ABSTRACT

Davis B. Smith, THE RELATIONSHIP BETWEEN CATEGORICAL EXPENDITURES AND GRADUATION RATES AT NORTH CAROLINA COMMUNITY COLLEGES (under the direction of Dr. Crystal Chambers). Department of Educational Leadership, October 2018.

The public perception of higher education, the culture of that institution, and its value to American citizens is changing. Taxpayer demands to downsize costly government expenditures, including government subsidizing of state supported educational institutions, have resulted in increased scrutiny of colleges and universities. Special programs have been reduced and in the case of post-secondary schools, there is increased pressure to find alternative funding sources and to increase tuition requirements. As a result, educational stakeholders have been forced to examine all aspects of institutional performance, especially numbers of graduating students.

Though numerous theories suggest innovative ways to increase student success, college presidents face the reality of limited money to implement every success effort. More informed spending decisions might be possible by exploring an economic production function model to see what expenditures might produce better student success results at post-secondary institutions. This study examined four expenditure inputs – instructional support, academic support, institutional support, and student services support –, to determine whether there were any relationships between expenditure categories and graduation rates. My population included the 58 North Carolina Community College System (NCCCS) schools between the years of 2004-2014 using ordinary least squares regression to test my research question. The data for this study were collected from The Integrated Postsecondary Education Data System (IPEDS).

The results of my study revealed there was no statistically significant relationship between individual expenditure category and graduation rates of those institutions for that time period.

THE RELATIONSHIP BETWEEN CATEGORICAL EXPENDITURES AND GRADUATION

RATES AT NORTH CAROLINA COMMUNITY COLLEGES

A Dissertation

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Davis B. Smith

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Davis B. Smith

APPROVED BY:

DIRECTOR OF DISSERTATION: _____

Crystal Chambers, PhD

COMMITTEE MEMBER: _____

David Siegel, PhD

COMMITTEE MEMBER: _____

Marjorie Ringler, EdD

COMMITTEE MEMBER: _____

Phyllis Broughton, EdD

CHAIR OF THE DEPARTMENT OF EDUCATIONAL LEADERSHIP:

_____

Marjorie Ringler, EdD

DEAN OF THE GRADUATE SCHOOL:

_____

Paul Gemperline, PhD

DEDICATION

I dedicate this work to my cohort classmates, and to all those who ask, "why?"

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CHAPTER ONE: INTRODUCTION

Background

American colleges and universities have historically benefitted from public financial support. As the political climate has changed in the United States, that financial support has waxed and waned, eventually leading to modern pressures on colleges to produce more graduates at a lower cost to the public. Tasked with a variety of edicts from their legislators, American colleges serve as adult literacy centers, retrain unemployed citizens, and prepare otherwise underprepared students for life at larger universities.

The 2008 recession marked a modern challenge for community colleges by reducing state financial support, while simultaneously sending droves of unemployed adults back to college seeking retraining for new careers. The demands to make community college students more successful with less money might leave college administrators tabbing through stacks of student success research that recommends a variety of solutions. While all have merit for producing increased student success, many of those researched solutions not only require financial investments in order to implement, but they also fit into diverse expenditure categories. When trying to determine in which of these areas to invest, college administrators might also find themselves needing to define which expenditure category is most influential in increasing graduation rates. Previous higher education studies have used an economic theory called production function to determine what financial inputs might increase outputs such as graduation rates.

This study attempted to determine if there was any relationship between the amount of money spent on any of four expenditure categories (instructional support, academic support, student services, and institutional support) and graduation rates at North Carolina Community

Colleges. The following sections and chapters will outline how the purposes and funding of American higher education has changed over time, and how taxpayer demands have led college administrators to focus on student success. I will also outline how I gathered and analyzed data based on production function theory in order to determine what, if any relationships exist between spending and graduation rates.

History of American Support for Higher Education

From the most elite private research institution in the Ivy League, to the most affordable, accessible community college, American colleges and universities have in their DNA a mission to educate individuals in order to create a stronger society. From Harvard's founding purpose of instilling culture and piety into young men, to Shaw University being established to providing education for African Americans in the post-civil war era, to Joliet College being founded to better prepare young students for moving into more rigorous university coursework, colleges have been developed on the principle that a well-educated populous is a more productive (financially, socially, and intellectually) populous (Goodchild, 2007).

As these institutions have grown and transformed, public attitudes toward higher education and its purpose have evolved, often as a reaction to the political or economic climate of that time. As industrial growth began to occur in the United States, public funding for agricultural and technical institutions increased in order to provide the American economy with workers that are more skilled. As soldiers came home from war after World War II, the public wanted to reward their service and ensure their economic success through the GI Bill, creating a new wave of college attendees. As the American economy changed and more citizens wanted access to higher education, along with an increase in employers' demand for job-specific

workers, the public once again invested in higher education through the creation of community and junior colleges (Pedersen, 2007).

New trends in the American economy and the attitudes toward American higher education are now clashing, causing new challenges and opportunities for leaders in higher education. The modern era of America's economy can arguably be defined by distrust in government (particularly with its ability to spend tax money) with a strong, vocal population of taxpayers demanding that government take less money from citizens, and become more efficient (Ness & Tandberg, 2013). As the United States economy took a downward spiral in 2008, Americans became even more protective of their tax dollars. With massive job losses in the United States during the recession, policy makers were not only fielding demands to spend money more carefully, but also had drastically less money to spend, since tax revenues were declining. The recession, and the job losses that followed, prompted Americans seeking job retraining to enroll in institutions of higher education, particularly at community colleges. (Romano, 2012). A new fusion was occurring in higher education where there was less money to operate, more accountability for spending that money, more students on campus to educate, and a new students-as-consumers mentality.

This modern phenomenon has led to higher education stakeholders demanding more efficiency and accountability. The definition of learning and success in American colleges has changed to mean that students are (only) successful when they complete the degrees that they intended to earn at the onset of their educational journey. To wit, students and their parents are now expecting the completion of a degree in exchange for their hard-earned tuition money (Serna & Harris, 2014). As the American economy changes, it is becoming more and more necessary for students to continue their education beyond high school, and colleges are bearing

the burden for ensuring that students complete degrees and find work in the economy. Rather than defining learning as a process where student and teacher work together to determine learning outcomes, public stakeholders, including students themselves, are now defining the learning process by the degree earned, and the benefits of achieving it, based on the costs taken to complete it (Liefner, 2003).

To emphasize this point, Travis Reindl, Education Division Program Director of the National Governor's Association, addressed the House Education Subcommittee on Higher Education and Workforce Training regarding transparency in higher education (Transparency in Higher Education, 2013). In his testimony, Reindl urged states to have greater transparency in higher education, strengthen completion metrics in colleges, increase efficiency and effectiveness in higher education, and focus on the outcomes of education just as much as the inputs. In other words, if states invest money into higher education, then the institutions should be measured on how effective they are at producing outputs, which Reindl defined as degrees earned.

What is even more challenging for colleges is that while enrollment numbers are higher, graduation rates are declining, particularly at community colleges, as adults are returning to school for job retraining. Whereas the United States previously led the world in college-educated adults, the country's rank is now declining, even though more adults are attending college. Furthermore, jobs in the new economy are requiring college-level degrees (Newfield, 2010). The combination of the attitudes of stakeholders and the economic environment are leading policy makers to demand that colleges and universities meet accountability standards, particularly through performance funding legislation and performance measures. In an effort to make public higher education institutions operate more like private businesses, performance funding models

provide monies based on the satisfactory meeting of certain performance benchmarks, typically graduation rates. This funding is often used as bonus funding over-and-above an institution's base funding, which is usually awarded based on enrollment. In recent years however, institutional funding is increasingly based on meeting performance measures, not enrollment (Liefner, 2003). While opinions vary about performance funding models, the National Conference of State Legislatures has recommended that states adopt performance funding models, and since Tennessee adopted the original performance funding model in the 1970s, thirty states have followed suit (D'Amico, Friedel, Katsinas, & Thornton, 2014).

These trends have put public college leaders under increased pressure to ensure that they are able to offset state budget cuts without raising tuition to the point of being a hardship for students. Colleges are attempting to provide an excellent education through instruction and campus facilities without becoming the targets of criticism for overspending. Additionally, colleges are struggling to find human resources that provide students with holistic assistance, without utilizing faculty members, a practice that often takes faculty too far away from their own teaching and research demands.

Many theories and models have emerged over time regarding what activities are most effective in keeping students engaged on campus, and what efforts produce more graduates. Strategies such as providing students with an opportunity to get involved on campus (Anonymous, 2009), constructing facilities for students to be engaged on campus (Lau, 2003), high-quality instructors (Hanushek, 1997), cutting edge technology (Deegan & O'Banion, 1989), and professional support staff to assist students outside of the classroom (Gransmeyer-Topf & Schul, 2006), have all been noted as being helpful in assisting students to succeed in college. These theories and strategies for improving an institution's graduation rates could leave a

president even more overwhelmed about the costs of implementing any of these models, particularly with already depleted institutional budgets. Prior to implementing a project to boost student success and graduation, a college leader might question if any of these strategies were more effective. The following section will explain how this study will go about determining if there is a relationship between the amount of money invested in expenditure categories and graduation rates at North Carolina community colleges.

Research Problem

In previous studies to determine what types of investments and efforts make students more successful, researchers have utilized a production function model where financial inputs are examined to see if any have an impact on desired outputs (Monk, 1990). In this study, financial input categories, or expenditures, included student services, institutional support, academic support, and instruction. These expenditure categories were consistent with the four expenditure categories reported by the National Center for Education Statistics (NCES) Integrated Postsecondary Educational Data System (IPEDS) data feedback reports (NCES, 2018). These four financial input categories were also consistent with expense reporting of the North Carolina Community College System to the North Carolina State Auditor (North Carolina Community Colleges, Finance and Operations Division, 2018). In a later section, I will discuss specific traits of the North Carolina Community System and its expenditure mechanisms. Additionally, these categories as variables were consistent with previous higher education production function studies, particularly Ryan's 2004 study of the same nature. The desired output of this study was completion rates (degrees earned within 150% of the prescribed timeframe) of North Carolina community college students, a measure of student completion used by all North Carolina Community Colleges when reporting annual data to IPEDS. Previous

studies involving the application of a production function model in education have often focused on K-12 education (looking mainly at test scores as an output) (Babcock & Betts, 2009; Krueger, 1999; Oshio, Sano, & Suetomi, 2010), or four-year institutions (looking at degree completion rates as an output) (Michalko, 1994; Ryan, 2004), but have not widely focused on community colleges.

It is important to study the efficiency of community colleges, considering that enrollment rates have been in flux; Community colleges are being held accountable for retraining much of America's workforce, and accountability measures are being put in place for community college graduation rates. Additionally, as Bound, Lovenheim, and Turner (2010) point out, community college admissions standards (open door admissions) often translate into community colleges admitting the most underprepared students, a population which accounts for the highest decline in graduation rates. North Carolina community colleges are currently developing student success initiatives that cover the various input categories, such as the Code Green Curriculum Improvement Project, Completion by Design, Developmental Education Initiative, Financial Aid Simplification, and others, which will be discussed in Chapter Two (North Carolina Community College System, 2012). In this study, I utilized a production function model to determine if any institution-level financial inputs influence completion rates of those programs (150% of the prescribed completion time) at North Carolina community colleges. In the following chapters, I will review the political, economic, and academic landscapes of higher education, particularly community colleges, and describe how determined whether any of four expenditure categories could influence graduation rates at the 58 North Carolina community colleges.

In order to determine whether or not there is any correlation between financial inputs and graduation rates at North Carolina community colleges, this quantitative study analyzed

secondary data from the NCES IPEDS data feedback reports collected from each of the 58 North

Carolina Community Colleges from 2004-2012. I analyzed expenditures in four expenditure

categories: instruction, academic support, institutional support, and student services. In the study,

I compared yearly expenditures per full time enrollment (FTE) with the 150% "normal time"

graduation rate of the same cohort year. I utilized Ordinary Least-Squares Regression (OLS), and

Analysis of Variance (ANOVA) statistics to determine if money spent in these categories have

impacted graduation rates at the institutional level. Chapter Three of this study will highlight

how and why I utilized the 150% rule as the standard for completion as a dependent variable.

Research Questions

This study sought to answer the following research questions:

1. Is there a relationship between institutional expenditures and normal time to
   completion of academic programs of students in the same academic year cohort?

2. Does financial support for student services, academic support, institutional support, or
   instruction help to explain variations in persistence to normal time to completion of
   academic programs of students in the same academic year cohort?

Null Hypotheses

I investigated the following hypotheses:

$H_0 1$: There is no statistically significant relationship between expenditures and normal

time to completion of academic programs of students in the same academic year cohort.

$H_0 2$: Financial support for student services, academic support, institutional support, or

instruction cannot explain variations in persistence to completion of academic programs of

students in the same academic year cohort.

It is important to answer these research questions because as community college administrators feel more pressure to graduate students and spend money frugally, potentially knowing what spending efforts produce the maximum number of graduates could help an administrator make more sound spending decisions. Previous studies (Gay, Mills, & Airasain, 2009; Ryan, 2004) have utilized Ordinary Least Squares (OLS), and Analysis of Variance (ANOVA) as statistical methods to measure the correlation between categorical expenditures and graduation rates. Powell and Lehe (2017) describe OLS as a suitable means for predicting unknown quantities from existing data. Roccon (2013) does note that utilizing OLS to measure a very heterogeneous population can be problematic. I argue that by studying the homogeneous population of North Carolina community colleges will correct for that concern. In Chapters Two and Three, I will discuss the population of North Carolina community college students more in depth, and will provide explanation as to their homogeneity. To aid in this correction, I utilized ANOVA, which Rocconi (2013) notes as being effective in accounting for heterogeneity in samples when trying to determine the effects of individual institutions on students.

Theoretical Framework

With various philosophies of how students can best succeed, and with the mounting pressures to spend money more efficiently, college administrators might find themselves making decisions about how to invest institutional money. In making such a decision, administrators might ask which programs are the most effective at raising graduation rates. A production function model would be one way to determine which expenditure categories are more efficient at producing student success. As Vandenberghe (1999) explains, the production function model theorizes that some type(s) of input (instructor salary, capital expenditures, and academic support expenditures) can yield a higher expected output (graduation rates). This section will review the

production function philosophy, and explore literature that both supports and criticizes the use of the production function model in education.

Borrowed from the manufacturing philosophy of determining what inputs produce the most outputs (products or profit), early educational production function models studied public primary, middle, and secondary schools to determine which inputs could produce higher student test scores. As Bowles (1970) writes, the educational production process can help explain the relationship between school inputs and student outputs. The production function model has been received in the educational realm with mixed enthusiasm, with scholars like Glenn (2007) and Browning and Browning (1992) noting that the production function model provides better efficiency and discovers which programs and practices are most effective. Others who have been critical of the model say that K-12 public school production function studies have focused mainly on aptitude test scores, and not graduation rates or other success factors (Hanushek, 1997). However, studies at the collegiate level (Blose, Porter, & Kokkelenberg, 2006; Ehrenberg, 2006; Pike, Smart, Kuh, & Hayek, 2006; Ryan, 2004; Titus, 2004; Webber & Ehrenberg, 2006), have found that certain inputs are significant to graduation rates.

Major criticisms of the production function model in education fall into one of two classifications: those who criticize its relationship to teaching and learning, and those who criticize it as a mechanism for predicting success. Those who criticize production function as being harmful to teaching and learning say that the model is more suited for administrators, not facilitators of learning (Hodas, 1993). Levin (1993) argues that the production function theory is an example of managers framing learning as something that students consume, rather than a process that happens between teachers and students. Vandenberghe (1999) opines that when this type of mentality occurs, students stop being motivated by learning and becoming better

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individuals, and begin viewing themselves as consumers who are supposed to be receiving something in exchange for their financial investment. Lastly, Bowles (1970) notes that the learning process has many variables outside of an instructor's control, including but not limited to students' attitudes toward learning, which might not benefit by financial inputs.

Critics of production function as a means to predict student success often argue that there are more effective ways to predict if a student will succeed in college. Coleman (1996) says that a student's socioeconomic status is a better predictor of success, while Hanushek (1997) argues that considering a student's family and peer influences can tell an instructor more about the types of obstacles that a student might have to overcome.

One flaw with these criticisms is that while a student's socioeconomic status might be a better predictor of student success than financial inputs, simply looking at a student's socioeconomic status is a passive measure that determines whether the student might statistically succeed academically, which is useless information if not acted upon by the institution. Using a production function model, an administrator can then take the knowledge of the student's socioeconomic status (or any other apparent risk factor) and determine what inputs might be most beneficial to help a student succeed. Many champions of the production function theory argue this and other points.

As perhaps one of the strongest advocates for the use of production function, Monk (1990) says that determining inputs that work is not in fact an authoritarian mentality, and that finding learning irregularities, and best teaching practices, all while attempting to spend public money efficiently is a moral method of conducting learning. Supporters not only argue that determining what types of teaching strategies and resources produce better student success is a moral obligation, but also that finding efficient strategies can produce best practices and can

provide instructors the incentive to adopt practices that provide a better likelihood of student success (Hanushek, 1997).

In many higher education production function studies, researchers have found that categorical expenditures can affect graduation rates (Ryan, 2004), that dollar-per-student expenditures can positively affect post-graduation student earning, and that overall, monetary inputs do affect student success outputs (Vandenberghe, 1999). Scholars also counter criticisms about negative impacts on teaching and learning by stating that the production function theory still allows for teacher autonomy, while enabling teachers to manage student shortfalls by identifying best practices (Kane, 2012). Webber and Ehrenberg (2010) add that it is best practice for institutions to look at other peer institutions (those with similar student populations and budgets) to consider the production function model to detect the root cause(s) of inefficiencies.

Regardless of the debates over the merits of production function, scholars do agree on several criteria for institutions that wish to consider using the model. First, it is important for colleges to look at what inputs the organizations can actually control (Vandenberghe, 1999). For instance, a community college with an open-door policy would need to realize that it could not control the academic preparedness level of its first-year students. Once an institution is aware of its limitations, it can then focus on which inputs the institution can control. Secondly, once an organization discovers an influential input, it is important for its members to subscribe to the investment in that input. Vandenberghe (1999) notes five points that colleges hoping to adopt a program need to do:

1. identify clear goals and values that are reflected by the input(s) and the desired output(s),

2. create incentives that are tied to adopting the successful inputs and achieving the desired outputs,

3. market information to stakeholders regarding best practices (i.e. inputs),

4. ensure that practices and inputs are widely accepted throughout the organization, and

5. ensure that technology and resources are available to execute the inputs.

Following this strategy could certainly assist with the successful implementation of a production function study at an institution. In the Methods section of Chapter Three, I will discuss how my study utilized the production function model to determine if any inputs affect degree attainment at NCCCS colleges.

Significance of Study

The significance of this study is that I will add to the body of work surrounding educational production function by contributing information about community college expenditures as they relate to the stated outcomes. There is not a current body of literature that has focused specifically on expenditure outcomes at community colleges, and because this study focused only on community colleges, I aim to contribute information that can be used by community college administrators and policy makers that can assist in making expenditure decisions. In a later section, I will further discuss the traits of community college students, as well as the structure of the NCCCS.

Though previous higher education production function studies have not explicitly suggested that a future community college production function study be conducted, various results and challenges of those studies arguably imply that a community college production function study could benefit the body of research in higher education. For instance, the following findings came from production function studies at the university level:

- Persistence (accumulating credits and advancing towards a degree) is positively correlated with an institution's selectivity (Titus, 2004).

- Institutions that admit students with higher aptitude test scores typically benefit from different expenditure categories (academic support and research), than institutions that admit students with lower (or no) aptitude test scores (Blose et al., 2006; Ryan, 2004; Webber & Ehrenberg, 2010).

- Enrollment of out-of-state students, and students who are enrolled full time are more likely to have higher graduation rates (Ehrenberg, 2006).

The current complexion of community colleges and their students will be discussed in a later section, however, it is noteworthy to point out that based on the above findings, community colleges are generally not selective, enroll students with low or no aptitude scores, and typically enroll students from their local area, many of whom enroll on a part-time basis. A study focusing on the efficiency of spending in community colleges (specifically North Carolina community colleges) is important in the NCCCS because new performance-funding measures have been adopted based on institutional completion rates (Dougherty, Jones, Lahr, Natow, Pheatt, & Reddy, 2014; General Assembly: Program Evaluation Division, 2016). As previously discussed, these growing performance measures will mean that institutions, their presidents, and stakeholders will accountable for student success and graduation rates, and will be expected to increase these statistics in the coming years.

Data Collection

Utilizing Data Feedback Reports from the IPEDS, a database housed by the National Center for Education Statistics (NCES), I measured year-to-year expenditures within the

aforementioned categories (from the 2004-2012 academic years), comparing those expenditure rates to the normal time to completion for those same academic cohort years.

Utilizing this data, I was able to test whether or not an institution's expenditures influenced its graduation rates. I analyzed this timeframe for three reasons. First, it ensured the most recent possible reporting data. Second, it allowed me to view data prior to and following the 2008 American economic recession. Thirdly, this date range provided the maximum number of academic years with accompanied cohort normal time to completion information that NCES Data Feedback Reports provide (NCES provides normal time to completion data for NC Community College System cohort years 2004-2012). As will be discussed in the next chapter, the 2008 American recession served as a catalyst for further accountability, enrollment, and expenditure changes in American community colleges, and this date range will provide diverse data in terms of funding, expenditures, and enrollment trends. As has been previously mentioned, I will further discuss the reasoning for using the regular time to graduation rate as a dependent variable in Chapter Three.

Utilizing OLS, and ANOVA, I measured whether or not categorical expenditures have any relationship to student graduation rates. I will discuss these statistical methods later.

Given the quantitative nature of a production function study, measuring quantitative data and results was appropriate for this study (Gay et al., 2009). As will be discussed in a later section, a further qualitative study might be helpful to determine attitudes and challenges of expenditures based on stakeholder feedback, but it was not appropriate for this study.

Definition of Terms

The following terms will be used throughout this study. These terms were defined by the IPEDS Data Feedback Report Glossary of Terms (National Center for Education Statistics, 2018), which I used for my data set:

FTE - The full-time equivalent (FTE) of students is a single value providing a meaningful combination of full-time and part-time students. IPEDS data products currently have two calculations of FTE students, one using fall student headcounts and the other using 12-month instructional activity.

Degree - An award conferred by a college, university, or other postsecondary education institution as official recognition for the successful completion of a program of study. This study will use the term "degree" as meaning an Associate degree as awarded by the institution. For any given expenditure year analyzed, the number of degrees will be reflected as the degree awarded for that year's cohort two years later. For example, the 2015 academic year cohort will be compared to the expenditures category amounts of the 2013 academic year spending of an institution.

Certificate - A formal award certifying the satisfactory completion of a postsecondary education program.

Certificates of less than one year – A certificate that takes a student less than one year to complete.

Certificates of more than one year, but less than two years – A certificate that takes a student more than one year, but less than two years to complete.

It should be noted that in the NCCCS, this same award is considered to be a "diploma," but IPEDS does not have a separate definition for "diploma" (North Carolina Community Colleges, 2018b).

Diploma – The NCCCS defines a diploma as a curriculum standard that has between 36 and 48 semester credit hours (or more than one year, but less than two years of credit) (North Carolina Community Colleges, 2018b). For this study, the IPEDS definition of "Certificates of more than one year, but less than two years," and the NCCCS definition of "Diplomas" will be considered as the same.

Full-time student - A student enrolled for 12 or more semester credits, or 12 or more quarter credits, or 24 or more contact hours a week each term.

Financial aid (institutional grants) – Scholarships and fellowships granted and funded by the institution and/or individual departments within the institution, (i.e., instruction, research, public service) that may contribute indirectly to the enhancement of these programs. Includes scholarships targeted to certain individuals (e.g., based on state of residence, major field of study, athletic team participation) for which the institution designates the recipient. For this study, I will only look at monies granted directly from the institution to the student.

Normal time to completion - The amount of time necessary for a student to complete all requirements for a degree or certificate according to the institution's catalog. This is typically 4 years (8 semesters or trimesters, or 12 quarters, excluding summer terms) for a bachelor's degree in a standard term-based institution; 2 years (4 semesters or trimesters, or 6 quarters, excluding summer terms) for an associate's degree in a standard term-based institution; and the various scheduled times for certificate programs.

Instruction - A functional expense category that includes expenses of the colleges, schools, departments, and other instructional divisions of the institution and expenses for departmental research and public service that are not separately budgeted. Includes general academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and regular, special, and extension sessions. Also includes expenses for both credit and non-credit activities. Excludes expenses for academic administration where the primary function is administration (e.g., academic deans). Information technology expenses related to instructional activities if the institution separately budgets and expenses information technology resources are included (otherwise these expenses are included in academic support). Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.

Academic Support - A functional expense category that includes expenses of activities and services that support the institution's primary missions of instruction, research, and public service. It includes the retention, preservation, and display of educational materials (for example, libraries, museums, and galleries); organized activities that provide support services to the academic functions of the institution (such as a demonstration school associated with a college of education or veterinary and dental clinics if their primary purpose is to support the instructional program); media such as audiovisual services; academic administration (including academic deans but not department chairpersons); and formally organized and separately budgeted academic personnel development and course and curriculum development expenses. Also included are information technology expenses related to academic support activities; if an institution does not separately budget and expense information technology resources, the costs associated with the three primary programs will be applied to this function and the remainder to

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institutional support. Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.

Institutional Support - A functional expense category that includes expenses for the day-to-day operational support of the institution. Includes expenses for general administrative services, central executive-level activities concerned with management and long range planning, legal and fiscal operations, space management, employee personnel and records, logistical services such as purchasing and printing, and public relations and development. Also includes information technology expenses related to institutional support activities. If an institution does not separately budget and expense information technology resources, the IT costs associated with student services and operation and maintenance of plant will also be applied to this function.

Student Services - A functional expense category that includes expenses for admissions, registrar activities, and activities whose primary purpose is to contribute to students emotional and physical well-being and to their intellectual, cultural, and social development outside the context of the formal instructional program. Examples include student activities, cultural events, student newspapers, intramural athletics, student organizations, supplemental instruction outside the normal administration, and student records. Intercollegiate athletics and student health services may also be included except when operated as self-supporting auxiliary enterprises. Also may include information technology expenses related to student service activities if the institution separately budgets and expenses information technology resources (otherwise these expenses are included in institutional support.) Institutions include actual or allocated costs for operation and maintenance of plant, interest, and depreciation.

NCCCS college accountants have consistency with their budgeting, which also provided consistency to the data of this study. When budgeting for the four expenditure

categories that I studied (Institutional Support, Instructional Support, Academic Support, and Student Services), the following further explanations for activities are taken into consideration when determining how money is budgeted, as defined in the North Carolina Community Colleges Finance and Operations Division documentation (North Carolina Community Colleges Finance and Operations Division, 2018).

- Institutional Support – These expenses include executive management of the institution; financial services, such as payroll and accounting; overall general administration of the college, such as legal fees, human resource officers, membership dues, insurance, and marketing fees); the federal college work study program; and information services.

- Instructional support - These expenses include salaries of instructors, expenses for supplies and equipment necessary for instruction, and materials and consumable supplies necessary for instruction.

- Academic support – These expenses include instructional resources and technology, academic administration (money needed to supervise curriculum programs and develop curriculum), and library services.

- Student Services – These expenses include the costs associated with admissions, registrar, counseling, career guidance, placement testing, and financial aid, as well as child care.

Assumptions

This study assumed that all North Carolina Community Colleges offer certificate and degree programs, and have both applied sciences (technical) and general (transfer) curriculum. I

assumed in the study that data variables had been reported to the IPEDS system in an accurate and consistent manner by the 58 institutions.

Limitations and Delimitations of the Study

This study utilized secondary data from the Integrated Postsecondary Education Data System. One limitation in using this data is that data categories were defined by IPEDS. This is important when considering expenditures, because certain expenditures, such as academic advising or tutoring, could arguably be considered by some institutions to be student services functions, while other institutions could consider them to be academic support functions, depending upon the administrative task divisions of the particular institution. I made every attempt to classify the data in a consistent manner to ensure the most accurate testing results.

A second limitation is that data collected from institutions might only include graduates from one specific institution, and therefore, expenditure data was analyzed based on that one particular graduating institution. This could be a limitation because students who transfer from one institution to another, or students who collect college credits at various institutions and compile them in order to graduate at one single institution are not necessarily correctly categorized as receiving support from the one graduating institution. For instance, a student could take courses at institutions "A," "B," and "C," but actually graduate from institution "D." There might have been some type of support mechanism provided at one of the former institutions, but in this study, institution "D's" expenditures will be considered as what affected the student's graduation success. Additionally, the IPEDS data collection considers graduates as first-time, full-time students (National Center for Education Statistics, 2017). This is very important to consider because a student who has attended an institution part-time, benefited from

resources at the institution, and graduated, would not be considered as part of the graduation data.

A third limitation is that this study did not take private funding of institutions into consideration. The primary reason for this is that expenditures of private monies were not reported in the IPEDS Data Feedback Reports (National Center for Education Statistics, 2018). In other words, I only considered expenditure of monies allocated to institutions by State public funding. This is important to understand because an institution might have a high level of private funding which it may use for certain expenditure categories. For instance, if an institution has a well-endowed foundation, it might use that foundation money for scholarship expenditures, and would thus not use as much (if any) state allocations for scholarship expenditures. Therefore, that institution would not appear in this study to have a high level of scholarship expenditures, when in fact, they might have a relatively high scholarship expenditure compared to other institutions because of its private foundation's contributions.

A final limitation, from Bound and Turner (2005), regards a general limitation of production function studies. Bound and Turner point out that production function studies can be hampered by the fact that individual institutions vary in the way they collect and spend non-tuition funding, while also differing in the preparedness-level and diversity of their students. This aspect might cause seemingly similar institutions to vary in a way that is undetectable by the data. In this study I minimized this limitation as much as possible by focusing on one system of community colleges from one state, with the hope of highlighting as homogeneous a population as possible.

I feel that many of these limitations were corrected by the consistency that were derived from focusing on the homogeneous population of NCCCS institutions in that all 58 colleges

within the system abide by the same code of funding and spending, that each institution is funded by a consistent funding formula, and that each institution has autonomy to budget state funding (NC Community Colleges, Financial Operations Division, 2018).

Chapter Summary

In summary, higher education administrators are struggling to cope with changes in public funding and sentiment toward their institutions. While state financial support is decreasing, educational leaders also face increasing enrollment numbers, decreasing graduation rates, and increasing demands from students to hold tuition steady. Additionally, educational stakeholders are demanding that colleges produce more graduates in an effort to provide students with a higher "return on educational investment." All of this leaves administrators looking for a means to spend money more efficiently and graduate more students.

Various theories about student success would likely have an administrator struggling to determine which areas of campus would most benefit from additional money. The production function theory provides a way in which administrators can prioritize those areas of spending which are most effective at improving graduation rates. This study focused on using the production function model to determine if there were any areas of spending that were more effective at producing graduates at North Carolina community colleges. In Chapter Two, I will review the literature surrounding current issues involving higher education financing, including decreased state financial support, tuition and enrollment increases, and accountability demands. I will also examine student success theory, including student financial aid, student services, academic support, instruction, and technology. The economic production function model was employed in this study to determine whether additional funding in specific areas of student success can lead to higher graduation rates.

CHAPTER TWO: LITERATURE REVIEW

Overview

In this chapter, I will give an in-depth review of the literature surrounding the challenges leaders face in higher education, particularly at community colleges. I will give an overview of the history of the decrease in state financial support, increasing student tuition, fluctuating (though ultimately increasing) student enrollment, and the effects of these challenges on institutions. I will then explore how these changes impact community colleges (especially North Carolina community colleges), and how performance-funding models are being implemented in an effort to help institutions become more efficient in graduating students. I will then discuss the various models and theories of student success, and finally I will explore the theoretical perspective of the production function statistical economics model, I used in this study to determine if any of the student success expenditure categories were more effective at producing graduates in community colleges.

Less Money

Economy

During and following the 2008 recession, American colleges and universities suffered financial hardships, particularly in the way of public financial support. For instance, in 2009, state and local appropriations for higher education declined by 5.1%; they declined another 7.1% in the 2010 fiscal year (Romano, 2012). In 2009, there was an overall decrease of real-dollar spending on higher education by 2.5% (Ness & Tandberg, 2013). The 2008 recession was especially difficult for higher education institutions because many of the cuts were so deep that colleges were required to cut programs and lay off faculty and staff members (Doyle & Delaney, 2009).

While appropriations for higher education were on the decline during the recession years, the North Carolina State tax revenues slowly returned to pre-Recession levels. At the beginning of the 2008 fiscal year, the North Carolina State tax revenue was $22.8 billion, an amount that fell to $20.5 billion in 2009. However, in 2012, tax revenues in North Carolina were back to $22.7 billion (Governing Magazine, 2017).

Shift in Public Support/Public Demands for Accountability

Federal and state governments have been involved with the funding of American public institutions since their founding. Though federal government support has come in various forms over time (Pell Grant, Perkins Grant, GI Bill, Morrill Land Grant Acts), state governments have dedicated major resources to ensure that colleges and universities are successful (Heller, 2011). States have been involved in the funding of higher education by dedicating large portions of their budgets to institutions through such means as creating grant funding to help students pay for college, and developing more affordable community colleges for their citizens (Heller, 2011). Citizens and lawmakers alike have subscribed to the idea that a well-educated populace translates into a stronger economy, as well as a decrease in long-term financial burdens including health care, criminal justice, and welfare costs (Gillen & Vedder, 2008).

Lawmakers have also argued for using public education as a means of national security. For instance, the National Defense Education Act (NDEA) passed in 1958 in the wake of the Soviet's Sputnik launches during the previous year, after a long-standing deadlock surrounding the role of the federal government in higher education (Krige, 2000). Higher education has become a part of the solution for other national security concerns throughout history as well. Kay (2009) notes four events in American history where education was the focus of national security improvement, including the Sputnik launches. The other three included providing higher

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education opportunities to returning soldiers after World War II, providing curriculum that encouraged strategic thinking after the Cold War, and more recently, to alleviate the concerns over the weakening of America's global control following the September 11, 2001 terrorist attacks. In fact, out of angst over waning public support and need for science, math, engineering, and foreign language education, an independent government task force convened and recommended that education be viewed as a national security tool (Klein, Rice, & Levy, 2012).

Proof of commitment through investments made by states to their public institutions is evident in their budgets; however, in recent years there has been a marked decline in states' budgetary prioritization of higher education. Nationally, higher education represents about 12% of state budgets (Ness & Tandberg, 2013). While state support for higher education expenditures has represented a large share of state budgets (Ness & Tandberg, 2013), the proportion of budgets dedicated to higher education is decreasing. For example, between 1950 and 1970 (a time when American college enrollments were increasing, particularly with the beginnings of the community college movement) higher education expenditures not only represented a large portion of state budgets, but the amount of money spent by states on higher education increased (Doyle & Delaney, 2009). Beginning in the 1970s, however, the sentiment of the American taxpayer began to shift towards a smaller, less expensive government. The "Tax Revolt" of the 1970s represented a movement by citizens to reduce the size of government by taking away its financial fuel through lower taxes and smaller government oversight (Archibald & Feldman, 2006). The decreased state revenues were the beginning of a decline in public investment in higher education.

Leslie and Ramey (1986) explain that following the Tax Revolt, there began to be a decrease in correlation between state money and enrollment. In other words, for the first time in

the history of publicly funded higher education, enrollments at colleges were increasing, but state appropriations for higher education were not. Prior to this time, increased enrollments correlated positively with increased state financial support. In addition to the shrinking of government through decreasing tax revenues, money and budgeting decisions began shifting from being under federal control to state control (Serna, 2013). This phenomenon caused more competition for resources at the state level. The decline in state financial commitment to higher education is evident in the following statistics:

- California has reduced its investment in public colleges and universities by 50% since 1980 (Newfield, 2010).

- Between 1975 and 2000, states shrunk the dollar/student ratio by 25% (Newfield, 2010).

- In 1984, the net state funding for higher education represented 4.1% of total state budgets in the United States. By 2004, the average state allotment had decreased to 1.8% of the states' total budgets (Trostel, 2012).

- In 1980, when compared to private colleges, public institutions spent $0.70/$1.00 on students. By 1990, that ratio fell to $0.55/$1.00 (Archibald & Feldman, 2006).

More recent data from a 2017 Pew Research Center shows that 58% of Republicans, and 19% of Democrats believe that colleges and universities are negatively affecting the United States (Pew Research Center, 2017). The Pew Center notes that the same study performed in 2016 indicated that 45% of Republicans felt the same way, which demonstrates a growing mistrust in American educational institutions.

The political environment within an individual state is also a factor when explaining reduced spending for higher education. The Tax Revolt of the 1970s was certainly a political

movement that centered around government spending, but Rizzo (2004) argues that while state

budgets are tightening, there are also more budget items for which states are now responsible that

simply crowd out higher education. The irony of the political spending environment is that

during strong economic periods, there is more tax revenue to support higher education, but

usually lower student enrollment due to a strong economic climate (i.e. job availability) (Delaney

& Doyle, 2011). When the economy is weaker, such as it was following the 2008 recession,

enrollments tend to increase at public colleges and universities (because unemployed workers are

seeking to be retrained, for example), yet politicians do not want to increase taxes. Consequently,

the amount of money going to higher education decreases, which dilutes the dollar-per-student

ratio because of the higher enrollment (Serna & Harris, 2014). As was noted in *The Magazine of*

Higher Learning (Anonymous, 1997), politicians and taxpayers often mistake tuition-based

income through higher enrollment during tough economic times as a solution for covering

budget cuts to public colleges and universities since there are more tuition-paying students.

However, the tuition money generated through increased enrollment is typically not enough to

cover the losses incurred by state budget cuts. To make matters more challenging for colleges,

institutions typically must revert unspent money back to the state at the end of the fiscal year, a

practice that neither encourages strategic budgeting, nor allows institutions to build a war chest

to support themselves during challenging economic times (Doyle & Delaney, 2009). The trends

of lowering budgets and increasing responsibility for revenues have left many public institutions

feeling as if they are "state supported," rather than "state funded" (Speck, 2010).

The phenomenon of lower tax revenue and tighter spending in state budgets has led to an

increased demand for accountability of public institutions of higher education. These criticisms

from the public have come in the forms of questioning higher education leaders' competency in

budgeting and spending money, and increasing the expectation that institutions raise their own money, questioning the services and quality of instruction that institutions provide, and causing the introduction and development of performance measures and performance funding for higher education. The following section will discuss public and stakeholder demands on higher education, and performance measures have increased demands for accountability in higher education.

Public Concern and Restriction of Funding

I have previously discussed how colleges and universities are receiving less money from states, but are being asked to do more with (overall) higher student enrollment (Romano, 2012), and that higher education is very sensitive to the financial and political climate when it comes to state budgeting. As leaders in higher education have tried to defend the purposes and benefits of public institutions in their campaigns for more public funding, they are met with public concerns and criticisms, many of which are founded in very troubling statistics. For example, graduation rates of college students seem to cause stakeholders and taxpayers an exceptional amount of anxiety about spending on higher education. Newfield (2010) noted that today's college-aged students are now less educated than their baby-boomer parents. Newfield also stated that between 1996 and 2004, California's college graduation rate dropped from 66% to 44%. As was mentioned by President Obama (The Whitehouse, 2014), the United States no longer leads the world in the percentage of adults who have college educations. When higher education leaders ask for more money to support the increased enrollment at their institutions, the critical public often counters with data to show that graduation rates are lagging behind these enrollment rates (Bound et al., 2010).

Many public education stakeholders interpret the falling graduation statistics as decreased productivity, and feel that they are not getting a return on their investment (tax dollars) in higher education. Odden, Monk, Nakib, and Picus (1995) write that many believe that too much public money is going into higher education, while others believe that proportionally, too much money is going to low-socioeconomic and underprepared college students (through remedial education programs and Pell grant funding), a population that seems to have a disproportionately high college dropout rate (Bound et al., 2010). With much concern about low graduation rates and high spending, colleges and universities (particularly community colleges) are refocusing their efforts to ensure that graduation rates increase at their institutions. Vandenberghe (1999) opines that unless college administrators take these statistics seriously, and make efforts to improve institutional graduation rates, taxpayers and lawmakers will not support higher education budgets.

Other data related to the state funding of higher education has given pause to many stakeholders when institutions petition for more money. Often, these critics look at the economics of other public industries, or consider the "big picture" economy to counter higher education's claim that it needs more funding. For example, during the 2010-2011 academic year, the net average cost for community college students to attend was actually negative (Romano, 2012). With this example, critics point to the fact that not only is the community college an affordable alternative for the public, there are also grants and scholarships available for students that often negate any tuition costs. Others, like Serna and Harris (2014), point to data that shows that when state legislatures cut budgets, they do not disproportionately reduce education budgets, compared with other state expenditures. In other words, the higher education budget is not reduced any more than the health care budget, or the highway budget.

Defenders of higher education argue that college presidents are being sought after for their fundraising abilities (Speck, 2010), yet, Drezner (2011) poses the ubiquitous "chicken and egg" question as to whether colleges are being forced to fundraise because their budgets are being cut, or if lawmakers first became privy to how much money institutions were making privately, and then made the decisions to start cutting education budgets back after realizing that private funds were available to colleges. In either case, Romano (2012), like many critics of higher education spending, advises college leaders to become more proactive in planning cost-saving activities for the future, instead of relying so much on state dollars to operate.

Criticisms of Spending

In addition to being critical of graduation rates, many stakeholders are also questioning how institutions spend state money. These critics are pointing out a variety of spending activities at public colleges such as the increase in human resources, administrator pay, and student amenities. For example, within the last twenty years, college support staff has grown by 40%, with many of these staff members having a much higher level of education and job specialty than the clerical support staff previously employed by institutions (Archibald & Feldman, 2009). Archibald and Feldman (2009) point out that the justification for having such a specialized staff is so that colleges can track, advise, and assist a growing population of students, yet fewer students are graduating, thus fueling critics' concerns about spending in higher education. The Raleigh News & Observer (Kayne, Raynor, & Owens, 2013) exposed administrative salary increases at North Carolina community colleges, which was of particular concern to the North Carolina public. In the article, Kane et al. (2013) noted that many North Carolina community college presidents (already making over $100,000 annually) were awarded double-digit

percentage pay increases during a time when the average state employee earned only a 1.2% pay increase.

With spending on professional staff and administration increasing (while graduation rates are decreasing) it is easy to see why taxpayers and politicians are anxious to understand more about why educational prices are rising, and what methods of spending are most efficient in getting students to complete college. Archibald and Feldman (2010) note that colleges and universities who do not try to understand exactly why prices are rising and efficiency is falling, have a "cost disease."

Performance Funding

The cure for this "cost disease" seems to be the implementation of performance funding and performance measures. Most colleges and universities already employ more internal mechanisms of accountability (such as internal assessments, audits, accreditation agencies, or even third-party rating systems (Frolich, 2011), but during tough economic times like the United States experienced after the 2008 economic collapse, the public has seemed to put a greater emphasis on student outcomes in higher education (D'Amico et al., 2014). Currently in American higher education, the public sees that there is a problem of less money to spend, and lower production at public institutions. Compared to the money being spent and the increased enrollments at institutions, there has been little increase in student achievement (Odden et al., 1995), which leads many to believe that taxpayer money should be focused on producing high levels of academic success. Romano (2012) notes that the public wants to see higher education produce more employable citizens who have higher incomes, and are less of a taxpayer burden in the long term. With fewer graduates however, they feel that these goals are not being achieved.

The public is now demanding change in higher education performance, and that this change come in the most efficient way possible (Liefner, 2003).

I previously discussed a recent Pew Research Center (2017) survey that illustrated the current American taxpayer sentiment towards higher education. A separate poll by Gallup indicated that 56% of American adults had "some/very little" confidence in American colleges and universities (Gallup, 2017). Jaschik (2017) expounded on the results from the same poll, and explained that Americans cited colleges as being too political (mainly liberal leaning), too expensive, and that the education provided was not relevant, among other reasons. As has been emphasized, this demand for educational relevance, affordability, and accountability is not a new topic among American taxpayers.

Beginning in the 1970s, Tennessee educational stakeholders began a quest to tie taxpayer money for education to performance, creating the concept of performance funding. By this, colleges and universities were expected to meet certain performance measures, such as graduation rates, in order to receive funding (D'Amico et al., 2014). When the state of Tennessee first began performance funding, the intent was to reward high-performing institutions with bonus funding, an idea that originated with institutions and higher education coordinating boards. With this model, institutions still received foundational (or base) funding from the state, but those institutions that met performance measures were given bonus money. This type of performance funding was dubbed "performance funding 1.0." After performance funding 1.0 was established, the funding model shifted (mainly from pressures of Republican governors, legislators, and political groups) to a structure where all funding was performance-based, rather than just bonus pay. The current funding model iteration, known as "Performance funding 2.0," supposedly encourages institutions to operate more efficiently and more like a business

(D'Amico et al., 2014). Performance funding is now based on the Resource Dependence Theory, which states that recipients of resources will change behaviors in order to acquire scarce resources on which they depend (Pfeffer & Salancik, 1978). Proponents of performance funding 2.0 argue that if public institutions were to manage themselves more like private institutions, they would become more innovative, rely less on directives from the state, and be more self-sufficient (D'Amico et al., 2014).

Since the time that Tennessee adopted the performance funding model, thirty states have at some time adopted performance funding, and as of June, 2014, 26 states were utilizing performance funding, including North Carolina, which adopted the model for the 2014-2015 fiscal year (Dougherty et al., 2014). Ohio has taken the most extreme stance of performance funding and has tied 100% of public education dollars to performance measures (Landsman, 2009).

Studies that have examined the performance-funding model have indicated that where it has been adopted, institutions (universities and community colleges overall) have begun producing more graduates. However, when analyzed independently, community colleges who have shifted to performance funding seem to be very sensitive to the model, with many eliminating certain courses that have high failure rates, eliminating developmental education courses (which are supposed to remediate academically underprepared college students) and have eliminated programs with low graduation rates (Dougherty et al., 2014). This change in curriculum structure can be seen through the North Carolina Community College System's "Reinforced Instruction for Student Excellence" initiative. This recent initiative has as its purpose to place students directly into college-level English and math courses, rather than have

underprepared students take remedial coursework prior to attempting college-level courses (North Carolina Community Colleges, 2018a).

On April 24, 2013, Travis Reindl, program director at the National Governors Association Center for Best Practices, testified before Congress, and stated challenges that faced higher education, as well as offered up some solutions (National Governors Association, 2013). In his speech, Reindl indicated that states are now calling for more transparency in higher education, and are implementing metrics to enforce accountability at public institutions. Among these efforts that Reindl mentioned were measures to ensure that community college students matriculated into curriculum courses from remedial courses, that graduation rates were increased, and that students were retained in higher numbers. Additionally, his proposed efforts included an initiative called "Complete to Compete," which among other items, integrates policies which would insure a return on public dollar investments, namely through graduation rates.

Arguments against Performance Funding

Not all education stakeholders are in favor of judging institutions based on their performance, and many believe that discussing higher education's need to produce more graduates before receiving state money has become inane. Many question why education has come under such scrutiny. For instance, one scholar notes that, "despite unparalleled economic and scientific achievements attributable to higher education during the last three decades, public dissatisfaction with colleges and universities has continued to permeate legislative halls throughout the United States" (Alexander, 1998). Many scholars are left wondering how the idea of lowering taxes became coupled with the notion that higher education was not meeting a performance expectation. For instance, Benjamin (1993) points out that the angst over higher

education performance is uniquely an American problem. In contrast, European taxpayers and corporations tend to prioritize the educational system and do not seem to have as many qualms over funding it.

Other scholars have pointed out the irony in the new performance standards of public higher education. For instance, Romano (2012) notes that the increased costs of research and documentation of performance and accountability measures could go directly to help institutions solve their funding woes. Archibald and Feldman (2009) add that new jobs (and thus new taxable income) must be created to support the infrastructure of measuring performance data for performance funding efforts. They also make an important observation that real income has tripled in the United States since the 1960s, adding that consumers are paying more real money for other personal services. This leads them to question why students are so upset about the rising costs of higher education, but not for other goods and services. Finally, Speck (2010) poses an astute query of why government oversight is growing (through performance measures and funding) while at the same time reducing the amount of money paid out. Speck opines that if institutions are being asked to fund themselves, then they should be able to govern themselves and determine their own performance outcomes. There is additional irony that increased accountability means increased expenditures administration to collect data and measure performance, rather than delegating that same money towards educating students. Speck's philosophy might bode well for community colleges, which typically are very sensitive to performance funding, mainly because their students have very short-term goals that often do not include graduation, and who are often not academically prepared for college (Romano, 2012).

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Enrollment Fluctuations

A third phenomenon results from strained institutional budgets. In recent years, statistics have shown that college enrollment is increasing drastically (Adams, 2011). This seems to be occurring for several reasons including the fact that the current US economy demands more of its workforce to have specialized technical skills. Also, the 2008 US economic recession saw an increase in unemployment, leading displaced workers to seek retraining at higher education institutions. According to the U.S. Department of Education (2013), enrollment at degree-granting institutions increased by 11% between 1991 and 2001, with another 32% enrollment increase between 2001 and 2011. The Department of Education predicts that by 2021, enrollment at U.S. institutions will increase another 27% overall.

Enrollment increases are evident in North Carolina in both the college and university systems. At North Carolina Community Colleges, degree-seeking enrollments increased from 213,400 students in the 2008-2009 academic year, to 267,838 students in the 2012-2013 academic year (North Carolina Community College, 2008; North Carolina Community College, 2013). In the University of North Carolina (UNC) system, enrollment increased from 215,692 in 2008, to 221,010 in 2012 (North Carolina General Administration, 2008; North Carolina General Administration, 2013).

The issues surrounding higher education have not been lost on at the executive level of American Government. In his concern about the future needs of the United States economy, former President Barack Obama placed the major burden for solving America's unemployment problems on institutions of higher learning. On the White House (2014) website, President Obama outlined a two-fold plan which included attaining the most (college) educated citizenry in the world, and producing an additional five million college graduates by the year 2020. He

commented on how the future American job market will depend on well-educated workers saying, "We will not fill these jobs (requiring at least an associate degree) without the training offered by community colleges" (The White House website, 2014). During the 2015 State of the Union address (CNN, 2015), President Obama laid out a plan for states to offer free community college tuition, and for companies and community colleges to work together to develop workforce training programs.

Unlike his predecessor, Donald Trump has not placed policy emphasis on higher education since being in office. In fact, there is no mention of higher education on the current White House website, including in Trump's outline for economic improvement (White House, 2017). In addition to an absence of higher education policy from President Trump, Betsy DeVos, current Secretary of Education, does not address higher education policy nor philosophy on the U.S. Department of Education website (U.S. Department of Education, 2017), nor on her personal policy website (Betsy DeVos, 2017).

These edicts to increase the number of citizens with college degrees will mean that community colleges in particular will need to focus not only on enrollment efforts, but also on graduation efforts. In doing so, it seems that America's public educational institutions will be catering to more students with fewer financial resources.

Diluted Resources Negatively Impacts Student Success

The phenomena of increased enrollment and decreased state financial support of colleges are having three major effects on schools. First, institutions are relying more on alternative funds, particularly from private donations. Secondly, colleges and universities have fewer (or more diluted) resources, which affect student success, and thirdly, education stakeholders are demanding and expecting more from institutions by holding them more accountable, which has

created operational changes at institutions. Those effects are discussed in the following sections.

An additional effect of lower financial resources, increased tuition, and increased enrollment at America's public institutions of higher learning, is that resources at these institutions end up becoming diluted. Bound and Turner (2007, 2010) have performed various studies on how funding affects student success, and found that historically, as public funds have increased, degrees attained have increased, and visa-versa. Additionally, it was found that when non-tuition shares of revenue (i.e. state spending, in the case of public institutions) do not vary proportionally with the number of students at an institution, it results in fewer resources per student (Bound & Turner, 2007). One of the side effects of lower public funding is not simply that there are fewer degrees produced, but that there are fewer college-educated workers in the workforce (Bound & Turner, 2007). This is important, because if workers are not able to be suitably placed, then tax revenues from those potential workers is not realized because those citizens are under or unemployed, and the cycle of revenue and spending cuts at the state level is continued.

A separate study by Bound et al. (2010) looked at the effects of higher enrollment on graduation rates. Just as decreased budgeting to institutions affects degree attainment, so does increased enrollment. In this case, higher enrollment at institutions leads to a "crowding out" effect on resources, which leads to lower completion rates. This crowding out is manifested in various ways at colleges. For example, if an institution has an increased number of students, but does not experience increased funding to support those students, then there will likely be larger class sizes (due to fewer teachers/students), and more students seeking the same types of resources such as tutors or library assistance, which would then be diluted due to the increased student population (Bound & Turner, 2007). Bound and Turner (2010) argue that the

combination of fewer financial resources and increased enrollment is leading to fewer degrees earned across the country. Perhaps the hardest hit institutions are public colleges and universities (particularly community colleges), which often are not able to control the number of students admitted to their institutions, nor the preparedness-level of the students who enter their institutions each year. Because of this, public institutions have a more difficult time of keeping pace with their private institution peers when it comes to per-student resources (Newfield, 2010).

This scenario is apparent when highly selective institutions are able to limit the number of students who enter their institutions (to the most highly academically prepared students). Because these high performing private institutions have the best academically prepared students, those students will tend to be more successful, meaning they pass through to graduation at a faster rate. As lower-performing students shift their attendance towards community colleges, the crowding out phenomenon occurs because these students have no other choice but to attend community colleges (Newfield, 2010). Because community colleges like the NCCCS which have "open-door" policies (North Carolina Community Colleges: State Board of Community Colleges Code, 2014), rely on tuition revenues to offset decreased state funding, these institutions find themselves seeking additional enrollment in order to increase Full Time Equivalency (FTE) enrollment. This additional enrollment adds to an already large student population, which dilutes the resource-per-student ratio even more at some of the neediest institutions (Romano, 2012). Bound and Turner (2007) note that when cohorts become larger, money is used to go towards resources like dormitories and other facilities (to accommodate the larger number of students), which are resources that do not necessarily focus attention on student success, meaning efforts that focus on assisting students with class completion, enrollment persistence, and degree completion. Additionally, requiring colleges to boost enrollment for the purpose of earning

additional funding (particularly when students are academically underprepared, as they are at community college) is arguably counterintuitive to the academic mission of the institution.

Diluted resources not only affect graduation rates, but also create problems with the quality of instruction at institutions (Archibald & Feldman, 2010). When institutions have less money to spend, they often times try to save money by increasing class sizes, or hiring instructors with less classroom and research experience. The decrease in quality of instruction is not lost on institutional stakeholders. In an attempt to combat this, performance-based incentives are often placed on institutions, which can intensify the inequalities of already under-funded institutions (Desjardins, 2013). Newfield (2010) argues that generally speaking, the aforementioned trends in higher education are resulting in degree attainment gaps between groups of students, particularly between under-prepared and low-socioeconomic students, and their better prepared, higher-income student peers.

Newfield's (2010) observation is very important because, as Oliverez and Tierney (2010) note, the stress of paying for college is increasing for all American families, but particularly those families who have low socioeconomic status. When families want to send students to college and are unsure of how to pay for their students' tuition, they tend take out student loans, which too often leaves students with the burden of debt long after they graduate from (or drop out of) college. Students in this economic class with financial anxieties are often attracted to schools that offer lower tuition rates (like community colleges), in order to minimize debt. As previously mentioned, these types of institutions are already experiencing diluted resources, and are less equipped to provide the necessary resources to help under-prepared college students be more successful (Kim, Desjardins, & McCall, 2009).

Hossler and Gallagher's (1987) Choice Model articulates this phenomenon. In this model, there are three stages through which students choose an institution of higher learning (if at all). The three stages include predisposition, search, and choice. If students and their families have financial constraints, then they could be affected at each of these stages. For instance, in the predisposition stage, a family might decide that sending a student to college is not realistic, or perhaps even not worth the cost of attendance. During the search and choice stages, a student might select a lower-cost (i.e. lower resource) institution, sometimes at the expense of not attending that student's first choice of institution.

After a student chooses an institution, low-income families tend to be affected even after the student begins attending their college of choice. As Mendoza, Mendez, and Malcolm (2009) point out, once a student begins attending college, low-income families can struggle with deciding how to continue to pay for college and living expenses of students, or in the case when a student is unsuccessful academically, they might deliberate about whether a student should try to continue with his education or repeat failed courses. This cycle is a point of concern, as Bowen (1998) notes because disadvantaged students often perform well at high-ranking institutions, yet they and their families feel limited or obligated to attend lower-ranking institutions due to cost savings.

A final concern related to the effects of shifting towards private funding sources expands beyond simply the securing of private funding. Other challenges have spawned from the shift in state funding to private and tuition-funded models. For instance, Garnett (2001) notes that due to the shift in private funding and increased tuition, colleges are noticing a trend in which education is seen as more of a business-like function, where students are "clients" or "customers" who expect a tailored educational experience to be defined not only by tangible items such as luxury

living facilities and meal plans, but also intangible rewards such as graduating quickly with a degree that immediately results in post-graduation employment, rather than defining the educational experience purely as a learning experience. What has become problematic with this student-as-consumer thought process is that with decreased funding, increased enrollment, and increased expectation, resources quickly become diluted within institutions (Liefner, 2003). The decline in resources per students at institutions has equated to more time per student to graduate (Bound & Turner, 2010). In other words, as resources such as tutors, advisors, small class sizes, and technology degreases, students are tending to take more time to graduate, presumable because there are fewer resources on campus to help them succeed. As students take more time to graduate and more new students continue to be admitted each year, students begin to accumulate at institutions (particularly institutions like community colleges which have "open-door" enrollment policies) and ultimately, graduation rates at institutions decline. As Newfield (2010) asserts, the American higher education funding model has itself caused a decline in earned degrees. Newfield (2010) explains that the trend in American higher education (due to decreased public funding) is for more selective universities to become even more selective (and expensive), thus less advantaged students are attending less selective institutions, which typically provide fewer resources to students. So, academically underprepared (or academically prepared, low-socioeconomic students) are attending colleges more often which do not provide academic support resources, and thus, Newfield asserts that graduation rates have declined across the country. The challenges institutions are facing might not have relief in the immediate site as enrollments are expected to increase in the coming years with unemployment rates, and the expectation of increased rates of high school graduates (Romano, 2012).

Community College Students are Especially Affected by Diluted Resources

With all of the challenges facing colleges and universities, Romano (2012) writes that community colleges are especially vulnerable to money cutbacks and increased enrollments. Performance funding schemes can be particularly stressful for community colleges because of some of the effects of their open-door policies.

Community colleges are unique in that they often have open-door policies that do not allow them to be selective with the students whom they admit, which may trigger further problems. For instance, with open-door policies, students frequently come to community colleges academically underprepared. This learning deficit often requires that these students spend precious semesters taking remedial courses in order to advance into courses that actually relate to their program of study (Bound et al., 2010).

When students come to college underprepared (and in need more), they have an increased risk for dropping out compared to their higher performing peers (Newfield, 2010). Bound et al. (2010) suggest that this creates a vicious cycle for community colleges, in that they accept all through admissions, but lose many to attrition. When a performance funding model is introduced into the equation, community colleges are often punished financially for not graduating students at a higher rate, an example of the attitude of modern-day taxpayers, which was discussed in a previous section. The irony of this scenario is that the public taxpayer is holding community colleges accountable for the success of all students, without considering an original purpose of the community college system, which is to accept all who wish to attend, a concept supported by those same taxpayers (Bound et al., 2010).

In a production function study performed by Ehrenberg (2006) on four-year universities, some interesting findings surfaced that would lend the need to perform a production function study on community college students. For instance, Eherenberg (2006) found that:

- Institutions with higher levels of state funding typically graduate a higher percentage of students.

- Institutions with higher student SAT scores have higher graduation rates.

- Institutions with higher percentages of out-of-state resident students have higher graduation rates.

- Institutions with higher full-time enrollment students have higher graduation rates.

- Institutions with higher admissions standards have higher graduation rates.

These findings, which essentially indicate that students who by all other means are predicted to be successful will be successful, tell us little about what types of spending might or might not make a more at-risk community college student successful. The populations of these studies have traits that are typically the opposite of community college attendees. For instance, Bound et al. (2010) note that community colleges often have more challenges obtaining state funding, their average SAT scores are lower than their university counterparts, they are designed to serve the local community (rather than the state or region), they have more students enrolled on a part-time basis, and they have (virtually) no admissions standards. The necessity to explore the community college population (one which tends to be at an academic disadvantage, and one that is very sensitive to public funding) to see what strategies might be best for creating more graduation rates was the foundation of this study.

Research limitations with previous higher education production function studies, which often include populations that are too heterogeneous, create a need for this proposed research

project. In those previous studies such as Ryan's (2004), the heterogeneous populations produced results that were either inconclusive, or did not focus enough on how expenditure categories could affect at-risk student populations, a population which is dominant in America's community college. Additionally, a flaw of such a heterogeneous population in these studies is that by using Ordinary Least Squares Regression analysis, data findings can be inaccurate when dealing with a heterogeneous population (Roccon, 2013). Chapter Three will further explain how this study appropriately utilized Ordinary Least Squares Regression analysis on a more homogeneous population of North Carolina Community College students.

Efforts to Produce Student Success

As public colleges and universities continue to manage shrinking budgets, they will also look to find ways to improve their performance measures, particularly completion rates, in an effort to maximize their performance funding. Many theories propose best practices for ensuring that college students are successful. These theories include ensuring that college is affordable (particularly for the lowest-income students), providing opportunities for students to get involved and feel connected to the campus, providing academic support systems and services on campus, providing high quality facilities and technologies for students to learn, and providing high-quality instruction. This next section will review these theories and efforts to enhance student success, and discuss the literature that surrounds best practices for student retention and completion. To be clear, this section is not meant to necessarily show scholarly debates about one method of student success being better than another (as most scholars do not present these tactics as being mutually exclusive to another) but simply to document the various philosophies and research on student success, and demonstrate that there are many efforts from which an administrator could choose when attempting to increase student success at their institution.

Financial Support for Students

One widely agreed-upon method for helping students to be successful in college is to ensure that they are financially secure through adequate financial aid sources. As previously discussed, college affordability is becoming more challenging for students as tuition rates are increasing in an attempt to offset decreasing state support. As has already been discussed, tuition increases can most negatively affect the most financially needy students. Likewise, proper financial aid can most positively affect this same population of students.

Scholars have indicated that financial aid allows students to focus more on their academic work, rather than being distracted by financial concerns. One scenario that Doyle (2010) mentions is that often students who receive financial aid (Pell grants) are also underprepared for college. Because these types of grants are performance-based, students who struggle academically during their first semester due to adjusting to college coursework can slip below the required academic standard for financial aid. When this happens, students and their families then face paying for college out-of-pocket until the student's grades improve enough to regain the grant money. The prospect of paying for college without financial aid is often too strenuous for families, and consequently, students frequently drop out of school not for academic reasons, per se, but because of the financial collateral damage caused by an unsuccessful academic semester (Doyle, 2010). As Strom and Strom (2013) indicate, aside from academic under-preparedness, a lack of financial support is the main reason that students drop out of college.

For other students, the prospect of having to pay for college on their own might not be enough to cause them to drop out of college, but it could mean that those students would then have to seek employment (or even multiple jobs) in order to pay their tuition (Shireman, 2009).

In doing so, students may devote less of their attention to their studies, and focus more on working in order to pay for school. Shireman (2009) argues that providing institutional aid for students could allow them to stay on campus and focus on their studies, rather than concern themselves with having to work to pay their tuition.

A similar phenomenon is that many lower-income families who are often sending their student to college as a first-generation college student are unaware of the financial aid resources available to them, and therefore either choose not to send their student to school, or decide to send their student to a more affordable community college (Mendoza et al., 2009). As Romano (2012) indicates, many grants and scholarships go unused. This type of mentality is illustrated in several ways. For instance, many first-generation college-bound families see the "sticker price" (the full tuition price) listed on private college websites. These families might be ignorant of institutional grants and scholarships that schools can provide which can significantly lower the net price of tuition for these families. The College Board website (2014) highlights a scenario where the sticker price of an institution shows as $8,660.00, but after the institution provides the student with grants and scholarships, the net price for the student lowers to $2,910.00, a much more affordable price.

Another scenario facing families that stems from financial (il)literacy, is that families can interpret the Pell grant as the only source of financial aid that is available to them (Romano, 2012). This is problematic because lack of information about resources affects college choice. For instance, the current Pell grant award for college students is $5,920.00 per academic year, (U.S. Department of Education, Federal Student Aid, 2018). The current cost of attendance for an academic year (in state resident) at the University of North Carolina at Chapel Hill is $8,374 (the university lists the estimated cost of attendance, after books, fees, etc., as $24,120.00) (The

University of North Carolina at Chapel Hill, 2014). However, the current maximum cost of tuition allowed at North Carolina community colleges (in state) is $2,304 per year (North Carolina Community Colleges, 2014). This is a stark contrast in affordability, and given the amount awarded from Pell grant, a family could easily make the decision to send their student to a community college, rather than a four-year institution. As previously discussed, community colleges tend to offer fewer resources to students, who are prone to be the least academically prepared.

In studying how financial assistance affects students, it has been found that financial aid has helped students persist from their first year to their second year of college (Mendoza et al., 2009), and that for low-income students (often served by community colleges), financial aid is one of the most important inputs for student success (Bowles, 1970). Romano (2012) argues that colleges should be earmarking more money for low-socioeconomic status students.

Financial aid expenditures can be more or less important for students depending upon the particular college, or even college system structure. For instance, the NCCCS sets the tuition for all 58 community colleges (North Carolina Community Colleges, 2014), while other states, such as South Carolina, set a minimum and maximum tuition cost, allowing individual institutions to set their own tuition rate within that range (South Carolina Technical College System, 2018). By having tuition rates set by the state system office, North Carolina community college students (particularly those who receive the Pell grant) might expect a net negative cost to attend school. Other financial aid expenditures that could assist a student might be institutional scholarships or grants, as well as state money that is distributed in the form of scholarships by individual institutions.

As will be mentioned in Chapter Three, in a community college system like North Carolina's, measuring financial aid inputs would be a delimitation in that all students in the State system would have the same costs, and therefore financial aid inputs would have very similar impacts on students regardless of the institution that they attend.

Student Services, Campus Involvement, and Engagement

In higher education research, scholars have often studied campus services and student engagement (particularly student engagement) as a means of student success. Resources that support student engagement have included campus facilities like recreation facilities, dining halls, dormitories, gymnasiums, and intramural sports programs. Additionally, student services activities such as student life offices, student government groups, fraternity and sorority life, and other offices on campus that support the student outside of the classroom in a non-academic fashion have been included as student services functions at various campuses. Or, as Pittman (2012) notes, student services on a college campus are activities that provide students with intellectual, character, spiritual, health, citizenship, and leadership growth opportunities. This next section will discuss the literature surrounding many of those resources.

While many critics feel that expenditures on student services are frivolous (Webber & Ehrenberg, 2010), there is no doubt that the number of student services staff members are growing at colleges and universities. In fact, Webber and Ehrenberg (2010) acknowledge that student and support services staff members have grown at the same rate as faculty members in recent years. Community colleges in particular are increasing their staff support. Between 1999 and 2009, community colleges increased the amount of money spent on staff members from 9.9% of total budgets to 10.7% (Romano, 2012). Proponents of student services staff members, such as Deegan and O'Banion (1989) argue that student services staff members, unlike many

faculty instructors, are well trained and educated in student development theory, that staff members are able to focus on non-intellectual goals of the institution, that student services staff can focus on the student-as-consumer goals of the college, and that student services staff members have the capability of serving many more diverse student populations given their availabilities.

Many studies have indicated the positive correlation of student services staff members to student success. For instance, Webber and Eherenburg (2011) found that expenditures on student success increase student persistence and graduation rates. Their research found that a $250 per student increase in student spending would increase overall graduation rates by .3%; by .8% at institutions that serve under prepared students. Others, like Pike et al. (2006), have found that students who are engaged on campus graduate at a higher rate. This finding translates into institutions providing students with opportunities to get involved on campus, usually through student services and student life functions. Tinto's Student Engagement Theory (2009) also recommends getting students involved on campus as a means for success. Involvement could include activities ranging from writing workshops (Cleary, 2011) to other activities such as intramural sports (Pfifer & Corneli, 2010).

One finding that is applicable to many student success studies is that low socioeconomic, under prepared students (especially community college students) benefit from student services support. For instance, Romano (2012) asserts unequivocally that when it comes to completion rates for community college students, student services is the most important student success input. Ehrenberg and Webber (2010) found that low socioeconomic students tend to persist beyond the first year of college more often when institutions spend money on student services, and that institutions with low admissions test scores (i.e. community colleges) saw better

persistence and graduation rates when they had strong student services support systems. A qualitative study performed by Public Agenda (Student Voices, 2012), which included many informants who had attended North Carolina community colleges, found that many students credited their success to knowledgeable support staff members and campus services.

Further justification for a community college production function study comes from two sources. First, Astin (1993) found that student services expenditures had a strong positive effect on graduation rates (at four-year institution). Adding to this, Pike et al. (2006) noted that few production function studies have been performed at the college level, with most educational studies taking place in K-12 environments and measuring the effects of expenditure categories on test scores. Their study hypothesized that expenditures on student engagement mediates student outcomes. At private institutions, they found that high-socioeconomic students were more engaged, while at public institutions, low-socioeconomic students were more engaged. This finding not only lends a need to study low-socioeconomic students specifically, which, as previously noted, attend community colleges in high numbers.

One difficulty with keeping community college students engaged is that this population of students is often transient, meaning they do not live on campus, and often leave campus as soon as classes have concluded (Tinto & Russo, 1994). Because of this, a primary means of getting community college students involved is to create learning communities within the curriculum. These learning communities allow groups of students to take courses together, and utilize learning community instructors as academic coaches for students. Tinto and Russo (1994) found that when community college students received this type of support, they progressed through coursework more quickly, and ended up having greater participation outside of the classroom. Kuh's (2011) study added to these findings, reporting that student performance was

positively affected by learning communities at all levels of coursework, including and beyond the first year.

Academic Support

Many researchers have studied how academic support for students might be related to student success. Academic support expenditures might include support provided by non-teaching faculty or staff members (outside of the classroom) that support the academic mission of the college. These services might typically include academic advising programs, tutoring centers, libraries, and counseling services (Gransmeyer-Topf & Schul, 2006). This section will discuss how these types of services might enhance student success rates.

It is important to note the differences between these two types of services that colleges provide, because many scholars have found distinctions between the types of services provided and their effects on student success. For instance, Gransmeyer-Topf and Schul (2006) contradict findings like those that Webber and Ehrenberg (2011) presented, finding that student persistence is positively correlated with academic support services (counseling, advising, and tutoring), but negatively associated with student services functions (campus life, involvement, admissions). In a production function study of four-year institutions, Ryan (2004) found that money spent on instruction and academic support produced higher completion rates, but not student services or financial aid. Lewis (2010) additionally found that there was no strong significance between the number of student services staff members and student success (student services expenditures), but that the number of counselors (academic support expenditures) that an institutions employed did have a significant effect on student success.

Another important distinction between student services support and academic support staff revolves around the definition of student involvement. While Cleary (2011) defined student

involvement to include activities like intramural sports, Hanning (2012) portrays student involvement to mean the amount of time that students devote to academic performance, cognitive development, psychosocial development, and moral and ethical development. These types of involvement require highly trained staff, and typically would involve overlap with instructors and curriculum.

Just as many of the theories surrounding student services point to making a difference in success for low socioeconomic and under prepared students, studies surrounding academic support services show the same. As Fowler and Boylan (2010) indicate, underprepared students benefit greatly from cohesion between academic support staff and faculty members, especially when there is integration between curriculum and service opportunities. Frost (1991) also showed that services like tutoring and academic advising allow underprepared students to focus on academics outside of the classroom, and give them resources to help make decisions about their career and academic field.

Providing Students with High Quality Facilities and Technological Resources

A third approach to student success involves providing learners with high-quality facilities and technology. Many institutions are investing money and trying to improve these resources on their campuses, and several research projects have pointed to the fact that investing in these items can create student success.

One specific avenue of technological investment in higher education is online learning. Online courses are currently in high demand, yet they yield lower success rates than traditional face-to-face courses (69% success versus 75% success) (Romano, 2012). Not wanting to be left behind, many institutions are investing in improving their online programs. For instance, colleges are focusing on technology improvements as their Quality Enhancement Plans (QEP)

for accreditation. For instance, Germanna Community College (Germanna Community College, 2014), Sandhills Community College (Sandhills Community College, 2014), J. Sergeant Reynolds Community College, and Mountain Empire Community College (Southern Association of Colleges and Schools Commission on Colleges, 2014) are all dedicating resources to improving technology and training for distance learning instructors. Romano (2012) notes that institutions will need to invest significantly more money to gain a real improvement in student success in online courses.

Aside from specifically studying online instruction, scholars have recognized that the benefits of investing in technology can include simplifying processes and increasing communications between faculty and learners, and student services offices and learners (Deegan & O'Banion, 1989). Ideally, communication between teachers and learners can be maximized so that students can be made aware of struggles and successes in the classroom as quickly as possible, and can be referred to help on campus in a timely manner.

Another aspect of infrastructure investment includes facilities such as student unions, dining halls, and libraries. Advocates for such capital projects note that these structures have bearing on student success (Lau, 2003), and that high-performing students are more likely to make use of campus facilities (Churchill & Iwai, 1981). A study performed by Tierno (2013) demonstrated that student union facilities improve retention by supporting the academic mission of the college, and can serve as a place where diversity can be celebrated, campus values can be communicated, and traditions can be passed down. Additionally, Gansmeyer-Topf and Schul (2006) found that with infrastructure support, there is a positive relationship between sports participation and educational attainment.

Investing in Instructors and Curriculum

A fourth area of financial investment for institutions to consider is instructors and curriculum. Even though institutional money spent on instruction has grown at a slower rate than on research, academic support, scholarships, and student services (Webber & Ehrenberg, 2010), many scholars still note the value of quality instruction on improving student success. For instance, Webber (2012) found that institutions with high admission scores have better student success rates when they invest in instruction, as do institutions with Science, Technology, Engineering, and Math (STEM) programs.

Though high admissions scores and STEM programs are not usually characteristics of community colleges, Lazear (1999) found that class size (smaller) and an increase in instruction did have a positive impact on student success for low-socioeconomic students. Hanushek's (1997) study revealed that while there is weak evidence to support that higher teacher pay correlates with student success, teacher qualification is significant. Furthermore, higher revenue institutions tend to hire more tenure-track faculty (Anonymous, 1997). Lastly, Lundberg (2014) found that although interaction with peers was important to a student's success, interaction with faculty members was much more important in determining student success.

Research has also found positive results from other types of curriculum investments. For instance, Allen and Lester (2012) found that providing students with a student success course during their first semester was very important. In addition, a study performed at Fayetteville State University (Anderson & Kim, 2011) showed that a campus-wide curriculum improvement project helped students to develop reading skills and increased student success.

In summary, few scholars argue that investing in any one particular area of campus can solve all student success challenges, and most would indicate that a combination of efforts could

produce the best overall student success outcomes. However, with tight budgetary restrictions, college administrators might not be able to increase expenditures in all areas, and would thus have to prioritize which programs will produce the most benefits. The next section will examine this problem through a production function perspective, which in theory, could determine which categorical financial inputs could produce the most desired student success outputs.

Using a Production Function Economic Model to Determine the Most Effective Efforts

With various philosophies touting programs for improving student success, and with the mounting pressures to spend money more efficiently, college administrators might find themselves having to make decisions about where to invest money and which efforts to forego. In making such a decision, administrators might ask which programs have the most impact on raising graduation rates. A production function model would be one way to determine which expenditure categories are more efficient at producing student success. As Vandenberghe (1999) explains, the production function model theorizes that some type(s) of input (instructor salary, capital expenditures, and academic support expenditures) can yield a higher expected output (graduation rates). This section will review the production function philosophy, and explore literature that both supports and criticizes the use of the production function model in education.

Borrowed from the manufacturing philosophy of trying to determine what inputs could produce the most products or profit, early educational production function models studied public primary, middle, and secondary schools to determine which inputs could produce higher student test scores. As Bowles (1970) writes, the educational production process can help explain the relationship between school inputs and student outputs. The production function model has been received in the educational realm with mixed enthusiasm, with scholars like Glenn (2007) and Browning and Browning (1992) noting that the production function model provides better

efficiency and discovers which programs and practices are most effective. Others who have been critical of the model say that K-12 public school production function studies have focused mainly on aptitude test scores, and not graduation rates or other success factors (Hanushek, 1997). However, studies at the collegiate level (Blose et al., 2006; Ehrenberg, 2006; Pike et al., 2006; Ryan, 2004; Titus, 2004; Webber & Ehrenberg, 2006), have found that certain inputs are significant to graduation rates.

Major criticisms of the production function model in education fall into one of two classifications: those who criticize its relationship to teaching and learning, and those who criticize it as a mechanism for predicting success. Those who criticize production function as being harmful to teaching and learning say that the model more suited for managers and supervisors in manufacturing settings, but not facilitators of learning in classrooms (Hodas, 1993). Levin (1993) argues that the production function theory is an example of managers framing learning as something that is "done to" students, rather than something that happens between teachers and students. When this type of mentality occurs, Vandenberghe (1999) opines, students are no longer motivated by learning and becoming better individuals, but instead look at themselves as consumers with the expectation that they are supposed to be receiving something in exchange for their financial investment. Lastly, Bowles (1970) notes that with the learning process, there are many variables outside of an instructor's control, including but not limited to students' attitudes toward learning, which might not benefit by financial inputs.

Critics of production function as a means to predict student success often argue that there are more effective ways to predict determine if a student will succeed in college. Coleman (1996) says that a student's socioeconomic status is a better predictor of success, while Hanushek

(1997) argues that looking at a student's family and peer influences can tell an instructor more about the types of hurdles that a student might have to overcome.

One flaw with these criticisms is that while a student's socioeconomic status might be a better predictor of student success than financial inputs, simply looking at a student's socioeconomic status is a passive measure that determines whether the student might statistically achieve academic success. This knowledge is useless if not acted upon. Using a production function model, an administrator can then take the knowledge of the student's socioeconomic status (i.e. the knowledge that that student is likely to be at-risk) and determine what inputs might be most beneficial to help that student overcome their socioeconomic barriers in order succeed. Many champions of the production- function theory argue this and other points.

As perhaps one of the strongest advocates for the use of production function, Monk (1990) says that determining inputs that work is not in fact an authoritarian mentality, and that finding learning irregularities and best teaching practices, all while attempting to spend public money efficiently is a morally sound method of conducting learning. Supporters not only argue that determining what types of teaching strategies and resources produce better student success is a moral obligation, but also that finding efficient strategies can produce best practices and can provide instructors the incentive to adopt practices which provide a better likelihood of student success (Hanushek, 1997).

In many higher education production function studies, researchers have found that categorical expenditures can affect graduation rates (Ryan, 2004), that the more money spent per student on certain expenditure categories like student services and academic support can positively impact post-graduation student earning, and that overall, monetary inputs are related to student success outputs (Vandenberghe, 1999). Scholars also counter criticisms about negative

impacts on teaching and learning by stating that the production function theory still allows for teacher autonomy, while enabling teachers to effectively manage student shortfalls by identifying best practices (Kane, 2012). Webber and Ehrenberg (2010) add that it is best practice for institutions to look at other peer institutions (those with similar student populations and budgets) to consider the production function model to detect the root cause(s) of inefficiencies.

Regardless of the debates over the merits of production function, scholars do agree on several criteria for institutions that wish to consider using the model. First, it is important for colleges to look at what inputs the organizations can actually control (Vandenberghe, 1999). For instance, a community college with an open-door policy would need to realize that it could not control the academic preparedness level of its first-year students. Once an institution is aware of its limitations, it can then focus on which inputs can in fact be controlled by the institution. Secondly, once an organization discovers an influential expenditure input, it is important for its members subscribe to the success of the input. Vandenberghe (1999) notes five points that colleges hoping to adopt a program need to do: (1) identify clear goals and values that are reflected by the input(s) and the desired output(s), (2) create incentives that are tied to adopting the successful inputs and achieving the desired outputs, (3) market information to stakeholders regarding best practices (i.e. explain how to put those financial inputs into practice), (4) ensure that practices and inputs are widely accepted throughout the organization, and (5) ensure that technology and resources are available to execute the inputs. Following this strategy could certainly assist with the successful implementation of a production function study at an institution. In the Methods section of Chapter Three, I will discuss how my study utilized the production function model to determine if any inputs are related to degree attainment at North Carolina community colleges.

Chapter Summary

In summary, this chapter reviewed the literature surrounding the current financial issues facing today's higher education leaders. Embedded in these challenges are declining state financial support, increasing college enrollments and decreasing graduation rates. The blend of higher enrollments and fewer resources on campuses have created a phenomenon where there are diluted campus resources and even fewer students graduating.

Additionally, educational stakeholders are demanding more production from colleges, particularly higher graduation rates and completion of programs. Many theories and practices claim to help with improving student success and graduation, but with limited financial resources, college administrators face decisions about which initiatives to fund and which initiatives to cut, based on data and anecdotal reports from other institutions. The production function model can be a useful tool in acquiring this information.

With the production function model, an administrator can determine which financial inputs produce the highest desired outputs, using statistical guidelines. This dissertation study examined North Carolina community colleges, and determined which financial inputs produced the highest outputs. In this study, inputs were categorized as faculty and instruction, student services, capital projects (including technology), and financial aid. The outputs studied were graduation rates at these institutions. The next chapter will define the production function process more in depth, and will discuss the methods of the study.

CHAPTER THREE: METHODS

Introduction

This quantitative study attempted to reveal if any of four pre-determined expenditure categories (academic support, instruction, institutional support, and student services) had any impact on the graduation rates of students in the 58 North Carolina community colleges. Similar to previous educational production function studies (Blose et al., 2006; Ehrenberg, 2006; Pike et al., 2006; Ryan, 2004; Titus, 2004; Webber & Ehrenberg, 2006), this study analyzed whether or not institutional financial inputs (money spent on the four expenditure categories) were related to production outputs (graduation rates). This study was unique in that it focused on a homogeneous population of community college students within North Carolina, which allowed the study to focus on a typically at-risk population of students, a trait explained in a previous chapter. This chapter will outline the methods, procedures, and variables that were used to measure the effects of expenditures within these categories.

Significance of the Study

The significance of this study is that was able to add to the body of work involving the use of the production function model in the field of education by contributing information about community college expenditures as they relate to the stated outcomes. There is not a current body of literature that has focused on expenditure outcomes at community colleges. Because this study focused exclusively on community colleges (a population of students that has been discussed in a previous section) I was able to contribute to a body of knowledge that can be used by community college administrators and policy makers regarding categories of expenditures that might be more likely to produce increased completion rates at community colleges.

Though previous higher education production function studies have not specifically recommended that a future study be conducted to examine expenditure categories at community colleges, various results and challenges of those studies arguably imply that a community college production function study could benefit the body of research in higher education. For instance, the following findings came from production function studies at the university level:

- Persistence (accumulating credits and advancing towards a degree) is positively correlated with an institution's selectivity (Titus, 2004).

- Institutions that admit students with higher aptitude test scores typically benefit from different expenditure categories (academic support and research) than institutions that admit students with lower (or no) aptitude test scores (Blose et al., 2006; Ryan, 2004; Webber & Ehrenberg, 2010).

- Enrollment of out-of-state students, and students who are enrolled full time are more likely to have higher graduation rates (Ehrenberg, 2006).

The current complexion of community colleges and their students has already been discussed in a previous section, however, it is noteworthy to point out that based on the above findings, community colleges are generally not selective, they enroll students with low or no aptitude scores, and they typically enroll students from their local area, many of whom enroll on a part-time basis. A study focusing on the efficiency of spending in community colleges (specifically NCCCS colleges) is important in the NCCCS, as new performance-funding measures have been adopted based on institutional completion rates (Dougherty et al., 2014). As previously discussed, these growing performance measures will mean that institutions, and their presidents and stakeholders, will be held accountable for student success and graduation rates, and will be expected to increase these statistics in the coming years.

Research Design

Utilizing Data Feedback Reports from the Integrated Post-Secondary Education Data System (IPEDS) (a database housed by the National Center for Education Statistics, [NCES]), I measured year-to-year expenditures within the aforementioned categories (from the 2004-2012), comparing those expenditure rates to the normal time to completion for those same cohort years.

Utilizing this data, I was able to test whether or not an institution's expenditures impacted its graduation rates. I analyzed this timeframe for three reasons. First, it ensured the most recent possible reporting data. Second, it will allowed me to view data prior to and following the 2008 American economic recession. As noted in the previous chapter, the recession served as a catalyst for further accountability, enrollment, and expenditure changes in American community colleges. Thirdly, this date range provided the maximum number of academic years with accompanied cohort normal time to completion information that NCES provides (NCES provides normal time to completion data for NC Community College System cohort years 2004-2012).

Utilizing Ordinary Least-Squares Regression (OLS), and Analysis of Variance (ANOVA), I measured whether or not categorical expenditures were related to student graduation rates. I will discuss these statistical methods later.

Given the quantitative nature of a production function study, measuring quantitative data and results was appropriate for this study (Gay et al., 2009). Based on the inconclusive results of this study, a further qualitative study might be helpful to determine attitudes and challenges of expenditures based on stakeholder feedback, but it is not appropriate for this study. In a later chapter, I will discuss further recommendations for a future qualitative study.

Research Questions

This study attempted to answer the following research questions:

1. Is there a relationship between institutional expenditures and normal time to completion of academic programs of students in the same academic year cohort?

2. Does financial support for student services, academic support, institutional support, or instruction help to explain variations in persistence to normal time to completion of academic programs of students in the same academic year cohort?

Null Hypotheses

The following hypotheses were investigated:

$H_0 1$: There is no statistically significant relationship between expenditures and normal time to completion of academic programs of students in the same academic year cohort.

$H_0 2$: Financial support for student services, academic support, institutional support, or instruction cannot help to explain variations in persistence to completion of academic programs of students in the same academic year cohort.

As was discussed in Chapter Two, the financial climate of community colleges, as well as increased public accountability measures to increase graduation, make the answers to these research questions significant. If in fact (a) particular financial input(s) is related to graduation rates, administrators at community colleges might adjust budgeting at their institution in an attempt to increase graduation rates.

In attempting to answer these questions, and testing these hypotheses, I utilized OLS and ANOVA statistical analyses to determine if there was any correlation between the stated variables. OLS, described by Powell and Lehe (2017) is a way to predict unknown quantities from existing data, and has been used in similar studies such as with Ryan (2004), and Gay et al.

(2009). Rocconi (2013) noted that there are flaws with using OLS, particularly when measuring samples with high levels of heterogeneity. However, I believe that by focusing my population on a homogeneous population of North Carolina Community Colleges, I was able to reduce or eliminate these concerns. To assist in this reduction of error, I also employed ANOVA, which according to Rocconi (2013), is effective in accounting for heterogeneity in samples when trying to determine the effects of individual institutions on students.

Site Selection

The population that I studied was all North Carolina Community College students during the aforementioned years. This population provided several opportunities for this study. First, measuring a homogeneous population of community college students corrected a common limitation of previous studies. In previous educational (higher education) production function studies, such as in Ryan's (2004) and others (Blose et al., 2006; Ehrenberg, 2006; Pike et al., 2006; Titus, 2004; Webber & Ehrenberg, 2006), it has been noted that a challenge in making generalizations about results was that the populations of the studies were too heterogeneous to make clear assumptions about the overall population in the study. For instance, Ryan's (2004) study noted that students at highly competitive universities benefitted more when more money was allocated to instruction and academic support, while students who attended less competitive institutions benefitted more from student services and financial aid expenditures. I will discuss assumptions about community college students in a later section, but utilizing this population will allow for analysis of a homogeneous population.

North Carolina Community College System

Colleges within the NCCCS have traits that are congruent with much of the literature that has already been discussed, and will be further highlighted in this section. The NCCCS consists

of 58 colleges around the state. Serving over 700,000 individuals in the state each year, and

taking at least $1 billion of the state's budget, the NCCCS has been charged with being the lead

state agency for workforce development and adult education in the state of North Carolina

(General Assembly: Program Evaluation Division, 2016).

Perhaps the most relevant aspects of the NCCCS are its budgeting structure, and the

budgeting pressures it has faced in recent years. The North Carolina General Assembly's

Program Evaluation Division (2016) outlines current budgeting guidelines for the NCCCS, and

makes note of the following: Over the previous decade, the NCCCS has received less money

from the state of North Carolina (a state that funds its community colleges proportionally more

than most other states), and has relied more on revenues from tuition and fees. In addition to

providing less money to the NCCCS, the North Carolina legislature has implemented a complex

performance funding model that takes into account the number of students enrolled, as well as

successful completion of performance measures. Essentially, all 58 colleges are funded based on

a four-step process. First institutions receive funding based on the number of students enrolled

during the current year, or the average number of students enrolled in the last two years,

whichever is greater (General Assembly: Program Evaluation Division, 2016). This initial

funding is awarded in the same manner (dollars per FTE for all colleges), and will be mentioned

later. Secondly, institutions receive a base funding allocation based on where they fall within

three size groupings: small (0-2499 FTE), medium (2500-6499 FTE), and large (6500 or more

FTE). Third, the types of courses (and number of courses) that a college offers are calculated,

and finally, additionally money is awarded based on a college's successful completion of eight

performance measures, one of which is curriculum program completion. As the General

Assembly: Program Evaluation Division (2016) document notes, large institutions are at a

disadvantage with initial funding in that their dollars per FTE (which are designated for instructional support (instructors and equipment needed for curriculum delivery) is diluted as an institution's population grows. This money is diluted primarily because of larger student-to-teacher ratio. However, those large institutions receive additional money based on FTE that can be used for additional institutional and academic support. Presumably then, larger schools might have an initial disadvantage with budgeting for instructors, but would receive additional money later (money that smaller schools would not receive) that could be used to balance out the diluted funding, should the institution choose to do so (General Assembly: Program Evaluation Division, 2016).

As mentioned previously, the final portion of the funding formula has to do with completion of eight performance measures, one of which is curriculum completion. Curriculum completion is defined by the North Carolina Community College System (2018) Performance Measures for Student Success as, "the percentage of first-time fall curriculum students who, within six years of first term of enrollment, have either graduated, transferred, or are still enrolled with at least 36 non-developmental credit hours (p. 12)." For this study, I will utilize normal time to degree completion by cohort year as the dependent variable, which I will explain in a later section, but the main point is that degree completion is a component of NCCCS colleges' funding.

The State of North Carolina adopted the eight performance measures (which include curriculum completion) in 2011 (North Carolina Community College System, 2018). Since adopting these performance measures, the NCCCS has implemented several initiatives that indicate the NCCCS's commitment to improving curriculum completion and student success rates. For instance, in 2012, the state adopted the Career and College Promise program, which

allows high school students to take college classes and therefore have a faster route to an

Associate's degree; in 2012 the NCCCS also began a redesign of developmental education

(remedial courses), in order to help students move into curriculum classes faster (General

Assembly: Program Evaluation Division, 2016). Lastly, in 2014, the NCCCS and University of

North Carolina System revised the Comprehensive Articulation Agreement between the two

bodies in order to provide an easier pathway for community college students to transition to

universities to earn a four-year degree (General Assembly: Program Evaluation Division, 2016).

Because the North Carolina community colleges are a part of a governing body, factors

such as tuition rates and funding formulae are consistent across all institutions (NC Community

Colleges, 2014). Furthermore, I hope that by focusing on this homogeneous population I can

reduce the limitations of previous studies where factors such as varying cost of living and

income were noted as challenges of studying a very heterogeneous sample (Blose et al., 2006;

Ehrenberg, 2006; Pike et al., 2006; Ryan, 2004; Titus, 2004; Webber & Ehrenberg, 2006).

Finally, the NCCCS provided this study with a population of 58 institutions. According

to Gay et al. (2009), a sample size of 30 or more is acceptable for predicting correlation between

variables in similar studies.

Data Collection

A major advantage of studying North Carolina community colleges through the IPEDS

data system is that all North Carolina community colleges report on consistent categorical

expenditures from year to year (National Center for Education Statistics, 2015; NC Community

College System, 2017). Utilizing this secondary data allowed for a timely and consistent analysis

of the total population of community colleges within the NCCCS.

My data collection process included keeping a spreadsheet of various data reporting categories from the IPEDS Data Feedback Reports. I compared the expenditure categories to a cohort of graduates who graduated within the normal time to completion of their starting time. Normal time to completion has already been defined in Chapter One, but this was essentially 150% of the prescribe time for completing any level of credential. For example, I examined how institutions spent money in 2010 and compared that to the number of graduates at a later time period from the same institutions, rather than comparing graduates from that institution from the same expenditure year. This enabled me to examine the more long-term effects of spending from that year on that particular cohort of students.

Each expenditure category was examined as a per Full Time Enrollment (FTE) expenditure, rather than an actual dollar amount.

Because NCCCS institutions are funded based on their FTE tier, I designated institutions accordingly, and performed regression analysis based on the respective tier. I designated tier one colleges as smaller institutions (0-2499 FTE), tier two institutions as medium sized institutions (2500-6499 FTE), and tier three institutions as larger institutions (6500 or more FTE). I compared the normal time to graduation rates for each cohort year within each tier. I have previously discussed how larger institutions receive more money to designate more freely among expenditure categories, and running multiple categorical regressions will allow me to determine the impacts of this funding model on normal time to graduation rates.

Independent Variables

The independent variables of this study included: (1) the amount of money per full time enrollment (FTE) spent at institutions on instruction, (2) the amount of money per FTE spent at institutions on academic support efforts, (3) the amount of money per FTE spent at institutions

on institutional support efforts, and (4) the amount of money spent per FTE on student services efforts. These variables were consistent with similar studies, especially Ryan's (2004) study, and provided consistent reporting data over the years to be studied (National Center for Education Statistics, 2017).

Dependent Variables

The dependent variables of this study were the normal time to graduation rates of students at the 58 North Carolina Community Colleges for each academic year cohort in the study. The independent variables were studied in terms of certificates, diplomas, and associate degrees earned at North Carolina community colleges. As was previously discussed, IPEDS does not have a definition for "diplomas," however, its definition for certificates of more than one year, but less than two years matches that of the NCCCS definition for diplomas.

Statistical Methods

As I have previously discussed, I utilized OLS to determine the relationship between expenditure categories and cohort graduation rates at North Carolina Community Colleges. Brase and Brase (1999) describe an advantage of using a multiple regression model as being able to analyze the effects multiple inputs on a phenomenon, such as graduation rates. Brase and Brase suggest a formula that I utilized in my study, which is as follows:

$$y = b_0 + b_1x_1 + b_2x_2 = \ldots + b_kx_k$$

In my study, y represented graduation rates, or the variable that was predicted; k variables were those upon which the graduation predictions were based, or in my case, the four input categories; b variables were those coefficients that I obtained from the OLS criterion. As was previously mentioned, I utilized ANOVA to correct for errors in the regression calculation.

Finally, I ran regression analysis to determine if the size of an institution had any consequential effects of the input categories on graduation rates.

Chapter Summary

In summary, this quantitative study measured the correlation between one of four expenditure categories (student services, academic support, institutional support, and financial aid) and cohort graduation rates of students. Because previous production function studies have noted varying results (mostly due to samples of four-year institutions that have very different characteristics), I studied a population of the 58 North Carolina Community Colleges. I believe that studying this population allowed for a homogeneous population and assisted in making sound assumptions about at-risk community college students. This study utilized secondary data from the IPEDS reporting system, which allowed for further consistency of expenditure data. In order to analyze correlations, I utilized OLS and ANOVA, both of which have been used in similar studies in higher education.

CHAPTER FOUR: RESULTS

Introduction

This chapter will discuss the overall findings of my study. I will begin by reviewing the descriptive statistics that I used, and address how I checked the data for normalization prior to proceeding with regression analysis. I will then discuss the ANOVA and regression analysis results. Finally, I will review how the statistical results of my study relate to my initial research questions and hypotheses.

Descriptive Statistics

The secondary data for this quantitative study were retrieved from data feedback reports in the IPEDS database. I captured data for each of the 58 NCCCS colleges for the individual academic years between 2004 and 2013. Tables 1, 2, 3, and 4 illustrate the data points that I used, and describe the input information of my study.

As previously mentioned, the population for my study included the 58 community colleges within the NCCCS. I captured graduation and expenditure data for each institution for the 2004-2012 academic years. I then categorized each institution (by year) into three groups based on their enrollment for that year. The three categorizations were Tier 1 (0-2499 FTE), Tier 2 (2500-6499 FTE), and Tier 3 (6500+ FTE). I categorized institutions based on the NCCCS funding model, as discussed in the previous chapter. Table 1 shows the year-to-year categorization for each institution.

It was common for an institution to change funding categories from year to year. For instance, Rowan-Cabarrus Community College was considered as Tier 1 (2006-2007), Tier 2 (2004-2005, 2005-2006, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012), and Tier 3 (2013-2014) institution for this study. By categorizing institutions this way, I was able to run

Table 1

North Carolina Community College Funding Category by Year

College	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Alamance Community College	2	2	2	2	2	2	2	2	2
Asheville Buncome Technical College	2	2	2	2	2	2	2	2	3
Beaufort County Community College	1	1	1	1	1	1	1	1	1
Bladen Community College	1	1	1	1	1	1	1	1	1
Blue Ridge Community College	1	1	1	1	1	1	1	1	1
Brunswick Community College	1	1	1	1	1	1	1	1	1
Caldwell Community and Technical College	2	2	1	2	2	2	2	2	2
Cape Fear Community College	2	2	2	2	3	3	3	3	3
Carteret Community College	1	1	1	1	1	1	1	1	1
Catawba Valley Community College	2	2	2	2	2	2	2	2	2
Central Carolina Community College	2	2	2	2	2	2	2	2	2

Table 1 (continued)

College	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Central Piedmont Community College	3	3	3	3	3	3	3	3	3
Cleveland Community College	1	1	1	1	2	2	2	2	2
Coastal Carolina Community College	2	2	2	2	2	2	2	2	2
College of the Albemarle	1	1	1	1	1	1	1	1	1
Craven Community College	1	1	1	1	1	2	2	2	2
Davidson Community College	2	2	2	2	2	2	2	2	2
Durham Technical Community College	2	2	2	2	2	2	2	2	2
Edgecombe Community College	1	1	1	1	1	1	2	2	2
Forsyth Technical Community College	2	2	2	2	2	2	3	3	3
Gaston College	2	2	2	2	2	2	2	2	2
Guilford Technical Community College	3	3	3	3	3	3	3	3	3
Halifax Community College	1	1	1	1	1	1	2	1	1

Table 1 (continued)

College	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Haywood Community College	1	1	1	1	1	1	2	1	1
Isothermal Community College	1	1	1	1	1	1	1	2	2
James Sprunt Community College	1	1	1	1	1	1	1	1	1
Johnston Community College	2	2	2	2	2	2	2	2	2
Lenoir Community College	1	1	1	1	1	2	2	2	2
Martin Community College	1	1	1	1	1	1	1	1	1
Maryland Community College	1	1	1	1	1	1	1	1	1
McDowell Technical Community College	1	1	1	1	1	1	1	1	1
Mitchell Community College	1	1	1	1	1	1	2	2	2
Montgomery Community College	1	1	1	1	1	1	1	1	1
Nash Community College	1	1	1	1	1	1	1	1	2
Pamlico Community College	1	1	1	1	1	1	1	1	1
Piedmont Community College	1	1	1	1	1	1	1	1	1

Table 1 (continued)

College	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Pitt Community College	2	2	2	2	2	2	3	3	3
Randolph Community College	1	1	1	1	1	1	2	2	2
Richmond Community College	1	1	1	1	1	1	1	1	1
Roanoke-Chowan Community College	1	1	1	1	1	1	1	1	1
Robeson Community College	1	1	1	1	1	1	1	1	1
Rockingham Community College	1	1	1	1	1	1	1	1	1
Rowan-Cabarrus Community College	2	2	1	2	2	2	2	2	3
Sampson Community College	1	1	1	1	1	1	1	1	1
Sandhills Community College	2	2	2	2	2	2	2	2	2
South Piedmont Community College	1	1	1	1	1	1	1	1	2
Southeastern Community College	1	1	1	1	1	1	2	1	1
Southwestern Community College	1	1	1	1	1	1	1	1	1

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Table 1 (continued)

College	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Stanly Community College	1	1	1	1	1	1	2	2	2
Surry Community College	2	2	1	2	2	2	2	2	2
Tri-County Community College	1	1	1	1	1	1	1	1	1
Vance-Granville Community College	2	2	2	2	2	2	2	2	2
Wake Technical Community College	3	3	3	3	3	3	3	3	3
Wayne Community College	2	2	1	2	2	2	2	2	2
Western Piedmont Community College	1	1	1	1	1	1	2	2	2
Wilkes Community College	1	1	1	1	1	1	2	2	2
Wilson Community College	1	1	1	1	1	1	1	1	2

Note. Tier 1 institutions enroll 0-2499 FTE, Tier 2 enroll 2500-6499 FTE, and Tier 3 enroll 6500 or more FTE.

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Table 2

Tier 1 Institutions (0-2499 FTE) Descriptive Statistics

	FTE	Graduation Rates (150% of normal time)	Instructional Support ($/FTE)	Academic Support ($/FTE)	Institutional Support ($/FTE)	Student Services ($/FTE)
Min	260 (Pamlico Community College, 2008)	4% (Pamlico Community College, 2008)	$2617 (Cleveland Community College, 2004)	$263 (Montgomery Community College, 2004)	$544 (Roanoke-Chowan Community College, 2008)	$171 (South Piedmont Community College, 2005)
Max	2466 (Craven Community College, 2007)	79% (Craven Community College, 2007)	$13554 (Nash Community College, 2006)	$2865 (Pamlico Community College, 2008)	$5219 (Rowan-Chowan Community College, 2012)	$3470 (Roanoke-Chowan Community College, 2008)
Mean	1544	23%	$5295	$837	$1839	$725
Median	1614	20%	$5044	$767	$1706	$628
Mode	1150	16%	$3803	$496	$1836	$393

Note. Tier 1 institutions represented 289 data points, and 39 institutions.

Table 3

Tier 2 Institutions (2500-6499 FTE) Descriptive Statistics

	FTE	Graduation Rates (150% of normal time)	Instructional Support ($/FTE)	Academic Support ($/FTE)	Institutional Support ($/FTE)	Student Services ($/FTE)
Min	2504 (Western Piedmont Community College, 2008)	5% (Catawba Valley Community College, 2007)	$2540 (Lenoir Community College, 2005)	$277 (Vance-Granville Community College, 2004)	$120 (Pitt Community College, 2006)	$198 (Alamance Community College, 2008)
Max	6489 (Asheville Buncome Technical Community College, 2011)	74% (Rowan Cabarrus Community College, 2006)	$10930 (South Piedmont Community College, 2004)	$1563 (Gaston College, 2007)	$2587 (South Piedmont Community College, 2004	$2066 (Johnston Community College, 2011)
Mean	3695	21%	$4394	$739	$1274	$562
Median	3570	21%	$4213	$703	$1238	$503
Mode	2552	24%	$3662	$699	$1250	$410

Note. Tier 2 institutions represented 185 data points, and 34 institutions.

Table 4

Tier 3 Institutions (6500+ FTE) Descriptive Statistics

	FTE	Graduation Rates (150% of normal time)	Instructional Support ($/FTE)	Academic Support ($/FTE)	Institutional Support ($/FTE)	Student Services ($/FTE)
Min	6668 (Cape Fear Community College, 2008)	6% (Fayetteville Technical Community College, 2011)	$3064 (Central Piedmont Community College, 2004)	$211 (Fayetteville Technical Community College, 2008)	$596 (Pitt Community College, 2011)	$331 (Guilford Technical Community College, 2005)
Max	16535 (Central Piedmont Community College, 2011)	22% (Cape Fear Community College, 2012)	$5496 (Wake Technical Community College, 2008)	$1322 (Wake Technical Community College, 2008)	$1594 (Central Piedmont Community College, 2011)	$919 (Central Piedmont Community College, 2012)
Mean	10122	13%	$4052	$650	$997	$1244
Median	9090	13%	$3994	$586	$944	$456
Mode	N/A	13%	N/A	N/A	N/A	N/A

Note. Tier 3 institutions represent 48 data points, and 9 institutions.

regressions more accurately, since it more accurately reflected the way that an institution was funded from year to year. For example, as a Tier 1 school, Rowan-Cabarrus Community College would have received less money overall, but would have had a lower student population, and therefore would have arguably had more dollars per FTE for classroom instruction. As a Tier 3 institution, its base funding dollars per FTE would have been more diluted (because there is a higher student population utilizing those dollars), but it would have received more additional funds that it could have spent more freely on the various expenditure categories. I have previously discussed complications of these spending schemata, but I argue that separating the data into categories for regression purposes gave me a more accurate depiction of how an institution's funding for a particular year might have influenced its cohort graduation rate.

Lastly, for each tier, the expenditure category with the most money spent was instructional support, while academic support and student services generally had the least amount of funding by institutions.

Tier 1 Institutions

Table 2 displays descriptive statistics for Tier 1 institutions. Tier 1 institutions represented 289 data points, and spanned 36 institutions. When measuring institutional size, the smallest institution had 260 FTE (Pamlico Community College in 2008), while the largest institutional size was Craven Community College in 2007, with 2466 FTE. The average FTE for Tier 1 schools was 1544.

Graduation rates (normal time to graduation) for this group ranged from 4% to 79%, with a mean of 23%. On average, Tier 1 institutions spent the most money on instructional support ($5295 per FTE), and the least amount on student services expenditures ($725 per FTE).

Tier 2 Institutions

Table 3 displays descriptive statistics for Tier 2 institutions. Tier 2 institutions represented 185 data points, and spanned 34 institutions. When measuring institutional size, the minimum institution had 2504 FTE (Western Piedmont Community College in 2008), while the largest institutional size was Asheville Buncome Technical Community College in 2011, with 6489 FTE. The average FTE for Tier 2 schools was 3695.

Graduation rates (normal time to graduation) for this group ranged from 5% to 74% with a mean of 21%. On average, Tier 2 institutions spent the most money on instructional support ($4394 per FTE), and the least amount on student services expenditures ($562 per FTE).

Tier 3 Institutions

Table 4 displays descriptive statistics for Tier 3 institutions. Tier 3 institutions represented the smallest data set, with 48 data points, and spanned 9 institutions. When measuring institutional size, the minimum institution had 6668 FTE (Cape Fear Community College in 2008), while the largest institutional size was Central Piedmont Community College in 2011, with 16535 FTE. The average FTE for Tier 3 schools was 10122.

Graduation rates (normal time to graduation) for this group ranged from 6% to 22%, with a mean of13%, making Tier 3 schools have the lowest average graduation rates. On average, Tier 3 institutions spent the most money on instructional support ($4052 per FTE), and the least amount on academic support expenditures ($650 per FTE), making it the only group of schools who spent less on a category other than student services expenditures.

<center>**The Research Questions**</center>

This study sought to answer the following research questions:

1. Is there a relationship between institutional expenditures and normal time to completion of academic programs of students in the same academic year cohort?

2. Does financial support for student services, academic support, institutional support, or instruction help to explain variations in persistence to normal time to completion of academic programs of students in the same academic year cohort?

Null Hypotheses

The following hypotheses were investigated:

$H_0$1: There is no statistically significant relationship between expenditures and normal time to completion of academic programs of students in the same academic year cohort.

$H_0$2: Financial support for student services, academic support, institutional support, or instruction cannot help to explain variations in persistence to completion of academic programs of students in the same academic year cohort.

Regression Analysis

Prior to running multiple regression analysis on my data through SPSS, I checked the data for normality, and tested the relationship between size of institution and graduation rates using a one-way ANOVA. The ANOVA test for homogeneity showed a significance of .000, which indicated that my data was normal, and that there was a statistically significant relationship between institutional size and graduation rates (Brase & Brase, 1999).

I then used a regression analysis to test the entire population to check for the significance of relationship between spending and graduation rates. For this regression, and for individual tier regression analyses, I used a dependent variable of graduation rates, and independent variables (4) of the expenditure categories. When analyzing the entire population, I found that there was no significance ($p = .126$) between expenditures and graduation rates. After running the

regression for all three Tiers, I found the variance inflation factor (VIF) to be rather high, indicating that the regression for each group may have bias (Field, 2013), an aspect which will be discussed in future sections. To account for this, I ran a two-tailed Pearson's correlation to determine significance of the relationship between variables within each model. I will discuss the outputs for each below.

Tier 1 Institutions

A multiple regression analysis showed that there is no statistically significant difference ($p = .137$) between expenditures and graduation rates at NCCCS colleges with 0-2499 FTE. Table 5 shows the R^2, adjusted R^2, and VIF coefficient data for the Tier 1 regression analysis. The model accounting for student services, institutional support, academic support, and instructional support per FTE only accounts for approximately 15% of the variance in graduation rates. The Tier 1 group included 288 cases, which according to Field (2013) provided enough of a test sample for a sound regression. However, the VIF statistics for each expenditure category (each > 1) indicated that the regression may be biased, and that there might be hidden variables, or more correlation within individual institutions than as an overall tier group. Because the VIF was so high, I ran an additional Pearson's Correlation, the results of which are outlined in Tables 6, 7, and 8.

Results of the ANOVA indicate significant differences across the expenditure categories with respect to graduation rates ($F[4,283]=12.386$, $p \leq 0.0001$). The means of instructional expenditures (M=\$5294.66, SD=\$1398.169) are more than double that of institutional support expenditures (M=\$1838.80, SD=721.932), which is more than twice that of academic support expenditures (M=\$836.63, SD=\$333.528) and student services expenditures (M=\$724.71, SD=359.197) respectively.

Table 5

Tier 1 Institutions Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
Normal time to completion rates (by cohort year).	.386[a]	.149	.137	13.283

Note. SPSS data output. [a]Predictors (constant), Student Services Expenditure/FTE, Institutional Expenditure/FTE, Academic Support Expenditure/FTE, Instructional Expenditure/FTE.

Table 6

Tier 1 Institutions Variable Means, Standard Deviations, and Variance Inflation Factors

	Mean	Std. Deviation	N	VIF
Normal time to completion rates (by cohort year).	23.12	14.298	288	
Instructional Expenditure/FTE	5294.66	1398.169	288	2.019
Academic Support Expenditure/FTE	836.63	333.528	288	1.975
Institutional Support Expenditure/FTE	1838.80	721.932	288	1.684
Student Services Expenditure/FTE	724.71	359.197	288	1.227

Note. SPSS output.

Table 7

Tier 1 Institutions Analysis of Variance (One-Way)

Model	Sum of Squares	df	Mean Square	f	Sig.
Regression	8741.052	4	2185.263	12.386	.000
Residual	49931.695	283	176.437		
Total	58672.747	287			

Note. SPSS data output.

Table 8

Tier 1 Institution Pearson Correlation

Expenditure Category	Pearson Correlation	Sig. (2-tailed)	N
Institution Support	.282**	.000	288
Student Services	.119*	.043	288
Academic Support	.351**	.000	288
Instructional Support	.152**	.010	288

Note. Compared to normal time to graduation rates. **. Correlation is significant at the .01 level (2-tailed). *. Correlation is significant at the .05 level (2-tailed).

The correlational analysis indicates that within the Tier 1 institutions, spending categories vary in their relationship to graduation rates. For instance, student services support expenditures (weakest relationship) had an *r* value of .119 with respect to graduation rates, while academic support expenditures (strongest relationship) had an *r* value of .351. While none of these relationships were strong, the correlational analysis indicates that perhaps when some Tier 1 institutions spend more on academic support, they might have better success with graduation rates. This is discussed in the following section.

Results of the ANOVA indicate significant differences across the expenditure categories with respect to graduation rates (*F*=1.155, *p*=.332). The means of instructional expenditures (M=$4395.05, SD=$1207.292) are more than double that of institutional support expenditures (M=$1273.73, SD=$426.254), which is almost twice that of academic support expenditures (M=$739.27, SD=238.569) and more than twice that of student services expenditures (M=$562.17, SD=255.304), respectively.

Tier 2 Institutions

The correlational analysis indicates that within the Tier 2 institutions, spending categories vary in their relationship to graduation rates. Tier 2 institutions differed from Tier 1 institutions in that instructional support expenditures represented the weakest relationship (*r*=.032), while institutional support had the strongest correlation (*r*=.108). All relationships in this Tier group were weak, which supported the null hypotheses. Tables 9, 10, 11, and 12 demonstrate these findings.

Tier 3 Institutions

A multiple regression analysis showed that there is no statistically significant difference (*p*=.213) between expenditures and graduation rates at colleges with 6500 or more FTE.

Table 9

Tier 2 Institutions Model Summary

Model	R	R^2	Adjusted R^2	N
Normal time to completion rates (by cohort year)	.158[a]	.025	.003	8.857

Note. SPSS data output. [a]Predictors (constant), Student Services Expenditure/FTE, Institutional Support Expenditure/FTE, Academic Support Expenditure/FTE, Instructional Expenditure/FTE.

Table 10

Tier 2 Institutions Variable Means, Standard Deviations, and Variance Inflation Factors

	Mean	Std. Deviation	N	VIF
Normal time to completion rates (by cohort year).	21.46	8.872	186	
Instructional Expenditure/FTE	4395.05	1207.292	186	4.300
Academic Support Expenditure/FTE	739.27	238.569	186	1.950
Institutional Support Expenditure/FTE	1273.73	426.254	186	3.282
Student Services Expenditure/FTE	562.17	255.304	186	1.485

Note. SPSS data output.

Table 11

Tier 2 Institutions Analysis of Variance (One-Way)

Model	Sum of Squares	df	Mean Square	f	Sig.
Regression	362.479	4	90.620	1.155	.332
Residual	14197.757	181	78.441		
Total	14560.237	185			

Note. SPSS data output.

Table 12

Tier 2 Institutions Pearson Correlation

Expenditure Category	Pearson Correlation	Sig. (2-tailed)	N
Institutional Support	.108	.144	186
Student Services	.067	.365	186
Academic Support	.051	.491	186
Instructional Support	.032	.668	186

Note. Compared to normal time to graduation rates. **. Correlation is significant at the .01 level (2-tailed). *Correlation is significant at the .05 level (2-tailed).

Table 13 shows the R^2, adjusted R^2, and VIF coefficient data for the Tier 3 regression analysis. The model accounting for student services, institutional support, academic support, and instructional support per FTE only accounts for approximately 28% of the variance in graduation rates. The Tier 3 group included 48 cases. As the smallest group, Field (2013) indicates that a sample this small (smaller than 60) would not pass for an acceptable size for an accurate regression. The VIF statistics for Tier 3 institutions were the lowest of all tiers, yet each expenditure category (each > 1) indicated that the regression may be biased, and that there might be hidden variables, or more correlation within individual institutions than as an overall tier group. Once more, I ran a Pearson Correlation for Tier 3 institutions, the results of which are represented in Tables 14, 15, and 16.

Results of the ANOVA indicate significant differences across the expenditure categories with respect to graduation rates (F=4.189, p=.006). The means of instructional expenditures (M=\$4052.13, SD=\$550.467) was nearly quadruple that of institutional support expenditures (M=\$997.31, SD=\$259.618), which was nearly twice that of academic support expenditures (M=\$650.27, SD=424.352), and student services expenditures (M=\$509.88, SD=143.093).

The t-test indicated, as it did with Tiers 1 and 2, that within the Tier 3 institutions, spending categories vary in their relationship to graduation rates. Tier 3 institutions had the strongest relationship between academic support and graduation rates (r = .313), while institutional support and student services expenditures had weak, negative relationships (r = -.013 and -.185, respectively).

Table 13

Tier 3 Institutions Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
Normal time to completion rates (by cohort year).	.530	.280	.213	3.370

Note. SPSS data output. [a]Predictors (constant), Student Services Expenditure/FTE, Institutional Support Expenditure/FTE, Academic Support Expenditure/FTE, Instructional Expenditure/FTE.

Table 14

Tier 3 Institutions Variable Means, Standard Deviations, and Variance Inflation Factors

	Mean	Std. Deviation	N	VIF
Normal time to completion rates (by cohort year).	12.83	3.800	48	
Instructional Expenditure/FTE	4052.13	550.467	48	2.019
Academic Support Expenditure/FTE	650.27	424.352	48	1.975
Institutional Support Expenditure/FTE	997.31	259.618	48	1.684
Student Services Expenditure/FTE	509.88	143.093	48	1.227

Note. SPSS data output.

Table 15

Tier 3 Institutions Analysis of Variance (One-Way)

Model	Sum of Squares	df	Mean Square	f	Sig.
Regression	190.301	4	47.575	4.189	.006
Residual	488.366	43	11.357		
Total	678.667	47			

Note. SPSS data output.

Table 16

Tier 3 Institutions Pearson Correlation

Expenditure Category	Pearson Correlation	Sig. (2-tailed)	N
Institutional Support	-.013	.930	48
Student Services	-.185	.207	48
Academic Support	.013	.931	48
Instructional Support	.017	.907	48

Note. Compared to normal time to graduation rates. **. Correlation is significant at the .01 level (2-tailed). *Correlation is significant at the .05 level (2-tailed).

Summary of Findings

Based on my two null hypotheses, I found that:

1. There is no statistically significant relationship between expenditures and normal time to completion of academic programs of students in the same academic year cohort, and

2. Financial support for student services, academic support, institutional support, or instruction cannot help to explain variations in persistence to completion of academic programs of students in the same academic year cohort.

It seems that for the overall models, expenditure categories cannot explain graduation rates. Where there are some correlations, the variance inflation factors are high, indicating that the correlation is not able to be specified within the larger model, but might be present at individual institutions, or that there are other hidden variables at play (Field, 2013). Two-tailed tests were able to compare means more accurately; however, it still appeared that the relationship between any variables and graduation rates for an entire tier was weak. A future study might consider looking at individual institutions, or for other variables such as trying to further determine how institutions specifically spend money in each category. For instance, the researcher might investigate whether an individual institution was spending instructional support money on faculty salary, professional development for faculty, etc. Hashing out and discovering those variables might account for the model misspecification of my regression. I will further discuss recommendations and implications in the next chapter.

Chapter Summary

This chapter discussed how I analyzed the data in my study in order to answer my research questions. The chapter began by analyzing the descriptive statistics of the institutions

within each of the three funding tiers within the NCCCS. It then reviewed the results of the

multiple regression analyses that I ran for each tier comparing graduation rates (dependent

variable) to the four expenditure categories (independent variables).

Based on these analyses, I found that across tiers, there is no statistical significant

relationship between expenditure category and graduation rates, and that money spent on certain

expenditure categories cannot help to explain graduation rates within the NCCCS.

CHAPTER FIVE: SUMMARY AND DISCUSSION

Introduction

This final chapter will summarize the findings of my study, and then provide guidance to practitioners and future researchers. Though overall, I found no significant relationship between expenditures and graduation rates at NCCCS institutions, there seemed to be some relationship in variables at some individual institutions, but not generally throughout the NCCCCS.

In this chapter I will explore those findings and connect them to previous studies related to expenditures and graduation rates, as well as analyze the limitations (and delimitations) of this study, and their implications for future studies of similar subject matter.

Summary of Findings

This study set out to determine if spending money in certain expenditure categories might impact graduation rates at NCCCS colleges. As was discussed in Chapter Two, enrollment fluctuations, economic turmoil, and stakeholder expectations of community colleges have all forced community college leaders to consider ways to ensure that more students are graduating with credentials. Many scholars have suggested that applying a production function economic theory can influence graduation rates, if categorical expenditures are adjusted. Previous educational production function studies have produced mixed results and opinions as to whether spending impacts graduation, all of which has been previously discussed.

This study was unique in that it focused on the population of all NCCCS colleges within a timeframe that represented fluctuating enrollments and funding as influenced by the American recession of 2008. For this study, I gathered data from the NCES database (IPEDS) on the 58 NCCCS colleges for the years 2004-2013. From this data, I extrapolated normal time to completion (a measure of graduation rates), FTE population of each institution, and the amount

of money per FTE spent on four expenditure categories. Based on the funding model outlined by the NCCCS, I separated colleges into one of three funding tiers, based on their FTE. Utilizing SPSS software, I checked my data for normality (using ANOVA), and found that my data was normal. I then ran a multiple regression analysis for each tier group to determine if there was a significant relationship between the dependent variable (graduation rates), and the independent variables (expenditure categories). I found that there was no statistically significant relationship between expenditure categories and graduation rates, and that there was likely bias within the regression, based on VIF results. To further test my inputs, I ran a two-tailed t-test on all variables, and found overall weak or no relationship within tier groups. Based on my research questions, I found that the amount of money spent on various categories does not impact graduation rates for my general population, though further research might indicate impacts of spending at individual institutions, or within individual expenditure categories.

Though there was no significance between spending and graduation rates, I did find that there was a greater significance (though still not statistically significant) in the tier 3 institutional category. In this category I found that there was a greater significance between money spent on instruction and graduation rates. It should be noted, however, that the Tier 3 group was statistically too small for a sound regression analysis (Field, 2013). In Chapter Three, I noted that tier 3 institutions began to receive additional money for instruction, and this could explain why there is perhaps a greater significance in this tier group. In other words, one could argued that tier 3 institutions have the ability to spend more money per FTE on instruction, which could influence graduation rates more than institutions with less money.

Another interesting finding of the data was that an outlying institution (Pamlico Community College), which had the largest average graduation rates (51% compared to the

statewide average of 22%), also has the smallest student population. As a tier 1 institution, the funding model would indicate that though Pamlico Community College does not receive extra funding to spend on various categories, it does inherently have fewer students per instructors. When running a multiple regression analysis on Pamlico Community College by itself, I found that there was a statistical significance between expenditure categories and graduation rates, particularly with expenditures on instruction.

A researcher might view the fact that there was a somewhat stronger relationship with instructional expenditures and graduation rates with larger schools (which have more money to spend categorically), and with the smallest institution (which inherently has more dollars/FTE on instruction), might indicate that a future study could focus specifically on how instructional expenditures, or even class size, might impact community college student graduation. In other words, where more money is available to, the relationship with graduation rates becomes stronger.

Another interesting data finding is that by far, NCCCS institutions spend more on instruction than other categories. Compared to a statewide average of $4205/FTE on instructional expenditures, NCCCS institutions spend only $728/FTE, $1410/FTE, and $612/FTE on academic support, institutional support, and student services, respectively. A future researcher might inquire if this amount of money spent on these other categories is enough to actually begin to make an impact on graduation rates at these institutions. Perhaps future studies could examine how much money per FTE would need to be spent on these categories to begin making a difference in student success. I will discuss this aspect further in the limitations section of this chapter.

Study Comparisons

In Chapter Two I discussed previous production function studies, and the results of this study seem to have parallels to results of those studies, yet there are also contradictions. For instance, Ryan's (2004) study showed that expenditures do influence graduation rates, and that instructional and academic support expenditures have the greatest impact. I have already discussed how my study showed no overall impact of expenditure categories; however, the strongest impact did occur with larger institutions, particularly with their instructional expenditures.

Other studies showed conflicting overall results. For instance, Astin (1993) found that expenditures do influence graduation rates, while Belfield and Thomas (2000) found the opposite.

From these mixed results, a future researcher might consider his or her population, and choose a more homogeneous group (perhaps homogeneous size or demographic) to study. A practitioner might also think in terms of what type of spending might benefit their individual institution the most. For instance, Pamlico Community College displayed a comparatively high graduation rate, and I noted that institution displayed a significant relationship between instructional expenditures and graduation rates. Peer tier 1 institutions might look to find ways to mimic Pamlico Community College's success by matching its dollars/FTE spent on instructional expenditures to see if there was any positive impact on graduation rates.

Limitations/Delimitations of Study

In a previous section I discussed the limitations and delimitations of this study. One of the limitations was that the expenditure categories were defined by the IPEDS reporting system, and to a further extent, are also defined by the NCCCS. Though these definitions exist, I believe

that a limitation is that depending on where and how an institution houses a function will determine how it categorizes the expenditures on that function. The example that I previously used would be a counseling or advising department. One institution might house such an office under academic support, while another might house the office within student services. The possibility of this inconsistency could have served as a limitation to the data.

A second limitation is that graduation rates were calculated as 150% of normal time to completion, as well as from that particular institution (National Center for Education Statistics, 2018). There could have been students from an institution's cohort year who graduated from another institution, or who graduated outside of the 150% who were not calculated as part of the graduation rate. This could be a limitation in that students could have benefited from services within an expenditure category, but were not counted because of the graduation definitions.

This study considered a third limitation that only public funding dollars were considered as part of the expenditure categories. This could be a limitation because institutions might utilize private funding for certain activities that would not have been calculated as part of the multiple regression analysis. For example, I have previously discussed Pamlico Community College's high graduation rates. It is not known from the data what type of private funding Pamlico Community College might be receiving and using for any of the four expenditure categories, or how this money might be impacting graduation rates.

Lastly, I have previously discussed the disadvantages of the NCCCS funding tiers. Again, a small institution (tier 1) could arguably benefit from having more money per student for instruction, but would not receive as much additional money for other activities on campus, whereas a tier 3 institution might have considerably larger class sizes (an effect of less money per student for instruction), but might receive more additional money to spend as it chooses.

While there were limitations in this study, it also had delimitations. For instance, I studied a very homogeneous population, which allowed me to study a consistent funding and reporting model. Studying a more heterogeneous population, such as in Ryan's (2004) study, would create a limitation in that each institution might have a different funding model. My population, however, was a part of the same community college system, and therefore had similar rules for operations, funding, and spending (North Carolina Community Colleges, 2014).

Implications for Practitioners

Based on the results of this study, I have several recommendations for practitioners. First, from gathering this research, it appears that NCCCS institutions seem to have few budgeting options for public funding, and it is clear from Tables 2, 3, and 4 that institutions are spending a much higher proportion of their budgets on instructional costs. Perhaps it might benefit North Carolina lawmakers to look at institutions that have higher-than-average graduation rates, and determine what types of efforts they are implementing to increase these numbers. By finding student success best practices, and implementing and funding those practices statewide, lawmakers might discover a better way to portion money; and, of course, measure the effectiveness of those changes.

Administrators in the NCCCS might also find themselves frustrated about their limited ability to budget public funding. I would suggest that administrators seek out peer institutions that have successful graduation rates, and discover what types of programs are being offered. Perhaps then administrators could seek out private funding to enhance those expenditure categories that suffer from low public funding. Administrators could use the success of these programs to inform potential donors in order to drum up more private support for such functions. At this juncture, it seems as if institutional budgets are so restricted, that moving any amount

money from category A to category B would cause category A activities to virtually disappear. In other words, with budgets as they are, even if successful initiative was discovered, there seems to not be any money to shift towards that initiative.

This lack of money for programs might also give lawmakers pause in the sense that as a production function study, this study was not able to find a point of diminishing returns for expenditures. Part of the reason is again that colleges simply do not have enough money to increase activities within expenditure categories, and therefore cannot begin to find improvements through spending. It is almost as if trying to measure any relationship between student success and spending is futile without investing more money in some category in order to determine any changes. From the data output, it can be seen that where there are more dollars per FTE available to an institution for instruction (based on NCCCS funding formulae), there is a slightly stronger relationship between graduation rates and expenditures in that category. It might prompt lawmakers to budget more money for all expenditure categories so that data could be collected to see if other expenditure categories have similar results. If so, then a point of diminishing returns might be able to be determined.

I previously explained that the data output revealed high VIF results for expenditure categories. I would recommend that practitioners and lawmakers explore expenditure categories further to determine why there might be bias within categories, or what hidden variables there might be that are causing a high VIF. For instance, institution A and institution B might spend budget the same dollars per FTE on instructional expenditures. However, institution A might have a much higher graduation rate than institution B. By looking further, a policymaker or administrator might find that institution A spends more on class space, while institution B might spend more on instructor pay. Both expenditure items would be considered instructional support,

yet they are very different in nature. It might also be discovered that institutions A and B budget their instructional moneys in the exact same fashion, but institution A might have a large sum of money from an endowment or grant that is not calculated into state spending, that causes graduation rates to be higher. Determining these types of biases could help administrators to further understand spending at their institutions.

Recommendations for Future Research

Perhaps the strongest recommendation that I would suggest for future studies of this nature would be to consider performing a study on institutions with higher-than-average graduation rates. By examining individual institutions with high graduation rates, a researcher could find out how money (public and private) is budgeted for the various expenditure categories. Once determined, those budgeting practices might be applied in an experimental capacity to determine if there is an impact on graduation rates at another individual institution.

As has been previously discussed, the nature of budgeting at NCCCS colleges does not allow institutions much freedom to spend extra money on any expenditure category, and therefore it is difficult to determine which items might be more influential on graduation rates. By looking further into the macro-level of institutional budgets – particularly those institutions who are more successful at graduating students – a researcher might find variations in budgets that can assist with highlighting best practices in spending, that could be further applied to and measured on other institution's budgets.

Chapter Summary

In summary, this chapter reviewed the results of my study and made recommendations for future use, as well as discussed limitations. Based on the findings of this study, there is no significant relationship between expenditure categories and graduation rates at NCCCS

institutions. Practitioners and future researchers might continue to examine institutions with higher-than-average graduation rates to determine if there are any budgetary differences in those institutions that they might employ. Additionally, practitioners and researchers might also examine how private funding might be budgeted at institutions to help offset limited public funding.

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APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVAL

From: Sparrow, Suzanne
Sent: Thursday, November 8, 2018 10:07 AM
To: Chambers, Crystal <CHAMBERSC@ecu.edu>; Smith, Davis Benton
<smithd08@students.ecu.edu>
Cc: Gemperline, Paul <GEMPERLINEP@ecu.edu>; Ringler, Marjorie
<RINGLERM@ecu.edu>
Subject: RE: IRB Exempt Memo

Good morning,
Correct, if the dataset included no individually identifying private information, then IRB
approval would not be required. Just as a reminder, the federal definition of "human subject"
is: a living individual about whom an investigator (whether professional or student) conducting
research obtains
(1) Data through intervention or interaction with the individual, or
(2) Identifiable private information.

Please let me know if there are any further questions.

Thank you,
Suzanne

Suzanne Sparrow, MPH, CIP
Office of Research Integrity & Compliance
University & Medical Center Institutional Review Board
East Carolina University
Brody Medical Sciences Building, Room 4N-70
Mailstop 682
Greenville, NC 27834
(252)744-1785