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MODERATOR EFFECT OF FINANCIAL AID ON
PREDICTORS OF COMMUNITY COLLEGE
GRADUATION RATE

by

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A Dissertation Submitted to the Faculty of
Old Dominion University in Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY
COMMUNITY COLLEGE LEADERSHIP

OLD DOMINION UNIVERSITY
May 2010

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ABSTRACT

MODERATOR EFFECT OF FINANCIAL AID ON PREDICTORS OF COMMUNITY COLLEGE GRADUATION RATE

Richard W. Wilt
Old Dominion University, 2010
Director: Dr. Dana Burnett

This study examined the resource allocation decisions community colleges make in order to gain insight into the relationship of those decisions to graduation rate and whether those relationships were influenced by the percentage of students at the college receiving financial aid. Much of the literature on persistence and graduation rate in higher education is based on student characteristics such as SAT scores, high school GPA, ethnicity, and socioeconomic status, or on college selectivity. This study switches the focus to the characteristics of the college rather than the student.

The relative lack of literature on community college graduation rates and the causes of the high variability in graduation rates provided an opportunity for discovery of how college resource allocation decisions and financial aid can influence graduation rate. By using a hierarchical ordinary least squares regression on data obtained from the IPEDS database, this study explored the relationship between college resource allocation decisions on expenditures on instruction, academic support, student services, institutional support, faculty salary, the percentage of instructional staff who are full-time, and professional staff to student ratio to graduation rate, and examined whether the relationship of those predictors of graduation rate was influenced by the percentage of students at the college receiving financial aid.

The results of this study indicate that the moderator effect of the percentage of students receiving financial aid was mixed among the predictors and that some of the predictors are significant in predicting graduation rate singly. The results also reveal two fundamental concepts: resource allocation at community colleges has a small but significant impact on graduation rate, and the percentage of students receiving financial aid at community colleges has an impact on some of the resource allocation predictors of graduation rate. The aggregated data of this study provide a generalized picture of the resource allocation variables' impact on graduation rate and establish a foundation for further research on the complex interactions of community colleges and the graduation goals that benefit students and society.

DEDICATION

To Anthony and Mitzi who were with me every step of the way with patient understanding while Dad was “doing his homework”. I’ll never be able to tell you how much it meant to me to hear “I’m proud of you Dad.” All I can say is thanks.

To Krisy and Malana. A dissertation may not be much inspiration, but I hope you aspire to and realize the goal of a graduate or professional degree. Just don’t wait as long as I did! I’ll try to support you as much as you supported me.

ACKNOWLEDGMENTS

First, I must acknowledge and express my appreciation for the support and leadership of my dissertation committee chair Dr. Dana Burnett. At our first meeting, Dr. Burnett opined that “we” could finish up the proposal by the end of the semester and maybe defend in time for graduation in May. Under his leadership and guidance we actually brought the project to completion with time to spare. Without such strong leadership, support, and guidance “in the trenches” this could still be a goal unrealized.

“We” also includes committee members Drs. Raspiller and Yen. Their close reading, timely feedback, and guidance provided a focus that enabled the concentrated effort it took to bring this to fruition. Also, I must acknowledge the faculty and staff of the Educational Foundations and Leadership Department and Community College Leadership program at Old Dominion University who guided me with the requisite knowledge, skills, and inspiration to start this project.

Much appreciation goes to my colleagues in cohorts one and two for their encouragement and support. And of course Joe; you are the model of perseverance. Even though the project you and I started out to do together didn’t work out, without that jumpstart, who knows how this could have turned out? Thanks for the encouragement along the way of this long journey.

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CHAPTER 1

INTRODUCTION

For many students, community colleges serve as the entry point to higher paying careers or entrance to four-year institutions and upward socioeconomic mobility (American Association of Community Colleges, 2006; Cohen & Brawer, 2001). An educated workforce adds to the local knowledge resource which serves to support local economic development (Baum & Ma, 2007; DeVol, 1999). Since the majority of community colleges are public institutions supported by tax dollars, taxpayers and public leaders expect a return on the public investment in the form of graduates who become a knowledge resource to the local economy. Unfortunately, most students who enter community colleges fail to earn the certificate or degree that can be their opportunity to achieve improved socioeconomic status and contribute to local economic development (American Council on Education, 2003).

Background

Studies have shown that at institutions similar in student and institutional characteristics graduation rates can vary widely (Carey, 2004; Carey, 2005; Gold & Albert, 2006; Horn, 2006). The National Center for Education Statistics (NCES) (2004) provides graduation rates for associate degree granting institutions ranging from 0% to 70%. The research that identifies these graduation rate discrepancies does little to describe the factors that may influence it, and community colleges are underrepresented in the research literature which is devoted to these factors and influences. In a study of community college policies and practices that impact student success, the Community College Research Center noted the lack of research related to institutional effectiveness in

community colleges and comparative institutional performance (Jenkins, Bailey, Crosta, Leinbach, Marshall, Soonachan, and Van Noy 2006).

The benefits of earning a college degree are quantifiable and identifiable; earning potential, health, quality of life, and economic development are linked to educational attainment. There is a correlation between obtaining college degrees and achieving higher income over an individual's working lifetime. Without a certificate or degree, low-income students are less likely to achieve upward socioeconomic mobility (Baum & Ma, 2007; DeVol, 1999; U.S Department of Education, 2004).

Students who enter college immediately after high school with good grades and standardized test scores, who attend full time, without interrupting their stay in college, who come from high income families, and whose parents also attended college are most likely to graduate (Bailey, Calcagno, Jenkins, Kienzel & Leinbach, 2005). That description does not match the characteristics of community college students. It is contrary to the community college mission to be selective (American Association of Community Colleges, 2006). When low-income students attend post-secondary institutions, it is more likely that they attend a community college than a four-year institution (Haskins, 2008; Horn & Griffith, 2006). Research on the relationship between institutional characteristics and retention and graduation will help community college leaders understand how they can address the issue of low graduation rates.

Graduating with a post-secondary credential impacts individuals and society with benefits that are both economic and social. Students who do not graduate will be less likely to enjoy the benefits that achieving a post-secondary credential can provide. The

importance of post-secondary education was accentuated by President Barak Obama in an address to the Joint Session of Congress, February 24, 2009. President Obama stated

...three-quarters of the fastest-growing occupations require more than a high school diploma. And yet, just over half of our citizens have that level of education....And half of the students who begin college never finish. This is a prescription for economic decline...countries that out-teach us today will out-compete us tomorrow....That is why we will provide the support necessary for you to complete college and meet a new goal: by 2020, America will once again have the highest proportion of college graduates in the world. (Remarks of President Barak Obama, 2009).

Post-secondary degree holders are more likely to hold full-time, year-round employment than those with less than an associate's degree; there is also a correlation between obtaining college degrees and achieving higher income over an individual's working lifetime (Day & Newberger, 2002; U.S. Department of Education, 2004). Finally, there is evidence that those who complete degrees are more involved in their communities, are more likely to remain in good health, are less likely to engage in criminal acts, and are more likely to benefit from their own greater economic productivity (A. Fletcher Magnum Consulting, 2003).

In 2008 the College Board issued a "wake-up call" regarding education in the United States. Among the concerns expressed were that the United States ranks near the bottom of industrialized countries in college completion rates, and is eleventh out of 32 nations in degree attainment in the 25 to 34 year-old cohort. The U.S. ranks second in the 55 to 64 year-old cohort, thus, the younger generation is less educated than its parents,

who will soon be retiring from the workforce (Commission on Access, Admissions and Success in Higher Education, 2008). The result will be that “Individual opportunity will suffer. Economic growth will falter. And America’s place in the world will be that much more diminished” (p.7).

Public support for higher education in the United States began with colonial governments supporting the establishment of Harvard and Yale (Institute for Higher Education Policy, 1998). The Morrill Acts of 1862 and 1890 established colleges with the purpose of making postsecondary education available to all citizens, and the GI Bill after World War II was partly justified as “ensuring that veterans would return to the workforce as productive, contributing citizens [and] a good way to avoid large-scale unemployment” (Institute for Higher Education Policy, 1998, p, 7). Today the goal of the successful completion of a post-secondary credential is expressed as a matter of public policy by most states. Forty-one states use graduation rate data as a measure of accountability for their colleges (American Association of State Colleges and Universities, 2002). Thirty-four states have efforts in place to increase the number of bachelor degrees earned by their citizens (Gold & Albert, 2006). The College Board believes that higher education serves the interests of the United States: “America’s schools, colleges, and universities create opportunities, build communities, and advance the national interest.” (Commission on Access, Admissions and Success in Higher Education, 2008, p.7).

The Institute for Higher Education Policy (1998) categorizes the benefits of post-secondary education into public economic benefits, private economic benefits, public social benefits, and private social benefits. The benefits are summarized as follows:

- Public economic benefits
 - Increased tax revenues
 - Greater labor productivity
 - Increased consumer spending
 - Increased workforce flexibility (critical thinking, writing, interpersonal communication)
 - Decreased reliance on financial support
- Private economic benefits
 - Higher salaries and benefits
 - Greater likelihood of employment
 - Higher savings
 - Improved working conditions
 - Professional mobility
- Public social benefits
 - Reduced crime rates
 - Increased charitable giving and community service
 - Increased civic and social participation (voting, civic and community groups)
 - Improved ability to adapt to technology
- Private social benefits
 - Improved health
 - Improved quality of life for children
 - Improved consumer decision making

- Increased personal status
- More hobbies and leisure activities

Public support for higher education and increased accessibility help to distribute these benefits throughout society. However, accessibility does not ensure successful completion, and recent research has begun to focus on how the benefits listed above are actually linked to completing a post-secondary credential, not just attending. These authors also suggest the means for facilitating an individual's completion of a certificate, diploma, or degree (Aitken, 1982; Bailey, 2006; Carter, 2002; Cragg, 2007; Tinto, 1987; Tinto, 1993).

Low socioeconomic status has a negative impact on higher education success. Students in the lowest socioeconomic group drop out of secondary school at higher rates than high income students, and fewer than ten percent earn a postsecondary degree (Alemeida, Johnson & Steinberg, 2006). Low-income students with high academic scores in eighth grade are less likely to enter higher education than high-income students with low scores, and students with high SAT scores from poor families attend higher education institutions at lower rates than higher income students (Carey, 2004; Haskins, 2008). The Haskins study concludes that low-income students are unprepared for the challenges of navigating the bureaucracy of forms and applications necessary to enter a college. Carrying this cultural capital of unpreparedness and not succeeding in post-secondary education leaves low-income students and families unlikely to achieve upward economic mobility (Cook & King 2004; Person, Rosenbaum & Gordon-McKeon 2004).

When low-income students do attend post-secondary institutions, it is more likely that they will attend a community college than a four-year institution (Haskins, 2008;

Horn & Griffith, 2006). Public two-year institutions, community and technical colleges, enroll about 40% of U.S. undergraduates. These students are more likely to be minority and low-income than students at four-year institutions, and less likely to complete a credential. In 2002 26% of incomes reported by community college students were below the threshold of 125% of the poverty level (Horn & Neville, 2006). In order for these students to enjoy the economic and social benefits of higher education, greater success at achieving a certificate, diploma, or degree is necessary.

Using a method common in the research of low income students in higher education (Carey, 2005; Horn, 2006; Paulsen & St. John, 2002), this study uses financial aid as an aggregate representation of the socioeconomic status of community college students. Community colleges with a high percentage of students receiving financial aid are considered to have a high percentage of low-income students enrolled.

Statement of the Problem

The problem of this study is to determine the predictive relationship which exists between institutional resource allocation levels, financial aid, and graduation rates at U.S. community colleges. This study recognizes that resource allocation decisions such as expenditures on student services, instructional support, and salaries and wages can impact the persistence and graduation of students. By exploring the relationship between resource allocation and persistence and graduation with a focus on financial aid, this analysis will lay a foundation for understanding the relationship between institutional financial aid levels and graduation rates. Using resource allocation characteristics identified from graduation rate and persistence studies of both four-year and two-year

institutions as predictors, this study contributes to filling a gap in the graduation rate literature of public community colleges.

Research Questions

Studies indicate that relationships exist between resource allocation decisions and persistence and graduation rate (Bailey, 2006; Bailey, Calcagno, Jenkins, Kienzl, & Leinbach, 2005; Carter, 2002; Gansemer-Topf, 2004; Jenkins, et al. 2006). This study will examine the relationship of these resource allocation decisions to graduation rate as moderated by the percentage of students on financial aid enrolled at the college. In order to analyze these relationships the following questions will guide the study:

1. Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on instruction and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will college expenditures on instruction predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on instruction predict graduation rate regardless of percentage of students receiving financial aid?
2. Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on academic support and graduation rate in community colleges?

- a. If there is the moderator effect of percentage of students receiving financial aid, how will college expenditures on academic support predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on academic support predict graduation rate regardless of percentages of students receiving financial aid?
3. Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on student services and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will college expenditures on student services predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on student services predict graduation rate regardless of percentages of students receiving financial aid?
4. Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on institutional support and graduation rate in community colleges?

- a. If there is the moderator effect of percentage of students receiving financial aid, how will college expenditures on institutional support predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on institutional support predict graduation rate regardless of percentages of students receiving financial aid?
5. Will percentage of students receiving financial aid moderate the predictive relationship between faculty salary and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will faculty salary predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will faculty salary predict graduation rate regardless of percentages of students receiving financial aid?
6. Will percentage of students receiving financial aid moderate the predictive relationship between percent of instructional staff that are full-time and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will percent of instructional staff that are full-time

- predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
- b. If there is no moderator effect of percentage of students receiving financial aid, how will percent of instructional staff that are full-time predict graduation rate regardless of percentages of students receiving financial aid?
7. Will percentage of students receiving financial aid moderate the predictive relationship between professional staff to student ratio and graduation rate in community colleges?
- a. If there is the moderator effect of percentage of students receiving financial aid, how will professional staff to student ratio predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will professional staff to student ratio predict graduation rate regardless of percentages of students receiving financial aid?

Purpose of the Study

This study examines resource allocation characteristics of community colleges as predictors of graduation rate. It examines whether there are relationships between the predictor variables and graduation rate, and whether there is a moderator effect of the percentage of students on financial aid on the relationships. In doing so, this study contributes to filling a gap in the graduation rate literature of public community colleges.

Definition of Terms

Academic support expenditures: Expenses in support of colleges' missions of instruction, research, and public service. Expenses such as academic administration, information technology, and library resources are included.

Community colleges: Public, two-year degree and certificate granting, Title IV institutions.

Core expenses: Expenses for the following functions: instruction, research, public service academic support, student services, institutional support, operation maintenance of plant, depreciation, scholarships and fellowships expenses, other expenses and deductions, total non-operating expenses and deductions.

Faculty salary: Average salary equated to 9-month contracts of full-time instructional faculty - all ranks were derived by summing the equated 9-month outlays for each rank and dividing by the total faculty on both 9/10 month and 11/12 month contracts.

Graduation rate: "The rate required for disclosure and/or reporting purposes under Student Right-to-Know. This rate is calculated as the total number of completers within 150% of normal time divided by the revised cohort minus any allowable exclusions" (National Center for Education Statistics, 2008a).

Graduation Rate Survey: One of the nine components of the Integrated Postsecondary Education Data System (IPEDS). A survey started in 1997 to satisfy the Student Right-to-Know Act. Data are collected on the number of students entering the institution as full-time, first-time degree or certificate seekers in a given year, the number completing their program within 150% of normal time to completion, the number that

transfer, and the number that receive athletically-related student aid and complete within 150% of normal time (National Center for Education Statistics, 2008a).

High financial aid institutions: Institutions whose percentage of full-time, first-time degree or certificate-seeking students receiving any financial aid is equal to or greater than one standard deviation above the mean.

Institutional support expenditures: Expenses for the day-to-day operation of colleges, including expenses for general administrative expenses, executive activities, logistical services, public relations, and development.

Instructional support expenditures: Expenses of the colleges' instructional division(s) including academic instruction, occupational instruction, community education, and adult basic education. Academic administration is not included.

IPEDS: Integrated Postsecondary Education Data System. A systematic collection of surveys conducted by the National Center for Education Statistics collecting data from postsecondary institutions on enrollment, program completions, faculty, staff, finances, libraries, and graduation rates (National Center for Education Statistics, 2008a).

Low graduation rate institutions: Institutions whose percentage of full-time, first-time degree or certificate-seeking students receiving any financial aid is equal to or less than one standard deviation below the mean.

National Center for Education Statistics: The primary federal provider of education statistics for the U.S. Department of Education.

Percent of instructional staff that are full-time: Persons employed at an institution whose assignments is primarily instruction, and persons for whom it is not possible to differentiate between teaching, research, and public service. It includes all ranks of

professor, instructor, lecturer and the equivalent. It includes deans, directors, and department heads if their principal activity is instruction, research, and/or public service. Full-time status is determined by the institution.

Professional staff: Employees of an institution whose primary function or occupational activity is instruction, public service, or research, and holding academic titles. It includes deans, directors, department heads and the equivalent. Its expenditures include positions whose primary responsibility is managerial.

Student Right-to-Know Act: “Also known as the ‘Student Right-to-Know and Campus Security Act’ (P.L. 101-542), which was passed by Congress November 9, 1990. Title I, Section 103, requires institutions eligible for Title IV funding to disclose completion or graduation rates of certificate- or degree-seeking, full-time students entering an institution to all students and prospective students. Further, Section 104 requires each institution that participates in any Title IV program and is attended by students receiving athletically-related student aid to annually submit a report to the Secretary. This report is to contain, among other things, graduation/completion rates of all students as well as students receiving athletically-related student aid by race/ethnicity and gender and by sport, and the average completion or graduation rate for the four most recent years. These data are also required to be disclosed to parents, coaches, and potential student athletes when the institution offers athletically-related student aid. The Graduation Rates component of IPEDS was developed specifically to help institutions respond to these requirements” (National Center for Education Statistics, 2008a).

Student Services expenditures: Expenses in support of admissions, registrar, activities in support of student emotional and physical well-being and development.

Title IV Institution: An institution with a written agreement with the U.S. Secretary of Education that allows the institution to participate in federal student financial assistance programs (National Center for Education Statistics, 2008a).

Total expenses: The sum of all operating expenses that result from providing goods and services.

Significance of the Study

Obtaining a post-secondary credential is a way by which low-income individuals can break out of their low socioeconomic status, enjoy a better quality of life, and contribute to local economic development. Studies indicate that there are factors specific to the student as well as institutional factors that act in concert to have an effect on students' persistence and completion of a certificate or degree (Advisory Committee on Student Financial Assistance, 2001; Almeida, Johnson, & Steinberg, 2006; American Council on Education, 2004; Cook & King, 2004; Jenkins, 2003; Person, Rosenbaum & Gordon-McKeon, 2004; Price, 2003; Zucker & Dawson, 2001). In addition to those actions surrounding specific activities, such as counseling, remediation, and accessibility to financial aid, there can be organizational, or resource allocation, factors that impact both the interface with the student as well as the delivery of instruction and other services. What is learned from this study will be of value to community college leaders in understanding the characteristics of community colleges with high or low percentages of students receiving financial aid, and how their college compares with those colleges. By understanding what resource allocation characteristics of a college can influence student persistence and graduation rates, college administrators can lead change in the institution that will lead to greater success of those students.

Relationship to Community College Leadership

“With such a diverse agenda ahead, community college leaders need to step into the administrative arena armed with both the knowledge of political, management, and decision-making processes and also the sharp, full-spectrum vision of a leader rather than the tunnel vision that can result from limited experience and exposure to diverse ways of thinking about or doing things” (Anderson, 1997, p. 27). Anderson’s agenda anticipates the social changes likely to occur in the twenty-first century. The community college agenda is expressed by Twombly & Amey, (1991, p. 395) as quoted in Anderson (1997), “creating institutional effectiveness and distinctiveness, establishing over-arching purpose, building communities on and off-campus, working with and serving diversified populations, acting affirmatively, and many variations on organizational renewal and institutional leadership.” To put this agenda into effect, leaders need both the theoretical and the practical skills required for leading the diverse organization known as the community college.

This study recognizes that organizational characteristics of community colleges impact the success of diversified populations, including low-income students. Low-income students are underrepresented in higher education and not likely to persist to graduation. Yet, some community colleges produce graduation rates of low-income students significantly higher than their peer institutions. Leadership involves guiding an organization through a changing environment and this study provides evidence to engage community college leaders to consider how they may be able to lead change that allows greater success of low-income students.

Overview of Methodology

This quantitative study used a cross-sectional design to explore resource allocation characteristics of community colleges as predictors of graduation rate. It examined the predictive relationships between the predictor variables and graduation rate, and whether there is a moderator effect of the percentage of students receiving financial aid on the relationships.

The target population is the 2003 data year public, certificate and associate degree awarding, two-year, Title IV participating institutions that reported institutional data to IPEDS. IPEDS data was utilized because they are standards used by researchers and are derived from data reports that are required of all postsecondary institutions that participate in federal student programs (Nation Center for Education Statistics, 2008b). Data were collected using the IPEDS online Data Center. Graduation rate is the criterion variable, predictor variables operationalize the following:

- College expenditures on instruction
- College expenditures on academic support
- College expenditures on student services
- College expenditures on institutional support
- Faculty salary
- Percent of faculty who are full-time
- Professional staff to student ratio
- Percentage of students receiving financial aid

Studies indicate that relationships exist between resource allocation decisions and persistence and graduation rate (Bailey, 2006; Bailey, Calcagno, Jenkins, Kienzl, &

Leinbach, 2005; Carter, 2002; Gansemer-Topf, 2004). This study examined the relationship of resource allocation decisions to community college graduation rate through an analysis of the strength of relationship of seven predictor variables to the criterion variable of graduation rate. Additionally, the analysis examined whether each single criterion variable interacts with, or is moderated by, an eighth variable, the percentage of students receiving financial aid. Thus, the focus of the analysis was on exploring moderated relationships between the predictor variables and the moderator variable in ordinary least squares multiple regression.

The literature is rich in empirical studies establishing a relationship between student income and persistence and graduation. According to Berkner and Wei (2006) the traditional types of financial aid received by students are grants, loans, and work-study. Grants may be either need or merit based, which could be a confounding factor when analyzing financial aid as it relates to student income, however, the data reveal a close relationship between student income and aid received. At public two-year institutions, students with low incomes receive financial aid at a higher rate than medium and high income students; as student income increases the percentage of students who have need and who receive financial aid decreases, Table 1. The data from Table 1 and the literature on the relationship of college success and persistence to income (Almeida, Johnson & Steinberg, 2006; Carey, 2004; Haskins, 2008; Zucker & Dawson, 2001) suggest that the merit aid that is included in grant aid is more likely to be awarded to students in the high income group, accounting for more of the 28% of students receiving aid, than in the low income group, accounting for fewer of the 61% of students receiving aid.

Table 1

Income Group and Financial Aid at Two-year Institutions

Income Group	Percentage of students	
	Who have need	Receiving any aid
Lowest 25%	96.1	61.0
Middle 50%	60.1	48.2
Highest 25%	11.8	28.4

Note. Adapted from *Student Financing of Undergraduate Education: 2003–04, With a Special Analysis of the Net Price of Attendance and Federal Education Tax Benefits*, by L. Berkner and C. C. Wei 2006, (NCES 2006-186). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Given the empirical evidence of the relationship of income to financial aid, this study uses the percentage of students receiving financial aid as a valid representation of student income. This is similar to the practice of using free/subsidized lunch to define income-serving status of K-12 public schools. Colleges with high numbers of low-income students will have a high percentage of students on financial aid. Conversely, colleges with low numbers of low-income students will have a low percentage of students receiving financial aid.

Limitations and Delimitations

A delimitation of this study is the nature of the data to be collected. The study will collect data only related to community colleges and the data they report to IPEDS surveys in the data collection period of 2003. The data is limited to full-time first-time students at public two-year colleges only. Any influence other institutional characteristics not reported in the data may have on graduation rates will not be reflected in the results. Similarly, characteristics external to the institution that may impact graduation rates, such

as local labor market conditions, and other data collection years, will not be reflected in the results.

Interpretation of results of this study should be limited to community colleges and their students in the aggregate. Generalizations to non-community colleges or non-community college students will not be appropriate. Also, since the data collected is reflective of first-time full-time students, which represents a minority of the community college population of students, generalizations to students not so identified will not be appropriate. The data is limited to one year of the annual IPEDS surveys and so reflects conditions reported by college only for the reporting year. Future studies may examine graduation rates of part-time and returning students for a more complete picture of community college graduation rates, and consider longitudinal data for trends and changes in graduation rate conditions and influencers.

Conclusion

Community colleges serve as the entry point for many students to higher paying careers or entrance to four-year institutions and a means to achieve upward socioeconomic mobility. The benefits of obtaining a degree or certificate accrue to both the individual through the potential for higher income and to society through enhanced economic development. Yet most students who enter community colleges fail to earn the certificate or degree that can lead to those outcomes, and low-income individuals are overrepresented in the group of students who fail. There is a large disparity among community colleges in graduation rate, with some institutions graduating a significantly higher number of graduates. This study will seek to discover if the percentage of students receiving financial aid influences the relationship of the predictors to graduation rate.

Chapter 2 provides a review of the literature related to persistence and graduation rate research, low-income as a factor in higher education, and a review of research on the impact of institutional characteristics on persistence and graduation. Chapter 3 outlines the details of the methodology used to identify variables, collect data, and for data analysis.

CHAPTER II

REVIEW OF LITERATURE

In the early development of American higher education when colleges were religiously oriented in the English tradition of Oxford and Cambridge, higher education was for the elite upper classes. The early U.S. population growth and migration from east to west meant social institutions, including higher education, must necessarily be built from scratch. The expansion and the frontier ideals of egalitarianism, access, and work-for-reward allowed for a coming together of the need for social institutions like education and incorporation of those societal attitudes in establishing post-secondary education for the masses in the new western states and territories (Altbach, 2001). The new paradigm was that higher education was available to anyone, and that was the philosophy of the land grant institutions and community colleges that followed.

In the early 20th century publicly supported institutions such as the land grant universities and two-year colleges prepared the working class for careers in vocational disciplines such as agriculture, business, teaching, and engineering. The two-year colleges would evolve into comprehensive community colleges by including vocational education along with the historical curriculum of traditional liberal education that prepared students for transfer to baccalaureate institutions. They served a popularizing function for higher education by making it accessible. Now community colleges are located within 90 to 95% of the population in the states they serve (Cohen & Brawer, 2003). They democratized higher education by enabling attendance to those who would otherwise not be able to aspire to the benefits of higher education. Their open-door acceptance of students as opposed to selective admissions brought in students with

characteristics, needs, and expectations significantly different from the well prepared 18- to 24-year olds at the traditional four-year colleges and universities. The community college serves as the entry point to well-paying technical jobs as well as the entry point to the baccalaureate degree and beyond. Unfortunately most students who enter community colleges fail to earn the certificate or degree that can be their opportunity to achieve improved socioeconomic status and contribute to local economic development (American Council on Higher Education, 2003).

This review of the literature informs this study in four areas important to persistence and graduation research. First, it presents evidence of the empirical validation of the value of a post-secondary credential. Second, it explores low income as a factor in individual success in higher education. Third, it presents the research on graduation and persistence as impacted by institutional expenditures and resource allocation. Finally, it examines the topic of graduation rate in public policy and as a measure of institutional effectiveness.

Benefits of Obtaining a Postsecondary Credential

Post-secondary education is of value to both the individual and society. Baum and Ma (2007) completed a comprehensive study of postsecondary education participation and completion that quantifies the benefits of postsecondary education attainment and includes evidence of the benefits to the community associated with the citizenry obtaining postsecondary degrees. The benefits of higher education are not distributed equally among all groups in the population, men, women, and minorities, but are consistent over all groups. Year-round, full-time employment also has a positive relationship with educational attainment. Post-secondary degree holders are more likely

to hold full-time, year-round employment than those with less than associate's degree (Day & Newberger, 2002).

Postsecondary Education Benefits to the Individual

In general, there is a correlation between obtaining college degrees and achieving higher income over an individual's working lifetime, age 25 to 65. There are several measures that demonstrate the benefits. Benefits are measurable in the aggregate and also demonstrable in various groups in the population, such as women and minorities. The benefit to the individual that researchers cite most is that higher levels of education are related to higher levels of income. The economic benefits, i.e. higher income to the individual, are progressive from high school dropout to professional and doctorate degrees (U.S. Department of Education, 2004). In October 2001 high school dropouts from the 2000-01 academic year participated in the labor force, i.e. they were employed or looking for work, at a rate of 64%. Of those, the unemployment rate was 36%. This compares to a labor force participation rate of 81% and unemployment rate of 21% for high school graduates who were not in college. For adults (persons age 25 and older) the labor force participation rate falls to 44% for high school dropouts with a 7.3% unemployment rate; 64% of adult high school completers were in the labor force with an unemployment rate of 4.2%. In stark contrast, 1992-93 bachelor's degree graduates had a 92% participation rate with a 2.7% unemployment rate in 1997 (U.S. Department of Education, 2004).

The U. S. Census measures characteristics of the population by levels of educational attainment by the following post-high school classifications: some college, associate's degree, bachelor's degree, master's degree, professional degree, and doctorate

degree. In the aggregate, full-time, year-round employment and average annual earnings generally increase with increasing levels of education for adult workers, Figure 1.

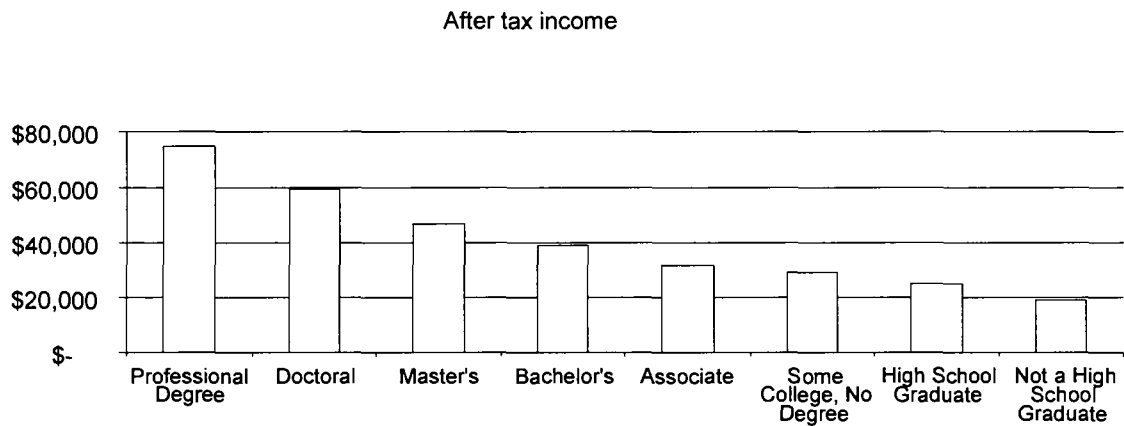


Figure 1. Median After Tax Income of Full-Time year-Round Workers Age 25 and Older, by Education Level (Baum & Ma, 2007).

The economic value of a post-secondary degree is demonstrated in the aggregate and for minority populations, but there is some variability among degrees and career fields.

Increasing monthly earnings for increasing degree levels is apparent but variable among all fields of training. The average monthly earnings for a high school diploma holder was \$2,279 for the period of the Census Bureau study. The value of vocational certificates and associate's degrees is evident in all fields of training but particularly evident in engineering and vocational fields as illustrated in Table 2. Since these certificates and degrees are typically awarded by community colleges, attending and graduating with a community college credential can significantly impact an individual's earning potential (Bauman & Ryan, 2001).

Table 2

Average Monthly Earnings and Percent Increase Over High School Diploma

Field of work	High School Diploma	Vocational certificate	Percent increase	Associate's degree	Percent increase
All	\$ 2,297				
Business		\$ 2,373	3%	\$ 2,727	19%
Computers		^a		\$ 2,996	30%
Engineering		\$ 3,046	33%	\$ 3,208	40%
Liberal Arts		^a		\$ 2,586	13%
Social Science, law		^a		\$ 2,660	16%
Science, medicine		\$ 2,412	5%	\$ 2,783	21%
Education		^a		^a	
Vocational		\$ 2,429	6%	\$ 3,197	39%
Other		\$ 2,578	12%	\$ 2,804	22%

^a Fewer than 200,000 people

Between 1992 and 2002 women have increased college participation rates at a faster rate than men, reaching about equal proportions; 52% for women and 53% for men. For the population 25 to 29 years of age, 31% of women and 26% of men had at least some college. Earnings of men and women are not equal regardless of educational level. Since the mid 1970s many social factors may have contributed to income disparity between men and women, including continuous employment in the labor force, career field, career commitment, promotions, and discrimination, which could affect all other factors. Post-secondary education can mitigate the earnings inequality (Stoops, 2004). In 1975 25-29 year old women earned 69% of men's earnings. By 1999 for the same age

group of men and women, that figure had risen to 81% of men's earnings for those with bachelor's degrees and 78% for high school diploma holders.

Earnings inequalities also exist for minorities, which are not similarly mitigated by post-secondary education, but earnings enhancement does exist. Working lifetime (from age 25 to 65) earnings for African Americans and Hispanics is about the same at all levels of education. The African American or Hispanic high school graduate earns 85% of the white high school graduate, 81% with some college, 87% with an associate's degree, 77% with a bachelor's degree, and 80% with an advanced degree. Although the inequality still exists for minorities, there is a positive impact on earnings in absolute terms with lifetime earnings increasing as education attainment increases (Stoops, 2004).

Earnings differences among the different levels of educational attainment have grown over time. In 1975 a bachelor's degree holder had 1.5 times the annual earnings of a high school diploma holder. In 1999 the ratio increased to 1.8 times. For advanced degree holders the ratio increased from 1.8 to 2.6 times. The nature of work in the U. S. economy demands more skilled and educated workers and this increased demand for skilled workers causes an increasing wage premium relative to less educated workers (Day & Newberger, 2002).

The effects of post-secondary degree attainment have a generational component. Individuals from low-income families are following a pattern set by their parents; they are less likely than affluent families to participate in postsecondary education, tending to perpetuate low-income status. Significantly, and of particular interest to this study, low-income individuals who do attend postsecondary institutions are more likely to attend public community colleges and are less likely to graduate (Baum & Ma, 2007). However,

those low-income individuals who attain a degree can benefit financially and break out of their low-income status.

The opportunity cost of obtaining a degree is recovered by post-degree earnings. If the student had borrowed the total cost of obtaining the degree, their total earnings paid for the opportunity cost of lost income plus borrowing cost while in college. Net earnings exceeded the high school graduate earnings after nine years of work for the associate degree holder and fourteen years for the baccalaureate degree holder. The average 2005 earnings for a baccalaureate degree holder between 25 and 34 years of age was \$19,200 higher than the average earnings of the same age group high school graduate (Baum & Ma, 2007).

Graduation with an associate's degree is also significant for students who intend to transfer to four-year institutions from a community college. There are benefits associated with earning the degree over just accumulating some credits for transfer to a baccalaureate institution. Many states have policies that will guarantee to the associate degree holder admission to a state baccalaureate institution. In Florida, state law dictates that associate degree holders are guaranteed admission to a public university (Wellman, 2002). In Virginia, earning the degree makes the student eligible for guaranteed admission to public and private baccalaureate institutions in the state (Virginia Community College System, 2008).

Other states do not have admissions guarantees, but admission is strongly encouraged through state policy. Texas, for example, does not have a state policy on guaranteed admission or common curriculum but encourages policies among institutions (Wellman, 2002). In a national study of the community college to four-year institution

transfer behavior of high school students who attended community colleges Eddy, Christie, and Rao (2006) discovered that students who transferred to four-year institutions are more likely to have earned a degree at a community college.

Postsecondary Education Spillover Benefits

Post-secondary educational attainment also benefits regional economic development. The general benefit is to improve the quality of the regional workforce by increasing productivity, attracting higher wage jobs, and improving opportunities for economically at-risk populations. So, while individuals benefit by receiving higher earnings, these earnings circulate through the regional economy as increased spending that contributes to economic growth and employment. Degreed individuals earn more income and so pay more taxes than individuals without college degrees. In addition to contributing to tax revenues, individuals with postsecondary degrees are much less likely to live in poverty and be dependent on public assistance programs.

Economic growth contributes to increased tax revenues and government investment in infrastructure. In the past, industrial resources such as raw materials and energy would attract private investment in a manufacturing economy; now an educated workforce, a “knowledge resource”, also attracts private investment by potential employers who contribute to the cycle of economic growth (Baum & Ma, 2007; DeVol, 1999).

Summary

There is significant empirical evidence of the value of post-secondary education. It is of value to both the individual and society. In general there is a correlation between obtaining college degrees and achieving higher income over an individual’s working

lifetime (Bauman & Ryan, 2001; Day & Newberger, 2002; U.S. Department of Education, 2004). Earnings of women and minorities are not equal to men, but the earnings enhancement from post-secondary education still exists. After post-secondary education, the earnings inequality still exists but is reduced (Stoops, 2004). Employment is also affected. Post-secondary degree holders are more likely to hold full-time, year-round employment than less-than associate's degree holders (U.S. Department of Education, 2004). For students who intend to transfer to a four-year institution after attending a community college, graduating with an associate's degree can impact the transfer. Many states have policies that will positively impact or guarantee to the associate degree holder admission to a four-year institution.

The higher earnings received by individuals circulate through the regional economy as increased spending that contributes to economic growth and employment. Individuals with post-secondary degrees are much less likely to live in poverty and be dependent on public assistance programs. The local knowledge resource created by an educated workforce also attracts employers who contribute to local economic growth (Baum & Ma, 2007).

Having observed the demonstrated benefits of earning a post-secondary credential, this study will seek to identify predictors of graduation rate that are controllable by the institution and independent of student characteristics.

Low Income as a Factor in Access, Persistence, and Graduation

Socioeconomic status is a factor in access to and completion of postsecondary education. In order for students to enjoy the benefits that accrue to post-secondary credential holders they must first have access to, and then persist in, higher education. In

a National Center for Education Statistics (NCES) longitudinal study of a national sample of students, Zucker and Dawson (2001) found that students with a family income of over \$40,000 were more than three times as likely to have completed a bachelor's degree than students with a family income under \$15,000 (in 1980 dollars). NCES statistics are also used by Almeida, Johnson, and Steinberg (2006) to study socioeconomic status, secondary and postsecondary dropouts, and postsecondary persistence. Forty percent of students in the lowest socioeconomic group drop out of secondary school compared to ten percent of students from the two highest socioeconomic groups. Half of the secondary school dropouts later enroll in postsecondary institutions, but less than ten percent earn a postsecondary degree. Carey (2004) reports that even poor students with high academic scores in eighth grade are less likely to enter postsecondary education than wealthy, yet academically weak, students. Seven percent of low-income students earned a bachelor's degree by age 26, compared to 60% of upper income students.

Paulsen and St. John (2002) address student socioeconomic status as it impacts students' ability to pay for college and as a factor in how students make decisions. As opposed to the traditional students studied by Tinto (1993) and Chickering (1987), Paulsen and St. John describe today's students as having "limited mobility, choice, and financial means" (p. 2). Additionally, these students' postsecondary education choices, including persistence to graduation, are influenced by cultural capital, i.e. family, environmental, and prior educational experience factors, the same factors that are inherent in community college students. These students are under represented in post-secondary education.

Low Income Graduation Gap

Over half a million college students leave postsecondary education short of a degree every year, a “graduation gap” (Carey, 2004, p. 2). That group is disproportionately made up of low-income students. The baccalaureate graduation rate reported in the Carey study was 54% for low-income students and 77% for high income students. The consequence of not acquiring a degree has a life-long impact on the student in terms of lifetime earnings, effectively carrying forward cultural capital and perpetuating the low socioeconomic status of unsuccessful students (Baum & Ma, 2007; Bauman & Ryan, 2001; Day & Newberger, 2002; Paulsen & St. John, 2002; Stoops, 2004). This is supported by Haskins (2008) and others (ACSFSA, 2007). Haskins reports that low-income students “are at a substantial disadvantage” (p.10) when preparing for college.

“They are ill prepared...by their high schools; they have less knowledge about and receive less help in searching for appropriate schools and filling out the application forms; and they have more difficulty applying for and receiving financial aid (which they need more than do students from wealthier families). Thus ... the nation’s colleges and universities contribute less than they might to the economic mobility of disadvantaged students” (p. 10-11).

In the Haskins report the difference in graduation rate between low-income and higher income students was greater than the difference in enrollments; that is, not only do fewer low-income students enroll in college, but once enrolled they drop out at higher rates. Children from wealthier families

were more than twice as likely to enroll in four-year colleges; less than 6% of students from the bottom income quartile actually graduated from four-year colleges. The low rate of access, persistence, and graduation of low-income students has implications for institutions and society. A Lumina Foundation study (Reindl, 2007) reports on the impact of the graduation gap on the U.S. economy, “The United States needs to increase its production of postsecondary education degrees and reduce gaps in achievement among racial and socioeconomic groups. Otherwise, the country will not be able to meet workforce needs, maintain international economic competitiveness, and improve the quality of life for all Americans.” (p. 1)

Low-income students are not achieving degrees at rates equivalent to their growth in the population. In order to increase degree production absolutely, low-income students must show disproportionately large increases in degree attainment which is currently contrary to existing trends. The percentage of workers ages 25-34 with a postsecondary degree is less than the workers ages 45-54 (Reindl, 2007).

The lack of graduation success of low-income students is reflected in institutional graduation rates. There is a direct relationship between the number of low-income students enrolled in colleges and institutional graduation rates. In a study of four-year institutions using NCES data, Horn (2006) grouped institutions by Carnegie Classification, selectivity, and size of the low-income first-year student population. Categories for low-income student enrollment were defined as small, 20% or fewer federal grant aid recipients; moderate, 21% to

39%; and large, 40% or more recipients. Horn found that for each Carnegie classification the graduation rate declined in each category of low-income enrollment. From small to large low-income enrollment, the graduation rate for doctoral institutions fell from 60% to 48%; for master's institutions the rate fell from 58% to 40%; and for bachelor's institutions the graduation rate fell from 69% to 44%. Institutions classified as low-income serving (a "large" freshman federal aid recipient classification plus at least 25% of the total undergraduate enrollment receiving federal aid) had a median graduation rate of 39% compared to non-low-income serving institutions at 56%.

Other studies suggest that for analysis and comparison purposes researchers should identify and classify institutions by the number of low-income students enrolled, along with other characteristics, so that they can be compared fairly, i.e. an institution serving low-income students should not be compared to an institution with few low-income students because a comparison would not fairly compare the drag on graduation rates the low-income students cause (Bailey, et al., 2006; Carey, 2005). The number of low-income students attending an institution becomes an institutional characteristic used to classify an institution as likely to have low a graduation rate.

In the aggregate, a high number of low-income students is associated with low institutional graduation rates, but there is a broad range of graduation rates. A study by Carey of four-year institutions demonstrates that "some institutions consistently outperform their peers" (2004, p.3) in graduation rate. Comparing similar institutions, a range of 30 percentage points is evident. In the Horn

(2006) study, low-income serving master's and bachelor's institutions showed a range in graduation rate from 35% to 51%. High graduation rate institutions may have a rate double that of the lowest institutions in a peer group. While the range of graduation rates among institutions is documented, there is little research to explain why the differences occur.

Low Income and Bureaucratic Challenges

Low-income students are characterized by a lack of skill in negotiating bureaucratic situations. "Enrolling in college courses can be overwhelming for them....Without a knowledgeable counselor to help guide students through...colleges and universities, low-income adult students are likely to become discouraged and subsequently discontinue their education" (Cook & King, 2004, p. 27). Glenn (2004) reported on a study by Person, Rosenbaum and Gordon-McKeon (2004) that first-generation college students, which can include low-income students, are more likely to complete an associate degree if they attend a college with a bureaucracy that is easy to navigate.

The American Council on Education (2004) reports that students attending community colleges are less likely to apply for federal financial aid than students who attend other institutions, accounting for 60% of students who did not apply. From a policy perspective the report concludes that "no student should miss the opportunity for vital assistance because he or she lacks necessary information, is misinformed about the nature of student aid programs, or is unable to navigate the financial aid application process" (p. 8). Cook and King (2004) give a comprehensive analysis of access to higher

education for low-income adults and determine that people who most need adult education to improve socioeconomic status are the least likely to get it.

Concurrent with bureaucratic challenges, low-income students have life circumstances that demand time and energy, so minimizing the opportunity cost of the college experience is significant to them. Person, Rosenbaum and Gordon-McKeon (2004) suggest that community colleges could be more sensitive to the needs of low socioeconomic status students in their organizational structure. Being assured that courses in the curriculum will be offered when the student can take them and being aware of that assurance early in their program enables students to plan their lives outside the demands of the college. The study included interviews with students of similar demographic characteristics who attended community colleges and private nonprofit and for-profit two year colleges. The for-profits were easier to negotiate, had more streamlined curricula, classes that were offered at more convenient times, and had one-stop centers that combined advising and counseling so students did not have to go to different offices to access services.

Low Income and Academic Preparation

In addition to an aversion to bureaucracy, a characteristic that is also expressed in the low-income population is inadequate academic preparation for college level work. Price (2004) reports that only 20% of low-income high school graduates were qualified or highly qualified for college based on their high school curriculum. Jenkins (2003) reports that the need for remediation is a significant factor for non-completion of a community college curriculum. While academic preparation is often cited as the cause, academic preparation per se may not be the limiting factor to higher education for low-

income students and may be wrongly identified when the real issue is the complex nature of low socioeconomic status (Advisory Committee on Student Financial Assistance (ACSFA), 2001). Bowen, Kursweil, and Tobin (2005) maintain that being prepared for college is a cumulative process that occurs during the life of the student and includes motivation, expectations, and knowledge of the college admissions process, all of which are negatively impacted by low socioeconomic status. The Federal government attempts to mitigate these factors through Title IV of the Higher Education Act of 1965, which defines Federal programs for low-income students that prepare students for post secondary education and provide financial aid that will enable access once their academic preparation is strengthened (ACSFA, 2001).

Summary

Socioeconomic status is a factor in accessing and completing post-secondary education. There is significant empirical evidence that establishes the relationship between low-income and lack of attaining a post-secondary credential. Low-income students enroll in post-secondary education at lower rates than other adults, and once enrolled they drop out at higher rates. Colleges and universities that enroll large numbers of low-income students have graduation rates that are significantly less than institutions that enroll fewer low-income students.

Once enrolled in post-secondary education the research shows that low-income students are more likely to be challenged by institutional bureaucracies and inadequate academic preparation. Low socioeconomic status leaves a student unprepared for the motivation, expectations, and bureaucracy navigation skills necessary for college success.

Their high school curricula provide inadequate preparation for college level work, causing them to have to endure remediation in college, which research shows is a significant factor in non-completion. Still, some institutions with high numbers of low-income students enrolled have significantly higher graduation rates than similar institutions. There is little research to suggest why this graduation rate disparity occurs.

Institutional Expenditures, Resource Allocation, and Graduation Rate

The study of persistence and graduation has historically been from the perspective of those student characteristics, such as academic preparedness, attitudes, race, gender, and socioeconomic status, which can be correlated with persistence to graduation, generally beginning with the work of Tinto (1987) and Aitken (1982). The studies concentrate on understanding characteristics of the student in order to help the student fit in to the institution. Tinto's second edition (1993) devotes a chapter to describing departure from higher education in terms of race, gender, age, and socioeconomic status. How those factors impact student social contact, e.g. black students feeling isolated on majority white campuses and two-year college students working and attending part time, are seen as impacting student departure. The Aitken model differs from the Tinto model in that it also includes variables that Aitken describes as capturing "the effect of various aspects of the physical environment and the quality of services provided by the institution" (p. 33), or, institutional characteristics. The variables of the Aitken model are based on and predictive for traditional aged students attending a residential four-year institution but represent the early thinking of including institutional characteristics, rather than only the characteristics of the student, in retention and graduation models.

More recent studies have looked at characteristics of institutions to determine whether institutional characteristics can predict graduation rates (Bailey, et al., 2006; Horn, 2006). However, these studies, conducted on four-year institutional data, suggest that institutional graduation rates are a function of selectivity and numbers of low-income students enrolled, not how the institutions use or make expenditures on available resources. Rather than looking at institutions and describing them in terms of student populations, other studies have explored institutional behavior or how resources are allocated, i.e. institutional characteristics, which impact student persistence and graduation (Bailey, 2006; Bailey, Calcagno, Jenkins, Kienzl, & Leinbach, 2005; Carter, 2002; Gansemer-Topf, 2004; Jenkins, et al. 2006). In addition to the institution's interest in meeting accountability measures, some of the rationale for looking at institutional characteristics comes from efficiency in resource allocation; institutions can change policies and institutional behavior to efficiently use resources to increase the probability of graduating their students (Cragg, 2007).

Selectivity

Selectivity accounts for differences in graduation rate. The study of selectivity as an institutional characteristic that influences persistence and graduation dates to Astin (1975) and Tinto (1993). Tinto used student SAT scores at four-year institutions as a measure of institutional selectivity, ranging from highly selective institutions requiring incoming first-year student SAT scores of greater than 1100, to open-admission institutions accepting student scores below 700. Highly selective institutions had the lowest first-year attrition, open enrollment institutions had the highest, ranging from 8% to 45% respectively. Not surprisingly, graduation rate followed a similar pattern. In

public institutions, the highly selective four-year institution degree completion rate is 66%, open enrollment four-year and two-year institutions are both 38%. Private institutions had higher overall completion rates but the pattern of diminishing rates by selectivity is the same. Of particular interest to the present study is Tinto's observation that "there is, within any category of selectivity, a wide range of institutional rates of first-year attrition...student attributes such as those measured by selectivity do not entirely explain differences between institutional rates of first-year attrition" (Tinto, 1993, p. 16).

Other early research used a measure called "institutional quality" that consisted of selectivity based on test scores such as SAT, high school GPA, and spending per student (Carter, 2002). When students are matched with the institution with regard to SAT scores they are more likely to graduate, that is, when an individual student's SAT score closely matches the typical SAT score of incoming first year students the student is more likely to persist to graduation (Cragg, 2007). In a study of the persistence of African American, Hispanic, and White first-year students, the selectivity of the institution was the most powerful predictor (Carter, 2002).

Relative to community colleges and the current study, a significant limitation of these studies is that selectivity cannot be used by community colleges as a predictor of institutional success given the public community college mission of open enrollment.

Institutional Spending

Following the trend to remove student population characteristics from the variables that describe the institution, Bailey, et al., (2005), in a study of community colleges, divide institutional characteristics into four groups: general institutional

characteristics which the institution can control as a function of local or state policy; compositional characteristics of the attending students; financial variables that account for revenue and expenses; and a fixed locational characteristic of being urban, suburban, or rural. The intent of the study was to isolate the effects of the variables over which institutions have control. Since four-year institutions can practice selectivity in admitting students and community colleges cannot, the compositional characteristics of attending students was reported separately from the other institutional characteristics reported in the study. The Bailey, et al., (2005) study is the first time in the literature where institutional characteristics associated with resource use or allocation as indicated by revenues and expenditures are used in the prediction of community college graduation rates (Bailey, 2006).

Carter (2002) studied persistence and graduation at four-year institutions by including institutional characteristics in groupings he called institutional quality, academic integration, and social integration, choosing variables inspired by the earlier works of Astin (1982) and Tinto (1987). Carter derived an independent variable from the IPEDS data on total expenditures, selecting student expenditures such as scholarships and student services rather than expenditures for instruction and academic support or total education and general expenditures, arguing that including expenditures that go directly to students and student services is a measure of the degree to which the institution is financially committed to the student. Other studies (Gansemmer-Topf, 2004, Ryan 2004) specifically exclude student services expenditures because they do not impact students directly as expenditures on instruction do, or found them not be significant in impacting retention and graduation, which was also Carter's result. It is, however, illustrative of the

fact that in these types of studies expenditures made by the institution are considered to have an impact on retention and graduation.

At private baccalaureate institutions Gansemer-Topf (2004) used standard multiple regression to explore whether institutional expenditures predicted graduation rates. Academic support expenditures were independent variables. Expenditures per student and percentage of expenditures in support of instruction and academic support significantly and positively predicted graduation rate. Expenditures on student services did not contribute to retention or graduation due in part to the fact that a significant amount of student services budgets are devoted to administrative activities such as recruiting and registrar functions rather than student-oriented activities.

Results of a study by Ryan (2004) support Gansemer-Topf (2004) in suggesting that institutional spending on instructional and academic support has an impact on graduation rates. Using ordinary least squares regression on IPEDS data, the study found positive significant relationships between instructional expenditures and academic support expenditures and graduation. Similar to Gansemer-Topf, student services expenditures did not show a significant relationship to graduation.

Goenner and Snaith (2004) studied the impact of institutional characteristics on graduation rates at doctoral universities. Their study confirms earlier research regarding the impact of selectivity on graduation rate. With selectivity operationalized as the percentage of students enrolled who graduated in the top 10% of their high school class and SAT score, their study indicates a significant positive relationship of SAT score and class rank with graduation rate at the four, five and six year time frames. Total educational and general expenditure at the universities was found to be significant in

predicting graduation rates: increased expenditures lead to increased graduation rates.

The expenditures variable was included in the study to represent direct impact on educational outcomes expenditures such as for support staff, programs for at-risk students, and other forms of direct student academic support, as well as indirect impact, such as better classrooms, instructional technology, and library resources.

Goenner and Snaith (2004) and the other institutional characteristics studies cited earlier included the expenditures variable in regression analyses that included examining other independent variables. In contrast, Gansemer-Topf and Schuh (2004) conducted a regression analysis using only expenditures for instruction and expenditures for academic support as independent variables, with graduation rate as dependent variable. Their study supports the conclusions of the other cited studies that at universities, expenditures on instruction and academic support are significantly correlated with graduation rate.

Faculty

Researchers influenced by the student integration model of persistence and graduation have studied student-faculty ratio as a variable (Carter, 2002; Goenner & Snaith, 2004; Creighton, 2006). Student-faculty ratio, percentage of full-time faculty, and faculty salary are included in studies as a measure of quality of resource allocation and student engagement. These studies propose that full-time faculty are more available and have more of a focus educating the students and higher faculty salaries attract professionals from other fields and reward faculty for better teaching. The Creighton study concluded that the percentage of full-time faculty shows a strong positive correlation with four, five, and six year graduation rates at four-year institutions. The study showed no correlation between faculty salary and graduation rate.

The history of the community college reveals a use of part-time instructors that the four-year institutions do not show. The early colleges used largely part-time faculty but by 1968 the percentage of part-time faculty had declined to 34%, its lowest point (Cohen & Brawer, 2003). A steady rise in the use of part-time faculty, coincident with the expansion of vocational education in community colleges, began so that by 2003 the relative percentages of part-time to full-time faculty at public associate degree granting institutions had reversed. It had become 67% part-time to 33% full-time (Forrest Cataldi, Fahimi, and Bradburn, 2005).

There are three reasons for the increasing use of part-time faculty in the community college; expertise in vocational topics by virtue of being a practitioner, decreasing public funding of higher education forcing colleges to hire part-time faculty as a cost effective alternative to full time faculty, and flexibility in starting and/or maintaining programs with low or variable enrollment that may not support full time faculty (Banachowski, 1996; Cohen & Brawer, 2001; Drewniany, (2006); Leslie, (2006); McCune, 2005).

An issue that relates to part-time faculty that has a long history in the literature is the general feeling of inferior status and lack of respect (Banachowski, 1996). This is a theme that occurs in the early literature as the “bluntly negative assumptions about the impact part-timers have had (or will have) on quality” (Gappa & Leslie, 1993, p. 4). As reported in Banachowski (1996) Kelly (1991) conducted a survey in 1988 in which 85% of part-time faculty surveyed reported being treated as second-class citizens. Similarly, Benjet and Loweth (1989) in Banachowski (1996) and Smith (1980) in Rouche, Rouche and Milliron (1996) use the term *the academic underclass* to describe part-time faculty.

Brewster (2000) concludes that they are “undervalued and underappreciated,” giving rise to negative implications for the institution because of their increasing number. However, Gappa and Leslie (1993) argue that the concern about the use of part-time faculty on the quality of education is misplaced. The concern is not in the quality of instruction but in the treatment of the part-time faculty by their institutions.

Despite the fact that there is an apparent lack of appreciation for part-time faculty, there is recognition of their importance and value to the institution. In the literature, and usually cited in defense of the use of part-time faculty, is reference to the quality and importance of their knowledge in their discipline or occupational area. Since the watershed Gappa and Leslie (1993) study there has been more scholarship on the advantages and disadvantages of using part-time faculty. A universal theme that occurs is the value part-time faculty have in bringing real world expertise to the classroom (Banachowski, 1996; Beckford-Yanes, 2005; Granville, 2001; McArthur, 1999; Snell, 2003). There is no literature which relates the use of full-time or part-time faculty to persistence or graduation in community colleges.

Goenner and Snaith report that student characteristics such as SAT scores, class rank in high school, and age are predictive of graduation rate, which is consistent with other research (Bailey, et al., 2005; Horn, 2006). They also included institutional characteristics in their study that they identified as contributing to the quality of the academic environment. These variables included percentage of full-time faculty, educational and general expenses, student-faculty ratio, and tuition and fees. Regarding faculty, the percentage of full-time faculty was found not to be significant for students graduating in four or five years, but a higher student-faculty ratio was positively related

to students graduating in five to six years. For students graduating in four years the student-faculty was not significant. The researchers pose that the possible explanation is that universities with high student-faculty ratios may have other support systems for students or that the quality of education may suffer but graduation rates are unaffected.

In Carter's (2002) study of the effects of institutional characteristics on persistence and graduation rates at four-year institutions, institutional characteristics were defined by institutional quality, academic integration, and social integration. The researcher operationalized the independent variable academic integration by using IPEDS data on student-faculty ratio. The study supports the Goenner and Snaith (2004) results that student-faculty ratio does not have a significant effect on graduation rates.

Class Size

Class size is related to measures such as student-faculty ratio. As budgets diminish, colleges may be tempted to increase class size as a money-saving measure. Larger class sizes may result in less student engagement with faculty, a factor commonly held to be significant in student retention (Tinto, 1987). Community colleges have historically had small class size as part of their mission of open access and student success (Cohen & Brawer, 2001). Current research is limited and mixed concerning the effect of class size on student success (Toth & Montagna, 2002). In their study of what they characterize as the "scarce recent literature" (p. 254) on class size in higher education, they conclude that what characterizes success is not well defined; some studies use a measure of the transfer of knowledge such as grades, others use measures of information retention, problem solving, and critical thinking. Their findings show mixed

results in the relationship between class size and student success measures and suggest future studies improve on definitions of success and study design.

In a limited study by Arias and Walker (2004), 75% of students who were surveyed in a university introductory economics class reported class size as their least important factor in deciding which section to enroll in, but an ordinary least squares regression of those students' standardized test scores relative to class size indicated that small class size had a significant positive effect on scores.

Summary

The studies on how institutional characteristics impact retention and graduation, largely involving universities, provide a framework for forming the same questions for community college researchers and practitioners. But, since community colleges cannot be selective because it is contrary to the community college mission (AACC 2006), community college studies should consider institutional characteristic variables over which the college administration can exercise some control, rather than consider characteristics that describe the institution in terms of the students enrolled such as SAT scores or other measures of preparedness, socioeconomic status, and ethnicity or race. Community colleges have to work with the students they have. Little research has been done using community college data to determine if institutional characteristics different from the selectivity and enrolled student characteristics of the four-year institution studies can be shown to influence graduation rates (Bailey, 2006; Bailey, et al., 2005).

Institutional spending on assets and activities in support of student learning has been the topic of some research, showing mixed results regarding the impact on persistence and graduation. The studies use differing definitions of what the expenditures

in support of students are. The value of these studies lies in the fact that researchers believe that expenditures made by the institution are considered to have an impact on retention and graduation.

In addition to measures of institutional spending, a few researchers identify faculty use as a way to operationalize resource allocation. Student-faculty ratio, percentage of full-time faculty, faculty salary, and class size are included in studies as measures, however, all of the studies are from four-year institutions, not community colleges. The studies propose that more full-time faculty will make them more available to students and the faculty as a whole will have more of a focus on educating students. The results of these studies are mixed regarding the impact on retention and graduation. Researchers pose that a possible explanation is that universities with high student-faculty ratios may have other support systems (which may be evident in the expenditures variables above), or that even though graduation rates may be unaffected the quality of education may suffer. More research is needed, and since none of the studies cited included community colleges, including them in future research is important in order to include them in the literature on how faculty allocation by institutions impacts retention and graduation.

Class size is a variable that also has limited study. The limited research available is based on the presumption that larger class size may result in less student engagement. Community colleges, which traditionally have smaller classes, may find additional research relative to class size of interest. Current research has not been consistent in defining success relative to the impact of class size. Studies have shown mixed results on

the impact of class size on various measures of success, such as performance on standardized tests or other measures of learning.

Graduation Rate as a Measure of Institutional Effectiveness

Since higher education should benefit the individual and society through increased earnings, personal development, and community development it is subsidized by tax dollars. Community colleges are financed almost exclusively from public funding, usually a mix of local and state tax revenues (Cohen & Brawer, 2001). In the last two decades a political climate has evolved that wants higher education to justify and explain to taxpayers what the institutions are doing with the money and demonstrate that taxpayers are getting a good return on the public investment in higher education (Altbach, 2001). In addition, the Secretary of the U.S. Department of Education commissioned a report on the state of higher education in the United States. The report “noted a remarkable shortage of clear, accessible information about crucial aspects of American colleges and universities, from financial aid to graduation rates.” (U.S. Department of Education (2006), p. 4).

The Student Right-to-Know and Campus Security Act amended the Higher Education Act in 1999. It requires colleges to report the graduation rate for the fall semester first-time, full-time students in degree programs (Bailey, et al., 2006) and is known as the SRK rate. It is reported to IPEDS through surveys colleges are mandated to complete (National Center for Education Statistics, 2008b). The SRK rate is the graduation rate for students who complete their program within 150% of the time required to complete the degree if attending full-time.

Graduation Rate as Institutional Effectiveness Measure

Research by Aitken (1982) differs from traditional graduation rate studies based on Tinto's (1987) student characteristics in that it includes consideration of the campus environment and institutional services received by students. Since then there have been studies focused on studying institutional characteristics such as behaviors and resource allocation and their impact on graduation rate. Institutions armed with the knowledge of the impact of institutional characteristics can effect changes within the institutions to have a positive impact on persistence and graduation.

Acknowledging Berger and Braxton's (1998) research on student departure as affected by institutional resource allocation Gansemer-Topf (2004) studied the impact of institutional expenditures on graduation rate. The study examined the amount of money spent per student as well as the percentage of institutional expenditures spent on instruction, academic support, student services, institutional support and institutional grants and the impact on first-year retention and six-year graduation rates at private four-year institutions.

Jenkins, Bailey, Crosta, Leinbach, Marshall, Soonachan, and Van Noy (2006) studied community college policy and practice and the impact on graduation. The researchers hypothesized a model of community college effectiveness that promoted student success; success is defined as completion to a degree or certificate, transfer, persistence. Even though success included measures in addition to graduation rate, graduation rate was an important measure in comparing college effectiveness.

Bailey, et al., (2006) studied graduation rates relative to certain institutional characteristics. The study sought to develop a model to measure the effect of institutional

characteristics on graduation rates using IPEDS data. Among the conclusions reached in the study was that greater instructional expenditures are related to increased graduation rate.

Bailey (2006) explored IPEDS data to discover variables that impact graduation rates. The study recognized the importance of graduation rate to institutional accreditation agencies, state legislatures, and system offices. Using data mining techniques on IPEDS enrollment, program completions, faculty, staff, financial, and institutional characteristics data the study sought to explain the relationship of those variables to graduation rate.

Creighton (2006) conducted a study to determine predictors of graduation rate from student and institutional factors. The study recognized the importance of graduation rates from the prospective of the university; allocating scarce resources to meet educational objectives, and from the prospective of the student; meeting educational and social objectives.

Caffey (2007) studied the impact of institutional characteristics on graduation rates of African-American students. The study reasoned that a college degree was particularly important for African-American students to raise socioeconomic status. In order to separate graduation from individual student characteristics of entering African-American students the study investigated whether characteristics of the institution impacted graduation rates.

Carter (2002) compared the graduation rates of African-American, Hispanic, and White students relative to institutional characteristics. The study examined if, and to what extent, institutional characteristics and student integration are positively or negatively

associated with persistence and six-year graduation rate at four-year institutions. The graduation rate data used in the study was from data reported by colleges to the National Collegiate Athletic Association rather than IPEDS.

Laughlin (2006) studied student engagement and the need to develop interventions to improve graduation rate. The study highlighted the differences in retention and graduation rates among different student groups and examined the differences in engagement, retention, and graduation between occupational-technical program and transfer program community college students. A focus of the study was what actions individual community colleges can take to improve retention, stressing the importance of graduation rate as an educational goal of the student.

Bailey, Crosta and Jenkins (2006) examined the validity of the SRK graduation rate as a measure of institutional effectiveness given that the measure is available on every U. S. undergraduate institution and used as a performance measure to compare institutions. The study concludes that comparison among community colleges is a valid use of graduation rate despite some of the shortcomings of the measure as an indicator of individual community college performance.

In these studies, and in this study, graduation rate is a measure of institutional effectiveness rather than student success. That is, graduation rate and factors impacting it are used to make institutional comparisons or as information to make institutional change.

Graduation Rate as Public Policy

Graduation rate can also be found in institutional and state higher education system statements of strategic planning and policy. Forty-one states use graduation rate

data for accountability and performance reporting. States use the NCES Graduation Rate Survey, state-defined measures of graduation rate, or other statewide goal assessments related to graduation rate for funding, strategic planning, and reporting to the public (American Association of State Colleges and Universities, 2002). Eighteen states tie graduation rate to funding (Gold & Albert, 2006).

States see higher education achievement and degree attainment as an economic development issue. In Virginia the system-wide goal is to attain a graduation rate in the top ten percent of peer institutions (Virginia Community College System, 2008). The North Carolina Community College System uses a set of performance measures “to ensure public accountability for programs and services” (North Carolina Community College System, 2007, p. 5). The measures include a graduation measure defined as “number of individuals completing a curriculum program with a certificate, diploma, or degree” (p. 33) divided by the total number of curriculum students in the cohort. The state of Washington is beginning an initiative that is a state wide effort to improve student achievement. Among the measures that will be used to determine financial rewards for colleges making improvement is for students to “earn a certificate backed by at least one year of college [or] earn a two-year degree” (Washington State Board for Community & Technical Colleges, n.d., Momentum Point Calculation). Kentucky has set a goal to “double the number of college educated adults in Kentucky by 2020” (Kentucky Council on Postsecondary Education, 2005, p.8). Among the strategies to do so is to reward and provide incentives to institutions to increase the number of degrees awarded. Thirty-four states have efforts in place to increase the number of bachelor degrees earned

in the state (Gold & Albert, 2006). Graduation rate is a part of the institutional effectiveness and policy landscape.

Disparate Graduation Rates among Institutions

Even though they enroll similar types of students, similar institutions as defined by Carnegie classification have widely different graduation rates (Carey, 2004; Carey, 2005; Commission on Access, Admissions and Success in Higher Education, 2008). Four-year institutions that are similar in enrolling students by race, ethnicity, income, and academic preparedness produce significantly different graduation outcomes. Low income is predictive of degree attainment. From an individual perspective, a student of low income is less likely to achieve a college degree (Adelman, 2006). Colleges that enroll higher percentages of low income students are more likely to show lower institutional graduation rates; 39% graduation rate for low-income serving institutions, 56% graduation rate for not low-income serving institutions (Horn, 2006). However, the Horn study identified low-income serving institutions that had graduation rates in the top 10% of their selectivity level indicating “that ‘successful’ low-income serving institutions are not easily categorized. They span the public and private sectors, small and large institutions, and urban and rural locations...” (p. 48). The purpose of the Horn study was not to determine why some low-income serving institutions have high graduation rates, but to point out that some low-income serving institutions are doing it.

Two reports by The Education Trust had findings similar to the Horn (2006) and College Board (2008) studies (Carey, 2005; Haycock, 2006). Colleges with similar characteristics in terms of Carnegie classification, enrollment, and student characteristics show a wide range of graduation rates among institutions. Generally, regardless of

Carnegie classification, colleges with higher percentages of students receiving Pell grants had lower graduation rates. However, in any given Carnegie classification and percentage of students receiving Pell grants, the graduation rate range varied from the teens to over 70% (Haycock, 2006). A comparison of IPEDS graduation rates for public, two-year degree and certificate granting, Title IV participating institution's 2003 entering student cohort shows a similar dispersion of data, Figure 2.

Concerns about Graduation Rate as a Measure

“Graduation rate measurement as a performance indicator is common to public colleges and universities and the states, and public policy ... should recognize this fact” (American Association of State Colleges and Universities (AASCU), 2002, p. 1). However, several complicating issues raise questions about using graduation rate as a measure of accountability. The AASCU study concludes that graduation rate must be considered within the context of student characteristics and private not-for-profit or public sector institutions. Private not-for-profit institutions have higher average graduation rates at all levels of Carnegie classification and low graduation rates occur disproportionately at low-income and first-generation-at-college serving institutions.

For community colleges, graduation rate does not account for the complex and multifaceted path community colleges students take. At community colleges in particular students are principally transient. The majority does not enroll in classes, remain continuously enrolled, and then graduate in two or three years (Cohen & Brawer, 2003). Community college leaders and researchers generally note that students enroll in the community college for a variety of reasons and those reasons frequently do not include graduating with a certificate or degree .

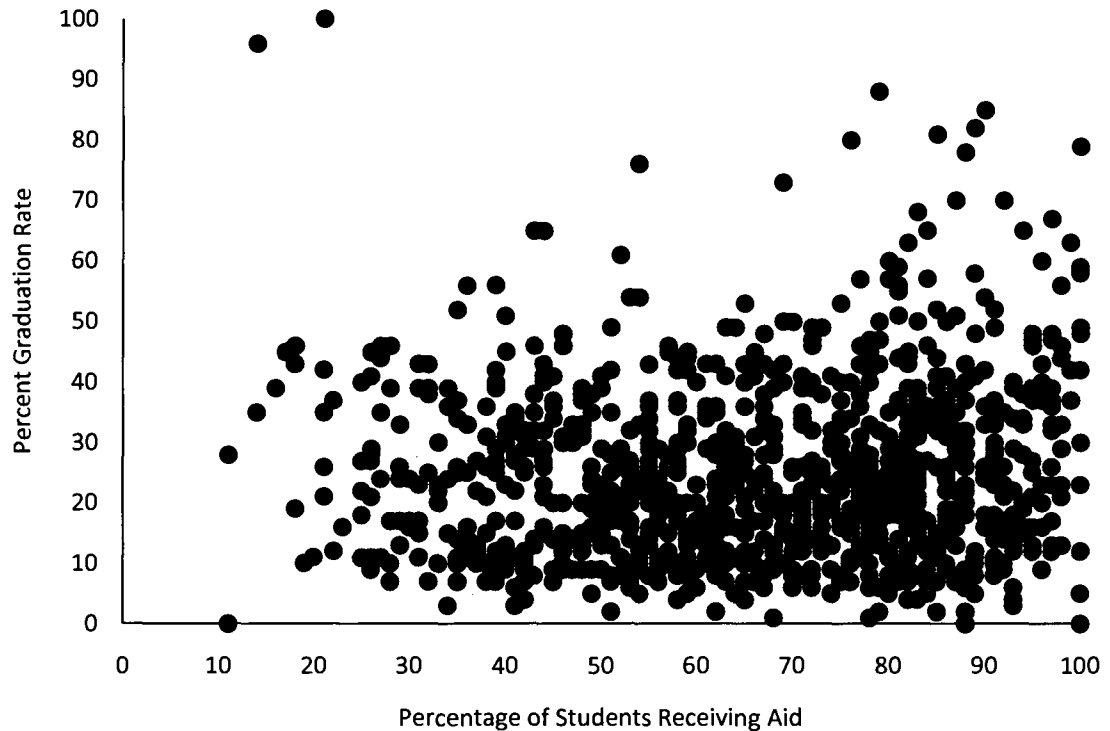


Figure 2. 2003 Cohort IPEDS Graduation Rate by Percent of Students Receiving Aid

There are three generalizations cited as rationale for not using graduation rate as a measure of successful student outcome at community colleges. First, students know what they want and many enter the community college with the knowledge that a certificate or degree is not their goal. A second reason cited for not using graduation rate as a measure is that conditions that impact a student's ability or inclination to earn a certificate or degree are beyond the ability of the college to influence. Family and work responsibilities that make demands on students cannot be mitigated by college policy or procedure. Third, students transfer among institutions. The student who starts at one institution but finishes a degree at a second institution is not considered to be a graduate at the first institution, that is, a student who enters but does not finish (Bailey, et al., 2006).

The response to these generalizations does not indicate a complete mitigation of the issues raised, but shows that concern need not be great enough to abandon graduation rate as a measure of institutional effectiveness. First, those students who do not enter the community college with a certificate or degree goal may not be aware of the economic benefits that can be realized as a result of acquiring the credential. Colleges should do a better job of advising these students. Second, some colleges do a better job of graduating their students than others. These higher graduation rates include low-income, minority, and other at risk students. This suggests that colleges with low graduation rates could improve. Third, students at a community college attend that college because of its proximity to the student. They tend to be less mobile than the students at four-year institutions. Family, work, and other obligations tie them to the community, and by default, the local community college.

It is true that some community college students transfer to a four-year or other two-year institution before graduating from community college. Transfer of community college students to four-year institutions does depress community college graduation rates somewhat for those transfers that occur before attaining the associate's degree.

Bailey et al. (2006) conclude that U.S. Department of Education mandated SRK graduation rates should be used cautiously but they are useful for comparison among institutions. In addition, the wide variation among institutions is of interest to research and public policy. Many states have developed reporting and accountability measures that enable them to gather persistence and graduation data that accounts for part-time students, transfers, and students still enrolled after several years (American Association of State Colleges and Universities, 2002). Still, as a measure of institutional

effectiveness, the SRK graduation rate is used as a metric and has a significant presence in both recent research and policy. Some institutions have higher rates of graduation than others, again suggesting that the low graduation rate institutions could improve, and that some institutions have some characteristics that distinguish them as having higher graduation rates.

Summary

A political climate has evolved that wants higher education to be accountable for taxpayer's dollars. In 1999 the Student Right-to Know and Campus Security Act established a definition for institutional graduation rate as a metric. There is a significant body of research that uses the SRK graduation rate as a measure of institutional effectiveness and as a metric by which institutions can be compared. As a matter of public policy and economic development, graduation rate is found in institutional and state higher education planning and policy statements. The SRK graduation rate is used for funding decisions, strategic planning, and reporting to the public.

Low income is predictive of degree attainment. A low-income individual is less likely to achieve a college degree, and institutions serving low-income students are likely to have lower institutional graduation rates. Yet, even though they may enroll similar types of students, some low-income serving institutions have a higher graduation rate than their peers.

Graduation rate is measured in this research by using the graduation rate as reported in the Graduation Rate Survey of the Integrated Postsecondary Education Data System. The graduation rate is the number of first-time, full-time, degree- or certificate-seeking undergraduates in a given year who complete their programs within 150% of the

normal time to complete the program as a percentage of the total number of those students (National Center for Education Statistics, 2008a). The measure is a standard used by researchers and is derived from data that is required of all postsecondary institutions that participate in federal student programs (National Center for Education Statistics, 2008b).

Conclusion

The benefits of post-secondary education are tangible, last a lifetime, and accrue across generations. Participation in the workforce is higher and unemployment is lower for those with education beyond high school. Since some of the post high school credentials earned by students are the certificates and associate's degrees awarded by community colleges, attending and graduating from a community college can significantly impact an individual's earning potential. Low-income individuals who attain a post-secondary credential can benefit financially and break out of their low-income status. Higher earnings received by individuals circulate through the regional economy as increased spending that contributes to economic growth and employment. This study focused on what characteristics of community colleges are significant in graduating low-income students, and attempted to identify characteristics that allow some community colleges be much more successful in graduating their low-income students.

Socioeconomic status is a factor in access to and completion of postsecondary education. Low-income students drop out of secondary school at higher rates than non-low-income students, enroll in post-secondary education at lower rates, and complete post-secondary certificates and degrees at lower rates. Some studies claim that the graduation gap between low- and higher-income students will have a negative effect on

national economic growth and global competitiveness. If community colleges can identify characteristics in high graduation rate institutions that are significantly different from their peers, they may be willing and able to effect the changes necessary to improve their own graduation rates.

Institutional graduation rates are part of the political and policy environment in which community colleges operate. Since 1999, colleges and universities have been required to report the graduation rate of fall semester, first-time, full-time students in degree programs. Since this metric is widely used in research and policy, this study will use this graduation rate in the analysis of graduation rates in U.S. community colleges. Graduation rate research is well represented in the literature. Most focus on student characteristics related to the likelihood of an individual graduating, some focus on the characteristics of institutions, and very few deal with community colleges and the percentages of the students they serve who receive financial aid. This study will help to fill that gap in the literature.

The following chapter describes the data, methods of analysis, and limitations of the study.

CHAPTER III

METHOD

The following questions guided the study:

1. Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on instruction and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will college expenditures on instruction predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on instruction predict graduation rate regardless of percentage of students receiving financial aid?
2. Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on academic support and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will college expenditures on academic support predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on academic support

predict graduation rate regardless of percentages of students receiving financial aid?

3. Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on student services and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will college expenditures on student services predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on student services predict graduation rate regardless of percentages of students receiving financial aid?
4. Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on institutional support and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will college expenditures on institutional support predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on institutional support

predict graduation rate regardless of percentages of students receiving financial aid?

5. Will percentage of students receiving financial aid moderate the predictive relationship between faculty salary and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will faculty salary predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will faculty salary predict graduation rate regardless of percentages of students receiving financial aid?
6. Will percentage of students receiving financial aid moderate the predictive relationship between percent of instructional staff that are full-time and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will percent of instructional staff that are full-time predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will percent of instructional staff that are full-time predict graduation rate regardless of percentages of students receiving financial aid?

7. Will percentage of students receiving financial aid moderate the predictive relationship between professional staff to student ratio and graduation rate in community colleges?
 - a. If there is the moderator effect of percentage of students receiving financial aid, how will professional staff to student ratio predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?
 - b. If there is no moderator effect of percentage of students receiving financial aid, how will professional staff to student ratio predict graduation rate regardless of percentages of students receiving financial aid?

Design

For this quantitative study data was collected from the IPEDS data center available online through the Department of Education National Center for Education Statistics IPEDS Data Center. Criterion and predictor variables were selected based on a review of the current literature on graduation and persistence studies. Ordinary least squares multiple regression with moderated relationships was used to analyze the data. The data represent a cross section of the population of public, two-year degree granting, Title IV participating community colleges. Private non-profit and for-profit institutions were not included because tuition is significantly higher than the public colleges and financial aid is awarded for attendance that may not reflect income status of the recipient but rather the price of attending the institution. According to the U.S. Department of Education the 2007-08 tuition and fees at public two-year institutions and private two-

year institutions was \$6966 and \$21712 respectively (National Center for Education Statistics, 2009a).

The main research questions explored what resource allocation characteristics are predictors of the graduation rates of U. S. community colleges and how those predictors are moderated by the percentage of students receiving financial aid. Follow-up research questions further explored the presence or absence of the moderator effect on the predictors. If a moderator effect was evident, a follow-up question explored the predictive relationships at high and low levels of the moderator variable. If no moderator effect was evident, a follow-up question explored the relationship of the predictor alone to the criterion.

Data Source

The instrument used to collect data for this study is the IPEDS Data Center available online through the Department of Education National Center for Education Statistics. IPEDS gathers data from higher education institutions that participate in federal financial assistance programs, referred to as Title IV (National Center for Education Statistics, 2008a). Accordingly, data obtained in the IPEDS Data Center represent the population of public, certificate and associate degree awarding, two-year, Title IV participating institutions that reported institutional data to IPEDS. Data are from the 2007 reporting year. This is the most recent reporting year available and represents data collected from the institutions' 2003 cohort of first-time, full-time, certificate or degree seeking students. IPEDS has been collecting data in its present form from institutions since 1997.

IPEDS data is collected from participating institutions by way of surveys that collect student data from individual institutions representing enrollment, completions and transfers, and financial aid, and institutional data representing staff numbers, salaries, and sources of expenses and revenues. Participating Title IV institutions are required to submit periodic survey data to IPEDS. Survey forms are mailed to institutions annually beginning July 15. Institutions submit responses either on paper or in electronic format directly to IPEDS, or to state coordinators who then report to IPEDS.

Data are retrievable from the IPEDS Data Center as pre-defined reports, user-defined reports, and as downloadable data files from individual IPEDS surveys or user-defined custom data files (National Center for Education Statistics, 2009b). Data for this study were downloaded custom data files with variables representing selected resource allocation and student characteristics of interest to the study from 1038 institutions.

Variables

This study focused on resource allocation characteristics that studies suggest impact graduation rates. The purpose of this study is to explore the relationships between institutional resource allocation characteristic variables rather than student characteristic variables, and institutional graduation rates, and to explore whether the percentage of students receiving financial aid will moderate those relationships.

Criterion Variable

The criterion variable is the IPEDS Student Right to Know graduation rate, “Graduation rate of first-time, full-time degree or certificate-seeking students - 2003 cohort (less-than-4-year institutions). The graduation rate is the rate required for disclosure and/or reporting purposes under Student Right-to-Know. This rate is

calculated as the total number of completers within 150% of normal time divided by the revised cohort minus any allowable exclusions.” (National Center for Education Statistics, 2008a)

Predictor Variables

Based on extant studies of the impact of institutional resource allocation on persistence and graduation, the predictor variables for this study were collected from the IPEDS Data Center and represent the following categories:

- College expenditures on instruction
- College expenditures on academic support
- College expenditures on student services
- College expenditures on institutional support
- Faculty salary
- Percent of faculty who are full-time
- Staff to student ratio

These expenditure categories represent areas over which the community college has at least some discretionary control and can be allocated to affect learning and/or the learning environment. Since dollar amounts can vary widely depending on the size of the institutions, the enrollment of the institutions is accounted for by using per-FTE data. IPEDS per-FTE data are calculated as the expense datum value divided by 12-month FTE enrollment. Data were accessed and downloaded in a format suitable for processing in SPSS statistical analysis software. Accessed from the IPEDS data tables, the variables are defined and operationalized as follows (National Center for Education Statistics, 2009b):

- College expenditures on instruction: an expense category representing expenses of instructional divisions within the institution including expenses for public service and research. Academic administration and information technology are not included. The value is dollars per FTE student.
- College expenditures on academic support: an expense category representing expenses on activities and services that support the institution's primary missions of instruction, research, and public service, including libraries, media services, academic administration, personnel development, and information technology related to academic support activities. The value is dollars per FTE student.
- College expenditures on student services: an expense category representing expenses for admissions, registrar, and activities whose purpose is to contribute to student emotional and physical well-being. The value is dollars per FTE student.
- College expenditures on institutional support: an expense category representing expenses for general administrative services, facilities management, executive management, public relations, human resources administration, and development. The value is dollars per FTE student.
- Faculty salary: average salary on a 9-month basis for all full-time instructional faculty. The value is dollars per year.
- Percent of faculty who are full-time: Persons employed at an institution whose assignments is primarily instruction, and persons for whom it is not possible to differentiate between teaching, research, and public service. It includes all ranks of professor, instructor, lecturer and the equivalent. It includes deans, directors, and department heads if their principal activity is instruction, research, and/or

public service. Full-time status is determined by the institution. Expressed as a percentage of all employees whose primary assignment is instruction, research, and/or public service.

- FTE professional staff to student ratio: full-time-equivalent professional staff is calculated by adding one-third of part-time professional staff reported to IPEDS to full-time professional staff. Professional staff is defined as staff who hold academic titles of professor, including assistant and associate, instructor, or lecturer whose primary function is instruction, public service, and research. Academic department administrators such as deans and department chairs, including assistant and associate, are included. The value is calculated as full-time-equivalent professional staff divided by full-time-equivalent enrollment.

Moderator Variable

In ordinary least squares regression, a moderated relationship of predictor variable to criterion variable presents itself for analysis when a third variable is hypothesized to have an effect on the relationship between the predictor and criterion. Depending on the value of the third variable, the relationship of the predictor to the criterion will vary. This study hypothesizes that the predictive relationships between each of the predictor variables and the criterion variable will be moderated by the variable percentage of students receiving financial aid. The percentage of students receiving financial aid is defined as the percentage of full-time, first-time, degree or certificate-seeking students who receive grants, loans, assistantships, scholarships, fellowships, tuition waivers, tuition discounts, veteran's benefits, employer tuition reimbursement, and Title IV loans (National Center for Education Statistics, 2009b).

Data Analysis Procedures

The instrument used to collect data for this study was the IPEDS Data Center available online through the Department of Education National Center for Education Statistics. Data obtained in the IPEDS Data Center represent the population of community colleges defined as the subjects of this study. The statistical analysis software application SPSS 16.0 is the software used to perform statistical analysis on the data. Ordinary least squares multiple regression was employed to analyze the strength of relationship of the predictor variables to the criterion variable of graduation rate as moderated by the percentage of students receiving financial aid.

Ordinary Least Squares Multiple Regression

Ordinary least squares multiple regression is an appropriate analysis method for the purpose of this study, determining the strength of relationship of predictor variables with graduation rate (Meyers, Gamst, & Guarino, 2006). When the effect of a predictor variable on the criterion variable differs depending on the value of a third variable, a moderator, or interaction, effect is occurring (Jaccard & Turrissi, 2003). In this analysis, the variable percentage of students receiving financial aid was the moderator variable. The remaining seven predictor variables were hypothesized to vary in the strength of their relationship to the criterion variable graduation rate as a function of the moderator variable. An ordinary least squares linear regression model in the general form $Y = a + b_1X + b_2Z + e$ estimates the effect of one predictor variable on the criterion variable at each level of the other predictor (Jaccard & Turrissi, 2003). When one predictor is classified as the moderator, then the effect of the predictor variable becomes dependent on the value of the moderator and the general form of the equation becomes $Y = a + b_1X$

+ $b_2Z + b_3XZ + e$ (Jaccard & Turrisi, 2003). The variable representing the percentage of students receiving financial aid is identified as the moderator variable in order to examine the effect of the percentage of students on financial aid has on each of the predictors. The main research questions required seven different regression equations based on the seven predictor variables and the moderator variable.

Procedure

Testing the research questions required conducting a hierarchical ordinary least squares multiple regression with two ordered sets of predictors. Regressions were run for each of the seven predictor variables. For the main research questions these regression procedures were conducted on the population data set to evaluate the strength of relationship of each of the predictors along with the percentage of students receiving financial aid on graduation rate, and then the moderator effect of the percentage of students receiving financial aid on graduation rate, for the population of community colleges.

For the follow-up research questions, if a moderator effect was evident, the first follow-up research question explored how the predictor variable and high percentage of students receiving financial aid predicts graduation rate, then, how the predictor variable and low percentage of students receiving financial aid predicts graduation rate. If no moderator effect was revealed by the main research question, a regression was conducted on the predictor variable alone to test its strength of relationship to the criterion graduation rate.

Assessment of Moderator Effects

The main research questions follow the general form: Will percentage of students receiving financial aid moderate the predictive relationship between each one of the seven predictor variables and graduation rate in community colleges? A moderated relationship occurs when the relationship between a predictor variable and the criterion variable is moderated by a third variable. For a moderated relationship to exist, the effect of the predictor variable on the criterion variable must differ depending on the value of the moderator (Jaccard & Turrissi, 2003).

Regressions were performed using a hierarchical regression for two ordered sets of predictors. This procedure determines whether a significant difference in the change in the squared multiple correlation coefficient occurs between the predictor sets: the first set is the predictor variable plus the financial aid variable, the second set adds the financial aid variable-predictor variable product term to the first set. R^2 , the squared multiple correlation coefficient, indicates the percentage of the criterion variance accounted for by its relationship with the predictor variables in each regression. The difference between the squared multiple correlations, $R_1^2 - R_2^2$, is the amount of explained variance due to the addition of the moderator-predictor product term (Jaccard & Turrissi, 2003; Green & Salkind, 2003). The significance of the change in R^2 is measured by an F test, testing the null hypothesis that the change in R^2 is not significantly different from zero.

Follow-up Analyses

The follow-up research questions follow the general form: If there is a moderator effect of percentage of students receiving financial aid, how will each of the seven predictor variables predict graduation rate in community colleges with high and low

percentages of students receiving financial aid? And, if there is no moderator effect of percentage of students on financial aid, how will each of the seven predictor variables predict graduation rate regardless of the percentage of students receiving financial aid? To operationalize high and low percentages of students receiving financial aid the values one standard deviation above and below the mean respectively were used. Even though this variable can be defined by grouping, high percentage and low percentage, and coded as a categorical dummy variable, that method was not chosen. The data is continuous so it does not fall into natural categories. Thus, the continuous scale data must be arbitrarily divided at some point or points into two or more groups (Schloss & Smith, 1999). By using groups and dummy variables to represent them, information available from the data becomes unavailable because the original continuous data values are replaced by a dummy with one value, thus measures of variability in the data are reduced (Jaccard & Turrisi, 2003). By using one standard deviation above and below the mean, the percentage of students receiving financial aid variable can remain continuous while still allowing for high and low categories.

Where a moderator effect was indicated, a regression was conducted using each predictor variable on cases with a percentage of students receiving financial aid one standard deviation above the mean to represent a high percentage of students receiving financial aid. A second regression was conducted on cases with a percentage of students receiving financial aid one standard deviation below the mean to evaluate the strength of relationship for the lower percentage financial aid colleges. The F test of significance for R^2 will indicate the predictive ability of the regressions for each of the two subsets (Jaccard & Turrisi, 2003).

If no moderator effect of percentage of students receiving financial aid is indicated in the main research question, then standard ordinary least squares regression will test the strength of relationship of each predictor variable to graduation rate without the moderator variable being present.

Limitations

Interpretation of results of this study should be limited to community colleges and their students. Generalizations to non-community colleges or non-community college students will not be appropriate. Also, since the data collected is reflective of first-time, full-time students, generalizations to students not so identified will not be appropriate. The data is limited to one year of the annual IPEDS surveys and so reflects conditions reported by colleges only for the reporting year. Future studies may examine graduation rates of part-time and returning students for a more complete picture of community college graduation rates, and consider longitudinal data for trends and changes in graduation rate conditions and influencers.

This study is delimited by the nature of the data to be collected. The data used in this study as reported to IPEDS is on first-time, full-time students at public two-year institutions only, and only for the reporting year 2007. Any influence other institutional characteristics not reported in the data may have on graduation rates will not be reflected in the results. Similarly, characteristics external to the institution that may impact graduation rates, such as local labor market conditions and other data years, will not be reflected in the results.

Conclusion

This quantitative study sought to determine if resource allocation characteristics can predict graduation rate at public U. S. community colleges and whether there is a moderator effect of the percentage of students receiving financial aid on the strength of relationship of predictor variables on the graduation rate. For each question a hierarchical regression was run to test the strength of relationship of a predictor variable and the percentage of students receiving financial aid to graduation rate, and then to test if a moderator effect occurred between the percentage of students receiving financial aid at a college and the predictor variable. Data analysis examined differences in the predictive ability of the predictor variables and moderator variable that will lay a foundation for an improved understanding of resource allocation characteristics and the impact of having a high or low percentage of students on financial aid on those predictors and graduation rate.

Chapter IV

FINDINGS

Seven predictor variables and one moderator variable were identified to assess the moderator's effect on the predictive relationships between predictors and graduation rate at Title IV, public, two-year U.S. community colleges. The main research question asked if there is a moderator effect of the percentage of students receiving financial aid on the predictive relationship between each of the seven predictors and the criterion variable, graduation rate. Follow-up questions explored whether there is a difference in the strength of the above predictive relationships across levels of the moderator variable or, if no moderator effect is present, what is the strength of predictive relationship between each predictor and the criterion variable respectively. Ordinary least squares multiple regression was conducted on data from custom data files downloaded from the IPEDS 2007 reporting year.

This was a cross-sectional population study delimited by the predictors selected. Mindful of the complex nature of graduation rate and the many variables associated with it, this was not a comprehensive study of graduation rate. There are variables that predict graduation rate that were not included. Rather, this study examined the predictive utilities of the selected predictors associated with resource allocation, and the moderator effect of the percentage of students enrolled who are receiving financial aid, so leaving out known predictors that are not associated with resource allocation did not weaken the model. According to Cohen, Cohen, West and Aiken, (2003) "theory and prior empirical research will often provide strong guidelines for the variables that should be included....correct specification implies that all variables identified by the theory are

included in the model” (p. 119, 127), but adding other variables would introduce noise in the data that may increase R^2 but not contribute to the predictive quality of the model. Selecting independent variables based on a known relationship with a dependent variable will cause an increase in R^2 , but “analysts should never simply ‘throw independent variables into a regression equation’” (p.144). Descriptive statistics for the predictors are in Table 3.

Table 3

Descriptive Statistics

	N	Mean	Std. Deviation
Graduation rate	1032	22.74	13.384
Instructional support expenditures	1033	4475.42	2048.222
Academic support expenditures	1033	854.85	627.598
Student services expenditures	1033	1092.84	753.183
Institutional support expenditures	1033	1640.330	1365.968
Faculty salary	1034	53733.07	13164.927
Percent of full-time faculty	1017	39.61	20.67
Staff to student ratio	1038	.062700	.0298501
Percent receiving financial aid	1027	66.00	20.530
Valid N (listwise)	1015		

Parametric Data Assurance

Ordinary least squares regression is a statistical model based on several assumptions regarding the data. Satisfying these assumptions allows researchers to use

ordinary least squares regression for statistical inference of a sample to a population and for tests of statistical significance (Berry, 1993). These assumptions include a linear relationship among variables, independence of the data, the variance of residuals is constant over the range of values for the predictors, and the residuals are normally distributed (Cohen, et al., 2003). When ordinary least squares assumptions are not met, the resulting regression coefficients may be biased and significance tests in error. Non-normality of residuals may also be an indicator of a regression model with incorrect specification (Cohen, et al.).

Model Specification Assumptions

Past studies do not suggest a non-linear relationship of the selected predictors to criterion so there was no reason not to use linear regression models (Cohen, et al., 2003). The assumption of a linear relationship can be tested by an examination of a model's residuals, "If substantial systematic variation remains in the residuals, this suggests that the regression model under consideration has been misspecified in some way" (p. 125). If a loess¹ fit line in a scatterplot of residuals to each predictor (Appendix A) approximates a straight line then the relationship between variables is linear (Cohen, et al.).

After removing outlier cases, analysis of residuals indicated a close to normal distribution of residuals for the regression models of all research questions (Appendix B). Normality of residuals helps to verify the proper specification of the models (Cohen, et al., 2003). Normality of residuals was also confirmed by the Q-Q plot of observed values of the residuals with values from a normal distribution (Appendix C) approximating the expected straight line (Cohen, et al.; Fox, 1991). Homoscedasticity was apparent in

¹ The locally weighted scatterplot smoother is referred to as lowess fit line in Cohen, Cohen, West and Aiken (2003).

scatter plots with a loess fit line of the criterion variable's residuals against predictor variables (Appendix A). No patterns were apparent in the scatter plots that would indicate the variability of the residuals changes with changes in the value of the predictors.

Outlier Data

While performing the regressions for each research question, data were tested for extreme values that would impact the strength of the model. Cook's D value was calculated for each case and extreme values were reported in SPSS. Analysis of residuals indicated the occurrence of extreme values in the residual error. Cases that were indicated as extreme values by Cook's $D > 1$ (Cohen, et al., 2003) and residual error analysis were removed from the subsequent analysis. Six of the 1038 cases, representing .6% of cases, were removed as outliers. Removing outliers resulted in a better fit of the models as indicated by Cook's D and residual analysis conducted after removing the outlier cases.

Missing Data

SPSS uses listwise deletion, treating missing data from any variable as a missing case and removing that case from the data. The regression models using the variables faculty salary, institutional support expenditures, student services expenditures, academic support expenditures, and instructional support expenditures each had 19 missing cases representing 1.8% of the total cases. The variable percent of faculty who are full time had 29 missing cases representing 2.8% of the total cases. The variable professional staff to student ratio had 15 missing cases representing 1.5% of the total cases. These small percentages of missing data would not be expected to impact results (Cohen, et al., 2003).

Research Question Results

Each of the seven research questions tested for the moderator effect of the percentage of students receiving financial aid on the predictive relationship between each of the predictor variables and the criterion variable, graduation rate. Follow-up questions explored whether there was a difference in the strength of predictive utilities of the predictor at high and low levels of the moderator variable or, if no moderator effect was present, what was the strength of predictive relationship. Ordinary least squares multiple regression was used to determine the strength of predictive utilities of the predictors and the effect of the moderator. Where the models indicated a statistically significant ($p < .05$) R^2 , the value was less than .06 in all cases, indicating the predictor and the moderator variables accounted for a small percentage of the variance in graduation rate. The ΔR^2 , where statistically significant ($p < .05$), indicates the strength of the moderator effect. The value of ΔR^2 is the percentage of the variation in graduation rate accounted for by the moderator effect. The ΔR^2 values were also small, given the small R^2 values. McClelland and Judd (1993) suggest small ΔR^2 values are common and expected in non-experimental studies of moderator effect, and go on to suggest that moderator effects accounting for 1% to 3% of the model's variance are important.

Research Question 1

Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on instruction and graduation rate in community colleges? If there is a moderator effect of percentage of students receiving financial aid, how will college expenditures on instruction predict graduation rate in community colleges with high and low percentages of students receiving financial aid

respectively? If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on instruction predict graduation rate regardless of percentage of students receiving financial aid?

A hierarchical multiple regression was conducted to determine the moderator effect of the percentage of students receiving financial aid on the predictive relationship between college expenditures on instruction and college graduation rate. The results did not support the moderator effect, $F(1, 1009) = .033, p > .05, \Delta R^2 < .001$.

Since there was no moderator effect caused by the financial aid variable, a simple regression was conducted using only the college expenditures on instruction variable to answer the follow-up question: If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on instruction predict graduation rate regardless of percentage of students receiving financial aid? The result of that analysis indicated college expenditures on instruction accounts for 5.2% of the variability of and reliably predicts graduation rate, $F(1, 1020) = 55.87, p < .05, R^2 = .052$.

Research Question 2

Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on academic support and graduation rate in community colleges? If there is a moderator effect of percentage of students receiving financial aid, how will college expenditures on academic support predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively? If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on academic support predict graduation rate regardless of percentage of students receiving financial aid?

A hierarchical multiple regression was conducted to determine the moderator effect of the percentage of students receiving financial aid on the predictive relationship between college expenditures on academic support and college graduation rate. The results did not support the moderator effect, $F(1, 1009) = .937, p > .05, \Delta R^2 = .001$.

Since there was no moderator effect caused by the financial aid variable, a simple regression was conducted using only the college expenditures on academic support variable to answer the follow-up question: If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on academic support predict graduation rate regardless of percentage of students receiving financial aid? College expenditures on academic support did not account for any of the variability of or reliably predict graduation rate, $F(1, 1020) = .023, p > .05, R^2 < .001$.

Research Question 3

Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on student services and graduation rate in community colleges? If there is a moderator effect of percentage of students receiving financial aid, how will college expenditures on student services predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively? If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on student services predict graduation rate regardless of percentage of students receiving financial aid?

A hierarchical multiple regression was conducted to determine the moderator effect of the percentage of students receiving financial aid on the predictive relationship

between college expenditures on student services and college graduation rate. The results did not support the moderator effect, $F(1, 1009) = .763, p > .05, \Delta R^2 = .001$.

Since there was no moderator effect caused by the financial aid variable, a simple regression was conducted using only the college expenditures on student services variable to answer the follow-up question: If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on student services predict graduation rate regardless of percentage of students receiving financial aid? College expenditures on student services accounted for 1.2% of the variability of graduation rate and reliably predicted graduation rate, $F(1, 1020) = 12.553, p < .05, R^2 = .012$.

Research Question 4

Will percentage of students receiving financial aid moderate the predictive relationship between college expenditures on institutional support and graduation rate in community colleges? If there is a moderator effect of percentage of students receiving financial aid, how will college expenditures on institutional support predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively? If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on institutional support predict graduation rate regardless of percentage of students receiving financial aid?

A hierarchical multiple regression was conducted to determine the moderator effect of the percentage of students receiving financial aid on the predictive relationship between college expenditures on academic support and college graduation rate. The results did not support the moderator effect, $F(1, 1009) = .024, p > .05, \Delta R^2 < .001$.

Since there was no moderator effect caused by the financial aid variable, a simple regression was conducted using only the college expenditures on institutional support variable to answer the follow-up question: If there is no moderator effect of percentage of students receiving financial aid, how will college expenditures on institutional support predict graduation rate regardless of percentage of students receiving financial aid? College expenditures on institutional support accounted for 1.8% of the variability in graduation rate and reliably predicted graduation rate, $F(1, 1020) = 18.653, p < .05, R^2 = .018$.

Research Question 5

Will percentage of students receiving financial aid moderate the predictive relationship between faculty salary and graduation rate in community colleges? If there is a moderator effect of percentage of students receiving financial aid, how will faculty salary predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively? If there is no moderator effect of percentage of students receiving financial aid, how will faculty salary predict graduation rate regardless of percentages of students receiving financial aid?

A hierarchical multiple regression was conducted to determine the moderator effect of the percentage of students receiving financial aid on the predictive relationship between faculty salary and college graduation rate. A moderator effect of the percentage of students receiving financial aid was revealed. When the product term of faculty salary and percentage of students receiving financial aid was added in the second step of the hierarchical regression, a significant change in R^2 was indicated; $F(1, 1009) = 31.235, p < .05, \Delta R^2 = .029$. Since a moderator effect was indicated, a second set of regressions was

conducted to answer the follow-up research question: If there is a moderator effect of percentage of students receiving financial aid, how will faculty salary predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?

Data were filtered to select cases with a percentage of students receiving financial aid value one standard deviation above and below the mean to represent high and low percentages of students receiving financial aid respectively. A simple regression was conducted on the filtered high and low percentage of students receiving financial aid cases using faculty salary as the predictor variable.

For the high percentage of students receiving financial aid cases, faculty salary reliably predicted graduation rate; $F(1,174) = 6.094, p < .05, R^2 = .034$. For the low percentage of students receiving financial aid cases, faculty salary did not reliably predict or account for the variance in graduation rate; $F(1, 184) = 2.966, p > .05, R^2 = .016$.

Research Question 6

Will percentage of students receiving financial aid moderate the predictive relationship between percent of instructional staff that are full-time and graduation rate in community colleges? If there is a moderator effect of percentage of students receiving financial aid, how will percent of instructional staff that are full-time predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively? If there is no moderator effect of percentage of students receiving financial aid, how will percent of instructional staff that are full-time predict graduation rate regardless of percentages of students receiving financial aid?

A hierarchical multiple regression was conducted to determine the moderator effect of the percentage of students receiving financial aid on the predictive relationship of percent of instructional staff that are full-time to college graduation rate. A moderator effect of the percentage of students receiving financial aid was revealed. When the product term of percent of instructional staff that are full-time and percentage of students receiving financial aid was added in the second step of the hierarchical regression, a significant change in R^2 was indicated; $F(1, 999) = 4.693, p < .05, \Delta R^2 = .004$. Since a moderator effect was indicated, a second set of regressions was conducted to answer the follow-up research question: If there is a moderator effect of percentage of students receiving financial aid, how will percent of instructional staff that are full-time predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?

Data were filtered to select cases with a percentage of students receiving financial aid value one standard deviation above and below the mean to represent high and low percentages of students receiving financial aid respectively. A simple regression was conducted on the filtered high and low percentage of students receiving financial aid cases using percent of instructional staff that are full-time as the predictor variable.

For the high percentage of students receiving financial aid cases, percent of instructional staff that are full-time reliably predicts graduation rate; $F(1, 174) = 5.782, p < .05, R^2 = .032$. For the low percentage of students receiving financial aid cases, percent of instructional staff that are full-time does not reliably predict or account for the variance in graduation rate; $F(1, 183) = .950, p > .05, R^2 = .005$.

Research Question 7

Will percentage of students receiving financial aid moderate the predictive relationship between professional staff to student ratio and graduation rate in community colleges? If there is a moderator effect of percentage of students receiving financial aid, how will professional staff to student ratio predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively? If there is no moderator effect of percentage of students receiving financial aid, how will professional staff to student ratio predict graduation rate regardless of percentages of students receiving financial aid?

A hierarchical multiple regression was conducted to determine the moderator effect of the percentage of students receiving financial aid on the predictive relationship of professional staff to student ratio to college graduation rate. A moderator effect of the percentage of students receiving financial aid was revealed. When the product term of professional staff to student ratio and percentage of students receiving financial aid was added in the second step of the hierarchical regression, a significant change in R^2 was indicated; $F(1, 1013) = 7.270, p < .05, \Delta R^2 = .007$. Since a moderator effect was indicated, a second set of regressions was conducted to answer the follow-up research question: If there is a moderator effect of percentage of students receiving financial aid, how will professional staff to student ratio predict graduation rate in community colleges with high and low percentages of students receiving financial aid respectively?

Data were filtered to select cases with a percentage of students receiving financial aid value one standard deviation above and below the mean to represent high and low percentages of students receiving financial aid respectively. A simple regression was

conducted on the filtered high and low percentage of students receiving financial aid cases using professional staff to student ratio as the predictor variable.

For the high percentage of students receiving financial aid cases, professional staff to student ratio did not reliably predict graduation rate; $F(1,174) = 1.028, p > .05, R^2 = .006$. For the low percentage of students receiving financial aid cases, professional staff to student ratio did not reliably predict or account for the variance in graduation rate²; $F(1, 184) = .169, p > .05, R^2 = .001$.

Summary

Table 4 is a summary of predictors and R^2 change for each main research question.

Table 4

Hierarchical Regression Analyses of the Moderator Effects of the Percentage of Students Receiving Financial Aid

Predictor	R^2 change	p
Instructional support expenditures	< .001	.855
Academic support expenditures	.001	.333
Student services expenditures	.001	.383
Institutional support expenditures	< .001	.876
Faculty salary	.029	< .001
Percent of full-time faculty	.004	.031
Staff to student ratio	.007	.007

² The apparent inconsistency of this variable showing significance over all cases yet showing no significance for the high financial aid or low financial aid subsets may be explained by the sample size. The relative sizes of the samples is extremely different; for all cases $N = 1016$, for the high and low percentage of financial aid cases N equals 176 and 186 respectively. The large N gives much greater precision to the significance test, yielding significance for a very small R^2 value where no significance is indicated for the much smaller number of subset cases (Cohen, et al., 2003).

For research questions 1 through 4 no moderator effect was indicated so the follow-up question was explored: If there is no moderator effect, how will the predictor predict graduation rate regardless of percentage of students receiving financial aid? Table 5 is a summary of the predictive utility of each question 1 through 4 predictor on graduation rate.

Table 5

Simple Regression Models with Different Predictors

Predictor	R^2	p
Instructional support expenditures	.052	< .001
Academic support expenditures	< .001	.881
Student services expenditures	.012	<.001
Institutional support expenditures	.018	< .001

For research questions 5 through 7, a moderator effect was indicated so the follow-up question was explored: If there is a moderator effect, how will the predictor predict graduation rate with high and low percentages of students receiving financial aid respectively? Table 6 is a summary of the predictive utility of each question 5 through 7 predictor on graduation rate at colleges with high and low percentages of students receiving financial aid respectively.

Conclusion

Through regression analysis seven predictor variables and one moderator variable were examined to determine their predictive utility on the criterion variable and the influence of the moderator variable on the predictors. Of the seven predictor variables, four were determined not to be moderated by the variable percentage of students at the

college receiving financial aid. The four variables not affected by the moderator variable represent per-FTE expenditures made by the institution for instructional support, academic support, student services, and institutional support. The three remaining variables affected by the moderator represent community college instructional staffing; faculty salary, percentage of faculty who are full-time, and professional staff to student ratio.

Table 6

Simple Regression Models at High and Low Percentages of Students Receiving Financial Aid

Predictor	High Financial Aid		Low Financial Aid	
	R^2	p	R^2	p
Faculty salary	.034	.015	.016	.087
Percent of full-time faculty	.032	.017	.005	.331
Staff to student ratio	.006	.312	.001	.682

Where no moderator effect was indicated, a follow-up regression analysis was conducted to explore the predictive relationship between each predictor and the criterion variable. Of the four predictors indicating no moderator effect, three were found to be significant in predicting graduation rate; instructional support expenditures, student services expenditures, and institutional support expenditures. Academic support expenditures was not significant in predicting graduation rate.

The three predictors moderated by the percentage of students receiving financial aid, faculty salary, percentage of faculty who are full-time, and professional staff to student ratio, received follow-up regression analyses to examine the relationship of the predictors and criterion at both high levels and low levels of percentage of students

receiving financial aid. The analyses revealed differences in the predictive utility of the predictors between the high percentage financial aid and low percentage financial aid cases in two of the predictors, faculty salary and percent of full-time faculty. The professional staff to student ratio was not a significant predictor in either high or low percentage financial aid cases. Faculty salary and percent of full-time faculty were significant predictors of graduation rate for institutions with a high percentage of students receiving financial aid. Those two predictors were not significant predictors of graduation rate at institutions with a low percentage of students receiving financial aid. A summary of the predictive relationships of predictors is shown in Table 7.

Table 7

Summary of Predictive Relationships

Predictor	Moderated?	Significant as bivariate predictor?	Significant for high % financial aid cases?	Significant for low % financial aid cases?
Instructional support expenditures	No	Yes		
Academic support expenditures	No	No		
Student services expenditures	No	Yes		
Institutional support expenditures	No	Yes		
Faculty salary	Yes		Yes	No
Percent of full-time faculty	Yes		Yes	No
Professional staff to student ratio	Yes ^a		No	No

^a See footnote 2.

The predictive utility of the predictor variables to community college graduation showed a mix of results regarding whether being moderated or unmoderated, both significant and not significant in bivariate relationship, and showing significance over high and low levels of students receiving financial aid. Where the predictors were shown to be significant in predicting graduation rate the R^2 value was less than .06 in all cases, indicating the predictor accounted for a small percentage of the variance in graduation rate. The ΔR^2 values were also small, given the small R^2 values. Studies suggest that small R^2 and ΔR^2 can be expected in non-experimental studies (McClelland & Judd, 1993), so with the delimitation of this study being selecting predictors associated with resource allocation, small yet significant R^2 values demonstrated that these predictors were useful in predicting graduation rate within the context of community college spending and staffing.

Chapter V

DISCUSSION

This study was an examination of the predictors of graduation rate related to the allocation of limited institutional resources in public U.S. community colleges. The study also included an examination of the influence the percentage of students receiving financial aid had on those predictors. The research questions were based on the hypothesis that the predictors of graduation are influenced by and different for high or low levels of the percentage of students receiving financial aid. Through ordinary least squares regression, analysis of the research questions revealed mixed results regarding the impact of financial aid on the predictors of graduation rate. The research questions tested for the moderator effect of the percentage of students receiving financial aid on the predictive relationship between each of the predictor variables and the criterion variable, graduation rate. Follow-up questions explored whether there is a difference in the strength of predictive utilities of the predictor at high and low levels of the moderator variable, or if no moderator effect is present, what is the strength of predictive relationship.

This was a cross-sectional population study delimited by the predictors selected. Mindful of the complex nature of graduation rate and the many variables associated with it, this analysis was not a comprehensive study of graduation rate. There are variables that predict graduation rate that were not included. Rather, this study examined the predictive utilities of the selected predictors associated with resource allocation and the moderator effect of the percentage of students enrolled who are receiving financial aid.

The moderator effect of the percentage of students receiving financial aid was mixed among the predictors. The percentage of students receiving financial aid did not moderate the predictive relationship of expenditures on instructional support, academic support, student services, and institutional support, but did moderate faculty salary, percent of instructional staff that are full-time, and professional staff to student ratio. The last three predictors were further tested for significance where the percentage of students receiving financial aid was at high and low levels. Faculty salary and percent of instructional staff who are full-time were significant predictors of graduation rate at colleges with a high percentage of students on financial aid. None of the predictors was a significant predictor for colleges with a low percentage of students receiving financial aid. Of the four predictors not moderated by the percentage of students receiving financial aid, three proved to be significant in predicting graduation rate singly: expenditures on instructional support, student services, and institutional support. Of the seven predictors tested in the regression models, five proved to be significant in predicting graduation rate, and two of the five are significant for institutions with high percentages of students receiving financial aid.

Interpretation of Findings

Exploration of a moderator effect was the main question posed by this study, so the discussion of the findings will first consider the moderator effect. A discussion of the predictive utility of the predictor variables will follow.

Moderator Effect

The literature is rich in empirical studies establishing a relationship between student income and persistence and graduation (Almeida, Johnson & Steinberg, 2006;

Carey, 2004; Haskins, 2008; Zucker & Dawson, 2001). This study uses the percentage of students receiving financial aid as a valid representation of student income (Berkner & Wei, 2006). Colleges with high numbers of low-income students will have a high percentage of students on financial aid. Conversely, colleges with low numbers of low-income students will have a low percentage of students receiving financial aid. Studies also indicate that relationships exist between resource allocation decisions and graduation rates (Bailey, 2006; Bailey, et al., 2005; Carter, 2002; Gansemer-Topf, 2004). This study hypothesized there would be an interaction between the percentage of students receiving financial aid and resource allocation variables that would be revealed in regression analysis.

In three of the seven predictor variables a moderator effect was revealed. The three predictors moderated by the financial aid variable are all predictors that operationalize conditions that represent the colleges' relationship with students through professional staff; faculty salary, percentage of full-time instructional staff, and professional staff to student ratio. Even though these three predictors were moderated by the financial aid variable, only faculty salary and percent of full-time instructional staff demonstrated a difference in predictive relationship between high and low percentages of students receiving financial aid. They proved to be significant for the high percentage of financial aid cases but not for the low percentage of financial aid cases.

Consider the findings of percentage of full-time instructional staff and the professional staff to student ratio in the context of existing research on income and college persistence and graduation. The research shows low-income students are more likely to be challenged by institutional bureaucracies and inadequate academic

preparation (Cook & King, 2004). Concurrent with bureaucratic and academic challenges, low-income students have life circumstances that demand time and energy, so minimizing the opportunity cost of the college experience is significant to them. Closely monitoring individual student progress and intervening when necessary can aid students in weathering the unavoidable stop-out or prevent it in the first place (Person, Rosenbaum and Gordon-McKeon 2004). This suggests a relationship with a college staff person, faculty or other professional staff, will positively impact the low-income student. The opportunity for the student to be engaged with a staff member in a meaningful way is enhanced by access to full-time faculty or other professional staff members who have the time and resources to devote to student interaction (Carter, 2002; Goenner & Snaith, 2004; Creighton, 2006).

There is little research literature linking the use of full-time versus part-time faculty to graduation rates, and none was discovered for community colleges. Gappa and Leslie (1993) conducted one of the early studies on the use of part-time faculty. Their study and many studies since (Banachowski, 1996; Beckford-Yanes, 2005; Granville, 2001; McArthur, 1999; Snell, 2003) describe the value of part-time faculty in bringing real-world expertise to the classroom. Consider also that there is a difference in engagement and student intention to persist between vocational and transfer students at some community colleges (Laughlin, 2006). Industry professionals delivering high quality instruction to lower income students seeking vocational career opportunity may be a significant factor in the persistence and graduation decisions of those community college students. This could be significant for community colleges, where the delivery of vocational programs of study is part of the mission. Further research in this area could

explore the relationships between part-time faculty, vocational programs, and persistence to graduation.

A generalization about faculty salary and an interaction with the percentage of students receiving financial aid is not as clear. The limited research available on faculty salary proposes that higher faculty salary is correlated to more full-time faculty, and higher faculty salary attracts professionals from other fields and rewards faculty for better teaching (Carter, 2002; Goenner & Snaith, 2004). If it is true that higher faculty salary attracts professionals from other fields, this could be significant for community colleges. Fields of study that are not the traditional academic subjects of the liberal arts and sciences proliferate at community colleges. These vocational programs of study must necessarily attract faculty members from the industries or vocations to which the students aspire. Even though these professionals may discover teaching has its own reward, salaries would still need to be competitive to their former careers. As with the percent of full-time faculty variable being significant for the high percentage of financial aid cases, the lower income student in vocational programs may have the opportunity to establish that important relationship which encourages engagement by virtue of having the industry professional delivering instruction.

Further research could provide clarity to the effect of faculty salary on graduation rate. One topic suggested by the literature but not in this study is faculty salary and whether there is a relationship to attracting professionals from occupational-technical career fields to community college teaching. Laughlin's (2006) limited study of student engagement tells us that occupational-technical and transfer students differ in engagement characteristics except in student-faculty interaction. Research could explore

the salary to occupational-technical faculty to career professional links, and further, explore the student engagement relationships to faculty. Case studies, comparisons of occupational-technical to transfer student and faculty engagement, and perceptions of faculty and professionals studies could prove instructive.

Bivariate Predictors

Of the four predictors not moderated by the variable percentage of students receiving financial aid, expenditures on instructional support, academic support, student services and institutional support, only expenditures on academic support proved to be not significant in predicting graduation rate. Studies linking institutional spending to graduation concentrate on four-year institutions and show mixed results in terms of the influence of spending on graduation. Some of the differences in results are accounted for by varying definitions of the variables or the inclusion of other variables, such as selectivity, which have a strong influence on graduation (Gansemer-Topf, 2004; Goenner & Snaith, 2004; Ryan, 2004; Schuh, 2004). While this study found expenditures on academic support to be not significant, these studies found academic support expenditures to be a significant predictor of graduation rate.

In community colleges, the academic support expenditures variable is the smallest of the four expenditure predictors in the study. The mean of academic support expenditures is just 19% of the mean of expenditures on instructional support, and 10.6% of the total of the four expenditure predictors. By being such a small contributor to spending in community colleges, academic support expenditures, which includes expenses such as academic administration, information technology, and library resources, may not contribute significantly to student life at community colleges. Part-time adult

students with work and family obligations may not spend enough time at the college to benefit from academic support resources. Also, academic support expenditures do not include services which provide students an opportunity to be engaged with full-time faculty or other staff, engagement being a factor in persistence to graduation (Laughlin, 2006). Further research investigating the relationship of academic support to community college graduation rate is needed.

Instructional support, student services, and institutional support proved to be significant individual predictors of graduation rate. The literature is mixed regarding the impact of these characteristics on graduation rate. Studies on four-year institutions do not agree on student services expenditures in particular. Some studies of institutional characteristics and spending explain away student services expenditures as not directly impacting students as expenditures on instruction do, or argue that they are composed of largely administrative expenses (Gansemer-Topf, 2004; Ryan 2004). On the other hand, Carter (2002) includes student services expenditures as a measure of the institution's commitment to students and thus considers it an important factor toward retention and graduation. Carter's study, however, concurs with the other studies and does not find student services expenditures to be significant in impacting graduation rate.

In contrast to the cited four-year institution studies, this study found student services expenditures to have a small but significant impact on graduation rate. An obvious difference is that the subject of this study is community colleges instead of four-year institutions. The previously mentioned effect of student engagement may be more pronounced in community college student services expenditures. As smaller institutions with a mission less broad than four-year institutions it is conceivable that student services

activities are more directed to and accessed directly by students; access to counseling and career services for example.

The instructional support expenditures variable is the most intuitive variable in predicting graduation rate. These expenditures account for institutional spending on academic instruction, occupational instruction, and community and continuing education. Academic administration expenses are not included. In this study it had the largest predictive relationship to graduation rate of all the predictors. The results of this study on community colleges concurs with the literature investigating instructional support expenditures at four-year institutions, supporting the conclusion that it is significantly predictive of graduation rate (Gansemer-Topf, 2004; Goenner & Snaith, 2004; Ryan, 2004; Schuh, 2004).

The institutional support expenditures variable is the least intuitive variable in predicting graduation rate. Where it is mentioned in the literature, it is used as a general measure of institutional quality. The Goenner and Snaith (2004) study included such expenditures as a measure of what they called indirect impact on students, such as better classrooms, instructional technology, library resources, and physical plant. It would be difficult to try to use similar logic in explaining the impact of such expenditures at community colleges, whose students are less mobile and attending because of proximity and availability of instructional programs rather than amenities (Cohen & Brawer, 2003). Further research in this area would help explain the relationship between institutional support expenditures and graduation rate.

Implications

Obtaining a post-secondary credential is a way by which low-income individuals can break out of their low socioeconomic status, enjoy a better quality of life, and contribute to local economic development. There are a few studies that indicate there can be institutional resource allocation factors that affect student persistence to graduation (Advisory Committee on Student Financial Assistance, 2001; Almeida, Johnson, & Steinberg, 2006; American Council on Education, 2004; Cook & King, 2004; Jenkins, 2003; Person, Rosenbaum & Gordon-McKeon, 2004; Price, 2003; Zucker & Dawson, 2001). Resource allocation by the institution can impact both delivery of instruction and other services important to students. With an understanding of what resource allocation decisions impact persistence and graduation, college administrators can manage efficient allocation of resources that can lead to greater student success. Since community colleges cannot change the characteristics of their students, colleges will have to change themselves to improve the persistence and graduation of their students.

Student and Institutional Characteristics

Low socioeconomic status has a negative impact on higher education success. Students in the lowest socioeconomic group drop out of secondary school at higher rates than high income students, and fewer than ten percent earn a postsecondary degree (Almeida, Johnson & Steinberg, 2006). Without a certificate or degree, low-income students are less likely to achieve upward socioeconomic mobility (Baum & Ma, 2007; DeVol, 1999; U.S Department of Education, 2004) and, when low-income students attend post-secondary institutions, it is more likely that they attend a community college than a four-year institution (Haskins, 2008; Horn & Griffith, 2006). The findings of this

study are significant in that they relate only to public U.S. community colleges and take into consideration the income status of students when examining the institutional characteristics that are predictive of graduation. Even though the change in the predictive quality of the community college resource allocation variables in this study is small when considering the level of financial aid, and therefore the income level of its students, it can be instructive to community college leaders when making resource allocation decisions.

The most likely students to graduate from post-secondary education are students who enter college immediately after high school with good grades and standardized test scores, attend full time, do not interrupt their stay in college, come from high income families, and have parents who also attended college (Bailey, Calcagno, et al., 2005). Public community colleges are open-door institutions so they cannot make selectivity decisions about the college readiness of their incoming students. Most students who enter community colleges fail to earn their certificate or degree (American Council on Education, 2003).

The studies that predominate persistence and graduation literature are founded in the traditional student characteristics referenced above, as studied by Tinto (1987) and others since. This study differed by examining institutional characteristics instead of student characteristics and found there are areas where community college leaders can make decisions about resource allocation that are predictive of graduation rate.

Resource Allocation

Even though the Tinto (1987) model of persistence and graduation predominated early studies of college student success, there was some recognition that “the effect of various aspects of the physical environment and the quality of services provided by the

institution” (Aitken, 1982, p.33) could have an effect. These studies were based on the traditional four-year college student (Tinto, 1993). More recent studies have looked at characteristics of institutions to determine whether institutional characteristics can predict graduation rates (Bailey, et al., 2006; Horn, 2006). Other studies have explored institutional behavior, or how resources are allocated, which impact student persistence and graduation (Bailey, 2006; Bailey, Calcagno, et al., 2005; Carter, 2002; Gansemer-Topf, 2004; Jenkins, et al. 2006). In addition to the institution’s interest in student success, some of the rationale for looking at institutional characteristics comes from efficiency in resource allocation; institutions can change policies and institutional behavior to efficiently use resources to increase the probability of graduating their students (Cragg, 2007), i.e. the same dollars are reallocated to generate higher graduation rates.

Expenditures on instructional support, student services, and institutional support are all predictive of graduation rate regardless of the percentage of students receiving financial aid. Even though the changes are small in the aggregate, they may be instructive to individual colleges to examine their own situation. Spending limited budget dollars on academic support is an intuitive action by some colleges, yet it is shown not to be a significant predictor of graduation in this study. Could a college reallocate those dollars to instructional support or student services and see an improvement in graduation?

In the aggregate, the influence of faculty salary and percent of full-time faculty on graduation rate is affected by the percentage of students receiving financial aid. Is it important to individual colleges to have competitive salaries to draw talented professionals away from industry in order to offer quality vocational programs? Does

having more full-time faculty available to engage low-income students to persist, or more career counselors to advise low-income students on their career path, make a difference at an individual college? This study's results indicate that colleges should ask those questions.

Implications for Community College Leaders

As open-door institutions, the mission of public community colleges is to enroll and offer opportunity to all students who present themselves. These students are increasingly diverse in college readiness, demographic characteristics, and socioeconomic status. At the same time that increasing numbers of first-time-in-college and low socioeconomic status students are coming to community colleges, the number of academically well prepared traditional age students is also increasing. Community college leaders must recognize that as the diversity of students arriving on campuses changes, so must the community college change in order to facilitate persistence to graduation for all students. Community college leaders need both the theoretical and practical skills required for leading such a diverse organization as the community college (Anderson, 1997).

Graduation rate is part of the political and policy landscape. It is used by states and the federal government as a measure of accountability and in funding models. Graduation with a post-secondary credential is important to the individual as a factor in future economic security, and to society which gains from the spillover benefits of an educated citizenry. Community college leaders are in positions to impact conditions at their institutions which promote persistence to graduation.

This study's results add to the knowledge of resource allocation by community colleges. By being aware of the aggregate impact of the level of financial aid received by students at community colleges in combination with resource allocation decisions on graduation rate, community college leaders should examine their individual college situations to gain insight into how spending limited budget dollars can optimize their graduation rates.

Recommendations for Further Research

Studies of student characteristics and graduation rate universally reveal that, in the aggregate, a high number of low-income students at otherwise similar institutions is associated with low institutional graduation rates. These studies also reveal there is a broad range of graduation rates among those institutions; some institutions with high numbers of low-income students consistently manage to maintain high levels of graduation rates. The data from this study also revealed a broad range of graduation rates. Further research is needed at public U.S. community colleges to explore the relationship between institutional behavior and the ability to graduate their students.

This study identified resource allocation predictors and the effect of high or low percentages of students receiving financial aid on graduation rate in public U.S. community colleges. Much of the research on persistence and graduation rate has been conducted on four-year institutions and their students. Since this study is one of just a few to investigate community college graduation rates relative to resource allocation, there are many more opportunities for further investigation.

The results of this study are aggregated over all public U.S. community colleges and are limited to one reporting year of IPEDS data. IPEDS historical data is limited, but

there would be value in a historical perspective of graduation rates and resource allocation. There may be other sources of data and other ways to operationalize resource allocation variables that could provide a historical longitudinal examination of the topic.

Disaggregating the data would provide information revealing under what conditions, groups, or other factors resource allocation decisions made by colleges impact graduation rate. Community colleges vary widely in enrollment, programs offered, numbers of students receiving financial aid, faculty characteristics, level of funding, urban/rural, and many other factors. The composition of community college students is varied and complex. There is great variability in age, family income, college readiness, educational and career goals, and many other factors. Applying aggregated descriptions to such a complex system is bound to overlook relationships among factors that may be of significance to individual colleges or colleges similar in certain characteristics.

One way of disaggregating the data would be to conduct individual case studies of community colleges with certain characteristics: for example the high financial aid yet high graduation rate institutions. Case study comparisons of similar combinations of financial aid level and graduation rate but with different enrollment size could prove instructive. There could be many combinations of factors to answer a wide variety of research questions.

In addition to case studies, qualitative and mixed research designs could serve to disaggregate the data by documenting actual practice at contrasting institutions and combining that with perceptions of institutional decision makers. The perceptions of students, particularly from the different income groups, would be of interest to community college decision makers. Aggregated data cannot account for individual or

group behavior. Resource allocation decisions are bound to be perceived differently among different classes of colleges and student groups at the colleges. The question of how faculty salary may attract industry professionals and how that impacts student persistence and graduation may be approached using qualitative and mixed method designs. The issue of quality of instruction related to full-time versus part-time faculty is well represented in the literature, but further study regarding persistence and graduation could bring more clarity to decision and policy makers.

Quantitative researchers would want to explore the marginal effects of changes in resource allocation predictors. To say that a given change in spending will result in some change in graduation rate ignores the reality of limited budgets. An increase in spending in one area is likely matched by, or at least impacts, decreases in spending in other areas. Would those changes in spending affect high financial aid institutions the same as low financial aid institutions, or students on financial aid the same as students not on financial aid, or institutions with predominantly vocational programs the same as institutions that are predominantly transfer? Such models would necessarily use aggregated data but could still be instructive regarding broad classes of institutions or student groups.

Finally, further research involving graduation rate and the spending decisions of colleges should prove useful to higher education and community college policy makers and to state and federal level policy makers who must allocate limited budget dollars among many competing needs. This is relevant to the efficiency of resource use issue. Graduation rate measures are increasingly making their way into both political rhetoric and accountability measures of higher education. Policy makers can be armed with better

information regarding how scarce resources can be allocated to optimize higher education goals.

Summary

This study was an examination of the predictors of graduation rate related to the allocation of resources in U.S. community colleges. The results indicate that the moderator effect of the percentage of students receiving financial aid was mixed among the predictors and that some of the predictors are significant in predicting graduation rate singly.

There is limited research with which to compare the results of this study; however, the study variables which operationalize conditions that represent college staffing levels agree with other studies that indicate the engagement of the student as measured by interaction with professional staff is important to student success. Other variables in the study proved to be predictive of graduation rate and are supported by the limited research relating spending decisions and graduation rates.

This study contributes to the knowledge of resource allocation by community colleges. In the aggregate, even though the effects of the predictors are small, they can be informative to community college leaders and decision makers. The results also reveal several topics that may be of further interest to researchers and policy makers. Disaggregating the study data by qualitative and mixed method researchers can provide information to community college stakeholders to optimize the allocation of limited resources to meet individual college and state wide student success goals.

Conclusion

The literature on graduation rates in higher education is dominated by studies at four-year institutions based on the characteristics of students associated with a lack of persistence to graduation. However, there are no studies of that type investigating community college graduation rates. Recent studies, again predominantly at four-year institutions, have begun to examine the characteristics of the institution itself, particularly of how the institution allocates its scarce resources, to explore the impact on graduation rates. There is also a wealth of literature on the impact low socioeconomic status has on student success. Generally, low-income students fare far worse in higher education success than their higher income contemporaries. Again, little research has been conducted to study low-income community college students specifically. To address the gap in community college graduation rate research, this study examined seven resource allocation variables in conjunction with the level of financial aid received by students to explore their relationship to public U.S. community college graduation rates.

The most recent IPEDS reporting year available at the beginning of this study, 2007, was used to collect data on the seven variables this study used to represent resource allocation in community colleges: expenditures on instructional support, academic support, student services, and institutional support, and faculty salary, percent of full-time faculty, and professional staff to student ratio. Using hierarchical multiple regression, the seven predictor variables were analyzed to discover if they were moderated by an eighth variable: the percentage of students receiving financial aid. The F test of the change in R^2 value for each predictor revealed the significance of the moderator effect of the financial aid variable. A follow-up analysis was conducted to determine if the moderated

predictors were significant predictors at either high or low percentages of students receiving financial aid. For the predictors not moderated by the financial aid variable a follow-up analysis was conducted to determine if the predictor was significant in predicting graduation rate by itself.

The results of this study reveal two fundamental concepts: resource allocation at community colleges has a small but significant impact on graduation rate, and the percentage of students receiving financial aid at community colleges has an impact on the resource allocation predictors of graduation rate. The aggregated data of this study provide a generalized picture of the resource allocation variables' impact on graduation rate and establish a foundation for further research on the complex interactions of community colleges and the graduation goals that benefit students and society.

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Appendix A

Residuals to Predictor Scatter plots

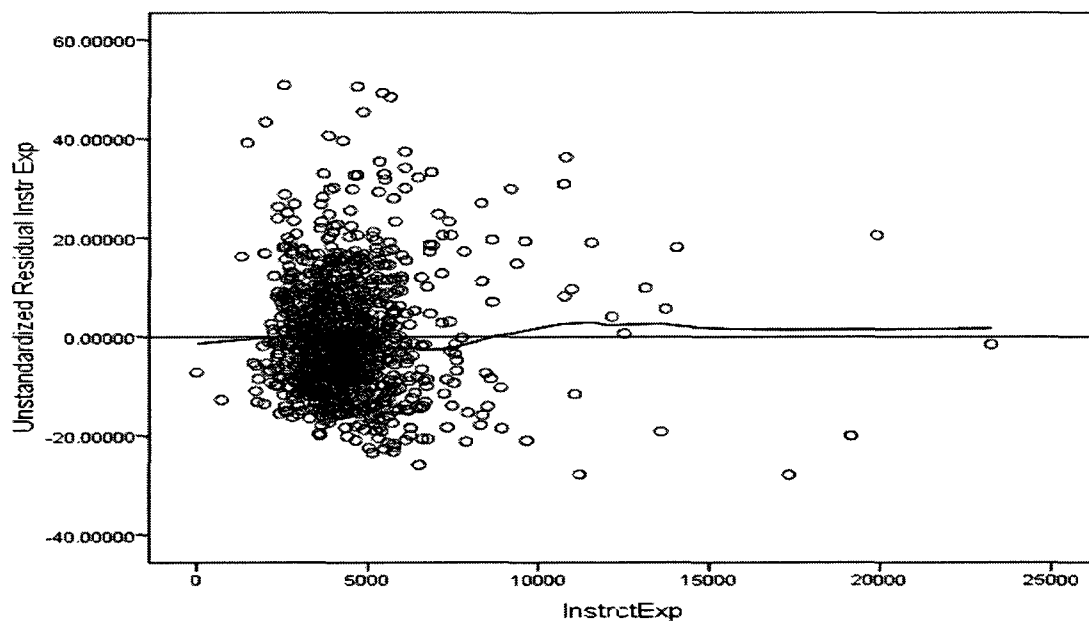


Figure A1. Predictor: Instructional Support Expenditures

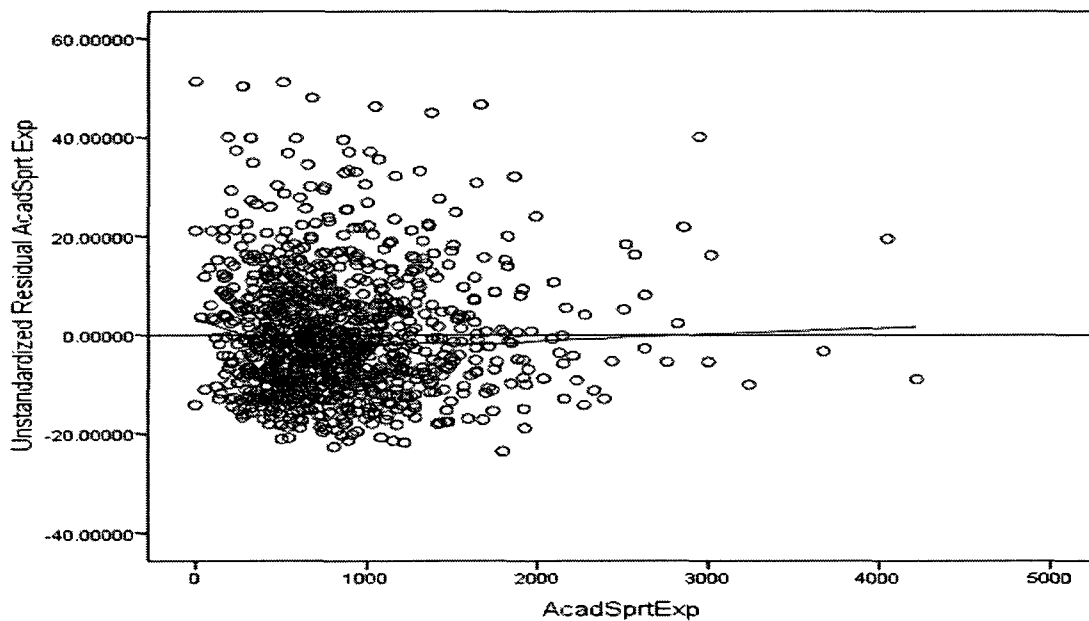


Figure A2. Predictor: Academic Support Expenditures

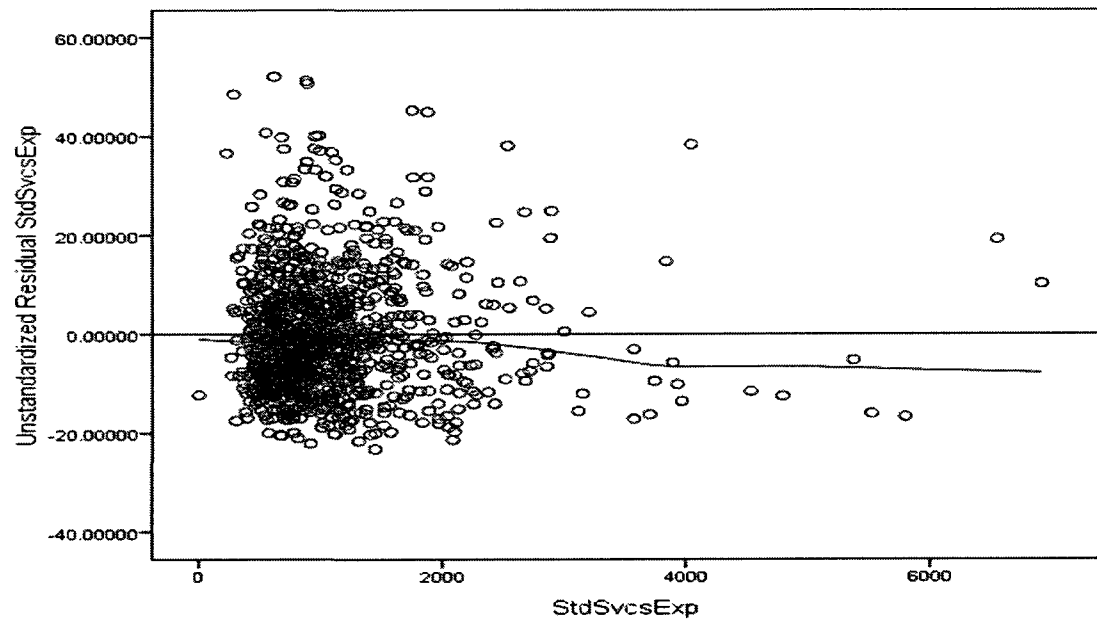


Figure A3. Predictor: Student Services Expenditures

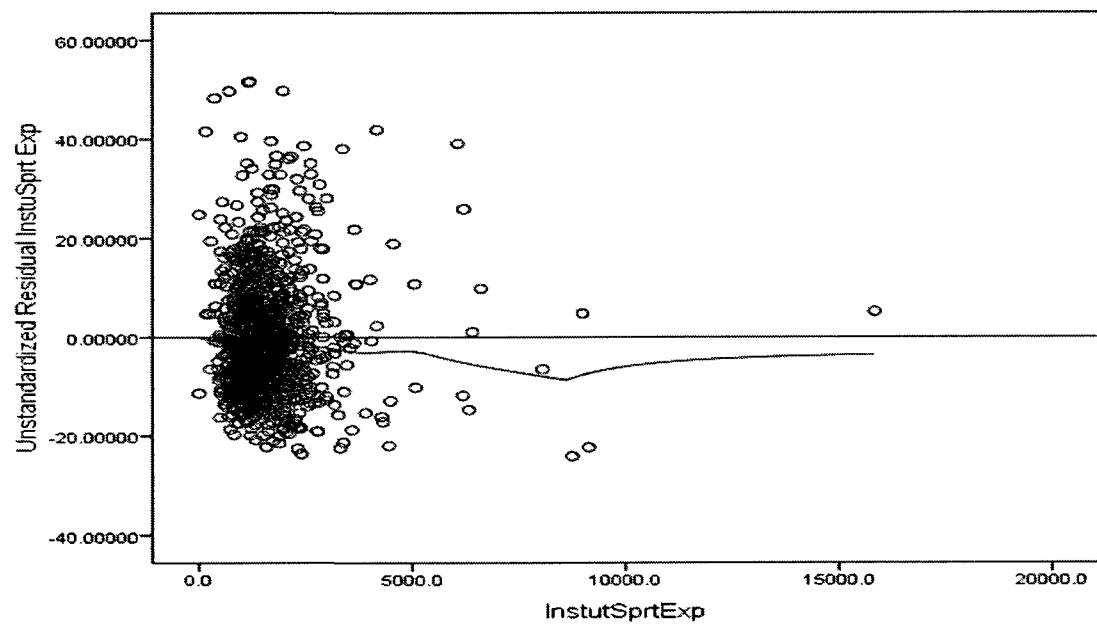


Figure A4. Predictor: Institutional Support Expenditures

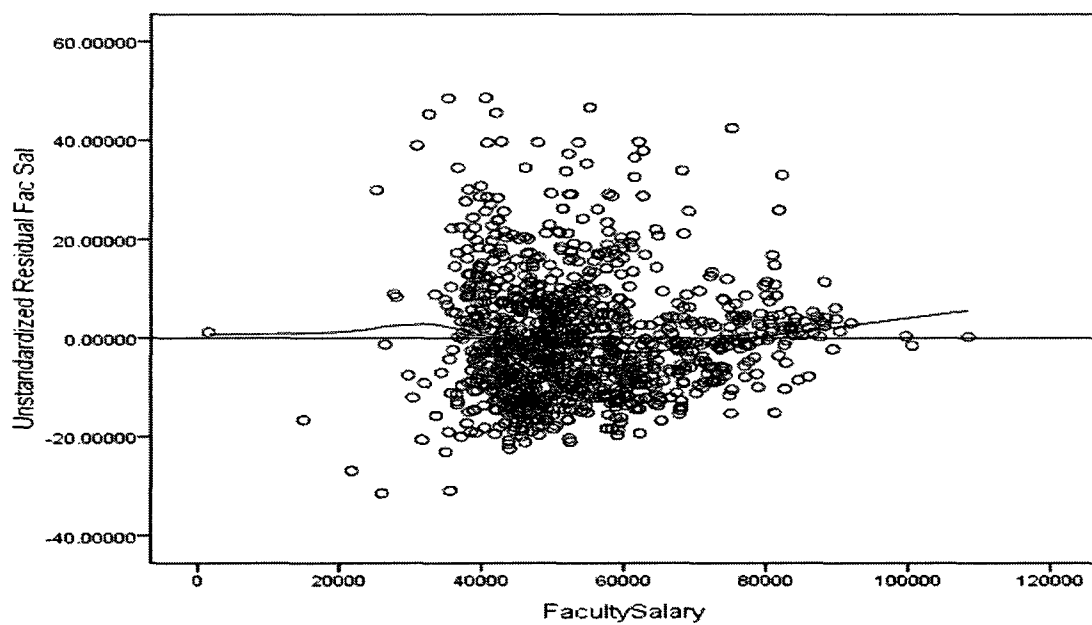


Figure A5. Predictor: Faculty Salary

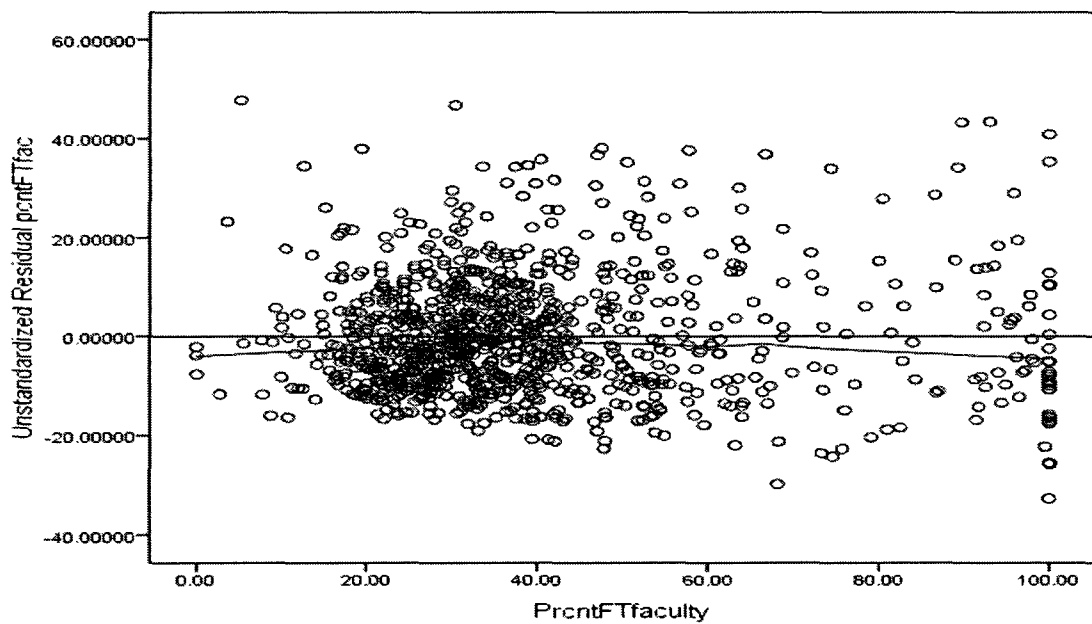


Figure A6. Predictor: Percent of Instructional Staff Who are Full-time

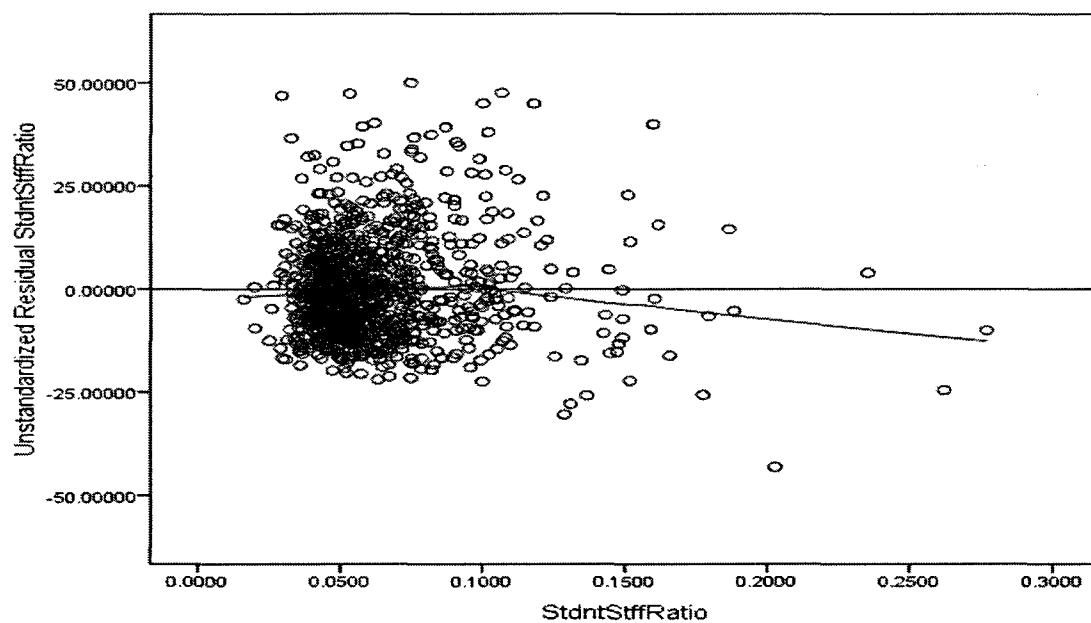


Figure A7. Professional Staff to Student Ratio

Appendix B

Histograms of Residuals by Predictors

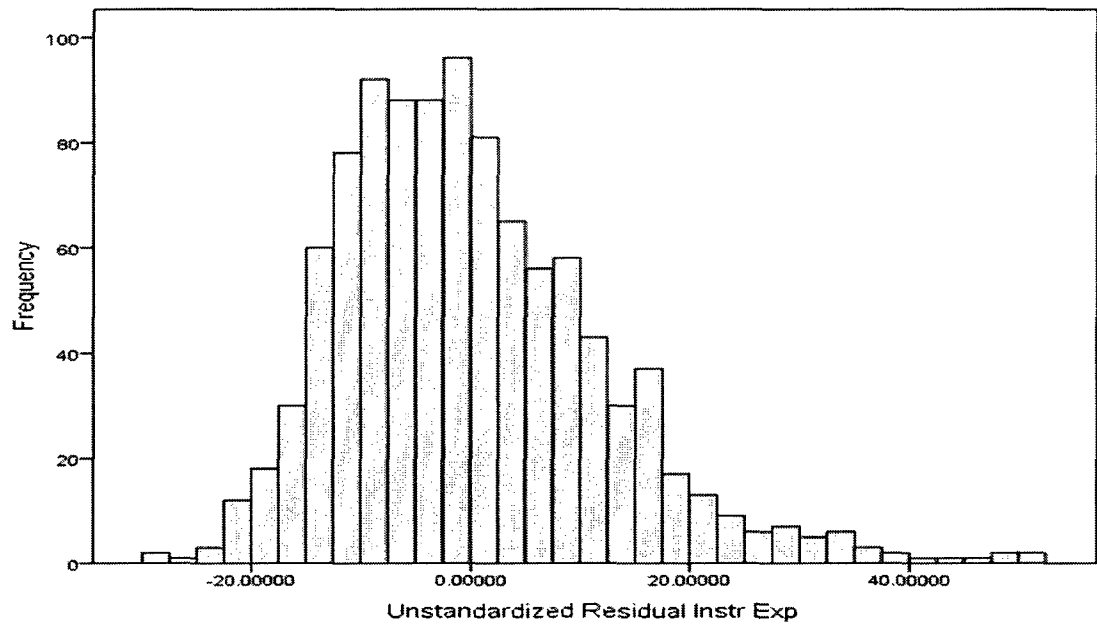


Figure B1. Predictor: Instructional Support Expenditures

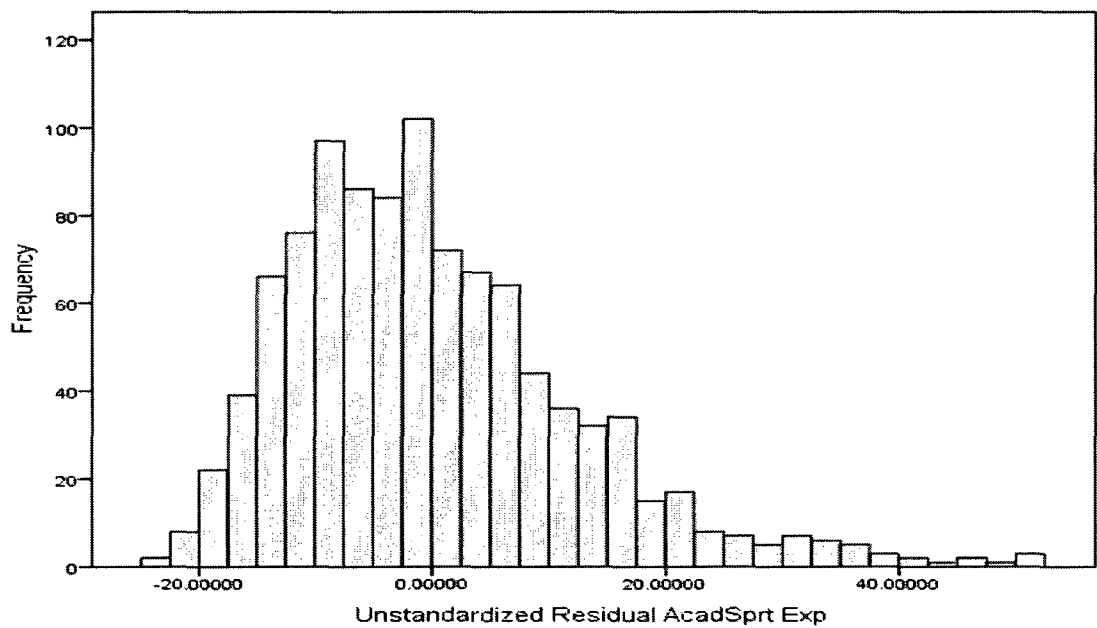


Figure B2. Predictor: Academic Support Expenditures

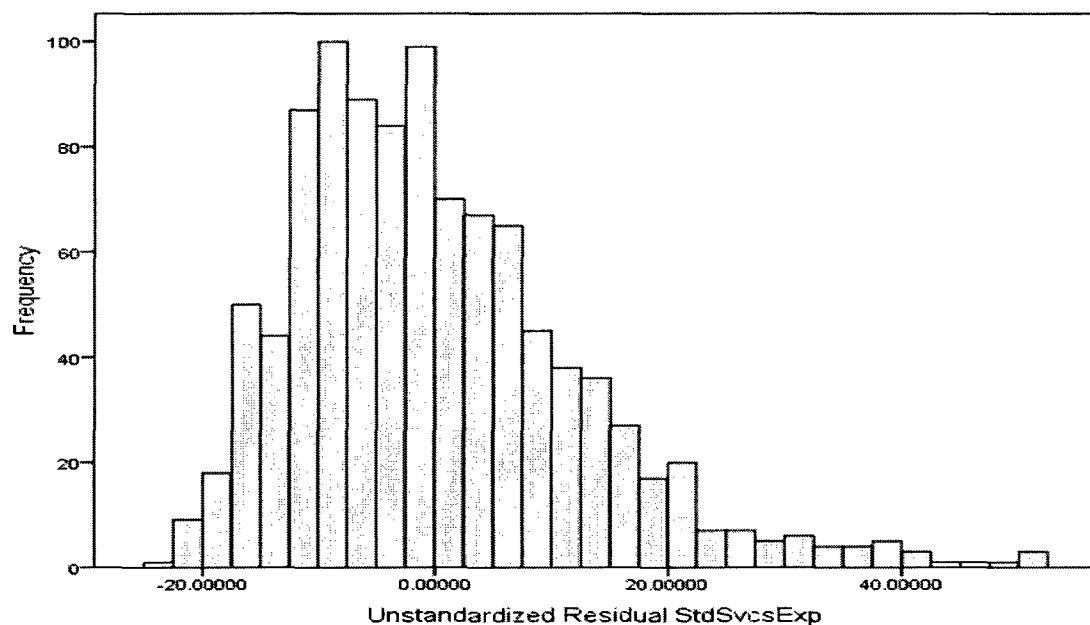


Figure B3. Predictor: Student Services Expenditures

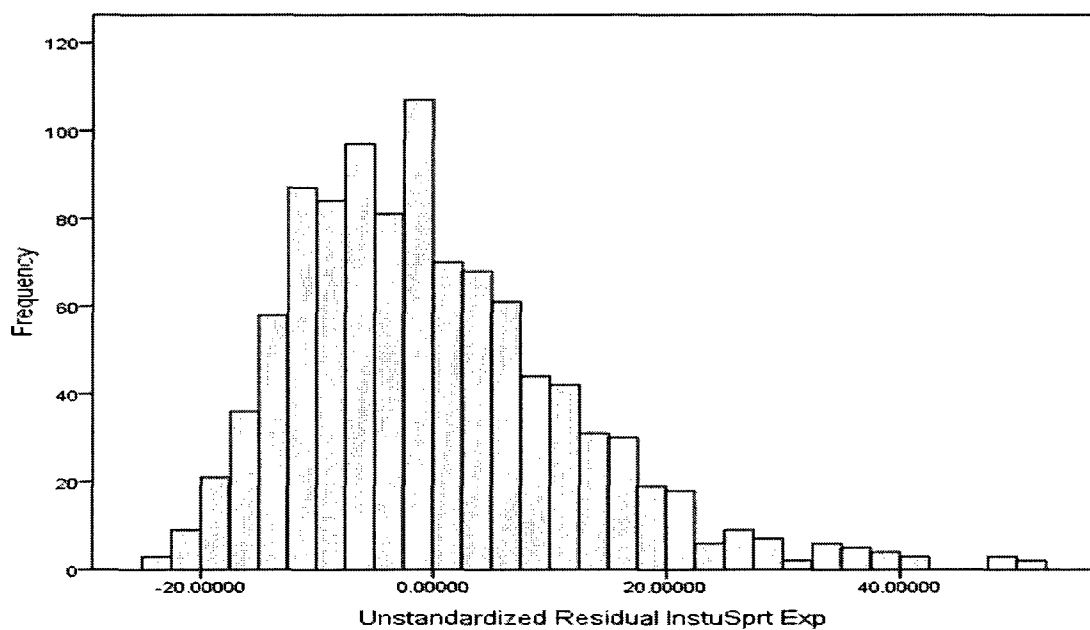


Figure B4. Predictor: Institutional Support Expenditures

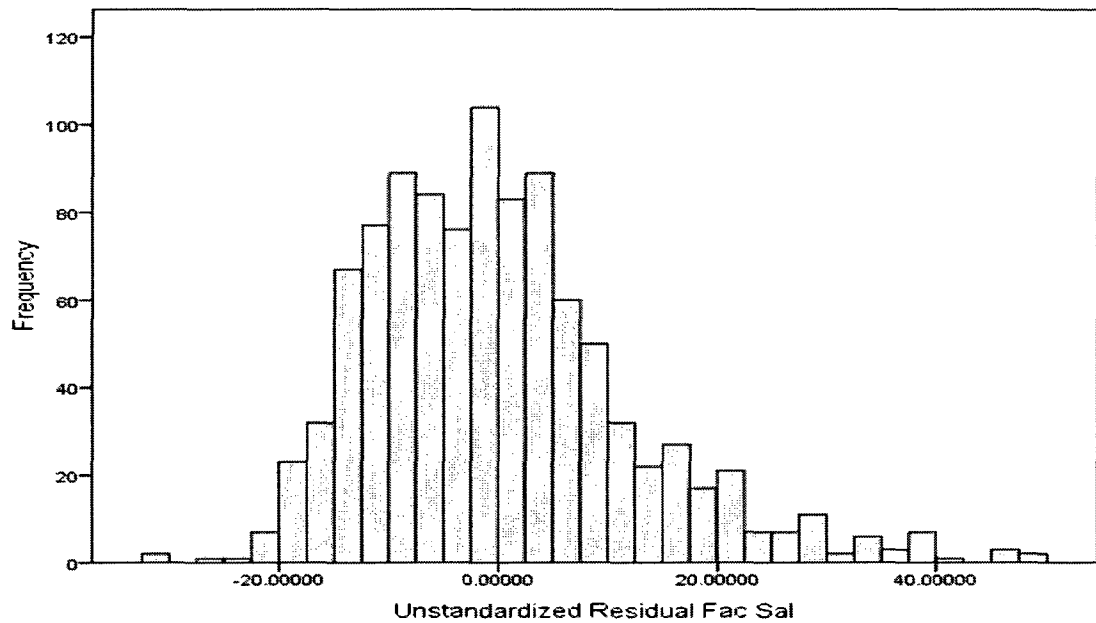


Figure B5. Predictor: Faculty Salary

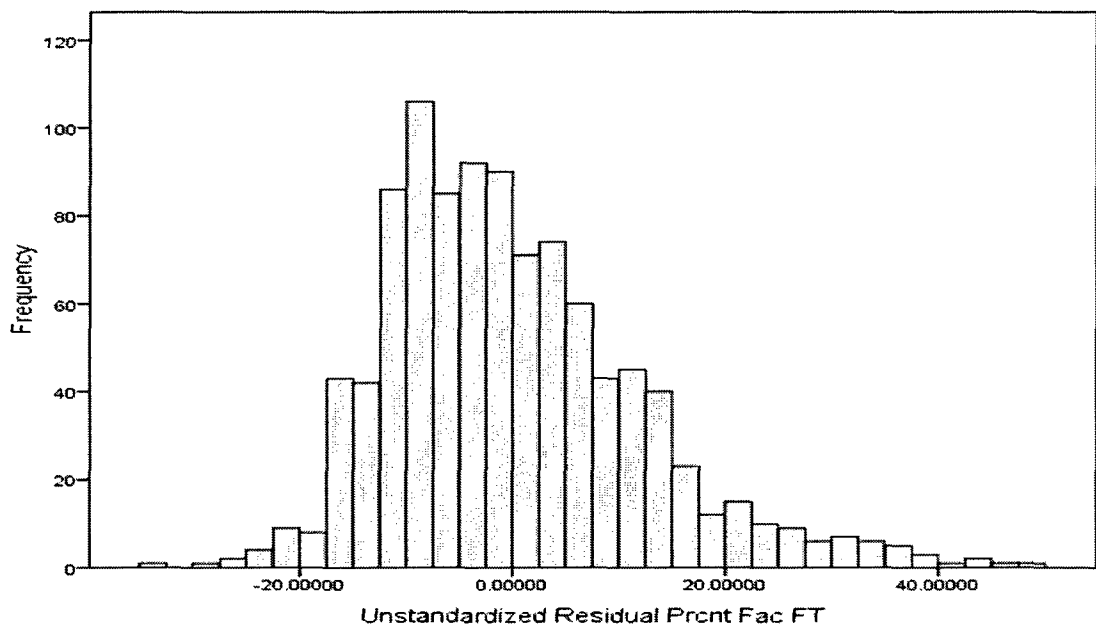


Figure B6. Predictor: Percent of Instructional Staff Who are Full-time

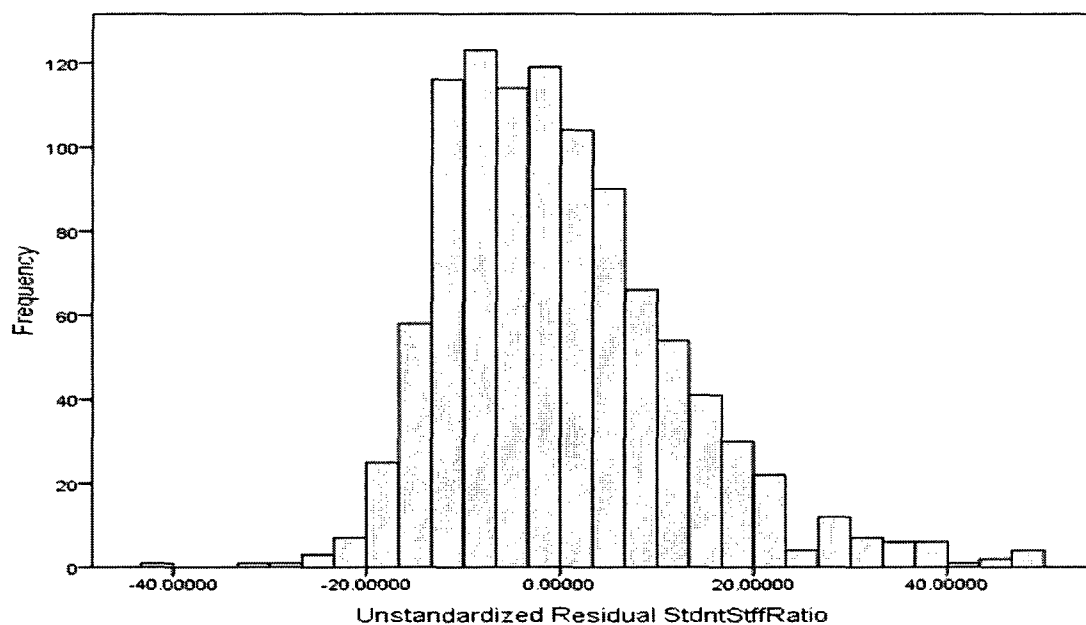


Figure B7. Predictor: Professional Staff to Student Ratio

Appendix C

Q-Q Plots of Residuals

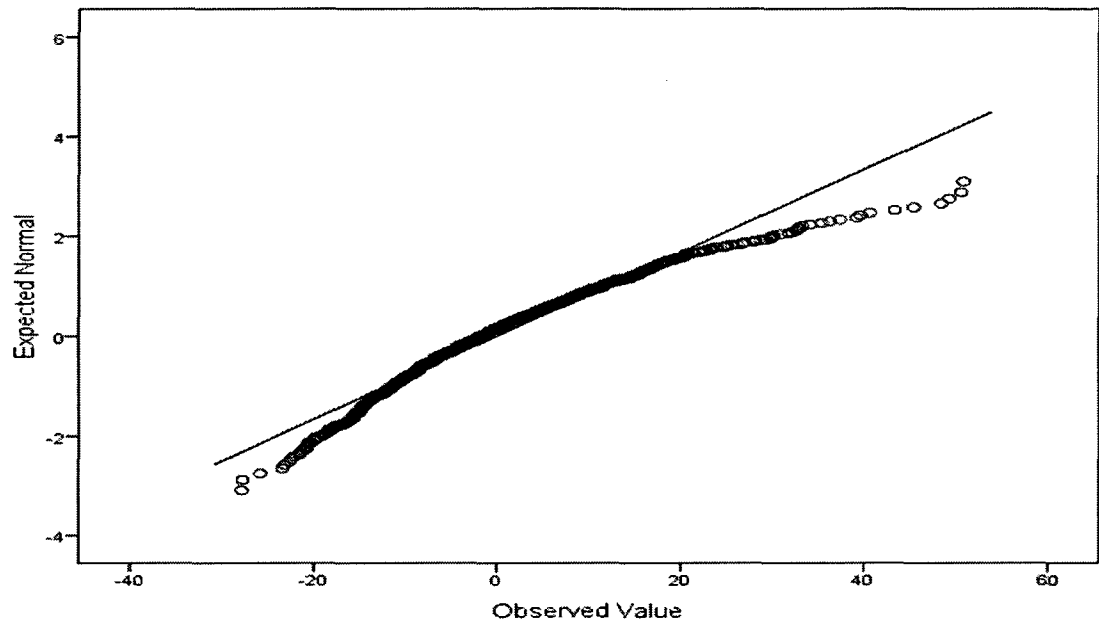


Figure C1. Predictor: Instructional Support Expenditures

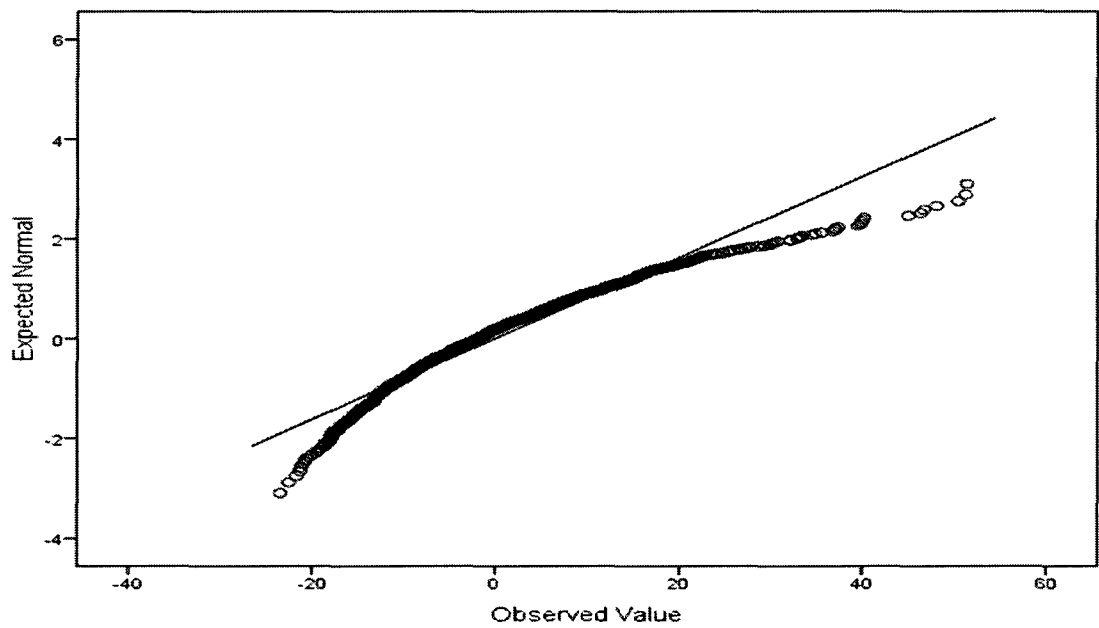


Figure C2. Predictor: Academic Support Expenditures

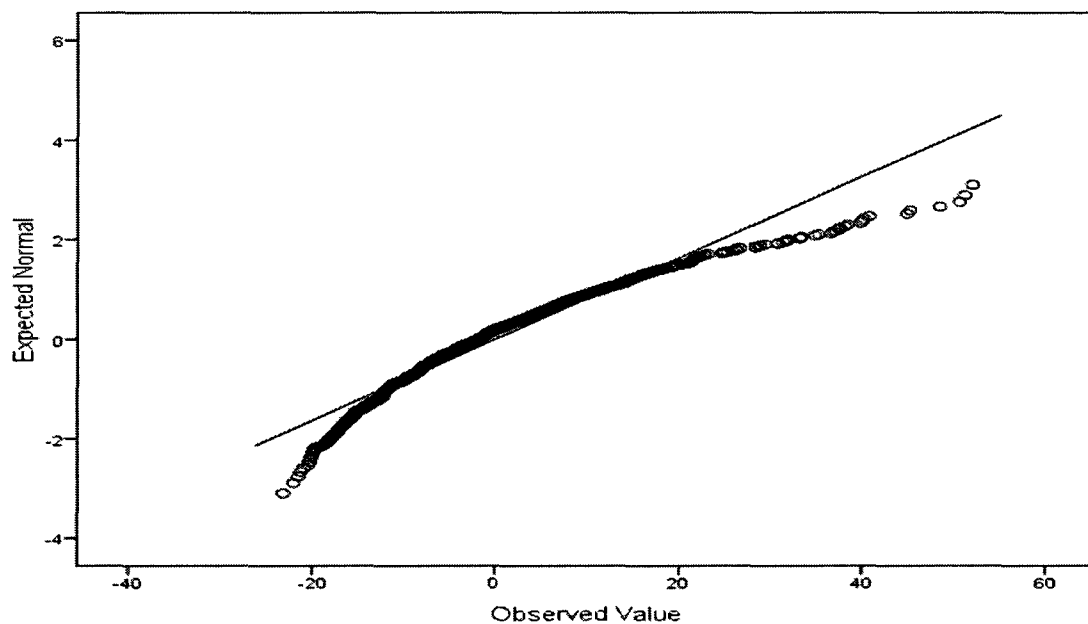


Figure C3. Predictor: Student Services Expenditures

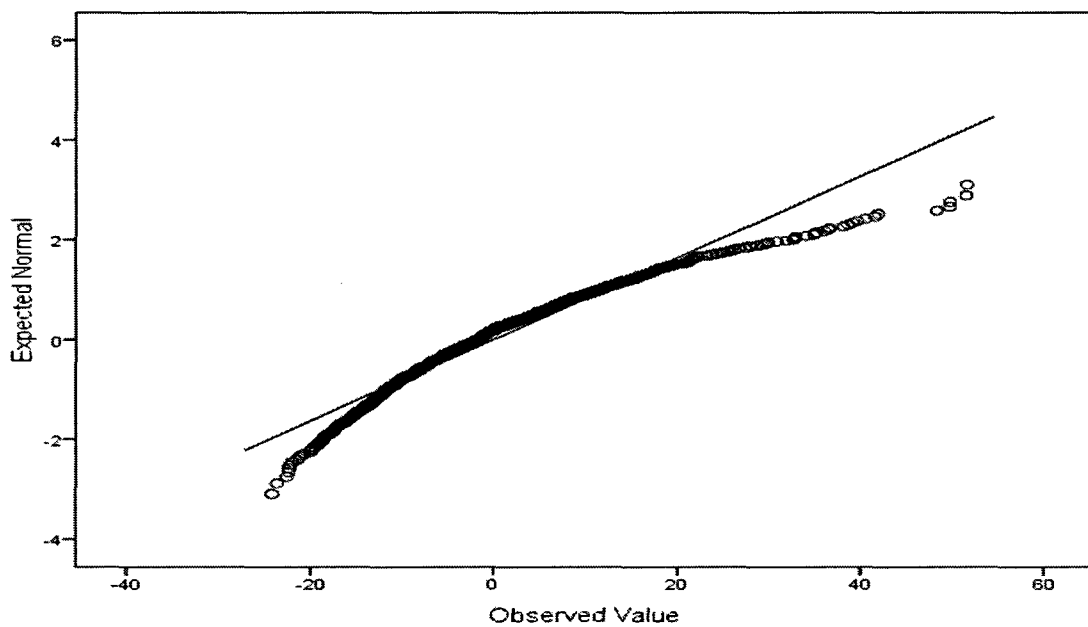


Figure C4. Predictor: Institutional Support Expenditures

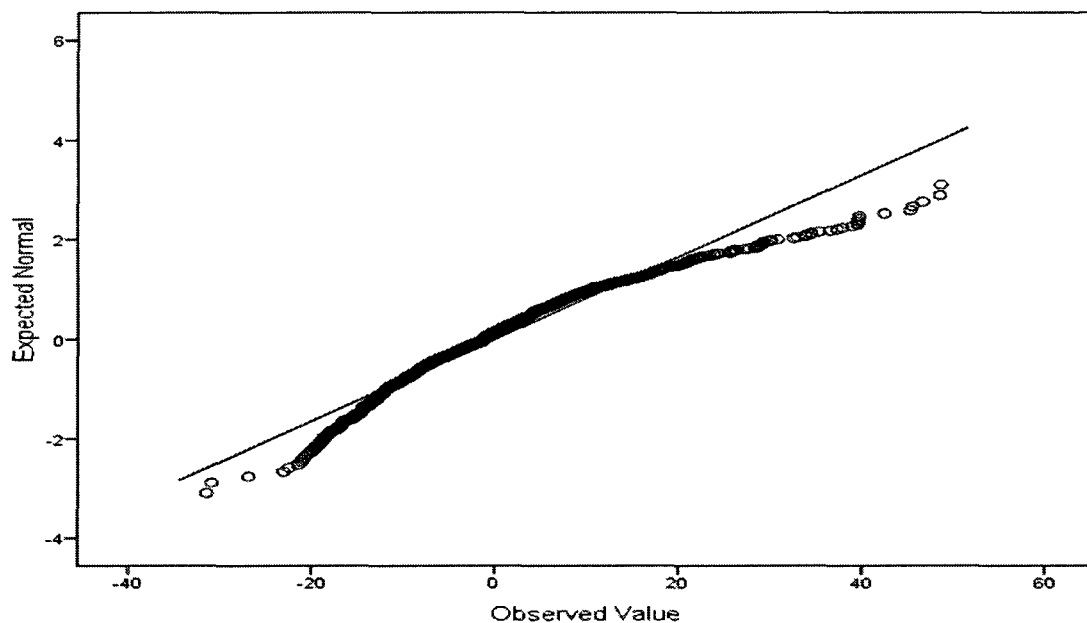


Figure C5. Predictor: Faculty Salary

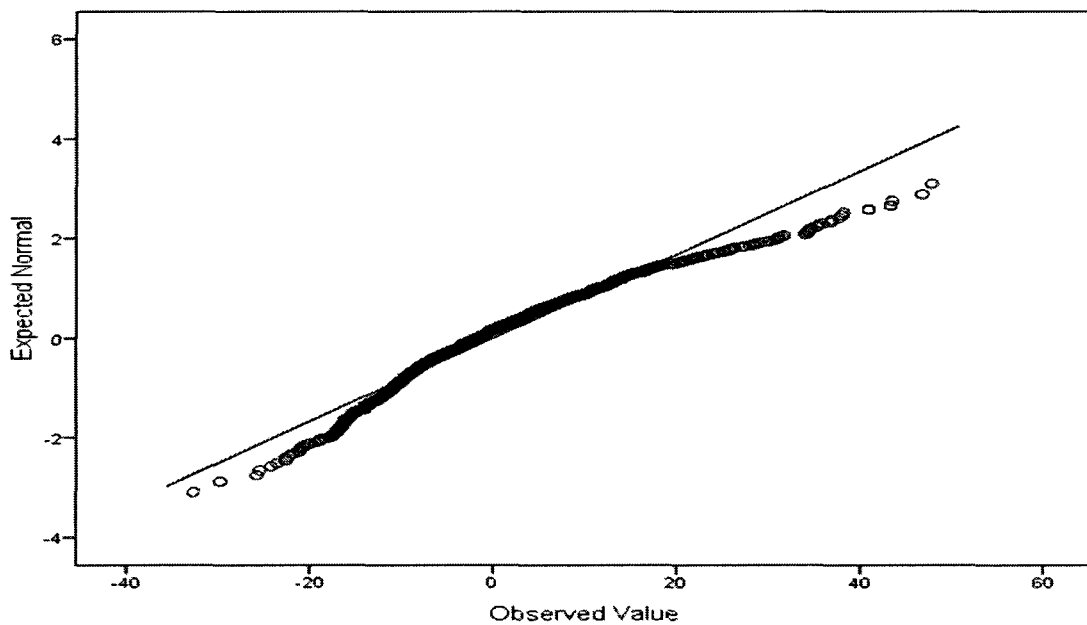


Figure C6. Predictor: Percent of Instructional Staff Who are Full-time

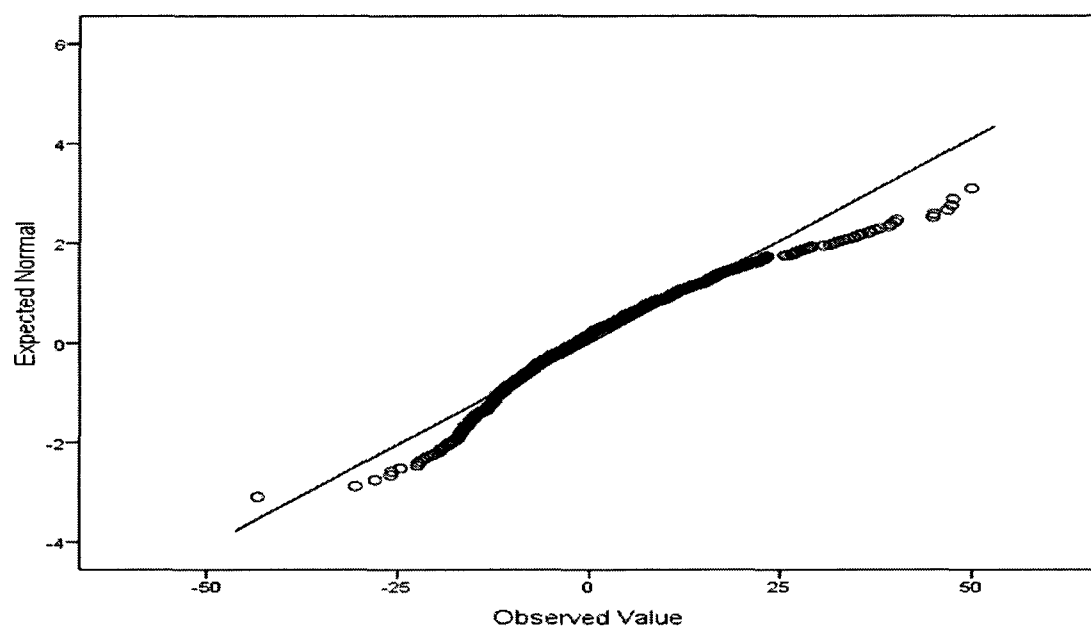


Figure C7. Predictor: Professional Staff to Student Ratio

Appendix D

Residual Scatterplots

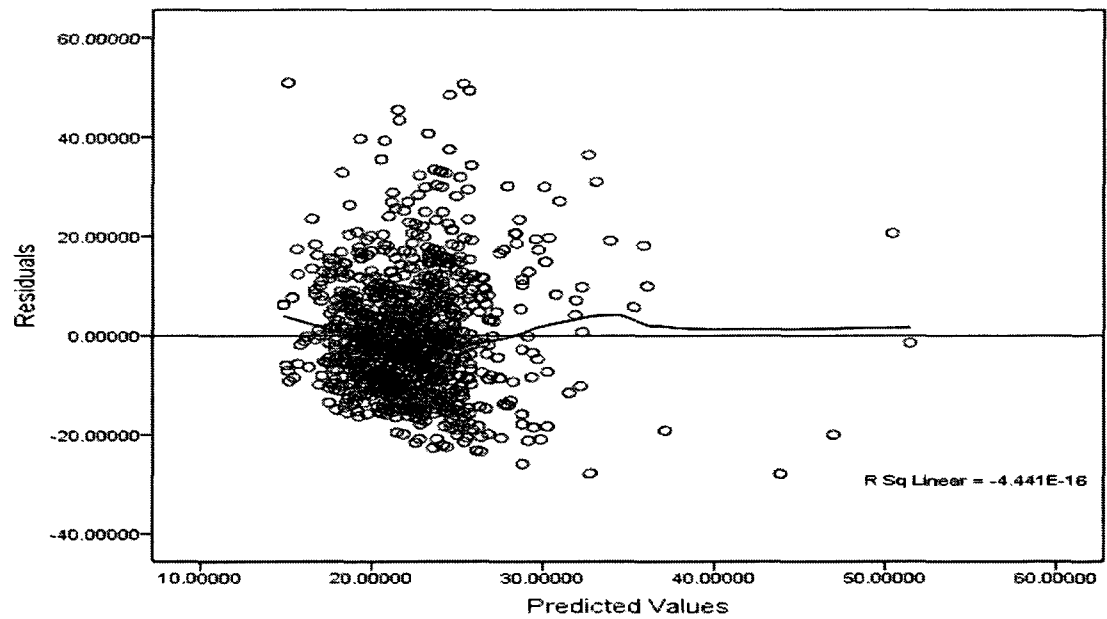


Figure D1. Predictor: Instructional Support Expenditures

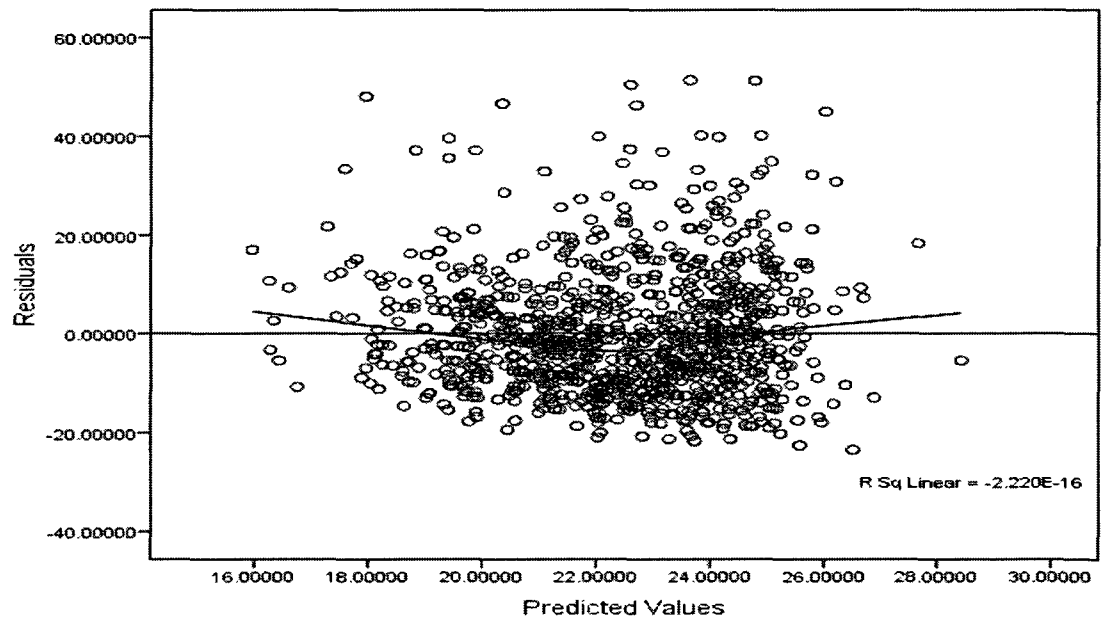


Figure D2. Predictor: Academic Support Expenditures

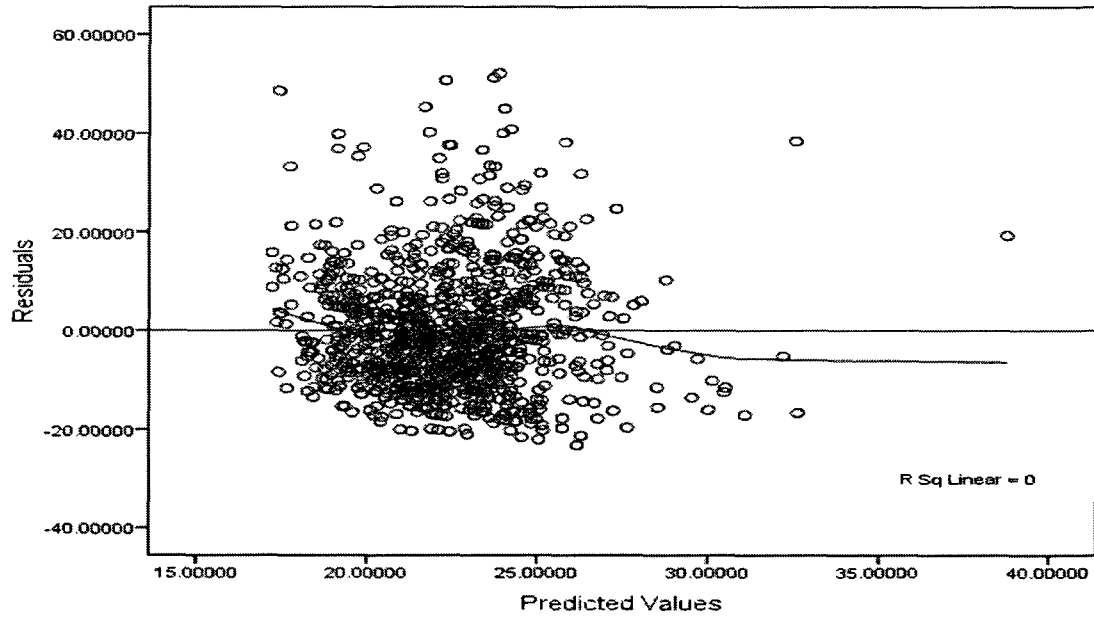


Figure D3. Predictor: Student Services Expenditures

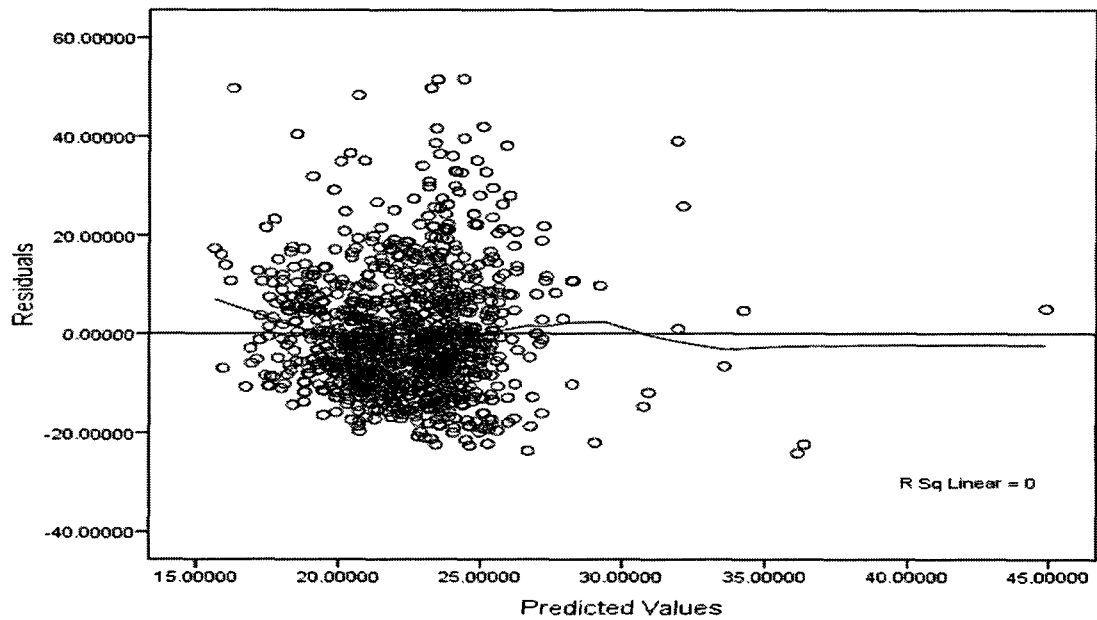


Figure D4. Predictor: Institutional Support Expenditures

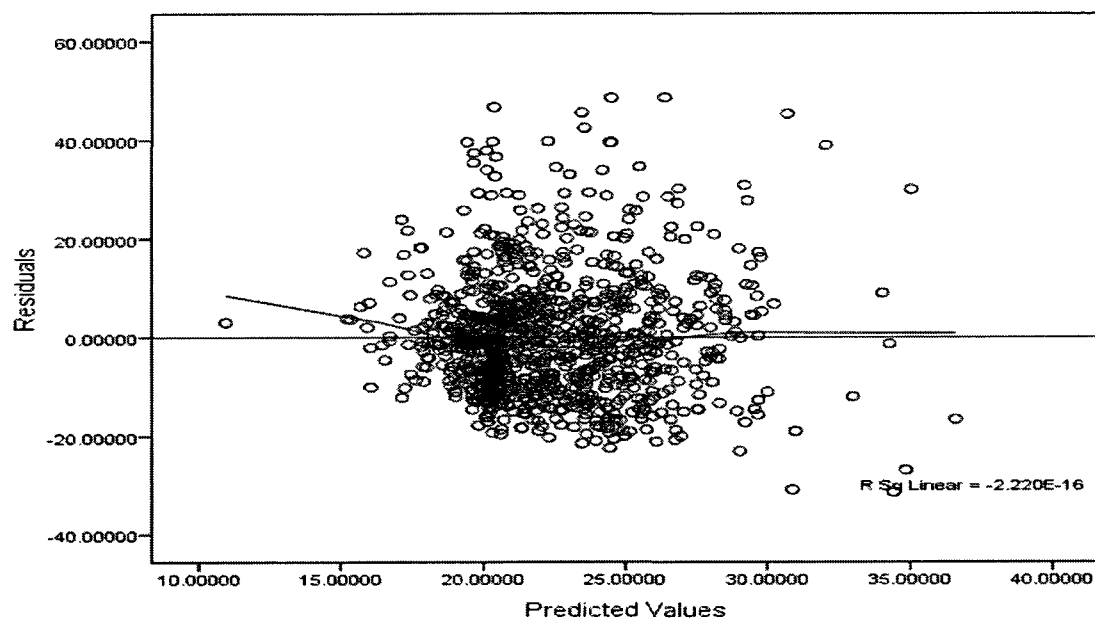


Figure D5. Predictor: Faculty Salary

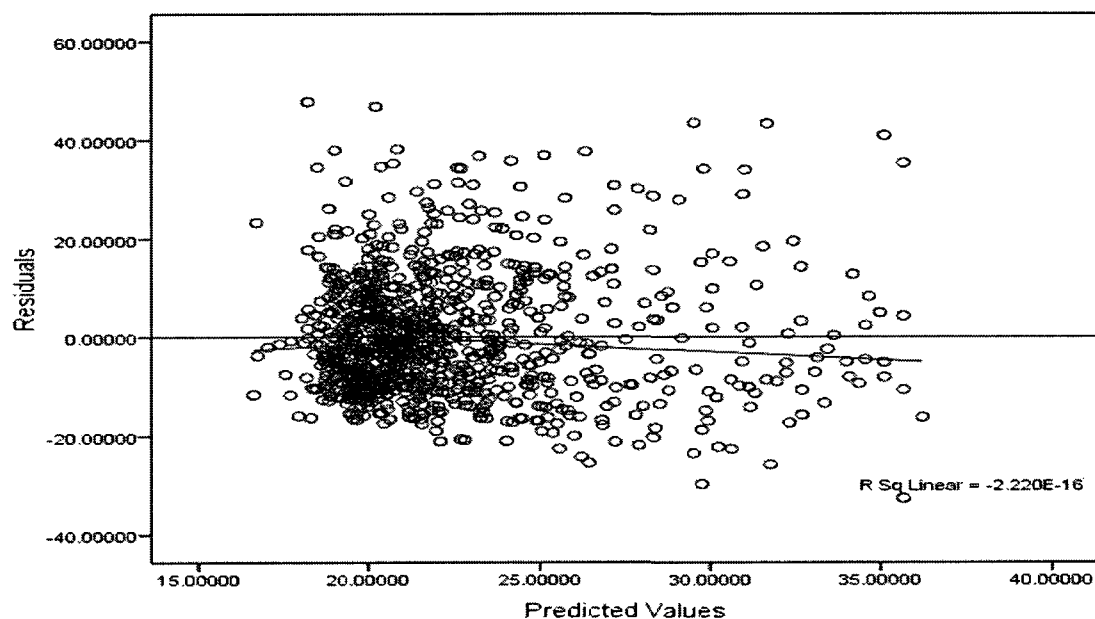


Figure D6. Predictor: Percent of Instructional Staff Who are Full-time

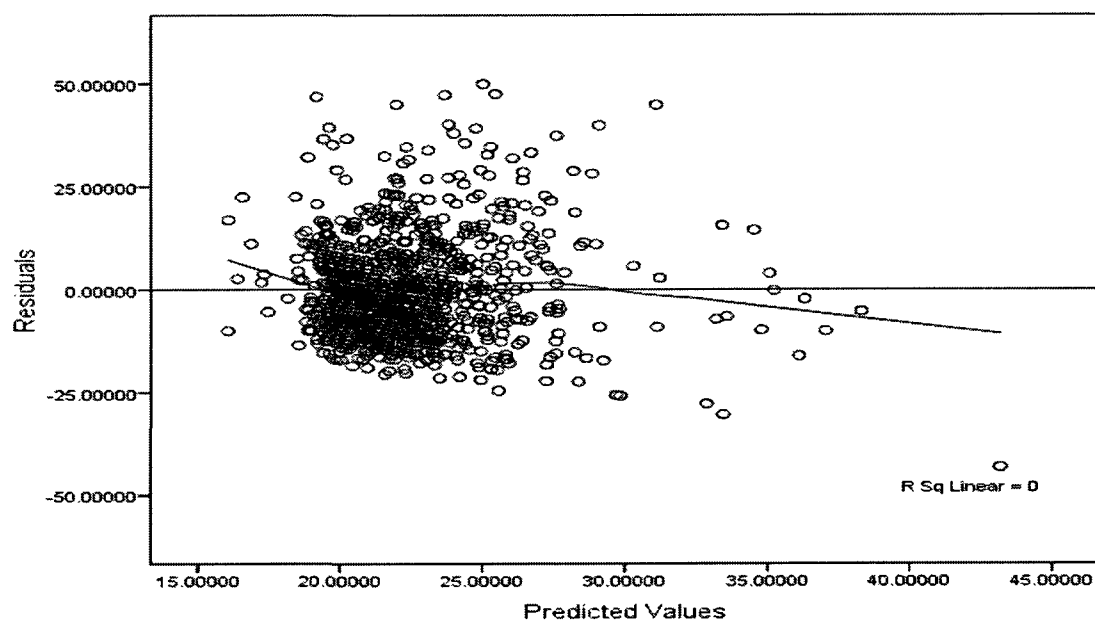


Figure D7. Professional Staff to Student Ratio

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 National Institute for Staff and Organizational Development conference, May, 2007.

“Graduation Rates Do Matter”, *Community College Times, Opinion*, July 4, 2006.

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Prepare for Success: Business Career Opportunities, keynote address FBLA regional conference, Richmond, VA, Fall 2003.