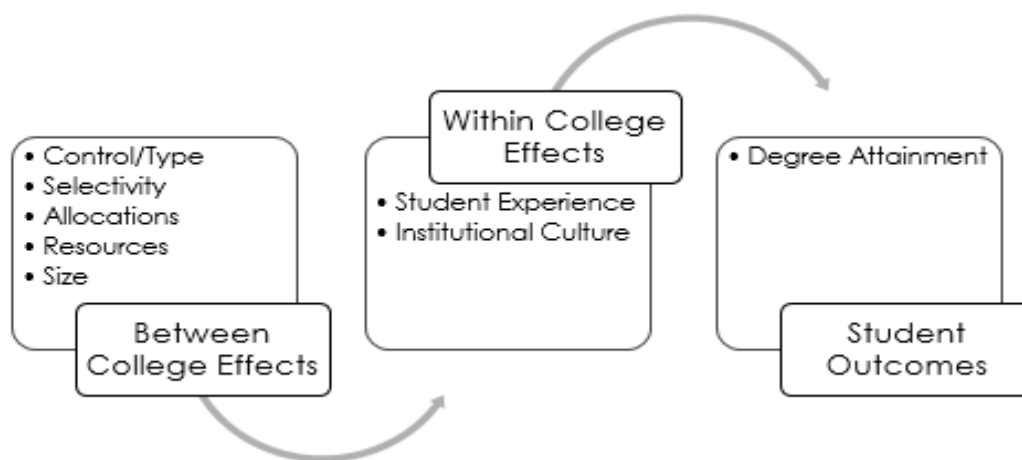


Figure 3. Conceptual Model of College Effects. The model details institutional factors that influence between-college and within-college experiences for students. Adapted from “How college affects students: A third decade of research”, by E. T. Pascarella, and P. T. Terenzini, 2005. Copyright 2005 by Wiley.

Pascarella and Terenzini (2005, 2016) provide a considerable amount of information regarding if and which institutional attributes predict graduation. The institutional characteristics central to the model are foundational and somewhat fluid based institutional goals and external forces. Critics of the model propose, institutional characteristics and elements of culture as factors are functionally removed from students, and overshadow subcultures and social and academic influences on educational attainment (Ro et al., 2013). As a result, institutions vary in important and overlooked ways that may affect student outcomes (Terenzini and Reason, 2005). As such, traditional institutional factors may not be the most significant factors in shaping outcomes or contain powerful predictors that minimize the effects of other institutional

traits, and critics suggest integrating “finer-grained” variables not commonly used (Ro et al., 2013, p. 255).

Structural and Demographical Factors and Graduation Rates

College effect studies have been recorded since the early 1990’s as interest and focus on how and if institutional characteristics influence graduation rates grew (Mayhew et al., 2016). As such, structural factors are often one of two types of institutional characteristics considered in many multi-institutional impact studies (Berger and Milem, 2000). The most consistent and most impactful finding supports the notion that attending a four-year college or university increases the likelihood of degree attainment, by as much as 15-25% (Lockwood Reynolds, 2012; Mayhew et al., 2016; Pascarella and Terenzini, 1991, 2005; Roksa, 2010). By itself, attending a four-year college or university may have the largest effect of any other institutional characteristic on student success as defined by completion rates (Mayhew et al., 2016). From 1972 to 2005, 49% of all first-year students attended a two-year college, and in 2007-08 enrollment increased another 15% resulting from the financial recession (Lockwood Reynolds, 2012; Melguizo, Kienzl, and Alfonso, 2011). Despite 19% of students attending two-year colleges will complete a bachelor’s degree, Ruska (2010) found a strong positive correlation between the distributions of enrollments in public education and student outcomes, and suggests the larger the ratio of students attending two-year colleges in a given state, the higher the probability of bachelor degree attainment at four-year institutions (Lockwood Reynolds, 2012). As a result, the finding implies four-year institutions may have higher graduation rates in states with large community college

sectors (Roksa, 2010). Interestingly, contemporary trends suggest Roksa's (2010) theory may be accurate. States such as California, Arizona, Texas, Illinois, and New York have slightly higher overall completion rates than states with a smaller community college presence (Goodwin, 2011; U.S. Department of Education, 2012). Contrary to historical evidence, Melguizo (2011) suggests starting at a two-year college does not necessarily reduce the likelihood of degree completion particularly for students who actually make an effort to transfer, transfer to a four-year institution with a large number of credits, and transfer within the sophomore or junior year (Mayhew et al., 2016). Furthermore, there has been little evidence of the long-term effects on income potential for students who begin at a two-year college and persists to four-year institutions once the degree is obtained (Miller, 2007).

Beyond the effects of attending a four-year institution, institutional control is also a significant factor influencing student persistence and subsequently degree attainment (R. Chen, 2012; D. Kim, 2007). In earlier years, public institutions had a clear mission of open access for underrepresented communities, offer lower tuition rates, and have little control over appropriations and tuition rates which drive operating revenue and ultimately the overall environment (Scott et al., 2006). However, in recent years the refocus of funding for public institutions has shifted to tuition revenue, and as a result forces students to consider future income to offset the cost of higher education as opposed to in-depth scholarship and inquiry (Newfield, 2016). In 2008-09, enrollment at public institutions began to increase significantly simultaneously with decreases in state support creating a massive debt crisis for students which threatens retention and

subsequently graduation rates (Dwyer, McCloud, and Hodson, 2012; NCES, 2017). Private institutions often charge higher tuition rates, offer smaller classes and more personal mentoring, have control over the tuition rates, generally offer institutional support, and utilize selectivity in the admission process which generates a better-prepared student and subsequent completion rates (Dwyer et al., 2012; Scott et al., 2006). Generally, private universities graduate noticeably more matriculating students (64 percent) than public (54.7 percent) institutions (DeAngelo, Franke, Hurtado, Pryor, and Tran, 2011; Ginder, Kelly-Reid, and Mann, 2017b). However, the overall empirical assessment of institutional control on completion rates are extremely inconsistent. Chen (2012), Franke (2012), Chen and St John (2011), and Scott et al., (2006) found no significant differences in completion rates for private and public institutions. DeAngelo et al., (2011) found some influence on the probability of completion within four years but no influence within six years. A finding which also applies to low-income students attending public and highly-selective institutions (DeAngelo et al., 2011). Scott et al., (2006) went further accounting for the differences in institutional resources and student populations, finding no significant difference in six-year graduation rates for public and private institutions. Yet, Titus (2004), Morrison (2012), Cohodes and Goodman (2012), and Dwyer et al., (2006) found a statistically significant relationship between control and graduation rates with private institutions producing more graduates across multiple variations of institutions and students, with much of the disparity explained by differences in student characteristics associated with the control type (DeAngelo et al., 2011; Scott et al., 2006).

With the racial composition changing in the country, and race identified as an explanatory variable in the probability of college completion, colleges and universities are expanding efforts to support underrepresented groups through graduation (J. P. K. Gross, Berry, and Reynolds, 2015; Lipka, 2013; Wall, 2007). Minority students continue to lag behind Caucasian peers in degree completion resulting in the need to investigate the effects of institutional diversity climate on student persistence (Hughes, 2012; Lipka, 2013; McGhee, 2011; Tate, 2017). Hurtado et al., (1999) describes diversity climate as an internal product of the college environment. Race relation theorists suggest increases in minority representation on campus may lead to conflict with members of majority group during resource shortages (Hurtado, Milem, Clayton-Pedersen, and Allen, 1999). Gelbgiser and Alon (2016) suggest the race gap in college completion occurs after matriculation and through the environments that the student encounters at the institution such as field of study particularly at elite institutions. Rhee (2008) suggests institutional characteristics matter but have differential effects on student persistence. Kim and Conrad (2006) found similar probabilities for completion rates for African-American students attending historically black college or university or a predominantly white institution. With no significant difference in the mean completion rates, Kim and Conrad (2006) further validate research claims suggesting high attrition rates at HBCUs are simply the result of high numbers of first-generation, low-income, Pell-eligible students (Gasman, 2013). Increasing diversity on campuses is associated with higher stop-out rates for minority students, but it is unknown why stop outs are more susceptible to the institutional context than other variables (Rhee, 2008).

Currently, nine states have active bans on affirmative action in college admissions, and little is known about the longer-term effects on graduation rates for minorities in those states (DeSilver, 2014; Hinrichs, 2014; Nittle, 2016). In Texas, with landmark legislation such as the Texas Top 10% Law aimed at racial equality, studies suggest affirmative action bans have actually increased the completion gap and decreased graduation rates for minority students by as much as four percent (Cortes, 2010). Alternatively, California's affirmative action ban increased minority completion rates by 4.35 percent, indicating certain schools are better at graduating a better-prepared student, while other schools are better at graduating less prepared students (Hotz, Arcidiacono, Coate, and Aucejo, 2013). Holtz et al. (2013) attributes an increase in completion rates to matching effects or efficient sorting of students with unique institutional factors that support individual student development. However, Hinrichs (2014) opposes that graduation rates only increase for minorities at selective institutions, and the increase in completion rates may be related to a changing demographic of students more so than the institutional characteristics.

Women represent approximately 57 percent of post-secondary matriculating students and outnumber men in every state in the country, while enrollment trends are expected to outpace men for many years to come (Conger and Dickson, 2017; National Center for Education Statistics (NCES), 2017; Wells, Seifert, Padgett, Park, and Umbach, 2011). Women are also enrolling in HBCUs at larger numbers, but more importantly are also more likely than men to graduate from these same institutions ("Factors critical to the access and success of black men in postsecondary education", 2014). In 1925, half

of all college students were attending public institutions and 55 percent of enrolled students were women (Goldin, Katz, and Kuziemko, 2006). The gender gap reversed and began to widen in favor of men in the 1930's, and graduation rates significantly increased in the 1940's and 1950's and leveled out (Goldin et al., 2006; Wells et al., 2011). The female advantage in degree attainment began in the 1950's driven in part by increases in the projected labor market and female completion rates have remained higher than that of males since that time (Goldin et al., 2006). Utilizing census data from 1940 to 2000, Goldin et al. (2006) could not explain the gender gap in degree completion for males but found 40 percent of the gender gap was associated with the combined impacts of test scores, grades, and math and sciences courses, which may positively affect completion rates. Palmer et. al. (2009) examines persistence for men, specifically at HBCUs and suggests more qualitative influences impact persistence, such as failure to utilize support systems, and problems with family life. Reynolds and Burge (2008) attribute the educational attainment gender gap to a growing gap in educational expectations mostly experienced by white students and suggest larger populations of male students have negative impacts on completion rates. Overall, Dynarski (2008) suggest women tend to be more receptive to offers of financial and academic support than men, and therefore benefit from institutional environments which support student success at higher rates (S. Dynarski, 2008). Graduation rates vary tremendously across institution type and size (Powell, Gilleland, and Pearson, 2012a; Ro et al., 2013). Although frequently used in college effect studies, size has been characterized as a weak predictor of overall student outcomes (Astin and Astin, 1992; Mayhew et al., 2016). Evidence suggests the influence

of size on graduation rates is more of an indirect effect on outcomes (Astin and Astin, 1992). Additionally, size is found to influence completion rates through short-run economies of scale, whereas larger institutions may provide more effective academic and support services (Ryan, 2004; Toutkoushian, 1999). Morrison (2012) suggests size does positively influence completion rates for public and private four-year institutions, while Li (2010) suggests size negatively affects completion rates. However, a number of studies suggest size has no correlation with graduation rates across institution types (C.-H. Chen, 2010; Cragg, 2009; Titus, 2006a).

The between-college framework's partial focus of potential differences in student outcomes found in institutional characteristics is crucial in understanding if the types of institutions students attend have a differential effect on student outcomes (Ro et al., 2013). As a result, the roles of institutional factors are of primary interest and essential for models studying college impact when controlling for student pre-college influences (Pascarella and Terenzini, 1991; Ro et al., 2013). Although of central interest, Pascarella and Terenzini (2005) concluded through their research that "no single institutional characteristics or set of characteristics has a consistent impact across outcomes, but statistically reliable between-college effects are apparent in certain outcomes" (Pascarella and Terenzini, 2005). Institutional characteristics have been criticized as being too distant from the student experience, while researchers invite the use of alternative institutional features not commonly used as potential powerful factors (Pascarella and Terenzini, 1991; Ro et al., 2013). Ro (2013) suggests traditional ways of examining between-college effects are flawed in variable selection and propose considering the

influence of institutional characteristics as an indirect influence on outcomes through the influence on the student experience which Pascarella and Terenzini (2005) indicate shape student outcomes.

Institutional Grants, Merit Aid, and Graduation Rates

There is a substantial amount of research surrounding the effects of institutional financial aid on postsecondary student access, persistence, and success, but a far less specifically on the relationship with graduation rates (Franke, 2012; D. Kim, 2007). As an additional influence on on-time degree attainment, the net cost of attending college, and the amount of institutional student aid award matter in student success (Raikes, Berling, and Davis, 2012). To offset the increasing cost of college for students, colleges spend large amounts of money on institutionally funded financial aid (Lee, 2016), reaching 50.6M in 2015-16 (The College Board, 2017). Students who withdraw voluntarily, do so for personal reasons such as insufficient financial aid, and even so, students who receive student aid are as likely to persist as other students with the strongest relationship being associated with grants and scholarships (Pascarella and Terenzini, 2005; Rhee, 2008). Of the research surrounding financial aid, there is little consensus on if and how aid influences completion (Alon, 2007; Singell and Stater, 2006). The goal of any institutional aid program should be to provide equal educational opportunities for students regardless of the financial ability to pay (Browning, 2013; D. Kim, 2007). As a result, financial aid is an important policy tool for maintaining post-secondary degree opportunities for low and middle-income students (Riegg, 2008). In recent years, institutions are moving toward providing student aid as a means to offset

costs for the middle class, compete for affluent families with the financial means to support education expenses, and attract academically gifted students which ultimately advances institutional mission and reputation (Browning, 2013). Empirical evidence suggests institutional aid policies could potentially further support stagnant graduation rates, and potentially change the way student aid influences student behavior (R. Chen and DesJardins, 2010; Singell and Stater, 2006). As a result, student aid is increasingly considered a crucial factor in the persistence process particularly for minority students (Alon, 2007; Franke, 2012; J. P. K. Gross et al., 2015; J. P. K. Gross, Hossler, Ziskin, and Berry, 2014; Hughes, 2012; D. Kim, 2007; B. T. Long, 2010; St. John, 2000).

When examining the effects of student aid on completion rates, it is critical to understand enrollment patterns associated with state and institutional aid which often flows to high-income students, and in turn affect access and attainment for low-income and students of color (Baum, 2007; Heller, 2011). Likewise, the blended effect of financial aid eligibility with the amount of aid also influences academic outcomes, although difficult to isolate (Alon, 2005, 2007). Understanding the blended effect of eligibility and degree attainment is difficult to isolate primarily because aid is awarded based on student characteristics that have unique effects on the probability of college enrollment and persistence to completion (S. M. Dynarski and Scott-Clayton, 2008). Alon (2005) notes the effect of aid on graduation may be related to a number of external factors, as well as being randomly selected into institutional aid eligibility. As a result, the challenge in measuring the impact of student aid on student persistence is related to the difficulty in dissecting financial need-based scholarships from those related directly

to the student's academic performance (Alon, 2007; Hossler, Ziskin, Gross, Kim, and Cekic, 2009).

As a consequence of inconsistent methodologies and data limitations concerning the study of student aid on completion rates, studies also suggest institutionally funded aid has little or no quantifiable impact on persistence or completion rates (Adelman, 2006; Alon, 2005). The difficulty in measuring the relationship is related to factors which support merit aid eligibility, are in fact the same factors that are components of student success, which also traditionally follow students from higher socioeconomic statuses (Alon, 2005). Endogeneity, which is used to describe internal forces of change sourced through omitted variable bias, creates additional challenges in measuring the impact on completion rates for institutions that require students to self-select into institutional funded scholarship programs, which is a major concern and weakness with research related to the effects of student aid on completion rate (Hossler et al., 2009; Riegg, 2008). As a result, the "interrelationship between aid eligibility and graduation mask the positive impact of financial aid on graduation" (Alon, 2005, p. 109).

Generally, studies indicate the effects of merit aid on student persistence are largely positive, may be limited to enrollment choice, or diminish after the first couple of years without controlling for institutional or student level variables (Avery and Hoxby, 2003; Franke, 2012; J. P. K. Gross et al., 2014; Herzog, 2005; Singell and Stater, 2006). Outside of the basic academic structure, students need to be able to afford continued enrollment. However, when considering the socioeconomic status of recipients, Gross et

al (2014) found low-income students are grossly underrepresented in merit-based financial support.

St. John (1997) found grant aid at private institutions is positively associated with persistence, considering the negative effect of students choosing a college based aid. In doing so, college costs become a controllable expense and may be related to a form of social integration that often occurs at private institutions (Paulsen and St. John, 1997).

Alon (2005) and Raikes, Berling, and Davis (2012) found a positive impact with the amount of student aid and completion, while Gross et al., (2015) and Avery and Hoxby (2003) found named scholarships had unquantifiable impact persistence above the dollar value of the institutional award. Singell and Stater (2006) found merit aid positively influenced graduation rates at large public universities mainly through the academic ability of the type of student that enroll based on tuition discount. Considering the impact on retention, Chen (2011) found a negative relationship with the amount of aid received and drop out, noting the impact of financial aid not only supported retention but also narrows the gap between low socioeconomic status students and their higher socioeconomic peers. Similarly, at public institutions, Gross et al., (2014) finds a \$1,000 increase in merit-based aid is associated with a 6.5 percent reduction in the odds of departure per student. Singell and Stater (2006) finds that same \$1,000 increase in merit based aid per year associated with an increase in the probability of degree completion by six percentage points not considering student pre-college characteristics. With the influence of precollege considered, the effect becomes zero, supporting the notation that merit-based aid programs only increase completion rates through the quality of student

aid packages attract (Singell and Stater, 2006). Singell and Stater (2006) conclude, although student aid yields positive effects on enrollment, there is no effect on graduation rates for four-year public institutions. Franke (2012) found similar insignificant results from state and institutional merit aid programs at both public and private institutions. Somers (1995) found merit aid negatively associated with persistence specifically for commuter institutions and generalizes merit aid may be used to effectively attract and enroll students who are more likely to persist but will not necessarily retain them. As a result, student aid does make a difference in enrollment and persistence through degree completion, however, the impact is not is not the same (St. John, 2000).

Historically, very little research on the effect of need-based grants on completion and those studies that have been completed are largely inconsistent (Castleman and Terry, 2016). Customarily used to promote equality in college outcomes, the effectiveness of need-based financial aid is also being considered (Goldrick-Rab et al., 2016). Plagued by the same challenges as merit-based aid programs, isolating the effect of need-based aid from factors that correlate with student success and barriers to degree attainment commonly found with need-based eligibility challenge the validity of results in both directions (Alon, 2007; Castleman and Terry, 2016).

Proponents of need-based aid believe it is an effective tool to contribute to four-year bachelor's persistence and degree completion (Castleman and Terry, 2016; Franke, 2012; Goldrick-Rab et al., 2016). Increases in grant often replace traditional student loans which beyond \$10,000 have a negative effect on the probability of graduation at public institutions (Dwyer et al., 2012). Alon (2007) found the negative effects of need-

based eligibility masked by the positive influence of financial aid and concluded each additional \$1,000 grant increases the probability of graduation by .015. Franke (2012) found the same additional \$1,000 in institutional need-based grant, increased the probability of completion within six-years by 1.31 to 1.62 percent. Studies suggest students are more responsive to grant overall, however stronger effects on persistence are seen primarily in African American, Hispanic, and low-income students (Alon, 2007; Franke, 2012; Hu and St. John, 2001; Paulsen and St. John, 2002). Grant aid is needed because “an additional \$1,000 in loans has a negative effect for black students, as compared to a slight positive effect for white students” (D. Kim, 2007, p. 90).

St. John (1999) found the state of Washington's need-based grant program was effective in one year of a three-year study in increasing the probability of persistence to degree completion. In addition, St. John (1999) found the positive impact specifically for minorities. More recently, Georgia State University received a 200 percent return on investment (ROI) in tuition revenue over the life of the institutionally funded Pather Retention Grant (Association of Public and Land-grant Universities (APLU) and the Coalition of Urban Serving Universities, 2016). The institution reports, 82 percent of recipients of the Pather Grant graduate or are still enrolled 12-months after receiving the institutionally funded grant (Abdul-Alim, 2016). However, skeptics caution the claim that the grant has a direct impact on completion rates without more longitudinal data (Abdul-Alim, 2016). Likewise, in a landmark study of the state of Washington, St. John (1999) found overall increases in need-based aid were positively associated with persistence and a reduction in the persistence gap for minority students. A study of

thirteen Wisconsin public institutions paralleled results found in Washington for students from low-income families (Goldrick-Rab et al., 2016). In a Wisconsin study, \$3,500 grant increased on-time degree completion by 29 percent, and Florida increased six-year completion rates by 22 percent at \$1,300 need-based aid eligibility (Goldrick-Rab et al., 2016).

Widespread indoctrinated evidence surrounding a direct impact on completion rates for need-based aid may be related to the intersection of eligibility and factors of student success. Studies suggest need-based aid eligibility decreases the probability of graduation by .152 (Alon, 2007). As such, Alon (2005) relates much of the lack of evidence supporting an impact on completion rates to the existing relationship of need-based aid eligibility and the probability of graduating which ultimately masks correlations. Attewell, Heil, and Reisel, (2011) found students who specifically begin at four-year institutions, the amount of aid has no impact on completion rates (Attewell et al., 2011). Although Singell and Stater (2006) found a three percent increase in graduation rates associated with \$1,000 of need-based aid, conclusions note the increase is not directly related to the amount of aid but more the student's ability to choose a well-matched institution that supports the student culturally. Likewise, in a multi-year cohort study of a public research university, student persistence from year one to two is related more to college readiness and ability to pass college math than any form of financial aid (Herzog, 2005). Opponents of need-based aid, as a completion rate tool, suggest need-based should be used as an incentive to award behavior that supports on-time degree completion (Hanover Research, 2014). As such, Ball State University implemented a

\$500 scholarship for on-time completion and realized large gains in institutional graduation rates (Hanover Research, 2014).

Although studied inconsistently, empirical research data suggests financial aid has varying degrees of impact in influencing student persistence particularly across racial groups (R. Chen and DesJardins, 2010; St. John, 2000). Specifically for Historically Black Colleges and Universities (HBCUs), college cost is a critical factor influencing persistence, therefore instituting financial aid as a direct and positive effect on graduation rates (Cheng, Suwanakul, and Ruohan Wu, 2015). Alon (2007) found similar results for minority students attending elite institutions, specifically finding " minority students' persistence is found to be more sensitive to the number of financial resources they secure, especially in the form of grants and scholarships than that of their white counterparts" (Alon, 2007). Overall, institutional aid contributes positively to graduation rates; except at highly selective institutions (Gansemer-Topf and Schuh, 2005). Trajectory gaps in college completion for racial groups could be lessened by improving access to student aid (R. Chen and DesJardins, 2010). As a result, the national investment in institutional student aid warrants a thorough investigation of the impact on stagnant completion rates (J. P. K. Gross et al., 2014; Singell and Stater, 2006).

From a student support perspective, basic economic theory suggests financial aid in any fashion should support student persistence. When considering an institutional centered approach, unstrategized support of institutional aid could potentially threaten the overall financial health of an institution and therefore, counter impact any gain in completion rates. Tuition discount rate is a measure of the educational discount provided

to students and affects key measures of the institution's overall financial health (Seltzer, 2017b). Tuition discount rates reached an all-time high in 2016-17 having increased from 35.1 percent in 2006-07 to 44.2 percent (National Association of College and University Business Officers, 2016). Rising discount rates have translated into much slower growth in revenues for public and private institutions alike, primarily because endowments are not the primary funding source for student aid (National Association of College and University Business Officers, 2016). As tuition discount rates continue to increase, college and universities see less operating dollars from tuition which is used to administer educational services to students, often a sign of financial stress (Seltzer, 2017b). Browning (2013) found as institutions become financially stable tuition discount rate increases in an effort to attract a higher academically qualified student. Likewise, financially unstable institutions increase discount rate to meet enrollment goals, institutions ultimately stretch financial resources which could affect student support services (Browning, 2013). Managing rising discount rates remains a challenge while maintaining enrollment, retaining students through completion, and remaining financially viable in an effort to remain committed to institutional mission has been a great challenge for some institutions (Deegan and Deegan Jr., 2014). “Financial aid should affect graduation because it reduces the cost of persistence” (Alon, 2007). As a result, institutional financial aid policies should be considered from both the institutional mission to serve students, as well as the long term financial health because both ultimately affect the landscape for student success (Baum, 2010).

Institutional Resources, Expenditures, and Graduation Rates

Using graduation rates as an indication of institutional effectiveness, it is unclear if outcomes are due to academically superior students, resources, or institutional practices that influence outcomes. Multi-institutional comparisons of completion rates must consider the resources available to the institution, as well as the students who attend (Scott et al., 2006). As such, an institution's resources are also a valuable component in an institutional evaluation and are considered an appropriate proxy for college assets and institutional policy (Bailey and Xu, 2012; Scott et al., 2006). As a result, the appropriate allocation of institutional resources is critically important in the continuation of educational services (Pascarella and Terenzini, 2005). Likewise, leaders must justify institutional expenses needed to generate outcomes, or graduate students (Powell et al., 2012a). The Iron Triangle (National Center for Public Policy and Higher Education, 2008) notes college presidents may believe more spending is needed to increase effectiveness. Despite the importance of the overall evaluation of student learning, few institutions understand the relationship between expenditures and outcomes (Bowen, 1980).

Without a real understanding of the potential influence of resources and expenditures on completion rates based on institutional characteristics, administrators may increase spending with anticipation of similar increases in graduation rates (Hamrick et al., 2004; Powell et al., 2012a; Titus, 2006c). Colleges and universities receive multiple forms of revenue including tuition, state appropriations and grants, private gifts, investment returns, and auxiliary enterprises, which are typically used to

fund the educational mission. Overall revenues increased slightly over a ten year period for both public and private colleges and universities despite unsteady and often declining trends (Desrochers and Hurlburt, 2016a). In 2013, average revenues per FTE had a one year reported change of -.6 percent for public bachelor's institutions, and .7 percent for private institutions, while ten year changes stabilize around 2.9 percent for public bachelor's and 11.2 percent for private colleges and universities (Desrochers and Hurlburt, 2016a). As revenue generating strategies, roughly 28 percent of business officers at private institutions report implementing strategies centered on increasing enrollment, 27 percent use financial aid strategies, 24 percent implement tuition pricing strategies, and 6 percent of did not implement new strategies in FY15 (National Association of College and University Business Officers, 2015). As such, private institution business officers believe long term retention strategies will ultimately improve the overall financial stability of the institution (Jaschik and Lederman, 2017).

In addition to using graduation rates as an indication of institutional effectiveness institutional resources and budget allocations have also been tied to institutional accountability. As a result, there is a need to understand if the financial context of an institution impacts student completion rates (Turner, 2004). Titus (2006b) controlling for differences in student and institutional characteristics found a dependent relationship between completion rates and the extent to which an institution relies on tuition as a primary source of income. Through the use of a multilevel persistence model, Titus (2006b) discovered when adding institutional variables that reflect revenue and expense policies the variance in differences in completion rates for institutions increased from 26

to 36 percent. Particularly for low-income students who are most often enrolled in institutions with minimal financial resources, an institution resource dependence is a critical factor in supporting student success (Titus, 2006b). This finding is consistent with the strategic direction of university business officers who note, increased reliance on tuition as a primary source of revenue will force institutions to continue to focus on increasing enrollment and retention as a means to generate additional revenue (Jaschik and Lederman, 2017). As a result, institutional practices in financial stability support prior college impact research suggesting, persistence is positively influenced by institutional revenue and total expenses, and negatively associated with expense patterns (Titus, 2006c).

As the demographics of higher education continue to shift, prior research regarding the influence of college costs on persistence decisions by socioeconomic status remains important (Paulsen and St. John, 2002). Tuition costs when considered a factor in choice for middle and upper income students promote persistence and therefore completion, while it negatively impacts persistence to completion for low-income students (Paulsen and St. John, 2002). As a result, institutions may also influence student persistence through cost control measures such as enrollment levels, research level, and faculty characteristics (Toutkoushian, 1999).

Overall, research on institutional expenditures largely supports a positive influence on completion rates at four-year institutions (Mayhew et al., 2016; Powell et al., 2012a; Walker II, 2016; Webber, 2012; Webber and Ehrenberg, 2010). Despite a recession in 2008, overall spending allocations for both public and private institutions

rose in 2013, the largest increase since 2008 (Desrochers and Hurlburt, 2016a). However in 2013, institutions were still heavily relying on tuition revenue to fund a majority of education related spending, and therefore maintained resource ratios of 62 percent from tuition revenue, 37 percent from subsidies from the public, and 69 percent and 30 percent for privates (Desrochers and Hurlburt, 2016a). As a result, institutional budgets may be used as a proxy for broader institutional initiatives and goals that support and supplant student learning. In 2013, education related spending per student rose approximately 1 percent over five years for public bachelor's level institutions (Desrochers and Hurlburt, 2016b, 2016b). While private bachelor's institutions saw increases year over year, spending remained 2 percent lower than five years prior (Desrochers and Hurlburt, 2016a). Although spending remains relatively stable in recent years, increases in education and related spending have seen significant ten year changes (Desrochers and Hurlburt, 2016a).

Student services grew 11.1 percent at public and 21.8 percent at private institutions over ten years. Likewise, academic support saw similar increases at 9.5 percent and 5 percent and institutional support at 11.2 percent and 2.9 percent respectively (Desrochers and Hurlburt, 2016a). To understand if financial allocations are merely a component of the business of higher education or have a significant impact on the student experience, a careful dissection of the intended role of the units along with the direct impact on persistence is needed.

Powell et al., (2012) took a different approach in evaluating institutional effectiveness, by concentrating on the process through which financial resources translate

into degrees awarded. The Benchmark Model of Institutional Efficiency and Effectiveness (BMIEE) found expenditures and institutional characteristics are predictive of effectiveness, while some institutions are more effective based on specific characteristics (Powell et al., 2012a). Powell et al. (2012) through BMIEE using institution size, Carnegie classification, and percent of students receiving federal aid can identify optimal funding levels per FTE for instruction, academic support, and student services. For baccalaureate liberal arts institutions with enrollments less than 5,000, and less than 50 percent of students receiving federal aid, the model suggests to optimize effectiveness, funding allocations per FTE should equate to \$12,341 in instruction, \$2,082 in academic support, and \$4,827 for student services (Powell et al., 2012a). Powell et al., (2012) findings support Titus (2006b) who has proven student persistence is further supported by institutions with higher total expenditures per FTE.

Similarly, Hambrick et al., (2004) explored the predictive ability of an institution's resource allocation policy directly on graduation rates. The Hambrick et al., (2004) model explores a range of administrative service units from student affairs, instruction, library, physical plant, institutional support, academic support, library, and educational and general. Considering the funding allocations of the service units within the study, instructional and academic support were significantly related to completion rates, accounting for 21 percent and 34 percent of the variance in graduation rates when evaluated as individual predictors (Hamrick et al., 2004). Important to note, a major limitation of expenditure analysis is the inability to compare at the detail level due to the

nature of differences in organizational structure, thus making the nature of the impact unclear (Hamrick et al., 2004).

Webber (2012) attempts to mitigate this limitation by exploring individual-level data from public institutions in the state of Ohio. Through the use of a regression model to assume the probability of post-secondary completion, is the product of institutional inputs, and institutional and student characteristics, Webber (2012) found student service expenditures have a larger impact on completion rates for students with low SAT/ACT scores, while instructional expenditures have greater impacts on students in scientific programs of study (Webber, 2012). Webber's (2012) individualized study supports previous research suggesting non-instructional expenditures have higher effects for students, including lower dropout rates specifically at institutions with lower entrance test scores and a significant percentage of students receiving Pell grants (R. Chen, 2012; Webber and Ehrenberg, 2010). College impact literature also suggests differences in institutional resources for minority serving and predominately white institutions, specifically HBCUs who enroll an overwhelming less affluent student than traditional institutions (M. M. Kim and Conrad, 2006). Minority serving institutions and institutions serving minority students who report quantitative improvements in retention and completion rates made investments in student services and aligned such programs with academic programs (Benítez and Dearo, 2004; Swail, 2004). As a result, research suggests institutions should consider shifting funding into student services, which support Astin (1993) belief that investment in student services support social development,

promote persistence, and is more critical to the educational environment than traditional instructional programs.

Powell et al., (2012), Hambrick et al., (2004), Ryan (2004), and Coupet (2013) also found positive and significant effects of instructional and academic support expenditures on cohort graduation rates. Specifically, instructional expenditures having one of the highest degrees of change in graduation rates ($b = .281$) indicates for each percent increase in instructional expenses, the institution can expect approximately .28% change in the cohort graduation rate (Ryan, 2004). In fact, Raikes et al., (2012) found instructional expenditures to be the only significant allocation contributor to degree completion at four-year institutions, although not as critical in on-time degree completion as other financial considerations. Similarly, using unconditional quantile regression, Webber and Ehrenberg (2010) predicts the effect of increasing instructional allocations by \$100 per FTE, increases completion rates by .2 percentage points for institutions within the 15th and 80th percentile of graduation rates, and decreases for institutions with rates outside of that quartile. Webber and Ehrenberg (2010) predict the same \$100 increase, although in student service expenditures, would equate to a .6 percentage point increase in graduation rate for institutions with completion rates below 50 percent. Translated into measurable effects, a \$100 reallocation from instructional to student services could increase the institutional graduation rate by more than .5 percent for institutions in the lower 20 percent (Webber and Ehrenberg, 2010). In a separate study, Ehrenberg and Webber (2010) confirm empirical evidence supporting the predictive influence of funding levels for instructional and student services expenditures

on completion rates for four-year institutions. As with prior studies, the impact on graduation rates related to increases in funding levels for student services activities is most impactful at institutions that have lower test scores, higher levels of Pell grants, and lower existing graduation rates (Ehrenberg and Webber, 2010). Ehrenberg and Webber (2010) took a similar reallocation approach to Webber and Ehrenberg (2010) by simulating the impact of \$250 per FTE from instruction to student services and realized an overall .3 percent increase. Although the average increase is minimal, the effect is differentiated across institution types based on characteristics. Institutions with low entrance exams may expect a .8 percent increase compared to a .1 percent increase for institutions with high entrance exams (Ehrenberg and Webber, 2010). Likewise, institutions with high levels of Pell eligible students may expect a .5 percent increase, compared to .2 for institutions with low levels of Pell expenditures (Ehrenberg and Webber, 2010). Finally, the Ehrenberg and Webber (2010) model predicts .7 and 1.4 percent increases in graduation rates for institutions below the 50th percentile.

Considering the impact of spending on instruction differently, Toutkoushian (1999) using a cost function model to compare actual and predicted undergraduate instruction costs per student at four-year institutions, found expenditures per student minimized at enrollment levels of approximately 23,000. The Toutkoushian (1999) model also suggests an increase in faculty/student ratio could reduce costs by \$170, while a \$100 increase in faculty compensation would increase per student costs by \$20.

The research surrounding administrative expense has not been as positive as other functional allocation spending policies. Schools generally agree the growth in

administration cost is at least in part due to additional regulatory burden institutions routinely face (Carlson, 2014). The Task Force on Federal Regulation of Higher Education (2015) revealed the number of positions with compliance responsibilities has increased by 33 percent, supporting schools claims that extensive and unnecessary government regulation is one of many potential factors of overall cost increases (Immerwahr et al., 2008; Marcus, 2015). Using student and institutional level data, Titus (2006c) found administrative expense allocations associated with significantly lower odds of student persistence at four-year institutions, considering other predictors of persistence. Correlation analysis further clarifies a relationship with grants and contracts and instructions, and suggests institutions "with a higher percent of revenues from grants and contracts and a lower percent of expenditures on instruction will most likely have a higher percentage of expenditures on administration" (Titus, 2006c, p. 368). Ryan (2004) found similarities to Hamrick et al., (2004) and Powell et al., (2012), suggesting evidence surrounding institutional support is inconsistent.

Ryan (2004) denotes nonacademic overhead funded by institutional and student service expenditures have insignificant effects on graduation rates (Ryan, 2004). Coupet (2013) discovered comparable results when minority-serving institutions such as HBCUs are examined. A production function estimation determined institutional support expenditures are insignificantly related to outcomes, however, have a significantly negative impact on graduation rates specifically at HBCUs, (Coupet, 2013). Coupet (2013) further quantifies funding impact by identifying an 8.74-point decrease in graduation rates associated with each one percent funding increase. Consequently, Scott

et al., (2006) suggest the insignificance of institutional support relates to the aggregate impact measured too vaguely to obtain empirical significance.

State allocations and appropriations are also a component of institutional resources. However, state based accountability measures do not parallel institutional influence, whereas performance based accountability does not significantly increase institutional performance (Shin, 2010). Shin (2010) examined public four-year institutions in states with performance-based accountability measures and found state factors influence institutional performance. As a result, state influence on institutional performance is strengthened through accountability measures well connected to institutional practices.

In summary, research surrounding the impact of resource and expense allocations suggests institution policy decisions positively influence completion rates at four-year institutions. However, funding priorities and levels are critically important to student persistence and degree attainment based on institutional characteristics and student demographics (Hamrick et al., 2004; Ryan, 2004). Institutional allocations in instructional services and academic support largely support completion rates for institutions with large minority and nontraditional populations (Ryan, 2004). Overall, empirical research supporting institutional resource and expense allocations influence on completion rates is closely related to student involvement, experiences, and integration, which supports Astin's (1984) Theory of Student Involvement (Ryan, 2004).

Institutional Quality and Graduation Rates

Traditional measures of student persistence commonly used as a measure of institutional effectiveness have fueled considerable research determining if selectivity and faculty student ratio are representative of quality and predictive of completion rates (Bailey and Xu, 2012; Mayhew et al., 2016; Schneider and Kelly, 2012). Most quantitative studies that do not consider the student experience point toward a positive influence of institutional selectivity and faculty student ratio on graduation rates (Adelman, 2006; Alon, 2005; R. Chen and St. John, 2011; Furstenberg, 2010; Hamrick et al., 2004; Smith, 2013). An effective approach considering student characteristics often wash out any potential effects of institutional characteristics which are found linked to student persistence (R. Chen and St. John, 2011; Ro et al., 2013).

Largely, through the use of a number of different approaches, research suggests in comparison with less selective institutions, students who begin their educational careers with more selective four-year institutions are more likely to persistence to completion (R. Chen and St. John, 2011; Cohodes and Goodman, 2012; D. Kim, 2007; Smith, 2013; Titus, 2004b, 2006c; Walker II, 2016). Using longitudinal data and hierarchical generalized linear modeling, Kim (2007) finds selectivity has a significant relationship with the probability of degree attainment, and students attending less selective institutions decreased the probability of degree attainment by approximately 10 percentage points, controlling for individualized student and institutional characteristics. Hamrick (2004) isolates public institutions and finds decreasing selectivity one-percentage point equates to a .295 percentage decline in graduation rates. Titus (2004) finds similar results in the

probability of degree attainment, with an increase of seven percentage points when institutional selectivity likewise increases by one stand deviation, and overall positively influenced via institutional expenditures per FTE student (Titus, 2006c). Walker II (2016) finds as an institution's selectivity increases, transfers seem to decrease thus indirectly impacting completion rates. Likewise, utilizing a dataset of 11,000 fraternal and identical twins entering post-secondary education in the United States, with minimal differences in SES and precollege qualifications, Smith (2013) finds the probability of degree attainment differences of approximately five percentage points for institutions with mean SAT scores differences of 100 points. Considering Texas' Top 10 Percent Law, Furstenberg (2010) considered the effect of attending a highly selective institution for students granted automatic admission. The Texas study revealed negative and statistically- significant results for attending a highly selective institution. For the subset of minority students, attending a highly selective as a part of the Top 10 Percent Law reduced the probability of degree attainment by 47 percentage points using a local average treatment effect (LATE) model (Furstenberg, 2010). When the focus adjusts to consider four-year completion rates, Raikes et al. (2012) find faculty-level variables significantly contribute to the variation in degree attainment and account for 9 percent of the variation of the model considering 80 institutions.

Hispanic and Black students traditionally attend cheaper, less selective four-year and two-year institutions (Chun and Evans, 2015). In fact, between 1995 and 2009, eight out of ten new white students have gone to selective institutions, while seven out of ten African-American and Hispanic students have gone to two- and four-year open-access

institutions (Carnevale and Strohl, 2013). With only 12 percent of Hispanic students enrolled in highly selected institutions in 2013-14, graduation rates (68%) remains higher than rates at less selective institutions (Santiago, Taylor, and Galdeano, 2016). Cheng et al. (2015) consider the effect of quality on completion rates important specifically for minorities attending HBCUs. Using a sample of 81 institutions, college quality as defined by retention rate, selectivity, expenditures per FTE, and median ACT has a positive and significant effect on completion and alone explains 65 percent of the variation in degree attainment (Cheng et al., 2015). Regardless of the level of selectivity, Kim (2007) found although students who attend highly selective institutions were also likely to incur the increased level of student loan debt as a direct result of higher costs associated with high selectivity, particularly at private colleges and universities. Oddly, Scott et al., (2006) found no evidence of any influence of student-faculty ratio on six-year graduation rates. Gansemer-Topf and Schuh, (2005) took a different approach to examine the effectiveness of institutions selectivity by comparing the differential effects of institutional student aid and expenditures. Open access institutions with lower levels of selectivity and higher levels of institutional grant generally display higher completion rates, which are primarily explained variations in student ability (Gansemer-Topf and Schuh, 2005). Additional challenges obtaining unbiased estimates of the influence of selectivity on degree attainment is complicated by the “unobserved characteristics” that influence attendance, performance, completion, and eventually earnings (Dale and Krueger, 2014).

Stretching the effects of institutional characteristics on long-term effectiveness, Dale and Krueger (2014) find the effects of college selectivity increases over time. However, when the regression model considers the effects of those "unobserved" student characteristics, the influence of selectivity dropped dramatically, suggesting institutional selectivity may be related to the environment that is perpetuated through academic success of the physical locality. Titus (2004) supports this view and finds selectivity has a contextual effect linked to peer and institutional climate, which also supports Astin (1993) framework involving the institutional environment. A statewide study of students earning bachelor's degrees in the state of Massachusetts proved a 4.2% decrease in earnings for each standard deviation decrease in quality (Black and Smith, 2006). The literature surrounding wage effects of college quality largely suggest positive long term results, but also includes methodological challenges related to the appropriate number and effective proxy for college quality (Black and Smith, 2006; Cohodes and Goodman, 2012; M. C. Long, 2008).

Multiple Factor Studies Exploring Graduation Rates

There has been a limited number of attempts of varied approaches to multiple factor college impact studies (Hamrick et al., 2004). With a vast number of factors involved, a clear understanding of which institutional factors significantly predict and explain variations in degree attainment is unclear. To understand if degree attainment is different by student SES attending diverse types of institutions, Kim (2007) found selectivity, institutional control, and tuition do in fact have a significant relationship with degree completion whereas Gansemer-Topf and Schuh (2005) found

significant relationships with institutional student aid and institutional expenditures for less selective institutions specifically. In a study of 428 public and private institutions, Morrison (2012) used logistic regression to determine the percent of Pell recipients, institutional control, average SAT, size, and expenditures per FTE were found to have the largest effect on graduation outcomes.

In a sample of 444 public institutions in the U. S., Hamrick et al. (2004) explains 58.8 percent of the variance in graduation rates via a multiple regression model using Carnegie classification, region, presence of medical school, HBCU status, urbanization, selectivity, and instructional, library, physical plant, institutional, E&G, and academic expenditure variables representative of institutional characteristics, demographics, and expense allocations. In a more selective population of 80 public conveniently sampled institutions mission driven by founding faith affiliations, Raikes et al. (2012) found institutional aid, net tuition, student-faculty ratio, and average GPA of the incoming class could explain 53.1 percent of the variance in four-year graduation rates. Regression analysis further determined student level characteristics remain the main contributor in the prediction equation, equating to 23.6 percent of the variance, while faculty level variables accounted for nine percent, and instructional expenditures contributing to the remaining seven percent (Raikes et al., 2012).

Considering the need to educate vastly diverse types of students, Scott et al. (2006) attempts to explain variations in degree attainment for public and private institutions by identifying significant predictors of completion. Using a regression model Scott et al. (2006) found institutional resources, selectivity, and student demographics are

significant in student outcomes at public and private institutions. A study containing 2,625 degree-granting institutions, Walker II (2016) uses a regression model to identify predictors of degree attainment for four-year institutions. Using 15 institutionally controlled variations of variables representing selectivity, enrollment, resource, expense, and demographical factors Walker II (2016) explains 82.8 percent of the variance in the 2013 graduation rate for public and private institutions included in the study. Variables such as percent of students receiving Pell, enrollment levels, percent admitted, the degree of urbanization, allocations in instructional and academic support, revenues, and student-to-faculty ratios are of particular interest to the model (Walker II, 2016).

Summary

College impact literature is diverse in its findings complicating by selection effects related to different types of students attending different types of institutions, and different types of institutions mission-driven to serve different students (Ro et al., 2013). Terenzini and Reason's (2005) college impact model, attempts to identify aspects of an institution's internal organizational factors such as structures, curricular configurations, budgetary and staffing issues, policies related to course sizes, and faculty classification which indirectly shape student's experiences (Terenzini and Reason, 2005). "Between College" effects represent institutional factors such as control, type, selectivity, budget allocations, expenditures, and state allocations which provide evidence in determining differential effects between institutions (Mayhew et al., 2016; Pascarella and Terenzini, 2005). As a result, traditional models in between-college effects studies may be flawed in approach and not utilize the most predictive indicators of

institutional influence on graduation rates (Ro et al., 2013). Overall, structural and demographic, institutional student aid, institutional resources and expenditures, and quality impact graduation rates at four-year institutions in different ways. Based on the type of students enrolled at an institution, the level of an institution, control, and level of institutional resources, institutional influence varies. As a result, it is critical that administrative planners facilitate a clear understanding of the context needed to strengthen success factors to make for a more successful academic institution.

CHAPTER 3

METHODOLOGY

Trends suggest postsecondary six-year degree completion (59.4%) remains stagnant despite (83.3%) of full time students receiving some form of student aid (Ginder et al., 2017a; Hughes, 2012; National Association of College and University Business Officers, 2016; NCES, 2017; Selingo, 2012; The College Board, 2016a). Empirical evidence supports shared accountability in completion rates; whereas student attrition is a product of inputs from both the student and the institution (Astin, 1984; Bailey and Xu, 2012; Berger and Milem, 2000; Pascarella and Terenzini, 2005)

Although overall access to higher education has increased, degree attainment gaps by race and social economic status at four-year institutions remain larger than ever before (Tinto, 2008). As a result, institutions need to be particularly sensitive to the needs of a changing demographic student population. Institutions looking to improve degree completion must fully and accurately assess the institutional context and what factors support students enrolled through completion (DeAngelo et al., 2011). Institutions must also directly focus on creating optimal conditions for success for all students enrolled (DeAngelo et al., 2011).

Historically, there has always been significant interest in determining the fundamental elements of student success. Variations of organizational theory introduce

opportunities to understand if and how college and universities affect student outcomes (Berger and Milem, 2000). Astin (1984) developed a framework for understanding college and the influence on students, and therefore considered college an interconnected relationship between inputs, the environment, and outcomes. Pascarella and Terenzini (2005) expanded this framework to further account for potential influence from multiple factors of the institutional environment, by separating institutional influence as the student experience and institutional characteristics. Accordingly, between-college effects help isolate differences in outcomes that may be explainable by institutional conditions and organizational characteristics once student precollege influence is considered (Mayhew et al., 2016; Ro et al., 2013). As a result, there is a need to understand if institutional investments in factors which support access, affordability, and quality are predictive of institutional completion rates at four-year private institutions (Attewell et al., 2011; Pascarella and Terenzini, 2005; Titus, 2006c).

Rationale for Research Study

The purpose of this study is to determine if institutionally controlled factors such as structural characteristics, institutional expenditures, institutional resources, institutionally funded student aid, and institutional selectivity which drive access, affordability, and quality are predictive of institutional completion rates at four-year institutions (Attewell et al., 2011; Pascarella and Terenzini, 2005; Titus, 2006c). Specifically looking at institutional level variables informed by Pascarella and Terenzini's (2005, 2016) between-college effects framework, the study is intended to identify potential operational influences on student success as defined by six-year completion

rates. This study provides a framework in which institutions can account for the probabilities associated with the characteristics of the students enrolled (DeAngelo et al., 2011). A change in traditional demographics of students entering post-secondary institutions requires administrators to understand what factors affect minority students whom traditionally come from low-income households, require more academic support, and have overall lower completion rates. (Dannenberg and Barry, 2014; Ginder et al., 2017b; The College Board, 2017). Findings generated from quantitative research uncover behavior and trends. This study will include an examination of predictors of differences in graduation rates at four- year institutions using descriptive statistics and analytics. The rationale for selecting four-year institutions was based on empirical research that suggests attending a four-year institution has a large effect on college completion (Mayhew et al., 2016; Pascarella and Terenzini, 1991, 2005).

This study builds upon emerging collegial impact literature focusing on multiple factors of institutional level predictors of completion rates (R. Chen, 2012; DeAngelo et al., 2011; Hamrick et al., 2004; Powell, Gilleland, and Pearson, 2012b; Walker II, 2016). This study contributes to the current body of literature by investigating a combination of institutional factors. With graduation rates frequently used as the most important measures of effectiveness and quality, it is critical college and universities understand the relationship between institutional factors, and how those factors interact with institutional characteristics to create and sustain environments that foster student success (DeAngelo et al., 2011). Higher education governing boards and administrative leadership at higher education institutions may utilize the results of this study to make policy changes in

student support or characteristic adjustments at the institutional level that will support an increase in degree productivity, revenue growth, and impact institutional quality. A quantitative methodology is appropriate to answer the research questions aimed at determining if institutional variables influence graduation rates at four-year institutions.

Research Question and Hypothesis

The research question for this study is listed below.

- Are institutional factors such as structural characteristics, institutional expenditures, institutional resources, institutionally funded student aid, and institutional selectivity predictive of six-year graduation rates at four-year institutions?

The hypothesis for the research question includes:

- Institutional factors, such as structural characteristics, institutional expenditures, institutional resources, institutionally funded student aid, and institutional selectivity, are predictive of six-year graduation rates at four-year institutions.

Research Design

Using a quantitative approach, this study intended to uncover the predictability of completion rates based on institutional variables. This college impact study included an ex-post facto or after-the-fact research design in which the investigation starts after the fact has occurred without influence from the researcher (“Ex Post Facto”, 2017).

Hofferth (2005) denotes advantages and disadvantages to utilizing secondary data in social science research. The widespread availability and use across

multiple disciplines provide a low-cost population representative of the larger sample which is supported and widely accepted in the scientific field (Hofferth, 2005).

Secondary data analysis traditionally uses larger samples to achieve greater accuracy of estimates of subgroups and avoid bias in representing the target population. Secondary data analysis traditionally employs larger samples to obtain greater precision of estimates of subgroups and avoid bias in representing the target population (Hofferth, 2005).

Additionally, secondary data analysis is limited to the availability of existing variables and requires the researcher to ensure the fit between the research question and the data is adequate (Hofferth, 2005).

Population and Sample

The universe of institutions from which the sample was drawn includes more than 7,000 institutions (NCES, 2017). The data are based on institution-level variables, whereas, the institution encompasses the sample, not students attending those institutions included in the study. The study was intended to examine the predictive ability of institutional factors at four-year institutions on six-year graduation rates. Therefore; the inclusion of all of the colleges and universities in the IPEDS database is not appropriate. The sample criteria include institutions with Carnegie classifications in 2017 as four-year, private, degree-granting, has full-time, first-time undergraduate students, non-profit colleges, and universities eligible to participate in federal student aid programs. By accounting for institutional level as a significant institutional predictor of completion rates, the study provides an opportunity for new predictors to emerge.

Nationally, 11% of Pell Grant recipients entering public universities do not enroll for the second year of college, and about 80% do not receive bachelor's degrees within four years, only another 20% earn degrees over six years (Goldrick-Rab et al., 2016). With a focus on the changing demographics of students enrolling in higher education, generally "to judge an institution's service to low-income student access, analysts have traditionally relied on the percentage of full-time students eligible for a Pell Grant" (Dannenber and Barry, 2014, p. 6). As a result, the sample was further reduced to include institutions with at least 50 percent of Pell Grant eligible students as a proxy for institutions serving low SES families. As the criteria are applied to the population, the sample was further reduced to 509 institutions (NCES, 2017).

Data Collection

The data, utilized in this study, is a part of a larger collection of data owned by the National Center for Education Statistics (NCES) and authorized under the Section 153 of the Education Sciences Reform Act of 2002 (P.L. 107-279). The researcher extracted twenty years of data from the Integrated Postsecondary Education Data System (IPEDS), which utilizes a survey protocol to collect data from all institutions participating in or planning to participate in Federal financial assistance programs authorized in Title IV of the Higher Education Act (HEA) of 1965. Annual completion of the IPEDs survey is mandated by 20 USC 1094, Section 487(a)(17) and 34 CFR 668.14(b)(19) (IPEDS, 2017).

Integrated Postsecondary Education Data System (IPEDs) acts as the data collection center on behalf of the U.S. Department of Education's National Center for

Education Statistics (NCES). Survey data includes numerous variables categorized in IPEDs as components; institutional demographics; institutional pricing; admissions; enrollment; financial aid; degrees awarded; student persistence and success; and academic libraries, and fiscal resources (The Integrated Postsecondary Education Data System, 2017). Each component was further divided into various subcategories based on the type of information included. Institutional characteristics include geographical information about the institution, cost of attendance, institutional control, academic calendar system, levels of awards offered, and programs (The Integrated Postsecondary Education Data System, 2017). Institutional pricing includes data from institutions for full-time, first-time degree/certificate-seeking undergraduate students (The Integrated Postsecondary Education Data System, 2017). Admissions data included admissions considerations, admissions yields, and SAT and ACT scores, while enrollment data contains different measures of enrollment and several indicators of access (The Integrated Postsecondary Education Data System, 2017). Financial aid data consists of full-time, first-time degree-seeking undergraduate students who receive financial aid from various sources at each institution (The Integrated Postsecondary Education Data System, 2017). IPEDS also collects average amounts of aid received by students, and the average net price at each institution (The Integrated Postsecondary Education Data System, 2017). Degrees awarded data included the number of students who complete postsecondary education by program and degree type (The Integrated Postsecondary Education Data System, 2017). Student persistence and student success collect data to measure first-year retention rate, graduation rate data provide information on institutional productivity, and

starting in 2015-16 captures the number of degrees awarded and enrollment status for all four-year degree-seeking undergraduate students (The Integrated Postsecondary Education Data System, 2017). Finally, the institutional resources component included institutional data on human resources, finances, and academic libraries (The Integrated Postsecondary Education Data System, 2017). Variables from the institutional demographics, institutional pricing, admissions, financial aid, student persistence and success, and institutional resources are major components of the methods in this study.

As a supplemental resource for data collection, the study utilized data from College Insight (College InSight, 2017). The supplemental data was derived from additional data elements contained in the institutional Fiscal Operations Report and Application to Participate and the Common Data Set (College InSight, 2017). The Fiscal Operations Report and Application to Participate contains institutionally reported data used to participate in the federal campus-based financial aid programs, while the Common Data Set provides data on undergraduate student profiles including financial support, is used primarily by publishers of college guides, and was licensed from the Peterson's Undergraduate Financial Aid and Undergraduate Databases (College InSight, 2017).

Variables

The variables utilized in this study are organized into three groups, independent, dependent, and control variables (see Table 1). The independent variables are the potential institutional predictors of graduation rates which include: institutional control, institutional level, Carnegie classification, selectivity, student-faculty ratio, endowment

assets, institutional demographics reflective of race and gender, and expenditures in student services, instructional services, institutional support, academic support, and institutional financial aid.

The dependent or outcome variable used to determine, if any, changes occur because of independent variables is institutional graduation rate and supports the interest in understanding the fundamental elements and influence of student success. Finally, the percent of Pell-eligible students and the total amount of Pell grant awarded are utilized as control variables as a constant to account for differences in student academic ability at different institutions, which created an opportunity to clarify the relationships between the independent and dependent variables.

Table 1
Summary of Variables

Variable Types		
Independent	Dependent	Control
<i>Structural</i>	<i>Six-Year Graduation Rate</i>	<i>Percent of Undergraduates awarded Pell Grants</i>
Institutional Control		
Institutional Level		
Carnegie Classification		<i>Total Amount of Pell Grants awarded to Full-Time-First-Time Undergraduates</i>
Institutional Demographics		
<i>Institutional Resources and Expenditures</i>		
Institutional Commitments		
<i>Institutional Student Aid</i>		
<i>Institutional Selectivity</i>		
<i>Student-Faculty Ratio</i>		

Independent Variables

Independent variables are stand-alone aspects of a study that are generally used to measure specifics and manipulated and used as predictors of a study. The independent variables included are segmented into categories based on the aspect of the institutional environment the variable represents. Independent variables included in the study are structural characteristics, institutional expenditures and resources, institutional student aid, institutional selectivity, and faculty-student ratio. Structural characteristics include variables capturing and identifying foundational aspects of an institution that are more descriptive and categorical in nature. For this study, structural characteristics are defined

as institutional control, institutional level, Carnegie classification, and demographics. More specifically, Institutional controls are “a classification of whether an institution is operated by publicly elected or appointed officials (public control) or by privately elected or appointed officials and derives its major source of funds from private sources (private control)” (U.S. Department of Education, 2017, p. 7). Institutional control is measured as a dichotomous variable with two distinct outcomes, public or private that are mutually exclusive and exclude the possibility of any institution classified as both. Institutional level is “a classification of whether an institution's programs are four-year or higher (four-year), 2-but-less-than four-year (2 year), or less than 2-year” (U.S. Department of Education, 2017, p. 16).

Institutional levels are restricted to four years or higher (four-year). The Carnegie classification is “an institutional classification coding structure developed by the Andrew W. Carnegie Foundation for the Advancement of Teaching. The Carnegie Classification variable will be categorical in nature and classified as Doctoral/Research Universities (Extensive/ Intensive), Master's Colleges and Universities I and II, Baccalaureate Colleges-Liberal Arts, Baccalaureate Colleges-General, Baccalaureate/Associate's Colleges, and Tribal Colleges and Universities” (U.S. Department of Education, 2017, p. 5) Institution demographics include reflections of the student population measured by gender and race and ethnicity. Race is captured as a categorical variable of “American Indian or Alaska Native, Asian, Black or African American, Hispanic, Native Hawaiian, White, or Race unknown” (U.S. Department of Education, 2017, p. 22). Gender is captured as a total through a dichotomous variable, men, or women.

Institutional expenditures and resources contain variables identifying availability of resources, deployment, and utilization of those resources, and measure an institution's ability to generate revenue. In this study, institutional expenditures are commitments in student services, instructional services, institutional support, academic support, and tuition revenue, and level of endowment assets. More specifically, institutional commitments incorporate expense allocations supporting service units such as "admissions and registrar offices those activities whose primary purpose is to contribute to the student's emotional and physical well-being, intellectual, cultural, and social development outside the context of the formal instructional program" (U.S. Department of Education, 2017, p. 26). Student service expenses are recorded and reported using GASB, and FASB methods of accounting and are measured in US dollars.

Institutional commitments include expense allocations "supporting services directly related to the daily operations of educating students directly such as faculty salaries and support" (U.S. Department of Education, 2017, p. 15). Instructional services are recorded and reported using GASB, and FASB methods of accounting and is measured in US dollars. Institutional commitments in Institutional Support include expense allocations "supporting the daily operational support of the institution including, general administrative services, central executive-level activities concerned with management and long-range planning, legal and fiscal operations, space management, employee personnel and records, logistical services such as purchasing and printing, public relations and development, and information technology" (U.S. Department of Education, 2017, p. 15). Institutional support was recorded and reported using GASB

and FASB methods of accounting being measured in US dollars. Institutional Commitments in Academic Support include expense allocations to “support services for the institution’s primary mission, including Libraries, Museums and Galleries, Educational Media Services, Academic Computing Services, Ancillary Support, Academic Administration, Academic Personnel Development, Course and Curriculum Development” (U.S. Department of Education, 2017, p. 1). Academic support was recorded and reported using GASB, and FASB methods of accounting and is measured in US dollars.

Institutional resources comprise of human, financial, technical, facilities and other resources necessary to achieve an institution’s mission and goals and may be measured in several ways. Tuition revenue being one way, “is the amount of money charged to students for instructional services, and may be charged per term, per course, or per credit” (U.S. Department of Education, 2017, p. 27).

Endowment assets are “gross investments of endowment funds, term endowment funds, and funds functioning as an endowment for the institution and any of its foundations and other affiliated organizations” (U.S. Department of Education, 2017, p. 9). The endowment income is recorded and reported using GASB, and FASB methods of accounting and total assets are measured in US dollars. Institutional Student Aid is “granted and funded by the institution and/or individual departments within the institution, and includes scholarships targeted to certain individuals (e.g., based on state of residence, major field of study, athletic team participation) for which the institution designates the recipient” (U.S. Department of Education, 2017, p. 14). Institutional

student aid is measured by the institutional grant from restricted and unrestricted sources was recorded and reported using GASB, and FASB methods of accounting and is measured in US dollars.

Institutional selectivity was a measure of the profile of students who enter an institution which is used as a component which ranks higher education institutions into in to four categorical destinations; highly selective, selective, moderately selective, and open enrollment. Selectivity measures the percent of students who are admitted to each institution (“Understanding College Selectivity”, n.d.). Supportively, student-faculty ratio measures “the ratio of FTE students to FTE instructional staff and is calculated by the number of full-time students/staff plus 1/3 the number of part-time students/staff” (U.S. Department of Education, 2017, p. 26).

Dependent Variable

The dependent variable included in this study serves as the outcome variable to which the independent variables have potential influence over. A 6-year graduation rate was used as the dependent variable in this study. *6-Year Graduation Rate* is considered “the rate required for disclosure and/or reporting purposes under Student Right-to-Know Act, and is calculated as the total number of students completing a bachelor’s degree within 6 years (150% of normal time) divided by the revised adjusted cohort” (U.S. Department of Education, 2017, p. 13). “Data are collected on the number of students entering institutions as full-time, first-time, degree-seeking undergraduate students in a year (cohort), by race/ethnicity and gender” (U.S. Department of Education, 2017, p. 13).

Control Variables

Control variables often do not play an integral part of the study but are included because of the existence of an indirect impact on the dependent variable. The control variables included in this study are percent of undergraduate students awarded Pell grants along with total amount of Pell grant awarded to full-time first-time undergraduates. Percent of undergraduate students awarded Pell grants is the percent of eligible undergraduates awarded Pell grant population and represents “grant assistance to eligible students with federal demonstrated financial need to help meet education expenses” (U.S. Department of Education, 2017, p. 20). The total amount of Pell grant aid awarded to full-time first-time undergraduates was the total amount of Pell grant aid awarded to full-time, first-time degree/certificate-seeking undergraduate students.

Institutional Review Board Approval

The Mercer University Institutional Review Board (IRB) application was submitted as required by institutional research policy and procedures. Additionally, a waiver of committee consideration was completed, considering the study does not involve human subject testing (see Appendix B).

Data Analysis

Data was uploaded, prepared, and analyzed using IBM’s SPSS Statistic software. Unit of analysis in quantitative research was the major entity under investigation within the study; in this case, the institutions were utilized as the unit of analysis. The methods included encompassed both descriptive statistics and analytical methods to expand knowledge about institutional predictors of graduation rates at four-year institutions.

Descriptive statistics were used to inform an understanding of graduation rates, as well as each of the independent variables. Statistics included mean, standard deviation, minimum and maximum values, variance, and range. SPSS was adjusted to display test of significant and display actual significance levels. Unless otherwise noted, the determination of significance was completed at the .05 level.

Analytical methods included multivariate statistical predictive techniques such as Bivariate (Pearson) Correlation analysis, principal components analysis, and multiple regression which will explain the relationship between one continuous dependent variable and two or more continuous or categorical independent variables (Salkind, 2013).

Bivariate (Pearson) Correlation analysis was used to examine the strength of the relationship between each independent variable and graduation rates (Hoy, 2009). A principal components was used to confirm the strength of the variable as a predictor while also providing evidence of the effectiveness of inclusion (Salkind, 2013). The study utilized time series data to determine causal effects over time while the multiple regression equation provided details of the combined influence of predictor variables on graduation rates. Analytical methods included a comparison of institutions with a high number of Pell Grant eligible students in the lower and upper 25 percent quartiles to further identify institutional factors that supported higher graduation rates.

Literature surrounding post-secondary persistence examines student level contributions to institutional completion rates. Given the extensive literature on student persistence, this research design focused on institutional level dynamics. Removing the impact of student characteristics created a unique opportunity to examine persistence

from a different viewpoint. However, while the absence of student individualities created a unique opportunity for this study, data analysis at the institutional level was also a limitation because of the unique contribution of the student body.

An additional limitation was the utilization of secondary data. This study utilized the Integrated Postsecondary Education Data System (IPEDS); therefore, limiting the availability of variables in the dataset. The data was self-reported by institutions which potentially threatens validity at a level in which the researcher has no control. By utilizing secondary data, this study assumed the relationship among variables without direct involvement in the development of the data. This could possibly lead to misinterpretation of association and causation.

Another limitation was the potential changes in institutional policies and practices. The study utilized historical data. As such, student aid, institutional quality, and budget allocation practices changed with institutional goals and may not reflect all current practices. Finally, the study was limited to four-year institutions which are not generalizable to two-year colleges.

Reporting Results

To ensure validity, this data was analyzed, presented, and reported in Chapter 4 using tables, charts, and graphs created from SPSS chart builder. Additionally, pseudonyms utilized to reference all institutions in the results section. The research question was presented with the analysis and corresponding SPSS model summary tabled used in reporting results.

Summary

This chapter provides a description of the specific research design and methodology used to explore a quantitative non-experimental study of institutional predictors of six-year graduation rates at four-year colleges and universities. The data collection and source of data was appropriate for the study population, $N=509$, while IPEDS provides suitable quantifiable proxy variables for structural characteristics, institutional expenditures, institutional resources, institutionally funded student aid, and institutional selectivity. The data utilized in the study were audited, federally reported, publicly released, and retrieved from IPEDS. Before any analysis, the data was analyzed and reviewed for normalcy and outliers. A histogram, descriptive statistics, and analytical methods was used to view the six-year graduation rate over time, confirm the existence of a relationship between each independent variable, and graduation rates, and explained the combined influence of multiple institutional factors on six-year graduation rates at four-year institutions (Hoy, 2009; Salkind, 2013). As a result, the epistemology, methodology, and methods are appropriately positioned to determine if institutional factors such as structural characteristics, institutional expenditures, institutional resources, institutionally funded student aid, and institutional selectivity are predictive of six-year graduation rates at four-year institutions.

CHAPTER 4

DATA ANALYSIS

This chapter presents the quantitative results for this study. The findings are reported in the manner in which the study was examined and include descriptive analysis of independent variables as institutional components, two-step cluster analysis, and statistical modeling explaining the extent the independent variables predict graduation rates at four-year private institutions. Concluding the chapter are applicable findings and overall interpretation.

Preparing Data for Analysis

The data used in the study consists of 509 institutions (n=509), and 38 variables with data ranging from 2015-16 to 1996-97 academic years. Twenty years of data were extracted using the Integrated Postsecondary Education Data System (IPEDS), owned by the National Center for Education Statistics (NCES). These raw data were normalized to be useful for treatment. Within a given variable, within each year, the data for all 509 institutions were sorted in ascending order by Carnegie ID number. The data for each year were recorded and sorted descending by years. With 509 institutions and twenty years of data for each institution, this resulted in 10,180 rows of data for each of the 38 variables. After the data were organized, the SPSS rank procedure was used to transform each variable to approximate normality.

This was done to better approximate the multivariate normality assumed by the SPSS imputation procedure, and by other SPSS data analysis techniques. Besides that, the normalization process tends to minimize the possible effects of univariate outliers.

All 38 variables contained some missing data, most often related to variables that only existed in recent years. After the prior organization and normalization of data, the SPSS multivariate imputation procedure was used to estimate missing values for all the variables over the included academic years. The estimation procedure was repeated five times to account for possible sampling errors in predicting the missing data. Most subsequent analyses were done with the merged five imputed data sets. Data weights were used so the analysis procedures would prepare significance tests assuming a sample size of 509.

A principal components analysis with Varma rotation reduced the number of variables to be analyzed. As a result, principal component scores were used in most subsequent analyses. Table 2 presents the correlations among the independent variables. Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity, which test the reliability of the data for principal component analysis, and the possibility of reducing variables into components are represented in Table 3. The test returned $MO_j = .92$, with $P < .001$ which together provided a minimum standard by which should be met to support a statistically sound principal component analysis.

Table 2

Correlation among normalized independent variables

	<i>Stack Carnegie Rating</i>	<i>Stack Year</i>	NSTACK TOTBS	NSTACK WBSBS	NSTACK RACEUNKBS	NSTACK NATIVEBS
<i>Stack Carnegie Rating</i>	1.000	0.000	-0.402	-0.265	-0.326	-0.149
<i>Stack Year</i>	0.000	1.000	0.006	-0.040	0.067	0.031
NSTACK TOTBS	-0.402	0.006	1.000	0.678	0.674	0.619
NSTACK WBSBS	-0.265	-0.040	0.678	1.000	0.495	0.604
NSTACK RACEUNKBS	-0.326	0.067	0.674	0.495	1.000	0.465
NSTACK NATIVEBA	-0.149	0.031	0.619	0.604	0.465	1.000
NSTACK HISPBS	-0.368	0.147	0.696	0.547	0.580	0.522
NSTACK ASIAPACBS	-0.341	0.003	0.674	0.598	0.580	0.531

Table 3

Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.92
Bartlett's Test of Sphericity	Approx. Chi-Square	140447.31
	df	171
	Sig.	p<.001

As represented in Table 4, the principal components analysis returned five latent variables representative of institutional components, early years representative of time series and consistency of data, general missing data, general resources per capita, admission, and selectivity. Of the five latent variables, early years, general missing data, and general resources per capita proved to be most descriptive of the variables of the study. Correlations $\geq .30$ are considered statistically represented in the latent variable.

Table 4

Correlations of Variables with Components after Estimating Missing Data

VARIABLE NAME	EARLY_ YEARS	GENERAL_ MIA	GENERAL_ _FACTOR	ADMISSIONS	SELECTIVITY
NSTACK_PELLGRANTS	-.53	-.62	.99	-.01	.07
NSTACK_TOTBS	-.02	-.03	.90	.06	.00
NSTACK_WOMEN_BSSEEK	.00	-.03	.88	.06	.00
NSTACK_RATIO	-.38	-.50	.88	-.01	.06
NSTACK_DOCPRO	-.41	-.50	.79	.00	.06
NSTACK_INSTR_SUP	-.13	.03	.76	.06	.01
NSTACK_GRAD_RATE6YR	-.35	-.48	.76	-.01	.05
NSTACK_HISPBS	-.15	.15	.75	.04	.00
NSTACK_ASIAPACBS	-.01	-.01	.75	.03	.01
NSTACK_DOCRES	-.38	-.48	.75	.00	.05
NSTACK_STUDE_SERV	-.20	.08	.74	.06	.01
NSTACK_MEN_BSSEEK	-.05	-.01	.73	.05	.00
NSTACK_INSTI_SUP	-.15	.04	.73	.06	.00
NSTACK_AABS	-.07	.05	.71	.06	-.01
NSTACK_RACEUNKBS	-.08	.03	.71	.03	.00
NSTACK_ACAD_SUP	-.14	.04	.69	.05	.00
NSTACK_GRNTS_UNFUN	-.19	.13	.69	.06	.01

Table 4 (continued)

Correlations of Variables with Components after Estimating Missing Data

VARIABLE NAME	EARLY_ YEARS	GENERAL- MIA	GENERAL _FACTOR	ADMISSIONS	SELECTIVITY
NSTACK_GE2BS	-.19	.07	.68	.09	-.01
NSTACK_WBSBS	.03	-.06	.67	.03	.01
NSTACK_NATIVEBS	-.04	.01	.64	.03	.00
STACK_YEAR	-.98	-.13	.59	-.01	.06
NSTACK_GRNTS_TOT	-.25	-.09	.58	.06	.02
NSTACK_HAWORPACBS	-.08	.04	.55	.04	-.01
NSTACK_GRNTS_FUN	-.04	.00	.53	.04	.00
NSTACK_TUITIONANDFEES	-.18	-.01	.32	.04	.01
NSTACK_MSMA	-.13	-.01	.31	.02	.01
NSTACK_VALUE	-.26	-.11	.23	.03	.01
NSTACK_BABS	-.22	-.16	.21	.00	.02
NSTACK_APPLICANTS	-.25	.13	.14	.19	.06
NSTACK_ADMISSIONS	-.24	.12	.14	.20	.09
NSTACK_ENROLL_TOTAL	-.11	.02	.11	.16	.11
NDOCTORAL_MISSING	.78	-.58	-.01	-.01	-.02

Table 4 (continued)

Correlations of Variables with Components after Estimating Missing Data

VARIABLE NAME	EARLY_ YEARS	GENERAL- MIA	GENERAL _FACTOR	ADMISSIONS	SELECTIVITY
NSTACK_DOCOTH	.05	.00	-.06	-.02	.00
NSTACK_SELECTIVITY	.08	-.01	-.07	-.05	.96
NSTACK_DOCOLD	.51	-.21	-.11	.00	-.02
NSTACK_PERC_PELL	-.10	.18	-.20	-.01	-.02
STACK_CARNEGIE_RATING	.00	-.03	-.22	-.01	.00
NSTACK_YIELDS	.18	-.07	-.23	-.62	.67
NSTACK_OTHERVALUE	-.05	.09	-.44	-.04	.01
NGENERAL_MISSING	.15	.98	-.70	.02	-.05

Note: Numbers in bold font represent the major variables defining each component

Two-step Clustering Analysis

To better understand whether and how institutional components may predict graduation rates, a two-step cluster analysis was performed to statistically group college and universities by institutional components represented in the latent variables, and determine if those variables vary significantly among institution types. Using the automatic two-step clustering procedure, SPSS segmented the sample $n=509$ into three clusters. The cluster classification measured at approximately .60, which classified the results as good quality. The cluster sizes were nearly equal whereas clusters one, two, and three represented 32.8% ($n=167$),

23.2% (n=130), and 43.9% (n=212) respectively. Figure 4 represents the predictor importance for the combined clusters and identifies graduation rates, general resources per capita, general missing data, and early years as a significant components of cluster membership. Cluster comparisons using the components identified in principal components analysis (PCA) outlined similar scores in clusters one and three, the two largest clusters within the sample. While cluster two, the smallest cluster displayed distinct differences in the component scores identified as important predictors for cluster inclusion.

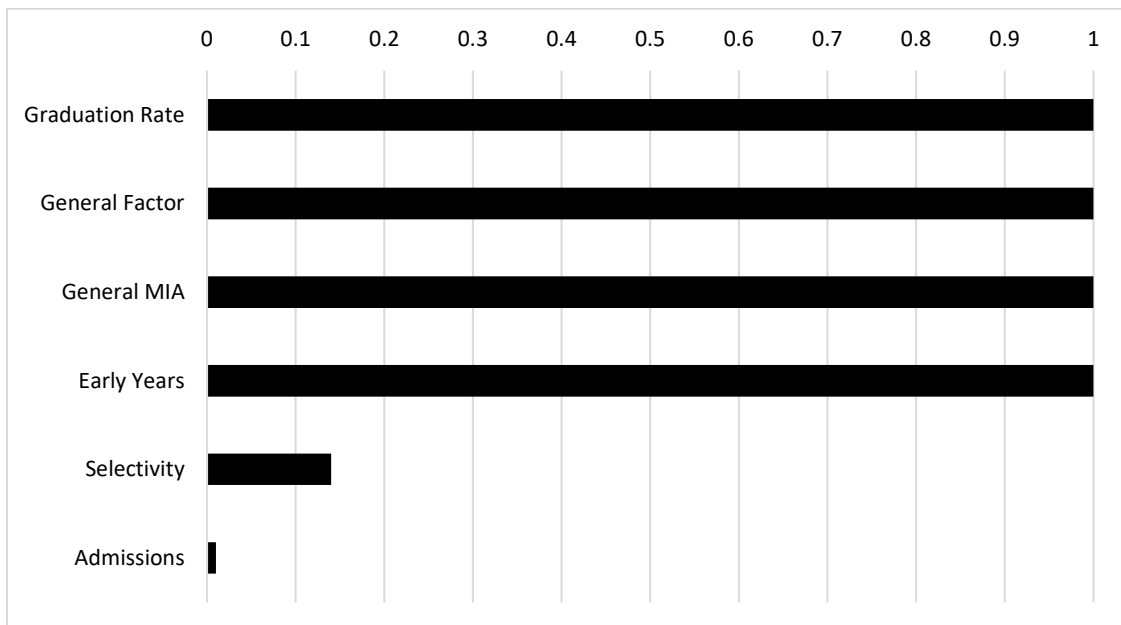


Figure 4. Predictor importance for cluster inclusion

Table 5 details median and overall scores for each cluster classified by the latent component. Statistically, cluster three had lower early years scores, and

higher general resources per capita, general missing data, and graduation rates scores, with scores in the average quartile for selectivity and admissions both unimportant predictors in cluster formations. Cluster two scores resembled those of cluster three except lower overall scores in general missing data. Cluster two scores suggested the cluster is reasonably different than one and three, with lower graduation rates scores, and significantly lower general resources per capita scores, lower than cluster one and three combined. Moreover, each component score was significantly different than the overall median scores for the sample which suggest the clusters do in fact have differences.

Table 5

Median z score cluster comparison

	Cluster One	Cluster Two	Cluster Three	Overall
	"resourced with consistent data institutions"	"low resource institutions"	"resourced with missing data institutions"	
Early years	0.46	1.10	-1.01	0.16
General resources	-0.06	-11.97	0.03	-0.43
Missing data	-1.20	1.31	0.40	0.23
Graduation rates	0.04	-1.84	0.01	-0.29
Selectivity	-0.03	-0.14	0.03	-0.03
Admissions	0.16	0.20	0.18	0.18

Discriminant Analysis

Following the automatic two-step clustering process used to group institutions by latent components and determine if there are differences in types of institutions, a discriminant analysis utilized by SPSS to distinguish how each of the three clusters differ. The processing summary accurately reflected 50900 observations, originating from sample size $n=509$, with five replications derived from imputations 1-5, and twenty years of data for each variable. Table 6 presents the descriptive statistics for the dependent variable, control variables, and independent variables represented in latent components derived from the principal component analysis. The means scores for both within and between clusters were not equal across all latent components. The most significant difference was observed in cluster two (c2 general resources per capita, $m = -5.422$, $sd = 4.016$) with a much larger standard deviation indicating the resources per capita scores for institutions within that cluster range between a wider number of values. However, the means scores for admissions and selectivity in cluster one (c1 admissions, $m = -.117$, $sd = .938$) (c1 selectivity, $m = -.041$, $sd = .904$) and cluster two (c2 admissions, $m = -.010$, $sd = .663$) (c2 selectivity, $m = -.013$, $sd = .888$) were far more similar with equal variability of spread, although cluster three (c3 admissions, $m = .100$, $sd = .920$) (c2 selectivity, $m = .009$, $sd = .934$) were not largely different.

Table 6

Group Statistics in Discriminant Analysis

		Mean	Standard Deviation	Weighted
1	GRAD_RATE6YRS	0.0252064	1.00184224	166.920
	PC_EARLY_YEARS	0.5206530	0.44394598	166.920
	PC_GENERAL_MIA	-1.2111000	0.37145390	166.920
	PC_GENERAL_FACTOR	-0.0551804	0.94653948	166.920
	PC_ADMISSIONS	-0.1170177	0.93862019	166.920
	PC_SELECTIVITY	-0.0419086	0.90471452	166.920
2	GRAD_RATE6YRS	1.0100202	1.32852891	130.320
	PC_EARLY_YEARS	1.0269604	0.34226103	130.320
	PC_GENERAL_MIA	1.1566720	0.50899371	130.320
	PC_GENERAL_FACTOR	-5.4227719	4.01612010	130.320
	PC_ADMISSIONS	-0.0103757	0.66346681	130.320
	PC_SELECTIVITY	-0.0135274	0.88858122	130.320
3	GRAD_RATE6YRS	-0.0329815	0.97350543	211.760
	PC_EARLY_YEARS	-1.0424106	0.47875423	211.760
	PC_GENERAL_MIA	0.2428189	0.31476615	211.760
	PC_GENERAL_FACTOR	0.0467615	1.04261232	211.760
	PC_ADMISSIONS	0.1008850	0.92046712	211.760
	PC_SELECTIVITY	0.0093271	0.93432667	211.760
Total	GRAD_RATE6YRS	0.2531417	1.16981752	509.000
	PC_EARLY_YEARS	0.0000000	1.00093460	509.000
	PC_GENERAL_MIA	0.0000000	1.00093460	509.000
	PC_GENERAL_FACTOR	-1.3870415	3.23537069	509.000
	PC_ADMISSIONS	0.0009404	0.87183049	509.000
	PC_SELECTIVITY	-0.0133264	0.91159026	509.000

SPSS delivered a test of equality of group means which is presented in Table 7 and displays the results of the univariate analysis of variance (ANOVA) for each component. In ANOVA Table 6, Wilks Lambda is significant as a result of the F test for grad rates $F = 42.838$, $p < .05$, early years $F = 1086.104$, $p < .05$, general missing data $F = 1413.239$, $p < .05$, and general resources per capita $F = 293.090$, $p < .05$. As a result, the analysis suggests differences among clusters one, two, and three as well as differences in the relative importance to the discriminant function.

Table 7

Tests of Equality of Group Means

	Wilks' Lambda	F	df1	df2	Sig.
NSTACK_GRAD_RATE6YRS	0.86	42.84	2	505	0.00
PC_EARLY_YEARS	0.19	1086.10	2	505	0.00
PC_GENERAL_MIA	0.15	1413.24	2	505	0.00
PC_GENERAL_FACTOR	0.46	293.09	2	505	0.00
PC_ADMISSIONS	0.99	2.95	2	505	0.05
PC_SELECTIVITY	1.00	0.15	2	505	0.86

The canonical discriminant function summary, shown in Table 8, was utilized because of three or more predetermined clusters returned an elgenvalue value for function 1 = 5.94 and function 2 = 4.41. The elgenvalue which measures

the discriminanting ability of the function, also measures how much of the dependent variable is explained by the function. Likewise, Wilks Lambda explains the portion of the variance in discriminant scores not explained by differences among groups. Here, the small Lambda of 0,.03 and 0,.18 combined with significant values ($P < .001$ and $P < .001$) provided evidence the cluster means were different. Additionally, Wilks' Lambda for just the second function was .18 noting using the combined weights of the components leaves about 18.5% of the variance in graduation rates unexplained.

The standardized discriminant function coefficients shown in Table 9 provided a statistical comparison of variables measured on difference scales and provided evidence of the relative importance of the independent variable in predicting the dependent variable. In this study, general missing data (1.06) had the greatest discriminanting ability in function 1, while early years (.88) had the greatest ability in function 2. As a result, using the hold out method, the canonical correlation which measured the association between the discriminant function and showed the function would successfully classify institutions with 97.30% accuracy.

The canonical discriminant function coefficient summary shown in Table 10 provided the unstandardized discriminant function coefficients used to construct the prediction equation to categorize new cases into one of three clusters.

Discriminant function 1 model equation was $D1 = .17 - .69\text{early_years} + 2.70\text{general_mia} + .12\text{general_factor}$, while discriminant function 2 model equation was $D2 = -.12 + 2.03\text{early_years} + .62\text{general_mia} - .09\text{general_factor}$.

The functions at group centroids provided the mean discriminant scores for each cluster which provide the basis for establishing intervals which classify new cases based on score range. As such, when predicting new cases, classification into clusters based on discriminant score uncover generalizations regarding six year graduation rates based on the factor scores and characteristics of the latent components

Table 8

Summary of Canonical Discriminant Functions

<i>Eigenvalues</i>				
Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	5.94	57.43	57.43	0.93
2	4.41	42.57	100.00	0.90
<i>Wilks' Lambda</i>				
Test o Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 2	0.03	1830.89	6.00	0.00
2	0.18	852.23	2.00	0.00

Table 9

Canonical Discriminant Function Coefficients

<i>Standardized Conical Discriminant Function Coefficients</i>		
	Function	
	1	2
PC_EARLY_YEARS	-0.30	0.88
PC_GENERAL_MIA	1.06	0.24
PC_GENERAL_FACTOR	0.27	-0.20

Structure Matrix		
	Function	
	1	2
PC_GENERAL_MIA	0.91	0.38
GRAD_RATE6YRS ^b	0.11	0.10
PC_EARLY_YEARS	-0.29	0.93
PC_GENERAL_FACTOR	-0.20	-0.46
PC_ADMISSIONS	0.01	-0.09
PC_SELECTIVITY	0.00	-0.02

Table 10

Canonical Discriminant Function Coefficients

<i>Canonical Discriminant Function Coefficients</i>		
	Function	
	1	2
PC_EARLY_YEARS	-0.69	2.03
PC_GENERAL_MIA	2.70	0.62
PC_GENERAL_FACTOR	0.12	-0.09
(Constant)	0.17	-0.12

Functions at Group Centroids		
<i>CLUSTERS</i>	Function	
	1	2
1	-3.47	0.19
2	1.93	3.16
3	1.55	-2.09

One-Way Analysis of Variance (ANOVA)

Although the discriminant analysis confirmed the clusters do significantly differ across components, a One-Way ANOVA was used to confirm the mean differences within clusters by factor. Table 11 presents the sample cluster size, mean, standard deviation, minimum, maximum, standard error, and confidence interval for each of the latent components within each cluster. The mean scores for

each component were vastly different for each cluster except admissions and selectivity, with similarities primarily in cluster one (admissions, $m = -.12$, $sd = .94$) (selectivity, $m = -.04$, $sd = .90$) and cluster two (admissions, $m = -.12$, $sd = .94$) (selectivity, $m = -.01$, $sd = .89$), with higher mean scores for cluster three (admissions, $m = .10$, $sd = .92$) (selectivity, $m = .01$, $sd = .93$) for both components. Also included in Table 11 is the test of homogeneity of variance, which provided evidence to accept or reject the null hypotheses that assumes variances among components are equal. In this case $P \leq .000$; therefore, the null was rejected, and a large Levene Statistic in general resources per capita $W=90.03$ suggest large variances among clusters one, two, and three. The one-way ANOVA shown in Table 12, compares the component scores of cluster one, two, and three. A statistically significant difference was found among the early years ($F(2,505) = 1083.96$, $p \leq .05$), general missing data ($F(2,505) = 1410.45$, $p \leq .05$), and general resources per capita ($F(2,505) = 292.51$, $p \leq .05$) components. However, as supported by mean differences, there was no significant difference found among admissions ($F(2,505) = 2.95$, $p > .05$) and selectivity ($F(2,505) = .15$, $p \leq .05$) components.

Table 11

Descriptive statistics for one way ANOVA and Test of Homogeneity of Variances

Descriptives										
			N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
							Lower Bound	Upper Bound		
PC_EARLY_YEARS	1	1	67	0.52	0.44	0.03	0.45	0.59	-0.21	1.25
	2		130	1.03	0.34	0.03	0.97	1.09	-0.87	1.39
	3		212	-1.04	0.48	0.03	-1.11	-0.98	-2.15	0.68
	Total		509	0.00	1.00	0.04	-0.09	0.09	-2.15	1.39

Table 11-continued

PC_GENERAL L_MIA	1	167	-1.21	0.37	0.03	-1.27	-1.15	-1.70	0.22
	2	130	1.16	0.51	0.04	1.07	1.24	-0.01	2.03
	3	212	0.24	0.31	0.02	0.20	0.29	-0.52	1.76
	Total	509	0.00	1.00	0.04	-0.09	0.09	-1.70	2.03
PC_GENERAL _FACTOR	1	167	-0.06	0.95	0.07	-0.20	0.09	-2.24	2.94
	2	130	-5.42	4.02	0.35	-6.12	-4.73	-19.40	2.58
	3	212	0.05	1.04	0.07	-0.09	0.19	-4.79	3.74
	Total	509	-1.39	3.24	0.14	-1.67	-1.11	-19.40	3.74
PC_ ADMISSIONS	1	167	-0.12	0.94	0.07	-0.26	0.03	-2.80	3.36
	2	130	-0.01	0.66	0.06	-0.13	0.10	-2.72	2.46
	3	212	0.10	0.92	0.06	-0.02	0.23	-2.61	3.76
	Total	509	0.00	0.87	0.04	-0.07	0.08	-2.80	3.76

Table 11-continued

PC_SELECTIVITY	1	167	-0.04	0.90	0.07	-0.18	0.10	-3.61	2.64
	2	130	-0.01	0.89	0.08	-0.17	0.14	-3.15	2.61
	3	212	0.01	0.93	0.06	-0.12	0.14	-4.46	2.78
	Total	509	-0.01	0.91	0.04	-.09	-.07	-4.46	2.78

Note. Min=Minimum, Max=Maximum

Test of Homogeneity				
	Levene Statistic	df1	df2	Sig.
PC_EARLY_YEARS	18.39	2	506	0.00
PC_GENERAL_MIA	18.29	2	506	0.00
PC_GENERAL_FACTOR	90.03	2	506	0.00
PC_ADMISSIONS	8.16	2	506	0.00
PC_SELECTIVITY	0.22	2	506	0.81

Table 12

ANOVA Table

		ANOVA				
		Sum of Squares	df	Mean Square	F	Sig.
PC_EARLY_YEARS	Between Groups	412.79	2	206.40	1083.96	0.00
	Within Groups	96.16	505	0.19		
	Total	508.95	507			
PC_GENERAL_MIA	Between Groups	431.67	2	215.84	1410.45	0.00
	Within Groups	77.28	505	0.15		
	Total	508.95	507			
PC_GENERAL_FACTOR	Between Groups	2853.96	2	1426.98	292.51	0.00
	Within Groups	2463.59	505	4.88		
	Total	5317.55	507			

Table 12 -continued

PC_ADMISSIONS	Between Groups	4.45	2	2.23	2.95	0.05
	Within Groups	381.67	505	0.76		
	Total	386.12	507			
PC_SELECTIVITY	Between Groups	0.25	2	0.12	0.15	0.86
	Within Groups	421.90	505	0.84		
	Total	422.15	507			

Post hoc Tukey B was used to determine significant differences in latent components between clusters, additionally with homogeneous subsets because the clusters varied in size. The analysis revealed for latent factor early years, cluster one, cluster two, and cluster three were significantly different. Based on the correlation of independent variables referenced in Table 3, high scores in early year's components are associated with cluster two ($m = 1.03$, $sd = .34$) and correlates to institutions with lower Pell grant scores, lower faculty-student ratio scores, lower levels of doctoral research associated with cluster two ($m = 1.03$, $sd = .34$) and correlates to institutions with lower Pell grant scores, lower faculty-student ratio scores, lower levels of doctoral research

scores, and lower graduation rate scores. High scores in general missing data component were found in cluster two ($m = 1.16$, $sd = .51$) and also correlate to institutions with lower Pell grant scores, lower faculty-student ratio scores, lower doctoral research scores, and lower graduation rate scores coupled with a large amount of institutional data not reported yet utilized in the study. Unlike principal component early years and general missing data, post hoc Turkey B did not find significant differences in general resources per capita for cluster one ($m = -.06$, $sd = .95$) or cluster three ($m = .05$, $sd = 1.04$). However, results indicate significant differences in cluster two ($m = -5.42$, $sd = 4.02$) which suggest high scores in general resources per capita are correlated with institutions which have higher Pell grant scores, higher levels of women seeing bachelor degrees, lower faculty-student ratios scores, allocate resources to support operations, provide institutional student aid, and are racially diverse. Consequently, there was no significant difference observed for the admissions factor in cluster one ($m = -.117$, $SD = .94$) cluster two ($m = -.01$, $sd = .66$) or cluster three ($m = .10$, $sd = .92$). Likewise, no significant difference was observed for selectivity factor in cluster one ($m = -.041$, $sd = .90$) cluster two ($m = -.01$, $sd = .89$) or cluster three ($m = .01$, $sd = .93$).

Excluding the results of the independent variable groupings completed in principal components analysis, one-way ANOVA was also completed by cluster using the original independent variables. Similar in nature to the mean differences shown with the principal components analysis, there are also significant differences in mean scores observed in independent variables between clusters. Most notable are significantly lower mean scores for cluster two ($n=130$) for endowment asset value ($m = 12967378.88$, $sd =$

24240161.39), faculty-student ratio ($m = 33.37$, $sd = 0$), presence of doctoral programs ($m = 0$, $sd = 0$), total institutional grants ($m = 12626.05$, $sd = 272069.59$), total Pell grants ($m = 271721.23$, $sd = 0$), allocations in academic support ($m = 1294038.39$, $sd = 2509955.82$) and tuition and fees ($m = 8875459.32$, $sd = 14079063.66$).

In general, the variability among the independent variables vary greatly between clusters due to the actual differences in the variable or between groups, and differences within the clusters within groups based on the independent variable. Of the independent variables included in the one way ANOVA, significant differences were found among expenditures related to student services ($F(2,378) = 3.425$, $p \leq .05$), the number of masters degrees awarded ($F(2,404) = 5.713$, $p \leq .05$), presence of doctoral level research ($F(2,200) = 11.222$, $p \leq .05$), the number of bachelor degrees awarded ($F(2,404) = 4.564$, $p \leq .05$), amount of unfunded institutional grant awarded ($F(2,358) = 5.173$, $p < .05$), total amount of institutional grant ($F(2,404) = 8.354$, $p \leq .05$), percent of Pell grant ($F(2,218) = 4.162$, $p < .05$), total amount of Pell grant ($F(2,404) = 4.193$, $p < .05$), number of admission applicants ($F(2,292) = 5.179$, $p \leq .05$), and total tuition and fees ($F(2,438) = 3.598$, $p \leq .05$). Tukey's HSB which was also used to confirm the nature of differences between clusters, and confirm lower overall scores for cluster two with total bachelor's degrees awarded, race diversity, endowment assets, women and men seeking bachelor's degrees, expense allocations supporting student services, instructional support, institutional support, and academic support. Additionally, cluster two had lower scores in total institutional grants, total enrollment, admission, and tuition and fee scores.

Table 13

Linear Regression Model Cluster One

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.140 ^a	0.020	0.014	0.9950034	0.020	3.289	1	164	0.072	^b

Note. ^a Predictors: (Constant), PC_GENERAL_FACTOR ^b Not computed because fractional case weights have been found for the variable specified on the WEIGHT command. ^c Dependent Variable: NSTACK_GRAD_RATE6YRS

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.256	1	3.256	3.289	.072 ^b
	Residual	163.276	165	0.990		
	Total	166.532	166			

Note. ^a Dependent Variable: NSTACK_GRAD_RATE6YR, ^b Predictors: (Constant), PC_GENERAL_FACTOR

Linear Regression Analysis

After determining differences exist between clusters for all components excluding selectivity and admissions, linear regression analysis within each cluster to uncover whether and how institutional components may predict six-year graduation rates. In cluster one, general resources per capita was the only latent variable with a correlation ($r(165) = .14, p > .05$), indicating a positive, and weak linear relationship with graduation rates. However, the linear regression analysis for cluster one ($n=167$) shown in Table 13, calculated a coefficient of determination $R^2 = .02$ which explains the proportion of the variance in the dependent variable, six-year graduation rate that is explained by the variation in the independent variables or latent components. In this case, the regression equation for cluster one ($n=167$) was not significant ($F(1, 165) = 3.29, p > .05$) with an $R^2 = .02$. For institutions included in cluster one, general resources per capita component is not a significant predictor of graduation rates. In cluster two shown in table 14, general resources per capita ($r(128) = .40, p \leq .05$), and general missing data ($r(165) = -.49, p \leq .05$) components proved to have moderate positive and negative relationships with graduation rates. Within cluster two ($n = 128$), the linear regression may be used to predict graduation rates for institutions based on the general resources per capita component variable. A significant equation was found ($F(1, 128) = 41.21, p \leq .05$) with $R^2 = .24$. Institutions within cluster two predicted graduation rate score = .13 - .16 (general resources per capita). As a result, graduation rates scores decreased .16 points for each additional point in general resources per capita for institutions within cluster two.

Likewise, within cluster three ($n = 212$) and shown in Table 15, general resources per capita and general missing data components both proved to have weak, yet positive relationships with graduation rates. As a result, the linear regression may also be used to predict graduation rates for institutions based on general resources per capita. A significant equation was also found ($F(1, 21) = 8.14, p \leq .05$) with $R^2 = .04$, indicating predicted graduation rate scores = $-.04 + .18$ (general resources per capita), and signaling a graduation rate score increase for each .18 general resources per capita score increase for institutions within cluster three.

Table 14
Linear Regression Model Cluster Two

Model Summary ^{a,d}

Change Statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.493 ^b	0.243	0.237	1.1603415	0.243	41.206	1	128	0.000	^c

Note. ^A CLUSTERS_062118 = 2 ^b Predictors: (Constant), PC_GENERAL_FACTOR ^c Not computed because fractional case weights have been found for the variable specified on the WEIGHT command. ^d Dependent Variable: NSTACK_GRAD_RATE6YRS

Table 14- continued.

Model	Coefficients ^{a, b}					Correlations			Collinearity Statistics	
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
	B	Std. Error	Beta							
1 (Constant)	0.126	0.171		0.734	0.464					
PC_GENERAL_FACTOR	-0.163	0.025	-0.493	-6.419	0.000	-0.493	-0.493	-0.493	1.000	1.000

Note. ^a CLUSTERS_062118 = 2. ^b Dependent Variable: NSTACK_GRAD_RATE6YRS

Table 15

Linear Regression Model Cluster Three

Model Summary ^{a, d}

Model	R	R Square	Std. Error of the Estimate		Change Statistics		Sig. F Change
			R Square Change	F Change	df1	df2	
1	.193 ^b	0.037	0.037	8.144	1	209	0.005

Note. ^a CLUSTERS_062118 = 3. ^b Predictors: (Constant), PC_GENERAL_FACTOR. ^c Not computed because fractional case weights have been found for the variable specified on the WEIGHT command. ^d Dependent Variable: NSTACK_GRAD_RATE6YRS

Table 15-continued

ANOVA ^{a, b}

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.465	1	7.465	8.144	.005 ^c
	Residual	192.274	210	0.917		
	Total	199.740	211			

Note. ^a CLUSTERS_062118 = 3 ^b Dependent Variable: NSTACK_GRAD_RATE6YRS ^c Predictors: (Constant), PC_GENERAL_FACTOR

Findings

The study examined whether and how institutional components such as structural characteristics, institutional expenditures, institutional resources, institutionally funded student aid, and institutional selectivity may be predictive of six-year graduation rates at four-year institutions. Having reviewed institutional cluster groups, differences in those groups, and the correlation of institutional components with graduation rates for those groups, the study found institutional components do have some predictability of six-year graduation rates at some four-year private institutions. Institutional components did not significantly predict graduation rates for institutions within cluster one with average and

higher than average graduation rate scores, general resources per capita, early years, and lower general missing data. As a result, institutions in Cluster one employ institutional allocations to support students and operations, primarily awarding bachelor's degrees with some doctoral research, have lower faculty-student ratios scores, moderate Pell grants awarded to students, and average selectivity and admissions scores. Institutional components did significantly predict graduation rates for institutions in cluster two, with lower than average graduation rate scores, general resources per capita, and selectivity, and higher early years scores and general missing data. Institutions in cluster two can be characterized as low Pell grant scores, lower faculty-student ratio scores, low levels of doctoral research, a large amount of missing data used in the study. Likewise, institutional components are predictive of graduation rates in cluster three, with higher than average general resources per capita, general missing data, and graduation rate scores. Cluster three institutions include higher Pell grant, faculty-student ratio, doctoral research, and bachelor's degree scores, with equally high scores surrounding ethnic diversity and resources per capita including institutional student aid.

CHAPTER 5

DISCUSSION, IMPLICATIONS, AND FUTURE RESEARCH

This chapter presents the findings of this study, exploring the predictive ability of institutional components on six-year graduation rates at four-year private institutions. The details of the finding are segmented and include an outline of the summary of findings, overall conclusions, implications for higher education administrators, recommendations for implementation, and suggestions for future research. As a result, the study may be used to expand the college impact literature and provide a deeper understanding of the influence of institutional environments on student outcomes as defined by six-year graduation rates.

Summary of the Study

The study, using a quantitative methodology, employed an ex-post facto or after-the-fact research design using data held by the National Center for Education Statistics (NCES). Using the Integrated Postsecondary Education Data System (IPEDS), the sample included institutions with Carnegie classifications as four-year, private, non-profit colleges, degree-granting with full-time, first-time undergraduate students, and eligible to participate in federal student aid programs. The study included 509 institutions (n=509), 35 independent variables including structural, institutional allocations, and institutional resources, dependent variable graduation rate, and control variables percent of Pell grant

and the total amount of Pell grant awarded with data ranging from 2015-16 to 1996-97 academic years.

Using SPSS version 24, the data were normalized to be useful for treatment. The data collected contained considerable missing values, primarily from reporting variables that only existed in recent years. Using the multivariate imputation technique in SPSS, the remaining missing values were estimated for the remaining time series. The study used statistical methods aimed at predictability and included descriptive analysis of independent variables as institutional components, two-step cluster analysis, discriminant analysis, and linear regression analysis.

Summary of Findings

To reduce the number of institutional variables to be analyzed, a principal component analysis (PCA) was used to group institutional variables into latent variables representative of institutional characteristics. The PCA returned five latent components supported by Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity. The first principal component early years, representative of consistency of time series data was found to be negatively correlated with Pell grants, faculty-student ratio, the presence of doctoral research, and graduation rates. The next principal component representative of general missing data was found to be negatively correlated with missing data, Pell grants, faculty-student ratio, presence of doctoral research, and graduation rates. The third component general resources was found to be highly and positively correlated with total Pell grants, total bachelor's degree awarded, number of women seeking bachelor degrees, faculty-student ration, the presence of doctoral

program, resource allocations in instructional support, graduation rates, number of Hispanic student seeking bachelor's degree, number of Asian student seeking bachelor's degree, presence of doctoral research, resource allocations in student services, number of men seeking bachelors, resource allocations in institutional support, number of African Americans seeking bachelor's degrees, resource allocations in academic support, institutionally funded grants, number of native Americans seeking bachelor's degree, and the amount of revenue derived from tuition and fees. Finally, the remaining principal components admission and selectivity were negatively correlated with yield rates, and positively correlated with selectivity ratio.

Using a two-step clustering procedure in SPSS institutions were grouped into three nearly equal groups with a cluster quality equal to .60 indicating good quality analysis; cluster 1 (n=167) 32.8%, cluster 2 (n= 130) 23.2%, and cluster 3 (n= 212) 43.9%. The latent components were used as predictors in the clustering procedure. Likewise as identified in the principal component analysis, general resources per capita, general missing data, and early years were identified as having primary importance in the clustering procedure. The two-step clustering procedure and cluster analysis compared overall mean scores for the latent components providing some insight into institutional characteristics within each cluster. Cluster one included higher than average scores in early years, general resources per capita, and graduation rates, while displaying lower mean scores in general missing data. Cluster two included higher scores in early years, and general missing data and lower scores in general resources per capita, graduation rates and selectivity. Cluster three included institutions with higher scores in general

resources per capita, general missing data, graduation rates, and selectivity with lower scores in early years.

To understand if institutions grouped in one of three clusters differed, a discriminant analysis was used to statistically support the findings. The mean score scores for each cluster were significantly different for all latent components. The largest difference was identified in cluster two for general factor indicating resources per capita scores for each institution were largely different. An ANOVA was used to confirm significant differences between clusters as well as differences in predictor importance for graduation rates, early years, general missing data, and general resources per capita scores across clusters one, two, and three. Additionally, a test of equality of covariance matrices was also used to further evaluate the presence of differences between clusters. Log determinants combined with significant results also confirmed variances between clusters for latent components early years and general missing data. The study found no difference in latent component general resources per capita for clusters one and three, and no difference among clusters for components admissions and selectivity. Having statistically confirmed differences exist among clusters, the study used the Eigenvalue as a determinant which measured how much of the differences in six-year graduation rates is explained by the discriminant function. The analysis returned a relatively small Wilks Lambda with significant results, indicating general missing data and consistency of time series data had the greatest discriminating ability. The hold out one method revealed the function may successfully classify institutions with 97.30% accuracy.

The study confirmed differences exist between clusters for all latent components, with the exception of admissions and selectivity. As a result, linear regression analysis was used to ultimately determine if institutional components predict six-year graduation rates at four-year private institutions in the sample. A per cluster regression analysis revealed, for institutions included in cluster one institutional components are not predictive of six-year graduation rates. Cluster one institutions on average had higher than average graduation rates, general resources per capita and early year scores, with lower general missing data scores. Historically, these institutions primarily award bachelor's degrees with some doctoral research, and utilize institutional allocations to support students and operations. Resources per capita seem to matter for this group, although not predictive of six-year graduation rates.

Institutional components did significantly predict graduation rates for institutions in cluster two, with lower than average graduation rate, general resources per capita, and selectivity scores, and higher early years and general missing data scores. Institutions included in cluster two have a moderate and positive correlation with general resources per capita and graduation rates, and a negative correlation with general missing data and graduation rates. As a result, general resources per capita was found to be the only significant predictor of graduation rates, and also predictive of graduation rates for institutions included in cluster two.

Likewise, institutional components are also predictive of graduation rates in cluster 3, with higher than average general resources per capita, general missing data, six-year graduation rate, and selectivity scores, and lower than average early years scores.

Institutions within cluster 3 have weak yet positive relationships with general resources per capita and general missing data. Cluster 3 institutions include higher Pell grant, faculty-student ratio, doctoral research, and bachelor degree scores, with equally high scores surrounding ethnic diversity and resources per capita including institutional student aid. As such, resources seem to also matter in this group as general resources per capita was also the only factor used to predict six-year graduation rates for four-year private institutions.

The between-college framework included in this study suggests institutional environments may predict student outcomes as measured by graduation rates. Using descriptive statistics, principal components analysis, two-step cluster analysis, discriminant analysis, and linear regression analysis the results indicate institutional components representative of structural characteristics, institutional resources, institutional expenditures, institutional student aid, and selectivity are predictive of six-year graduation rates at four-year private institutions but not all institutions presented in the study.

Discussion of Findings

The findings of the study largely support college impact literature theorized conceptually in the between-college framework detailed by Terenzini and Reason (2005) and rooted in Astin's (1984) model of student involvement. The theories suggest the institutional environment the student experiences while attending college may influence outcomes. The environment was further dissected to consider the influence of institutional characteristics as well as the experience of each institution. The study

focused on the influence of institutional characteristics on outcomes as measured by six-year graduation rate. Utilizing institutional level variables combined and consolidated as latent components, the study provided evidence that institutional components may predict six-year graduation rates at some private four-year institutions. Although the results of the study varied by type of institution and did not provide evidence for the same predictors for all three clusters, general resources per capita was found to be highly and positively correlated with six-year graduation rates. Additionally, general resources per capita was found to be highly correlated with the total amount of Pell grant awarded, the total number of bachelor's degree awarded, gender and racial diversity, faculty-student ratio, presence of doctoral programs and research, institutional allocations in student, institutional, instructional, and academic support, including institutionally funded student aid. Moderately positive correlations were also found with tuition revenue and presence of masters' level programs.

The results of the study confirm the prior research of Astin and Astin (1992) and Morrison (2012) supporting a positive and indirect influence of structural components on graduation rates. Specifically, disproving Chen (2010) and Crag (2009) who found no correlation between size and graduation rates. Likewise, the study supports previous claims by Gross, Berry, and Reynolds, (2015) Lipka (2013), and Wall (2007) whereas race was found to be an explanatory variable in predicting graduation rates. The number of women seeking bachelor's degrees were more correlated with graduation rates than the number of men which supports gender completion research from Conger and Dickson (2017) noting women are more likely to matriculate to completion.

This study found institutional grants both funded and unfunded have strong positive correlations with six-year graduation rates. As a result, the study indirectly supports Franke (2012) and the notion that institutional grants increase the probability of graduation. Likewise, the study supports the likelihood of retention and therefore completion as identified in the Georgia State Retention, Wisconsin Education System, and Florida Education System grants. Resource allocations supporting instructional, academic, institutional and student services proved to be of equal importance to the six-year graduation rate prediction equation in this study, like several studies included in the resource allocation college impact literature such as Bailey and Xu (2012), Powell et al., (2012), Walker II (2016), Webber (2012), and Webber and Ehrenberg (2010).

As the study was able to generally support the broad ideas found in previous research, it was not able to confirm with certainty any presence of influence of selectivity and quality on completion rates. The variables selected were too narrowly defined to be used as components. Despite the reliability of yield and selectivity as institutional components, the study confirmed institutions with higher yield and selectivity scores within the study had higher overall graduation rates as found by Cohodes and Goodman (2012) and Walker II (2016).

When considering a consolidated approach to examine influence the study found institutional variables selected and grouped as components may predict six-year graduation rates which support Walker II (2016), Kim (2007), and Gansemer-Topf and Schuh (2005) previous research in multiple factor studies. Although influence and predictability were evident in institutions included in the study, a significant prediction

equation was not found for one of the three clusters of institutions grouped in the study; which supports Rhee (2008) who suggests college effects are highly differential. As a result, the findings of this study contribute to the growing body of educational leadership research that supports the notation that institutional variables may influence six-year graduation rates, while broadly considering the influence of combined variables on graduation rates which are more representative of institutional environments rather than individual resource allocation decisions.

Conclusion

The findings of the study support college impact literature theorized conceptually in the between-college framework derived by Terenzini and Reason (2005) and rooted in Astin's (1984) model of student involvement. The framework suggested the student characteristic and the institutional environment the student experiences while attending college influence outcomes. The framework further dissected the environment to consider the influence of institutional characteristics as well as the student experience of each institution. Particularly evident considering institutional components are not predictive of six-year graduation rates in all institutions and suggest institutional characteristics have a differential effect on outcome; as explained by Rhee (2008).

Likewise, this research further supports the notation of differential effects primarily because of the predictability of graduation rates in some clusters but not others despite being correlated with the same latent components and institutional variables. Based on a differential influence, the study also suggests institutional characteristics and student demographics are different, therefore creating environments that foster student

success look different at different institutions. As a result, it is critical administrators understand student demographics and characteristics and how those elements interact with the institutional environment to foster student success as measured by graduation rates

Implications

This study builds upon the emerging literature which focuses on specific types of institutional components that influence six-year graduation rates. With graduation rates often used as a measure of institutional effectiveness and quality, it is critical that higher education administrators understand institutional components, along with how those components interact with institutional characteristics to create and sustain environments that foster student success and sustain the perpetuity of the institution. The study found institutional variables highly correlated with general resources per capita component capable of discriminating institutions within clusters, and were most significant in the ability to predict six-year graduation rates. However, because the study proves the combined influence of institutional components do not statistically support student outcomes in all environments within the sample, it also becomes critical administrators understand whether and how outcomes are influenced with changes in components. Higher education governing boards and administrative leaders at higher education institutions could utilize the results of this study to make changes in funding policy, enrollment, and sustainability initiatives at the institutional level that will support an increase in retention and degree productivity, and eventually revenue growth and quality.

Recommendations for Future Research

This study sought to determine whether and how institutional components such as structural characteristics, institutional expenditures, institutional resources, institutionally funded student aid, and institutional selectivity predict six-year graduation rates at private four-year institutions. Further research should be conducted to examine in greater detail why institutional components do not have predictive ability in certain institution groups identified in the study. By examining this group, leaders can better understand institutional and administrative cultures that do not foster environments that empower student success, and therefore work to avoid such circumstances for an institution.

Summary

The chapter presented the conclusions and implications surrounding the predictability of institutional components on six-year graduation rates at four-year private institutions. Using a quantitative approach, the study employed an ex-post facto research design using data owned by the National Center for Education Statistics (NCES). The sample included 509 institutions and 38 institutional level variables that span twenty years.

The study engaged statistical methods aimed at segmenting like institutions, understanding if they are different, understanding how the variables interact, determining whether and how those variables may predict student outcomes and does predictability differ by groups. The study found the variables of the study were correlated enough to form institutional components representative of institutional characteristics and substantial enough to be considered the basis of grouping institutions into clusters. Using

the two-step clustering analysis mean differences in institutional components were considered, whereas similarities were found in clusters one and three. Furthermore, to understand if and how clusters differed, a discriminant analysis statistically confirmed differences exist among groups and confirmed general missing data and consistency of time series data had the greatest discriminating ability. The discriminant function successfully classified institutions with 97.30% accuracy.

With statistical differences existing among clusters, a liner regression analysis was used to decipher whether and how institutional components early years, general missing data, general resources per capita, admissions, and selectivity are predictive of six-year graduation rates at four-year private institutions. The regression analysis confirmed the statistical predictability of six-year graduation rates in clusters two, and three but not cluster one. Specifically, and most impactful, was resources per capita which is the only significant predictor of graduation rates and seem to matter for institutions in all clusters, although not predictive of six-year graduation rates in cluster one.

The conceptual framework of this study suggests the institutional environment does have a relationship to student success. As a result, there is a need to understand what, if any institutional components are predictive of institutional completion rates (Pascarella and Terenzini, 2005; Paul Attewell, Scott Heil, and Liza Reisel, 2011; Titus, 2006). Using descriptive statistics, principal components analysis, two-step cluster analysis, discriminate analysis, and liner regression analysis the study indicates possible influence of institutional components representative of structural characteristics,

institutional resources, institutional expenditures, institutional student aid, and selectivity as predictors of six-year graduation rates at four-year private institutions but how much influence and the extent of the influence was not apparent in all institutions represented in the study.

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APPENDICES

APPENDIX A
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APPENDIX B
MERCER IRB EXEMPTION



Institutional Review Board
For Research Involving Human Subjects

Monday, April 9, 2018

Ms. Lori Cromwell
3001 Mercer University Drive
Educational Leadership
Atlanta, GA 30341

RE: College Impact: A Quantitative Study of Institutional Predictors of Completion Rates at Private 4 Year Institutions (H1804092)

Dear Ms. Cromwell:

On behalf of Mercer University's Institutional Review Board for Human Subjects Research, your application submitted on 03-Apr-2018 for the above referenced protocol was reviewed in accordance with Federal Regulations [46.101\(b\)](#) under category(ies) 04 and is **Exempt from further review at this time**.

Any changes to the above protocol **MUST** be resubmitted for IRB review to ensure that risks to the subject have not changed.

Item(s) Approved (09-Apr-2018):

New student application for quantitative analysis research study using bivariate correlation, factorial analysis, and multiple regression analytical methods to examine the predictive role of institutional controlled factors, which targets the post-secondary completion problem in the U.S. Use of existing data from a public clearinghouse.

We at the IRB and the Office of Research Compliance are dedicated to providing the best service to our research community. As one of our investigators, we value your feedback and ask that you please take a moment to complete our [Satisfaction Survey](#) and help us to improve the quality of our service.

It has been a pleasure working with you and we wish you much success with your project! If you need any further assistance, please feel free to contact our office.

Respectfully,

A handwritten signature in cursive script, appearing to read "Ava Chambliss-Richardson".

Ava Chambliss-Richardson, Ph.D., CIP, CIM.
Associate Director of Human Research Protection Programs (HRPP)
Member
Institutional Review Board

"Mercer University has adopted and agrees to conduct its clinical research studies in accordance with the International Conference on Harmonization's (ICH) Guidelines for Good Clinical Practice."

Mercer University IRB & Office of Research Compliance
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