NORTH CAROLINA COMMUNITY COLLEGE ENROLLMENT SINCE IMPLEMENTING TIERED FUNDING TO PROMOTE ECONOMIC DEVELOPMENT

by

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ABSTRACT

MARC RICHARD DAVIS. North Carolina community college enrollment since implementing tiered funding to promote economic development (Under the direction of DR. MARK D'AMICO)

Since the 2008 recession, public higher education in terms of both two- and four-year institutions has been cut by $9 billion in state and local funding (Mitchell, Leachman, & Matterson, 2017). Between 2005 and 2016, state and local appropriations to community colleges have declined, from 59 percent of a college's total revenue to 54 percent (College Board, 2018). Along with a decrease in revenue from state and local sources, how states are funding college has also changed. In 2011, North Carolina implemented a tiered funding model for community colleges in an attempt to address program cost differentiation; however, in 2014, the funding model changed from a three-tiered model to a four-tiered model with an added focus on economic development. The latest changes provided additional funding for courses that help fill the state's skills gaps and help program graduates or course completers to earn higher-wage jobs (Program Evaluation Division, 2016). North Carolina's economic development tiered funding is the only one of its kind even though ten states use tiered funding in some form (Mullin & Honeyman, 2007). This study used the theoretical framework of Resource Dependency Theory to examine how the implementation of tiered funding to promote economic development, or what could be referred to as the creation of Tier 1A, is associated with enrollment behavior at North Carolina community colleges.

This study used a causal-comparative research design, which attempted to examine the cause or reason for different behavior by groups (Gay, Mills, & Airasian, 2006). This study examined how a funding policy change in 2014 which provided

additional funds for courses that help fill the state's skills gaps and help program graduates or course completers to earn higher-wage jobs affected enrollment behavior at North Carolina community colleges. The period for the study was since the implementation of the policy in 2014 through fall 2018. To account for possible differences in enrollment patterns this study looked at aggregate enrollment for North Carolina community colleges along with specific institutional grouping categories: Geographical Region, Disciplinary Focus, Dominant Student Type, Undergraduate Classification, Size of Institution, and Degree of Urbanization (Locale).

The findings for this study support resource dependency theory and that both the aggregate community college enrollment and 19 out of 20 institutional groups saw decreased enrollment in the lower funded course and increased enrollment in higher funded courses. Also, this study found that both the aggregate and all the institutional groups had a significant chi-square test for independence when comparing the proportion of enrollment by program tier (tiered enrollment profile) over time since the introduction of the 2014 tiered funding policy.

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CHAPTER 1: INTRODUCTION

Since the 2008 recession, public higher education in terms of both two- and four-year institutions, has been cut by $9 billion in state and local funding (Mitchell, Leachman, & Matterson, 2017). Between 2005 and 2016, state and local appropriations to community colleges have declined, from 59 percent of a college's total revenue to 54 percent (College Board, 2018). Along with a decrease in revenue from state and local sources, how states are funding college has also changed. Some states have begun to use tiered funding which is a formula based funding model that uses "data and unit cost studies" to pinpoint the costs of particular courses or programs to figure a proper distribution of dollars (Mullin, Baime & Honeyman, 2015, p. 189). For example, community college technical programs tend to have significant laboratory times, which cost more money to operate than a transfer English course (Mullin & Honeyman, 2007). Therefore, states that operate a tiered funding model would give more money to a college for a student enrolled in technical courses versus a transfer course.

In 2011, North Carolina implemented a tiered funding model for community colleges in an attempt to address program cost differentiation; however, in 2014, the funding model changed from a three-tiered model to a four-tiered model with an added focus on economic development. The latest changes provided additional funding for courses that help fill the state's skills gaps and help program graduates or course completers to earn higher-wage jobs (Program Evaluation Division, 2016). This funding change can find support in a report by the Federal Reserve (Fed) of Saint Louis, Fed of Atlanta, and the National Skills Coalition. According to the report, the southern region of the United States, including North Carolina, represents eight of the ten states with the

highest number of working-age adults with high school being their peak education level. Also, the region has nine of the top twelve states with a large share of youths ages sixteen to twenty-four who are not working and not in school. Likewise, the report adds, "if each and every one of the South's graduating high school students were to stay in the region and train for open jobs that require post-secondary education or training there would still be unfilled positions" (Anderson et al., 2018, p.8).

Overview of Literature

There are currently 1,051 community colleges in the United States that in 2017 received $38 billion of taxes from the federal, local, and state level (AACC 2019). When community colleges first started they received the majority of their funding from local government, while student tuition and fees provided higher revenue to the school than the state (Tollefson, 2009). Today, the average public community college receives 54 percent of its revenue from local and state government (College Board, 2018).

How community colleges receive their funding has changed over the years. According to Cohen, Brawer, and Kisker (2014), early on, community colleges received small public dollars, so the public concern of how the college was using the money was also small. The types of colleges and the popularity of college grew significantly after World War II, so the new national popularity for college grew enrollment numbers. Along with returning members of the armed forces from the war, which had federal tuition vouchers through the Servicemen's Readjustment Act of 1944 (i.e., GI Bill), returning individuals could spend this money on any public or private college (Cohen, Brawer & Kisker, 2014; Mullin & Honeyman, 2008). The amount of public money that

colleges received also grew, which lead legislatures and communities to begin questioning the funding methods of higher education.

Originally, when community colleges started to receive public money, it was given to them as a base amount. Base amount means money that came from the government on an annual or biannual basis based on policymakers' perception of what institutions needed. This system had some positives like the low cost of production, but it also had flaws. One flaw is that if colleges had substantial increases in annual enrollment as they did with the significant enrollment increases from returning soldiers, this method would be challenging to operate under because base-dollars did not account for the enrollment spikes (Mullin, Baime & Honeyman, 2015). In an attempt to address the funding gaps from increases in enrollment, state and local governments began using a formula model of funding that would fund colleges based on the number of enrollments (McKeown-Moak & Mullin, 2014; Mullin & Honeyman, 2007).

Today, the majority of state and local governments use formula funding, which funds colleges based enrollment and/or performance (Mullin, Baime, & Honeyman, 2015). With enrollment funding, public money goes to institutions based on a formula that awards a designated amount of dollars for each student that is enrolled (2015). Today the term that is commonly used for these enrolled students is "full-time equivalent." Enrollment funding provided an incentive for colleges to increase enrollment because the number of students directly related to increases in a college's revenue (Hearn, 2015).

In an attempt to make enrollment funding more efficient or steer college focus, states adjusted or changed their funding formulas. One example is tier funding, in which

states provide more money for operationally expensive courses or courses which promote economic development (Mullin, Baime, & Honeyman, 2015; Program Evaluation Division, 2016).

The number of states using tiered funding is small, with fewer than ten states using this method. North Carolina is one state using tiered funding, and, according to a program evaluation by the state general assembly, tiered funding has received a positive response from state community colleges because it attempts to address the difference in operational costs in college courses. The report also found changes in enrollment behavior, where student enrollment in the higher tiered courses increased and lower-tiered courses decreased (Program Evaluation Division, 2016). The report looked at enrollment changes between 2011 and 2016, which only included two years of the economic development policy change, leaving an opportunity to examine the influence the policy had on student full-time equivalent (FTE) enrollment over a longer time frame using various factors to identify other potential effects.

Theoretical Framework

The theoretical framework of this study follows Resource Dependency Theory (RDT). RDT regards survival as the primary motivation for an organization. The way an organization maintains its survival is through the accumulation of critical resources that are provided by other organizations. This demand for critical resources gives the organization providing the resources influence over the organization demanding resources (Pfeffer & Salancik, 2003).

In North Carolina, 59 percent of community college revenue comes from the state, with 83 percent of the state revenue coming in the form of tiered funding FTE

enrollment dollars (Program Evaluation Division, 2016). Using RDT, community colleges represent the organization that is demanding the resources, in this case, money, while the state is the organization that is providing the resource. Because the community college needs the state's money for survival, this gives the state power and influence over how community colleges operate.

Statement of the Problem

According to the National Skills Coalition (2015), 53 percent of jobs in the United States are middle-skill jobs, requiring education beyond high school but not a 4-year degree. There is a shortage of middle-skill labor in the market place, with only 43 percent of employees having middle-skills training. Community colleges offer educational training in which students can enroll in occupational programs that are designed to create gainful employment once they complete a specified program (Cohen, Brawer, & Kisker, 2014).

In 2014, North Carolina attempted to address the local skills gap by funding community colleges using a tiered funding model. The model distributes monetary resources to programs based on cost and provides more funding to programs and courses that address state skills gaps and earn course completers higher wages (Program Evaluation Division, 2016). Each course in the North Carolina Community College System combined course library has a prefix. For example, business courses carry a prefix of BUS. In 2011, when tiered funding got its start, the State Board of Community Colleges designed a policy that assigned each course prefix to a tier, and each tier earned a different FTE funding level. In an attempt to promote economic development, the state adjusted the funding formula by adding a fourth tier, Tier 1A (Program Evaluation

Division, 2016). The original three-tiered funding model was used for three years, which started in the 2011 and 2012 fiscal year and continued until the 2013 and 2014. In its three years of being, the percentage of students taking Tier 1 courses increased while Tier 2 courses decreased (Program Evaluation Division, 2016). The economic development tier, Tier 1A, started in the 2014 and 2015 fiscal year and between its first and second year of existence, the percentage of students taking Tier 1A and 1B courses increased, while Tier 2 courses decreased (Program Evaluation Division, 2016).

North Carolina's economic development tiered funding is the only one of its kind even though ten states use tiered funding in some form (Mullin & Honeyman, 2007). Ohio, in its "State Share for Instruction" (SSI) funds, takes into consideration program and course costs. Fifty percent of the SSI funds are allocated based on completion, but it is cost-based, where the state gathers enrollment and cost data from all the campuses then generates an average per FTE using a three-year average. From this formula, money is allocated based on FTE accordingly, with particular weight going to courses in the STEM fields. The formula continues with an average cost of a degree that assigns the average course cost for the courses in a degree program (Ohio Department of Higher Education, 2017).

Despite the fact that ten states currently use some sort of tiered funding, there has been little research conducted on tiered funding and the relationship with enrollment. Some research has been conduted by the Program Evaluation Division of The North Carolina General Assembly but the time frame for the last policy change, which promoted economic development, was two only years.

Purpose/Research Questions/Significance

The purpose of this study is to examine how the implementation of tiered funding to promote economic development, or what could be refered to as the creation of Tier 1A, is associated with enrollment behavior at North Carolina community colleges. The 58 North Carolina community colleges served as the sample. The fall FTE enrollment for all community colleges was used, along with each college's enrollment data which was located into appropriate groups based on institutional factors that had been developed. The institutional factors come from the North Carolina State Board of Community Colleges along with various Carnegie Classifications. The research question for this research is as follows.

Research Questions and Hypotheses

1. Has the overall proportion of enrollment by program tier (tiered enrollment profile) changed over time across all 58 NCCC since the introduction of the 2014 tiered funding policy?

H0: The overall tiered enrollment profile is not dependent on year for the entire population of CC

2. Has the tiered enrollment profile within specific CC institutional groupings related to institutional size, classification, and location changed over time since the introduction of the 2014 tiered funding policy?

H0: The tiered enrollment profile is not dependent on year within institutional groupings.

The information gained from this study will provide two contributions. First, this research is going to advance the knowledge on state funding in community colleges and

provide information on how North Carolina is funding community colleges. Second, the study attempted to examine the policy change of using tier funding to promote economic development and its effects on college enrollment behaviors.

The results from this research could have impending consequences for practitioners, legislators, and researchers across the country who are involved in state funding of community colleges. For example, if the southern region of the United States has a labor shortage of middle-skilled labor (Anderson et al., 2018), an examination into the enrollment changes after North Carolina's tier model policy change to promote economic development might provide insight for other states to implement or restructure their funding formulas.

Methodology

This study used a causal-comparative research design which attempted to examine the cause or reason for different behavior by groups (Gay, Mills, & Airasian, 2006). Causal-comparative studies are also referred to as ex post facto, after the fact, because both the cause and effect have already taken place. This study examined how a funding policy change in 2014 has affected enrollment behavior at North Carolina community colleges since implementation through fall 2018 while including additional institutional characteristics to determine whether there are differences in enrollment patterns.

To answer research question #1, a causal-comparative research design was used to examine if there are significant fall enrollment increases in Tier 1A courses between fall 2014 and 2018. Research question #2 examined if proportionality of fall FTE enrollment differs based on group membership in different institutional factors. A tier enrollment proportionality was established for each group, then examined to see if the

proportionality of fall FTE enrollment within the groups differs. This process was repeated for all six of the institutional factors. It was not possible to effectively compare the pre-post enrollment profiles given the difference in enrollment tier classifications. Thus, the researcher aim was to understand whether enrollment profiles since the policy implementation had followed their intended effect, as well as to see how institutional size, classification, and location may be associated with enrollment profiles after policy implementation. More detailed information on groups and institutional factors is provided in Chapter 3.

Data for this research was provided from the North Carolina Community College System Office, which provided fall FTE enrollment per tier per college. College profile data came from two places. The majority was based on 2017 basic Carnegie classification while geographic profiling came from the North Carolina State Board of Community Colleges. The data was analyzed through a variety of descriptive and inferential statistics. Descriptive statistics included group means and standard deviations, while inferential statistics included chi-square.

Assumptions and Limitations

An assumption made in this study is that state funding exists and supports the overall mission and aim of the institutions. This study, in an attempt to contribute to a larger body of work that is specific to understanding the nuanced processes by which funding occurs, assumes that funding will continue regardless.

The study will have limitations, such as the assumption that all the collected data from the systems offices is accurate and up to date.

The uniqueness of North Carolina also limits generalization. North Carolina is considered to be a state that receives more state appropriation than average. In 2015, of all tax revenue, the state received 10.1 percent which was allocated to higher education compared to a national average of 5.7 (State Higher Education Finance, 2017). North Carolina funds community colleges based on performance and through tiered course enrollment. With respect to tier enrollment funding, North Carolina is the only state that uses this funding model to promote economic development.

The State has 58 community colleges, making it the third-largest community college system in the country (Freidel, Killacky, Miller & Katsinas, 2014). A campus or satellite campus is located within 30 miles of 99 percent of North Carolinians. As of 2014-15, 733,855 or seven percent of state residents took at least one course at a North Carolina community college (North Carolina Community College System, n.d; Assembly, N. C. G., 2016).

Definition of Terms

The following definitions are used for this study:

Community College. Cohen, Brawer, and Kisker (2014) defines a community college, "as any not-for-profit institution regionally accredited to award the associate in arts or the associate in science as its highest degree" (p.5).

Full-Time Equivalent (FTE). Reed (2016) defines "full-time equivalent as the total number of credits taken divided by 15 for a semester or 30 for a year. The idea is to aggregate part-time students into full-time students" (para. 2).

Middle-Skills Job. Jobs requiring education or training beyond high school but not a four-year college degree (Anderson et al., 2018, p. 4).

Performance Funding (PF). "directly connects state funding to an institution's performance on indicators such as student persistence, credit accrual, and college completion" (Dougherty et al, 2014, p.1)

Tiered Funding. Costs based on the expense of operating a class or program (Mullin & Honeyman, 2007).

Skills–Gap. An insufficient number of workers trained to fill middle-skill jobs (Anderson et al. 2018).

Organization of the Study/Summary

The funding of community colleges has changed since their beginning in the early 1900s. One change is that in the early years, community colleges received the majority of their revenue from student tuition and local funding (Richardson & Leslie, 1980). Since then, states have been the primary revenue source for colleges (College Board, 2018). Research has shown that in some cases, by changing how states allocate funding, colleges have changed operations (Hillman, Tandberg, & Fryar, 2015; Wright, 2016).

In 2014, the North Carolina state legislature changed how it allocated funding to the state's community colleges. Colleges started to receive FTE funding in a tiered model, with a premium allocated to courses that address state skills gaps and earns course completers higher wages. This study is going to examine the association between the policy change and student enrollment distributions.

Information from this study will provide two contributions to the area of state funding of community colleges. First, this study is going to advance the knowledge of state funding in community colleges and provide information on how one state is funding community colleges. Second, the study will attempt to examine a particular aspect of

formula funding, tiered funding, and how it is being used to promote economic development.

This first chapter shapes the general framework of the study. In Chapter 2, the literature associated with community college funding, North Carolina community college funding, gaps in the literature, and the theoretical framework are reviewed. In Chapter 3, the author provides an outline for the methodology used in this study.

CHAPTER 2: LITERATURE REVIEW

In the 100+ year history of community colleges, there has been an increase in both numbers of institutions along with enrollment (Cohen, Brawer & Kisker, 2014). As of fall 2017, there are 1,051 colleges enrolling 12 million students in both credit and noncredit courses (AACC, 2019). Another trend tied to community colleges' growth is the ever-changing question of funding. The literature related to community colleges generally centers on the core themes of history, enrollment, funding, purpose, and program and course development. The purpose of this study is to examine the effects tiered funding has on enrollment at North Carolina community colleges. Thus, this literature review focused on the following thematic areas, as outlined in Table 1.

Table 1
Identified Themes in the Literature

Theme	Sources
Founding of Community Colleges	
Importance and relevance of community colleges in the United States	Agatha, 2017; Cohen, Brawer & Kisker, 2014; Hudson, 2008; Phillippe & Sullivan, 2005; Richardson & Leslie, 1980; Tollefson, 2009
Community College Funding	
Base-Funding	Cohen, Brawer & Kisker, 2014; Hearn, 2015
Enrollment Funding	Cohen, Brawer & Kisker, 2014; Hearn, 2015; McKeown-Moak & Mullin, 2014; Mullin, Baime, & Honeyman, 2015; Pfeffer & Salancik, 2003
Performance Funding	Colbeck, 2002; Dougherty & Natow, 2015; Dougherty, Natow, Borg, Jones, and Vega, 2013; Dougherty, Natow & Vega, 2012; Kelchen, 2018; Hillman, 2016; McLendon, M. K., & Hearn, J. C, 2013; Umbricht, Fernandez, and Ortagus, 2015

Tier Funding	Manning and Crosta, 2015; Mullin, Baime, & Honeyman, 2015; Mullin & Honeyman, 2007; Program Evaluation Division, 2016; The Century Foundation Working Group, 2019
North Carolina Funding	
History	North Carolina Community College System, n.d.; Program Evaluation Division, 2016; Rowan Community College, 2019
Base Funding	Program Evaluation Division, 2016
Enrollment Funding	Harbour, 2002; Program Evaluation Division, 2016
Performance Funding	Harbour, 2002; N.C. Gen. Stat. §115D-31.3 Program Evaluation Division, 2016;
Tier Funding	Anderson et al., 2018; Manning and Crosta, 2015; Mullin & Honeyman, 2007; National Skill Coalition, 2015; NCCCS, 2018b; Program Evaluation Division, 2016; State Board of Community Colleges, Division of Finance and Operations, 2018

This study will focus on North Carolina, and the impact that changes in a community college funding model can have on student enrollment. The review of literature will continue from a contextual lens to understand North Carolina community colleges and how the state allocates funding by giving a history of community college funding in the state, along with an examination of how colleges receive their funding today.

Founding of Community Colleges

In the fall of the 2017 school year, 12 million students across the United States enrolled in a community college, 7.1 million in for-credit courses and another 5 million in noncredit (AACC], 2019). This growth came a long way from 1901 when the first junior college was founded in Joliet, IL. Joliet Junior College was started by William Rainey

Harper, who was President of the University of Chicago. Harper thought that universities were responsible for the education of junior and senior undergraduate students and the first two years of college should be taught by secondary schools as an extension of high school, giving a more significant number of students access to higher education (Phillippe & Sullivan, 2005).

In 1907, less than a decade after the founding of Joliet Junior College, California tried to pass the Caminetti Act, which allocated state funding to high schools to create junior colleges. The governor vetoed that legislation. In 1917 similar legislation was proposed again and would pass under the name of the Ballard Act. This act gave money to high schools to offer higher education as long as sufficient funds were available to help with the costs (Tollefson, 2009). The California legislature would also provide funding to start the first state system of junior colleges, which would later become the California Community College System (Agatha, 2017).

By 1921 there were 21 junior colleges in the state, making it the most extensive system in the land. All through the 1900s, the number of junior colleges across the country would increase. The most substantial growth, based on an increased number of institutions, came between 1960 and 1970. During this period, the nation saw the number of junior colleges grow from 400 to 909 institutions, and 1,051 by 2017 (AACC, 2019; Hudson, 2008; Phillippe & Sullivan, 2005).

The small size and number of community colleges created limited demand for public resources, which made public interest in community colleges small from individuals outside of the institutions. The largest provider of funds at the time were local districts, which provided 84 percent of total revenue (Richardson & Leslie, 1980). As the

size and number of community colleges grew, so did the demand for state funding, increasing the interest from outside parties (Cohen, Brawer, & Kisker, 2014).

Community College Funding

According to the College Board's *2018 Trends in College Pricing*, community colleges receive their revenue from three sources: state and local appropriations, which make up the principal revenue source (54%), net tuition revenue (31%), and federal appropriations (15%). Between 2005-06 and 2015-16, state and local appropriations to community colleges declined from 59 percent to 54 percent. During the same period, two-year colleges have seen increases in per-student revenues of $740 (7%) in 2015 dollars. The primary reason for the revenue increases comes from the net tuition increase. As state and local appropriations have declined, net tuition revenue has increased from 27 percent of a two-year college's revenue in 2005-06 to 31 percent in 2015-16 (College Board, 2018).

In fiscal year 2016-17, approximately $20 billion was allocated to community college nationally (AACC, 2019). How this money is allocated has changed over the years and comes in various forms and funding models.

Base-Plus Funding

Until World War II, tuition and fees represented a more significant percentage of revenue to a community college than state money (Cohen, Brawer, & Kisker, 2014). Public money from the state was small in size and came in the form of an allotment or base-plus funding. Base-plus funding provides resources to institutions using an established amount dispersed annually or bi-annually. Each year policymakers decide on

increasing or decreasing the funding based on various issues such as determining if the amount given to the institution is sufficient to achieve policy goals (Hearn, 2015).

A base-plus funding approach does have advantages like lower administrative costs and less need to analyze data on enrollment and achievement, and it gave college leadership freedom to use state resources as they saw fit. The downside of this funding model is that it tended to be slow to react to change like increased annualstudent enrollment (Hearn, 2015).

Enrollment Funding

Along with a new focus on increasing bureaucratic efficiency, formula funding became the new model, which meant allocating monetary resources to institutions was based on a formula such as enrollment funding. By states using enrollment funding to allocate their portion of a community college's revenue, they can designate a dollar amount to how much it costs to provide adequate services to students, then colleges are paid that dollar amount for each student they have enrolled. Simplicity is what makes this approach beneficial (Mullin, Baime, & Honeyman, 2015). This new model maintained that an institution was free to allocate resources as they deemed feasible, but also gave greater predictability to state funding (Hearn, 2015). In 1950, four states were using formula funding. By 2010, the number increased to 35 states (McKeown-Moak & Mullin, 2014; Mullin & Honeyman, 2007).

In 1910, five percent of eighteen-year-olds entered college. In 1960, eighteen-year-olds' college enrollment increased to 45 percent (Cohen, Brawer, & Kisker, 2014). In 2010, fall semester FTE enrollees at community colleges were 7.2 million (Lorenzo, 2018). Resource dependency theory and enrollment funding could have helped

encourage some of the enrollment growth over this time. Resource dependency theory views external resources as what motivates the direction of an organization to maintain its survival (Pfeffer & Salancik, 2003). As funding policy changed from a base model to a formula model centered on enrollment, colleges increased the number of students taking courses. Though enrollment formula funding incentivizes institutions to enroll students, money is not awarded for student completion or based on the delivery cost of a program which could influence the quality of education (Hearn, 2015).

Performance Funding

Over the years, state resources have increased in scarcity, and state legislatures are having difficulty balancing annual budgets. The result has been a shift in focus from enrollment to completion; thus leading to performance funding (PF). PF links the states' funding dollars to the performance of institutions based on numerous indicators such as degree or certificate completion or the attainment of third-party credentials. The premise of using this form of funding is an attempt to move public higher education institutions away from enrollment-based funding. Critics of enrollment-based funding assume that institutions are operating inefficiently, and it is the enrollment funding approach that is contributing to or promoting inefficiencies. Through the use of performance funding, it is presumed that there will be an elimination of inefficiencies because institutions will change focus to maximizing funding by meeting and exceeding metrics set by state legislatures (Kelchen, 2018; McLendon & Hearn, 2013).

PF has evolved over the years with the first version, starting in 1978 with the Tennessee Higher Education Commission which was implemented in 1979-80. The goal of the state was to address the dissatisfaction with enrollment based funding formulas and

rising concerns over performance assessments. In Tennessee's original version of PF, there were five equaled weighted metrics used, and 2 percent of additional funds were available. Over the decade, the metrics and funds available would increase. By 1993, 5.45 percent of additional funds were available, and the number of metrics grew from five to ten. Most of the other early models by states, that would later receive the designation of PF 1.0 were, similar to Tennessee's, focused on degree completion, but did not emphasize student progress through an institution. The money linked to PF funding was minimal in portion and represented bonus money for a college's total operating budget (Kelchen, 2018).

In the early 2000s, PF popularity started to decline from decreasing states dollars to fund the program, less political support, and the increasing complexity of measuring results (Dougherty & Natow, 2015; Dougherty, Natow & Vega, 2012). Since the last recession, the popularity of PF has increased, resulting in the latest version of PF 2.0 which moves the model away from a bonus structure for colleges to part of the overall college's state funding and raising the portion of funding (Dougherty et al., 2013).

When examining PF, one might understand and agree with the idea of giving incentives to promote desired outcomes or that the dependency of resources will lead to organizational changes. Review of the literature can start to change opinions because PF has not had a significant effect on college graduation rates or bachelor and associate degree attainment (Hillman, 2016). The intended effects of PF have been researched and tested in many forms and over various periods, resulting in similar outcomes. Now research is being conducted to look at the unintended consequences of PF policy. For example, results are showing that four-year institutions are increasing their selectivity in

order to limit students that might have uncertain academic success and hurt PF numbers (Colbeck, 2002). Umbricht, Fernandez, and Ortagus (2015) found the public universities in Indiana were responding to PF policies with "declining admission rates and increased selectivity" (p. 643).

PF policies have offered an option to the state legislature to try and control state money going to higher education by creating achievement metrics that award funding. Though PF has become popular, with over 35 states using some form of PF, there are still other forms of formula funding still being used by states.

Tiered Funding

Tiered funding formulas use "data and unit cost studies" to pinpoint the costs of particular courses or programs to figure a proper distribution of dollars (Mullin, Baime and Honeyman, 2015 p. 189). These approaches can be challenging to comprehend or to change as other variables change.

Another challenge with funding based on cost, and the reason there is little research on the cost of delivering a community college education, is the estimation of operational cost. To estimate costs there has to be a known outcome, and the outcomes of community college students vary from graduation to increase earnings. Another issue is the extensive portfolio of programs and courses and their different costs (The Century Foundation Working Group, 2019). Some studies like Manning and Costa (2014) attempt to establish a formula for figuring program costs, while a working group at The Century Foundation has established eight recommendations or a framework to "estimating the cost of a community college education" (The Century Foundation Working Group, 2019, p. 2).

Currently, ten states use some form of tier-based funding: Arkansas, Illinois, Kentucky, Massachusetts, Michigan, Minnesota, North Carolina, Ohio, Oklahoma, and South Carolina (Mullin & Honeyman, 2007). Massachusetts uses a tiered model approach that is part of its larger performance funding model, which accounts for 50 percent of community colleges' state funding (New England Board of Higher Education, 2014). There are three variables in their performance modeling: enrollment, completion, and alignment. Enrollment is "organized into clusters" which are designed to receive funding based on operational program costs, with cluster one receiving the most funding because these programs are the most expensive courses to operate, while cluster three is the least costly (New England Board of Higher Education, 2014, para. 6).

Table 2
Massachusetts Clusters

Cluster One	**Cluster Two**	**Cluster Three**
The Trades	Physical, Biological, and Social sciences	Liberal Arts
Health/Allied Health	Visual and Performing Arts	Business
Math and Computer Science	Pre-Education	Non-credit Workforce Development
Engineering and Architecture Technologies	Developmental Education Services	

Source: Adapted from the New England Board of Higher Education, 2014

Most states are similar to Massachusetts and use tiered funding to address differential costs in programs and courses. North Carolina is unique because tiered funding is used to promote economic development.

North Carolina Funding

History

North Carolina has a long history in higher education. It was the first to open a public university in the country and currently has 17 schools that are part of the University of North Carolina System. North Carolina community colleges started in 1957 when the General Assembly appropriated $500,000 for a state-wide system of industrial education centers and community colleges (Randolph Community College, 2019). In less than five years, North Carolina had five public junior colleges highlighting arts and sciences and seven centers for industrial education concentrating on vocational and technical training. In 1963 the state general assembly enacted G.S. 115A, which would be later changed to 115D, allocating $1 million for the development of the North Carolina Community College System, which was under the oversight of the state board of education. This oversight would last until 1979 when The General Asembly approved a separate state board of community college. Currently, the North Carolina Community College System is made up of 58 colleges with a campus or satellite location within 30 miles of 99 percent of North Carolinians. As of 2014-15, 733,855 or seven percent of state residents took at least one course at a North Carolina community college (North Carolina Community College System, n.d; Program Evaluation Division, 2016).

In fiscal year 2015-16 the North Carolin Community College System received $1.1 billion from the state's General Fund (Program Evaluation Division, 2016; Quinterno, 2019). How the system allocates this money to colleges comes in various forms like legislative priorities which is money allocated to achieve legislative priorities, or another example is base-plus funding.

Base-Plus Funding

As previously mentioned, base funding provides resources to institutions using an established amount dispersed annually or bi-annually. In North Carolina, the way the base funding model works is as follows: each college receives a designated amount that represents the equivalent of seven full-time faculty members, nine administrative positions, and 21 instructional support positions. Then, the college receives money for the salary and additional benefits of the college president. Additional money goes to colleges with higher enrollment and ones that operate multiple campuses. Base-funding averages about 15 percent of a college's state funding, while the majority of state funding comes from enrollment (Program Evaluation Division, 2016).

Enrollment Funding

From early on, formula funding based on enrollment has played a large role in how North Carolina community colleges receive funding. It was a way to maintain equity throughout a state that has a wide diversity in regards to service areas when looking at curriculum and local employment along with students coming from varying socioeconomic status (Harbour, 2002). Between 1967 and 1988, projected FTE was how the State Board of Community Colleges allocated dollars by adding 60 percent to previous fall actual FTE (Program Evaluation Division, 2016).

In 1989 the General Assembly switched from funding projected FTE to funding in arrears which is funding centered on actual enrollment in prior years. To prevent significant funding impact due to enrollment fluctuations, the General Assembly went back and forth between two devices, the Growth and Decline Rule and the Rolling Average Rule. The General Assembly applied the Growth and Decline Rule from 1994

to 1998. This rule stated that enrollment had to increase or decrease by a certain percentage for colleges to receive adjustments in funding. This rule saw a short life because it seemed to penalize colleges that had enrollment growth while helping colleges that were experiencing enrollment declines. The second device that ran from 1989 to 1993 and came back in 1999 was the Rolling Average Rule. This rule funded colleges based on whichever was higher, the actual FTE of the previous year or the average of the prior two or three years (Program Evaluation Division, 2016).

Performance Funding

North Carolina had used PF since 1999 when it began with the passage of House Bill 168, which was a general appropriation bill that dictated PF to North Carolina community colleges that were part of the state's community college system. In the beginning, colleges were given 12 performance measures with performance on six of the measures determining if the college would receive budget flexibility and an additional allocation (Harbour, 2002; N.C. Gen. Stat. §115D-31.3). By achieving the six metrics, colleges were able to carry forward funds equaling ¼ to 1 percent of the year's allotment over into the new academic year.

In 2013 the funding method was amended, and colleges started to receive funding based on a formula measuring quality and impact. Since Fiscal Year 2014-15, a total of $24 million was awarded to community colleges based on performance relative to other colleges (NCCCS, 2018c). Allocation of this funding came from a college's performance on eight performance measures:

1) the success rate in college-level English courses,
2) the success rate in college-level Math courses,

3) progress of first-year curriculum students,
4) curriculum student retention and graduation,
5) attainment of licensure and certifications by students,
6) performance of students who transfer to a four-year institution
7) progress of basic skills students and
8) high school equivalency/adult high school diploma attainment (NCCCS, 2018c, p. 32).

The PF money was allocated based on a college's performance on the metrics relative to the performance of other schools. The legislature has given a specified amount of money to the community colleges to be allocated based on the performance metrics. Then a formula was used to determine a college's potential PF for each particular metrics. A college would receive funding if they met the goal, exceeded the goal, or exceeded a set baseline for the metric that is set by the community college system office (Program Evaluation Division, 2016).

Tiered Funding

Tiered funding is another way North Carolina allocates money to community colleges. As compared to PF in North Carolina, which represents two percent of a college's overall budget, tiered funding has a more significant impact on community colleges' budgets because all curriculum, continuing, and occupation courses are assigned to a tiered funding level (Program Evaluation Division, 2016). The North Carolina 2011 Appropriations Act continued funding colleges using FTE but instructed the State Board of Community Colleges to establish a tiered funding model for the

distribution of FTE dollars joining nine other states (Manning & Crosta, 2015; Mullin & Honeyman, 2007).

North Carolina's tiered funding model gives more money to courses that are in high-cost areas such as health care, technical education, and lab-based sciences, along with occupational extension courses resulting in third-party certificates and other credentials and to promote courses that prepare students to close the state skills gap and earn higher wages (Program Evaluation Division, 2016). Courses can be designated Tiered 1A, 1B, 2, or 3 with 1A receiving top FTE dollars and a 15 percent dollar difference between Tiers, as shown in Table 3. An example of a 1A course would be community college nursing (NUS) courses; a biology (BIO) course would be classified as Tiered 1B course and would receive 15 percent less funding (NCCCS 2018b). The tier identification of a course is reviewed by the Community Colleges System Office's Tier Designation Review Committee every four years (Program Evaluation Division, 2016).

According to a survey of North Carolina community college presidents, the percentage of students taking Tier 2 courses has declined while the percentage of students taking Tier 1A and 1B has increased. College presidents also responded by saying that their respective colleges have increased their offering of Tier 1A courses or "taken steps to establish a priority instructional program in order to offer Tier 1A class" in response to a change to tier funding (Program Evaluation Division, 2016, p. 22).

Table 3
Current Tier Funding Amounts and Course Designations, Fiscal Year 2018–19

Tier 1A courses are funded at $4,583.10 per FTE	**Tier 1B courses are funded at $4054.28 per FTE**	**Tier 2 courses are funded at $3,525.46 per FTE**	**Tier 3 courses are funded at $2,229.86 per FTE**
• Curriculum courses in health care and technical education that train North Carolinians for immediate employment in priority occupations that have documented skills gaps and pay higher wages • Occupational extension courses that train students for the same third-party certification as curriculum courses in Tier 1A	• Curriculum courses in other high-cost areas of health care, technical education, and lab-based science • College-level math courses • Occupational extension courses that help prepare students for jobs in priority occupations and lead to competency-based industry credentials	• All other curriculum courses • All basic skills courses • Other occupational extension courses that are scheduled for 96 hours or more and lead to a third-party credential	• All other occupational extension courses

Source: Adapted from Program Evaluation Division, 2016 and State Board of Community Colleges, Division of Finance and Operations, 2018.

The purpose of a tiered funding model is twofold. The first is to assign money to programs and courses based on costs such as health care, technical education, and lab-based sciences. The second reason is to incentivize colleges to develop programs to help close the state skills gaps and earn program graduates and course completers higher wages (Program Evaluation Division, 2016). There is a significant concern for a worker skills gap in the United States, in particular for jobs requiring middle-skills. "Middle-skill jobs require education beyond high school but not a four-year degree" (National Skill Coalition, 2015, p. 1). According to the National Skills Coalition (2015), 53 percent of jobs in the United States are middle-skills jobs. The problem is that even though

middle-skill laborers are in high demand, the supply of these individuals is low, with only 43 percent of employees having middle-skills training.

One geographic area hit by the skills gap is the "southern states," starting with Maryland and Delaware, heading south down to Florida and westward to Oklahoma and Texas. Over fifty percent of jobs in the South classify as middle-skill jobs (Anderson et al., 2018). Historically the South has been considered a low wage, low skill economy. Recently those industries have withdrawn, and middle-skill industries have been on the rise.

According to a report conducted by eight members from the Federal Reserve (Fed) of Saint Louis, Fed of Atlanta, and the National Skills Coalition, "If each and every one of the South's graduating high school students were to stay in the region and train for open jobs that require post-secondary education or training there would still be unfilled positions" (Anderson et al., 2018, p. 8). Some other interesting details from the study is that the region represents eight of the ten states with the highest quantity of working-age adults with a peak education level of high school. Also, the region has nine of the top twelve states with a large share of youths ages sixteen to twenty-four who are not working and not in school. This report makes a strong argument for the significant demand for education that will help elevate the region's skills gap, along with supporting the reasoning by North Carolina to add a Tier 1A to the funding formula, which funds courses like "health care and other technical education programs that train North Carolinians for jobs that have documented skills gaps and that pay higher wages" (Program Evaluation Division, 2016, p. 19).

Gaps in the Literature

Tiered funding is a funding model based on course operational expense; it has support from institutions and has been recommended as an alternative to equal FTE enrollment (Manning & Crosta, 2015). The model looks at course costs, and the state assigns funding based on the cost to operate the course. North Carolina has been using this enrollment funding model since 2011. In 2014, the model was changed, moving from three tiers to four and allocating a funding premium to colleges that offer courses that promote economic development (Anderson et al., 2018; Program Evaluation Division, 2016).

There is little research available that looks at the funding of community colleges based on operational cost. The North Carolina General Assembly's Program Evaluation Division (2016) found that, since the state moved to tier funding in the 2011 and 2012 school year, the percentage of FTE enrollment in Tier 1 courses has increased while Tier 2 enrollment has decreased. The study also examined enrollment since the 2014 policy change to promote economic development and found that the percentage of FTE enrollment in Tier 1A grew from the first year the model started in the 2014/2015 school year to the next. Currently, there are only two years of data available. This study provides an opportunity to expand the enrollment study done by the States's Program Evaluation Division out to a longer time frame and create variables to get a deeper understanding of the topic (Program Evaluation Division, 2016).

Theoretical Framework

The theoretical framework of this study follows the Resource Dependency Theory (RDT). RDT examines the environment that surrounds an organization and provides

resources for the organization's survival (Pfeffer & Salancik, 2003). The theory assumes that the environment provides the organization with critical recourses. “Criticality measures the ability of the organization to continue functioning in the absence of the resource or in the absence of the market for the output” (Pfeffer & Salancik 2003, p. 46). Due to the dependence on the resource for survival, the provider of the resource has significant power over the organization. (Pfeffer & Salancik, 2003). RDT theory typically has been used in the analysis of for-profit industries (Powell & Powell Rey, 2015). For this study, the focus will be on higher education studies that used RDT.

RDT studies that have examined four-year institutions analyzed the relationship of tuition as the critical resource demanded by colleges, while students represent the provider of the critical resource, giving them power and influence over higher education operational decisions. Fowles’ (2014) study found that tuition dollars heavily influence institutional expenditures, which results in institutions that have a greater dependence on tuition shifting their funding on educational activities such as instruction, student services, and overhead. According to the study, a one percent increase in the amount of total operating revenue coming from tuition results in a .78 percent increase in education activities (Fowles, 2014). Tuition also has a positive relationship with college persistence and completion (Titus, 2006a; 2006b). In both of Titus’ (2006a; 2006b) studies, colleges that had a change to a more tuition-dependent revenue structure responded by altering their expenditures to emphasize activities such as student retention and completion.

RDT has also been used to examine the influence that resources have had on community colleges. Askin (2007) used RDT to examine the mission differences between community colleges in states that were dual-funded from the state and local

government or state-funded only. Due to the difference in the funding approaches and who was providing the critical resources, significant variances appeared in colleges' "student bodies, programming, expenditures, and outcomes" (p. 977). Kenton, Schuh, Huba, and Shelley (2004) examined the funding of 244 community colleges in 12 upper Midwestern states. Results from the study found that funding was consistent with RDT and that when a state had low critical funding from one revenue source, colleges would adapt and maintain their survival by locating other sources of revenue.

PF literature also references and uses RDT as a theoretical framework with different results (D'Amico, Friedel, Katsinas, & Thornton, 2014; Kelchen, & Stedrak, 2016; Li, & Kennedy, 2018; McKinney & Hagedorn, 2017; Rabovsky, 2012; Sanford & Hunter, 2011). Some studies have been able to show a slight to significant influence on expenditure patterns and the composition of their student body (e.g., Kelchen & Stedrak, 2016; Rabovsky, 2012).

While other studies have not seen any changes but have addressed the concern for the unintended consequences that come from PF, one such example of this is colleges limiting entrance to disadvantaged students or "creaming" (Li & Kennedy, 2018; McKinney & Hagedorn, 2017; Sanford & Hunter, 2011). This is a legitimate concern, especially to community colleges that have an open-access mission. Nonetheless, RDT could be a possible framework to explain creaming behavior. As funding or critical resources are removed, colleges respond by limiting students who provide smaller amounts of resources or soliciting students who will increase college resources.

One view of why PF is not providing the results its designers intended is because PF only represents a small portion of the institution's overall budget, so the money does

not fit the definition of a critical resource (Pfeffer & Salancik, 2003; Sanford & Hunter, 2011). North Carolina's PF approach to funding community colleges fits this framework. Currently, only two percent of a community college's overall state funding comes from a colleges performance on PF metrics. While community college presidents feel the metrics are useful from a planning perspective, they feel the amount needs to be higher, closer to nine percent (Program Evaluation Division, 2016).

In North Carolina, state funding for community colleges represents a critical resource because 59 percent of their revenue comes from the state which supports the assumption that the stability of the college depends on the stability of funding for the state (Kenton, Schuh, Huba, & Shelley, 2004; Program Evaluation Division, 2016). Funding for the state comes in three ways: base allotment, PF, and enrollment. Tiered enrollment funding accounts for 83 percent of the state revenue a college receives, which represents the most considerable portion of the critical resource (Program Evaluation Division, 2016). With colleges having such a high dependence on state funding, this equates to state governments having significant power and influence over community colleges.

Consequently, when the state decided to change the allocation of money in 2014 to have colleges focus on courses that promote economic development, then, according to RDT, the policy change should influence institutional operations in the form of student enrollment in Tier 1A courses which will provide colleges with a 15 percent revenue increase per FTE and the early research gives support to this theory. This research is interested in a longer-term view of this funding change to find out whether enrollment will continue to gravitate to higher-paying tiered courses, as well as whether this is

happening at all 58 community colleges or if the student enrollment changes are limited to certain factors.

The theoretical framework section explained RDT and provided examples of RDT used in higher education research with a strong focus on PF. Finally, this framework justifies using RDT as the theoretical framework when looking at the change in state funding to promote economic development through the use of tiered funding for North Carolina community colleges.

Summary

The history of community college funding has been established in this review of the literature. The review followed up with research and information on types of funding such as base-allotment, enrollment, PF, and tiered funding. The review continues with details on the history of North Carolina community colleges and state funding, along with information on the present funding of community colleges, base funding, enrollment, PF, and tier funding.

The literature reviewed establishes that community college funding is ever-changing, with policies being developed to accomplish defined goals. Tiered funding is one of the latest funding models, and North Carolina's use of the model to stimulate courses that promote economic development is even newer. An examination of this funding model helps address the gaps in the literature which shows that there is minimal research on this topic. Within the theoretical framework used in this chapter, this research contributes to the growing body of literature on community college funding and its influence on organizational behavior.

CHAPTER 3: METHODOLOGY

Regardless of the increasing research on community college funding and the variety of ways to use state resources to promote state initiatives, the research on using tiered enrollment funding to promote economic development is limited (Hillman 2016; Kelchen & Stedrak, 2016). The purpose of this study was to examine how the implementation of tiered funding to promote economic development was associated with enrollment behavior at North Carolina community colleges. In addition to increasings the developing body of community college funding literature, the knowledge gained from this study might have impending consequences for practitioners, legislators, and researchers across the country who are involved in state funding of community colleges. The proposed methodology investigating tiered funding and enrollment is outlined in the sections that follow.

Research Questions and Hypotheses

1. Has the overall proportion of enrollment by program tier (tiered enrollment profile) changed over time across all 58 NCCC since the introduction of the 2014 tiered funding policy?

H0: The overall tiered enrollment profile is not dependent on year for the entire population of CC

2. Has the tiered enrollment profile within specific CC institutional groupings related to institutional size, classification, and location changed over time since the introduction of the 2014 tiered funding policy?

H0: The tiered enrollment profile is not dependent on year within institutional groupings.

Research Design

This study used a causal-comparative research design which attempts to examine the cause or reason for different behavior by groups. Causal-comparative studies are also referred to as ex post facto, after the fact, because both the cause and effect have already taken place (Gay, Mills, & Airasian, 2006). This study examined how a funding policy change in 2014 was associated with enrollment behavior at North Carolina community colleges since implementation. It is not possible to effectively compare the pre-post enrollment profiles given the difference in enrollment tier classifications. Thus, the researcher aimed to understand whether enrollment profiles since the policy implementation had followed their intended effect, as well as to see how institutional size, classification, and location may have affected enrollment profiles after policy implementation.

Context

Setting and Sample

The setting for the study was the North Carolina Community College System. The system has 58 colleges with a campus or satellite location within 30 miles of 99 percent of North Carolinians. As of 2014-15, 733,855 or seven percent of state residents took at least one course at a North Carolina community college (North Carolina Community College System, n.d; Program Evaluation Division, 2016).

According to Carnegie "Basic" Classifications, all the institutions in this study are public two-year associate degree-granting colleges, with 40 percent of the institutions having a disciplinary focus mix between transfer and career and technical education, along with a mix of dominant student type of traditional and nontraditional. Sixty-two

percent of the institutions in the system have a Carnegie size classification of small, having fall FTE enrollment of 500 -1,999 students (Carnegie, 2018).

Background

After the passing of the first tiered funding formula model in 2011, every course prefix in the North Carolina community college combined course library received a tier designation (Program Evaluation Division, 2016). The tiers ranged from 1 to 3 with Tier 1 and 2 courses being curriculum and occupational extension courses that led to third party credentials while Tier 3 were occupational extension courses only. The Tier funding model established a 15 percent funding variance between each tier. Tier 1 courses received the most amount of full-time equivalent (FTE) enrollment funding, while Tier 3 courses receive the least. In 2014, a fourth tier was created, Tier 1A, which became the highest-funded tier (North Carolina Community College System, n.d.; Program Evaluation Division, 2016). With the new funding policy Tier 1A, 1B, and 2 were now for curriculum courses and occupational extension courses that yielded third party credentials while Tier 3 remained for occupational extension courses only. This research focused on tier funding of curriculum courses only, Tier 1A, 1B, and 2.

Based on a report conducted by the Program Evaluation Division of the North Carolina General Assembly in 2016, the percentage of FTE enrollment in Tier 1 increased while Tier 2 enrollment has decreased between the 2011-12 and 2015-16 school years. Similar results also occurred after the 2014 policy change, with a decline in the percentage of students taking Tier 2 courses and an increase in the percentage of students taking Tier 1A and 1B (Program Evaluation Division, 2016). In the same report, the authors concluded that respective colleges had “taken steps to establish a priority

instructional program in order to offer Tier 1A class[es]" (p. 22) in response to a change to tier funding, this information is based on a survey of community college presidents within the report.

Variables

The referenced 2016 report by the Program Evaluation Division provided tiered annual enrollment data as a sum of all community colleges after two years of policy implementation. This study differed from previous research by examining policy effects on fall enrollment only through additional years of implementation (through Fall 2018) and included additional institutional characteristics to determine whether there are differences in tier enrollment profiles. Research question 1 was answered by using a causal-comparative research design that examines if there are significant tier enrollment profile changes for North Carolina community colleges between fall 2014 and 2018. Research question 2 was answered by examining if proportionality of fall FTE tier enrollment profiles between 2014 -2018 changed within community college institutional groups related to institutional size, classification, and location since the introduction of the 2014 tiered funding policy.

- Geographic region: Six Trustee Association Regions are used by the State Board of Community Colleges when deciding on board member representation (N.C. Gen. Stat. §115D-62). The distribution of colleges by region is highest in Region 5 (12), lowest in Region 2 (eight), while the other four regions have nine or 10 colleges. A map of the regions is shown in Figure 1.

- Disciplinary focus: 27 percent of North Carolina community colleges have a transfer disciplinary focus as defined by basic Carnegie Classifications (Carnegie Classification, 2019a). The other colleges have a mixed to predominance in career and technical education.
- Dominant student type: Carnegie Basic Classification divides institution based on dominant student type (traditional, nontraditional, or mixed) (Carnegie Classification, 2019a). North Carolina community colleges have schools in each student type with mixed traditional/nontraditional being the largest at 48 percent.
- Undergraduate profile: Carnegie undergraduate profile has four groupings based on the percentage of part-time student enrollment. Higher part-time equates to 60 percent or higher, mixed part/full-time is 40 percent to 59 percent, medium full-time is 10 percent to 39 percent, and higher full-time enrollment is less than 10 percent (Carnegie Classification, 2019b). North Carolina community colleges have an undergraduate profile of either higher part-time or mixed part/full-time, with the latter being the majority.
- Institutional size: Carnegie Classification includes five size classifications. For this research, the five classifications have been consolidated down to three to create larger sample sizes. Based on fall FTE enrollment: Small (less than 1,999), medium, (2,000 to 4,999) and large (greater than 5,000) (Carnegie Classification, 2019c). The majority of community colleges in North Carolina are small (39), with a plurality being of medium size (13).

- Locale: Locale refers to the degree of urbanization in the Carnegie Classification data. Colleges will fit into one of ten groups: city large, city midsize, city small, suburb large, suburb midsize, suburb small, town fringe, town distant, town remote, rural fringe, rural distant, and rural remote (Indiana University Center for Postsecondary Research, 2018). In an attempt to increase sample sizes, the locale classifications have been condensed to four, city, suburb, town, and rural. Town and rural are the two largest sample sizes, with 26 and 22 colleges respectively.

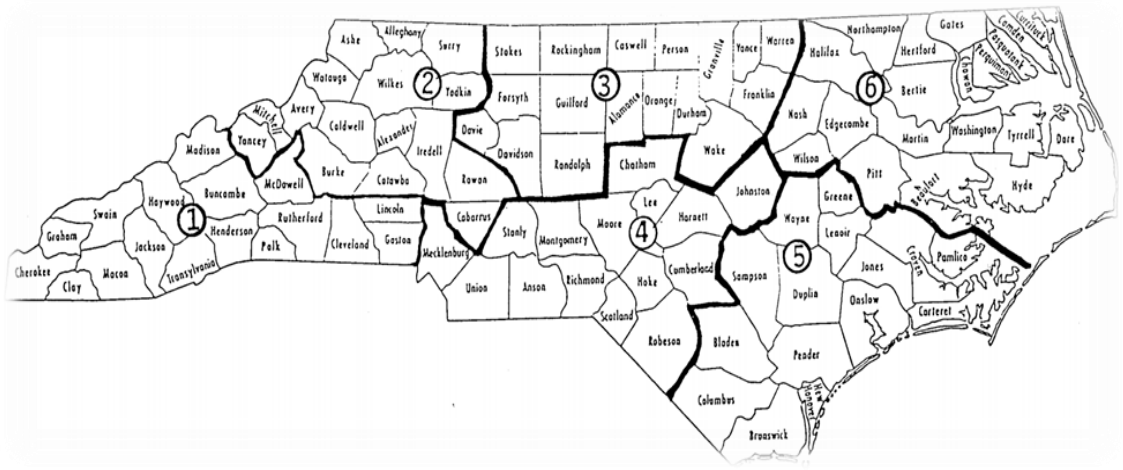

Figure 1. State Board of Community Colleges trustee association regions as established in NCGS 115D-62 (NCCCS, 2019).

The dependent variable for this study was the proportionality of enrollment (tier enrollment profiles) in the three tiers (Tier 1A, 1B, and 2), which was examined separately in relation to academic year (research question 1) and six different independent variables that detailed institutional factors that may be associated with enrollment (research question 2). Five of the factors were based on classifications specified by

different Carnegie classification categories, and one was based on a local geographic region categorization that is used by the North Carolina Board of Community Colleges.

Procedure

Data Collection and Data Analysis

Data for this research was provided by the North Carolina Community College System Office, which was Fall FTE enrollment per tier per college from 2014 to 2018 (Appendix A). The use of Fall FTE enrollment gave more accurate information about funding influence on enrollment than the use of whole school year data. Whole school year data included summer enrollment, which did not receive FTE funding from the state until 2016, which could have resulted in possible increases in enrollment that might not be attributed to any incentivizing of Tier 1A courses.

After the dataset was obtained the researcher completed the data set to enter the information for each college. A proportion of fall enrollment in each tier as a percentage of FTE was established for the entire system of North Carolina community colleges. For the aggregate of North Carolina community colleges, proportionalities were illustrated by the percentages of FTE Fall enrollment for Tier 1A, 1B, and 2 (tier enrollment profile) over the designated time frame, fall semester 2014 to fall semester 2018. Year by year data was analyzed using a chi-square test of independence to see if enrollment profiles across tiers were dependent on academic year. Since there was significant chi-square results, residuals were calculated to examine the difference between observed and expected FTE for each tier by year cell combination, based on criteria discussed by Sharpe (2015). "A residual is the difference between the observed and expected values for a cell. The larger the residual, the greater the contribution of the cell to the magnitude

of the resulting chi-square obtained" (Sharpe, 2015, p. 2). Also, examining the change in proportionality of FTE by tier between 2014 and 2018 offered another method to understand the nature of the tiered enrollment profile changes

The tiered enrollment profile for the fall semesters 2014 to 2018 within specific community college institutional groups was analyzed based on six factors: Trustee Association Regions, disciplinary focus, dominant student type, undergraduate profile, institutional size, and locale. Table 4 provides the category groupings for each factor, along with the number of colleges that are classified in the category.

Table 4
Institutional Factors for Research Question 2

Factors	**Groups**	**Number of Colleges**
Trustee Association Regions	Region 1: The counties of Buncombe, Cherokee, Clay, Cleveland, Gaston, Graham, Haywood, Henderson, Jackson, Lincoln, Macon, Madison, McDowell, Polk, Rutherford, Swain, and Transylvania.	9
	Region 2: The counties of Alexander, Alleghany, Ashe, Avery, Burke, Cabarrus, Caldwell, Catawba, Iredell, Mitchell, Rowan, Surry, Watauga, Wilkes, Yadkin, and Yancey.	8
	Region 3: The counties of Alamance, Davidson, Caswell, Davie, Durham, Forsyth, Franklin, Granville, Guilford, Orange, Person, Randolph, Rockingham, Stokes, Vance, Warren, and Wake.	10
	Region 4: The counties of Anson, Chatham, Cumberland, Harnett, Hoke, Johnston, Lee, Mecklenburg, Montgomery, Moore, Richmond, Robeson, Scotland, Stanly, and Union.	10
	Region 5: The counties of Bladen, Brunswick, Carteret, Craven, Columbus, Duplin, Greene, Jones, Lenoir, New Hanover, Onslow,	12

	Pamlico, Pender, Sampson, and Wayne.	
	Region 6: The counties of Beaufort, Bertie, Camden, Chowan, Currituck, Dare, Edgecombe, Gates, Halifax, Hertford, Hyde, Martin, Nash, Northampton, Pasquotank, Perquimans, Pitt, Tyrrell, Washington, and Wilson.	9
Disciplinary Focus	High Transfer	16
	Other: Mixed to Predominant Career & Technical	42
Dominant Student Type	High Traditional	14
	Mixed Traditional/Nontraditional	28
	High Nontraditional	16
Undergraduate Classification	Higher part-time	44
	Mixed part/full-time	14
Size of the Institution	Small is 1,999 and below	39
	Medium, is 2,000 to 4,999,	13
	Large is 5,000 and above	6
Locale	City	11
	Suburb	9
	Town	16
	Rural	22

Source: Adapted from Carnegie Classification, 2019a; 2019b; 2019c; Indiana University Center for Postsecondary Research, 2018: N.C. Gen. Stat. §115D-62

After tier enrollment profiles were developed for each respective group within each institutional factor, data was analyzed using a chi-square test of independence to see if tier enrollment profiles were dependent on academic year within each specific institutional grouping category. Thus, a chi-square analysis was calculated for each region (6), each disciplinary focus (2), each Basic Carnegie Classification (3), each undergraduate classification (2), each institutional size category (3), and each locale

category (4). Residuals were also calculated to examine the difference between observed and expected FTE for each tier by year cell combination, along with an examinantion of the change in proportionality of FTE by tier between 2014 and 2018.

Delimitations and Limitations

North Carolina community colleges provide three educational programs: curriculum programs, continuing education, and basic skills training (Program Evaluation Division, 2016). Tiered funding is earned for FTE enrollment in both curriculum programs and continuing education. This study focused on the 2014 policy change to use tiered funding to promote economic development and its effects on enrollment profiles. In an attempt to attain more specific information about college behavior, this study went beyond aggregate community college enrollment profiles and analyzed the enrollment profiles by subgroups.

This study was limited based on the quality of the data that was received from the system office, which was out of the researcher's control. Other limitations were the inability to conclude that the policy change was the cause of potential changes in enrollment profiles, and the inability to examine a large sample of colleges given that North Carolina was the only state to have introduced this type of policy.

Summary

This chapter discussed the methodology proposed by the researcher to conduct a causal-comparative study on the effects of tier enrollment funding policy on enrollment behavior among community colleges in North Carolina. The study design was clarified along with an attempt to establish context through the explanation of setting, sample, background, and variables. Finally, the study procedure was identified through an

explanation of the data collection and analysis process along with possible delimitations and limitations in the study.

CHAPTER 4: RESULTS

The purpose of this research was to examine how the implementation of tiered funding to promote economic development is associated with enrollment behavior at North Carolina community colleges. Enrollment behavior by tier was examined at the aggregate level for the entire community college (CC) system (research question 1), as well as by specific CC institutional grouping variables (research question 2): geographic region, disciplinary focus, dominant student type, undergraduate classification, size, and locale. The results of the analyses are presented in this chapter in the same order and format for the aggregate sample and for each of the six grouping variables. First, the results from the chi-square test for independence are presented followed by a review of the residual results, and finally information on the variance in proportionality between 2014 and 2018 Fall FTE hours is presented by tier. Data tables and summary tables for the aggregate enrollment are presented in the chapter, while data and summary tables for institutional groups are provided in Appendix B-V. Microsoft Excel 2016 was used for all analyses.

Tiered Enrollment Profile for NC Community Colleges, 2014-2018

The data provided by the North Carolina Community College system included Fall FTE hours by subject prefix by year (2014- 2018) for each of the 58 CCs. Each subject prefix was coded with its tier designation of 1A, 1B, or 2. The focus of research question 1 was to examine whether the overall proportion of enrollment by program tier (tiered enrollment profile) changed over time across all 58 NCCCs since the introduction of the 2014 tiered funding policy.

To answer research question 1, I sorted the Fall FTE hours by year then by tier level. I summed the Fall FTE hours by tier level for each year to create a tiered enrollment profile using proportionalities (Tables 5 & 6).

Table 5

Aggregate Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	13615.7	20184	56328.326	90127.9768
2015	13300.8	20402.7	52094.48	85797.963
2016	13275.4	20940.2	50495.04	84710.6546
2017	13304.4	21066.2	48995.665	83366.243
2018	13338.9	20949	47636.675	81924.5284

Table 6

Aggregate Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	15.11%	22.39%	62.50%
2015	15.50%	23.78%	60.72%
2016	15.67%	24.72%	59.61%
2017	15.96%	25.27%	58.77%
2018	16.28%	25.57%	58.15%

After creating a tiered enrollment profile for each year, I ran a chi-square test of independence to see if enrollment profiles across tiers were dependent on an academic year (Table 7). The results showed that the test was statistically significant ($p<.001$), indicating that the overall tiered enrollment profile was dependent on year for the entire population of community colleges.

Table 7

Aggregate Test Statistics

Chi-square statistic	461.27197895415
Df	8
Critical value	15.50731306
p-value	1.4201E-94

Given the significance of the chi-square test result, I next calculated residuals to examine the difference between observed and expected FTE for each tier by year cell combination. Based on criteria discussed by Sharpe (2015), I flagged a cell if the adjusted residual had an absolute value of 3 or higher, indicating that the observed value was significantly higher or lower than expected. Twelve of 15 cells met this criterion. All of the cells in 2014 and 2018 had large residuals. In 2014, Tier 1B had higher FTE than expected, while Tiers 1A and 2 had lower FTE than expected. In 2018, the pattern was slightly different, with Tiers 1A and 1B higher than expected, and Tier 2 lower than expected. The years in between (2015-2017) showed Tier 1B higher than expected, with Tier 2 lower than expected, with none of the Tier 1A residuals reaching the criterion value of -3. The largest positive residuals were all for Tier 1B (32-56), while the largest negative residuals were all for Tier 2 (-22 to -50).

When looking at adjusted residuals by tier over the five-year period, Tier 1A adjusted residuals started negative (lower than expected) in 2014, were relatively neutral in 2015 and 2016, changed to positive in 2017 and increased to higher than expected in 2018. Tier 1B adjusted residuals started and stayed positive, illustrating greater enrollment than expected in every cell. Tier 2 adjusted residuals started and stayed negative, illustrating less than expected enrollment in every cell.

Table 8

Residual Results for Fall FTE Hours by Tier, years 2014-2018

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	13615.7	20184	56328.3	90128
	Exp	14142.6	16838.1	59147.3	
	Column %	20.37%	25.37%	20.15%	
	Row %	15.11%	22.39%	62.50%	
	Res	526.935	-3345.9	2819	
	Std. Res	-4.4309	25.7853	-11.591	
	Adj. Res	-5.4348	32.2038	-22.266	
2015	Obs	13300.8	20402.7	52094.5	85798
	Exp	13463.1	16029.1	56305.7	
	Column %	19.90%	25.64%	18.64%	
	Row %	15.50%	23.78%	60.72%	
	Res	162.356	-4373.6	4211.24	
	Std. Res	-1.3993	34.5449	-17.747	
	Adj. Res	-1.7053	42.8684	-33.874	
2016	Obs	13275.4	20940.2	50495	84710.7
	Exp	13292.5	15826	55592.2	
	Column %	19.86%	26.32%	18.06%	
	Row %	15.67%	24.72%	59.61%	
	Res	17.076	-5114.2	5097.12	
	Std. Res	-0.1481	40.6529	-21.618	
	Adj. Res	-0.1802	**50.3677**	-41.196	
2017	Obs	13304.4	21066.2	48995.7	83366.2
	Exp	13081.6	15574.8	54709.9	
	Column %	19.91%	26.47%	17.53%	
	Row %	15.96%	25.27%	58.77%	
	Res	-222.84	-5491.4	5714.21	
	Std. Res	1.9483	44.0017	-24.43	
	Adj. Res	2.36603	**54.4097**	**-46.463**	
2018	Obs	13338.9	20949	47636.7	81924.5
	Exp	12855.3	15305.5	53763.7	
	Column %	19.96%	26.33%	17.04%	
	Row %	16.28%	25.57%	58.15%	
	Res	-483.53	-5643.5	6127.06	
	Std. Res	4.26464	45.6171	-26.425	
	Adj. Res	5.16814	**56.2888**	**-50.151**	
Marginals		66835.1	79573.4	279519	425927

Examining the change in proportionality of FTE by tier between 2014 and 2018 offers another method to understand the nature of the tiered enrollment profile changes (Table 9). Increases in proportionality were seen for Tiers 1A and 1B, with Tier 1B showing a greater increase in proportionality (3.18 percentage points; 14.18%) than Tier 1A (1.17 percentage points; 7.78 %). For Tier 2, the proportionality decreased by 4.35 points (6.96 %).

Table 9

Aggregate Tier Variance between 2014 and 2018

	1A	1B	2
Percentage Point Change	1.17	3.18	-4.35
Percentage Change	7.78%	14.18%	-6.96%

In summary, aggregate Fall FTE hours showed a significant response to time. Tier 1A and Tier 1B increased in proportionality between 2014 and 2018, while Tier 2 decreased in proportionality. Adjusted residuals for Tiers 1A and 1B were greater than expected in the later years of the study while Tier 2 estimates were less than expected, illustrating a movement of FTE hours out of Tier 2 into Tiers 1A and 1B.

Tiered Enrollment Profile Changes within Institutional Groupings, 2014-2018

As with the aggregated data for all 58 CCs, I sorted Fall FTE hours for each institutional grouping by tier year then tier level. Then, I summed the Fall FTE hours by tier level for each year to create a tiered enrollment profile using proportionalities. After creating a tiered enrollment profile for each designated year, a chi-square test of independence was run to see if group enrollment profiles across tiers were dependent on the academic year. Finally, I calculated residuals and compared the change in proportionality between 2014 and 2018 to understand the nature of enrollment profile changes.

Geographical Region

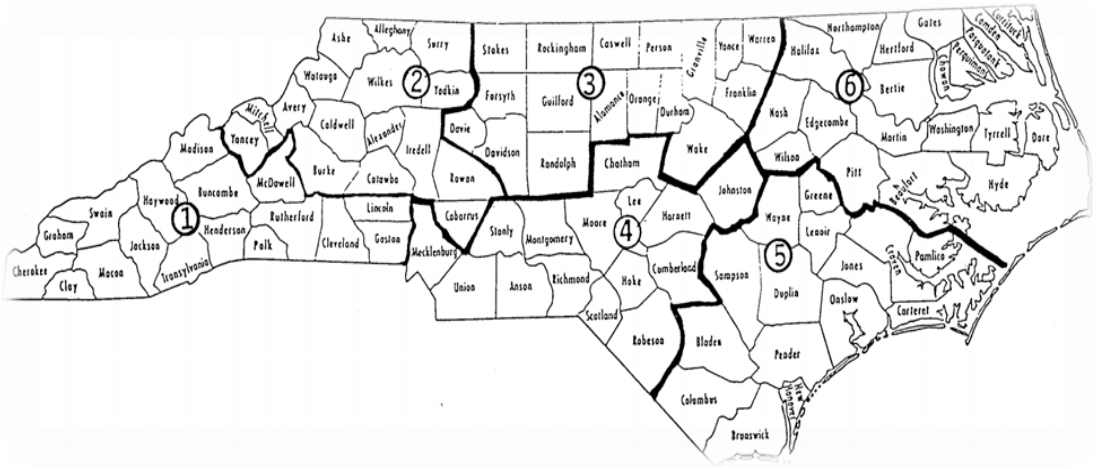

Figure 2. State Board of Community Colleges trustee association regions as established in NCGS 115D-62 (NCCCS, 2019).

Table 10
Overview of Regional Residuals

	Chi-Square Test for Independence Significant Yes or No	Adjusted residual cells with an absolute value that exceeded 3	Cells with the 5 largest adjusted residuals (largest to smallest)	2014 - 2018, Tier 1A adjusted residuals (positive or negative)	2014 - 2018, Tier 1B adjusted residuals (positive or negative	2014 - 2018, Tier 2 adjusted residuals (positive or negative)
Region 1	Yes	3	2014 (2), 2014 (1A), 2018 (1A), 2017 (2), 2018 (2)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Region 2	Yes	5	2014 (2), 2018 (2), 2014 (1B), 2018 (1B), 2014 (1A)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

Region 3	Yes	6	2014 (2), 2014 (1B), 2018 (2), 2017 (2), 2017 (1B)	2014 (-), 2015 (+), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Region 4	Yes	**7**	2014 (2), 2014 (1B), 2018 (2), 2017 (2), 2018 (1B)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (+), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Region 5	Yes	6	2014 (2), 2018 (2), 2014 (1B), 2018 (1B), 2014 (1A)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Region 6	Yes	4	2014 (1B), 2018 (1B), 2018 (2), 2014 (2), 2015(1B)	2014 (+), 2015 (-), 2016 (-), 2017 (-), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

As provided above in Table 10, all the regions had significant chi-square results. Region 4 had the largest number of adjusted residual cells (7) that had an absolute value that exceeded 3, indicating that the observed value was significantly higher or lower than expected. Five of the six regions' largest residual cells were 2014 Tier 2 with Region 6 having 2014 Tier 1B. Region 6 was also the only region that did not have its largest five residual cells exceed 3.

Four of the six regions had Tier 1A’s adjusted residuals start negative (less than expected) in 2014 and turned positive in 2016 with the positive numbers increasing in 2017 and 18. Tier 1A in Region 3 started negative in 2014 changed to positive in 2015, negative in 2016, and back to positive for 2017 and 2018. Tier 1A in Region 6 started positively in 2014, turned negative in 2015, 2016, 2017, and flipped back to positive in

2018. Five of the six regions had Tier 1B's adjusted residuals start negative in 2014, turn positive in 2016 and stay. Tier 1B in Region 4 started negative and turned positive in 2015 and remained for the rest of the study. All six regions had Tier 2's adjusted residuals start positive in 2014, then turned and stayed negative in 2016.

Disciplinary Focus

Table 11
Overview of Disciplinary Focus Residuals

	Chi-Square Test for Independence Significant Yes or No	Adjusted residual cells with an absolute value that exceeded 3	Cells with the 5 largest adjusted residuals (largest to smallest)	2014 - 2018, Tier 1A adjusted residuals (positive or negative	2014 - 2018, Tier 1B adjusted residuals (positive or negative	2014 - 2018, Tier 2 adjusted residuals (positive or negative
High Transfer	Yes	8	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Mixed	Yes	12	2014 (2), 2014 (1B), 2018 (2), 2017 (2), 2018 (1B)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

Table 11 illustrates the residuals for the Disciplinary Focus institutional groups. Both colleges with a High Transfer and Mixed to Predominance in Career and Technical Education had significant chi-square results. Colleges with High Transfer had eight of fifteen adjusted residual cells with an absolute value that exceeded 3, indicating the observed value was significantly higher or lower than expected. While colleges with Mixed to Predominance in Career and Technical Education had twelve of fifteen adjusted residual cells, twelve were the highest among all institutional groups.

Both group's cells with the three largest residuals were 2014 Tier 2, 2014 Tier 1B, and 2018 Tier 2. High Transfer's final two were 2018 Tier 1B and 2017 Tier 2, while Mixed to Predominance in Career and Technical Education had 2017 Tier 2 and 2018 Tier 1B as there fourth and fifth largest residuals.

High Transfers Tier 1A adjusted residuals started negative (less than expected) in 2014, turned positive in 2017 and stayed positive. While Mixed to Predominance in Career and Technical Education started negative in 2014, it turned positive in 2016, and stayed positive. Both groups, Tier 1B and Tier 2, had similar results. Tier 1B's adjusted residuals started negative, turned positive in 2016 and stayed positive. As Tier 2's adjusted residuals started positive (more than expected) in 2014, it turned negative in 2016 and stayed.

Dominant Student Type

Table 12
Overview of Dominant Student Type Residuals

	Chi-Square Test for Independence Significant Yes or No	Adjusted residual cells with an absolute value that exceeded 3	Cells with the 5 largest adjusted residuals (largest to smallest)	2014 - 2018, Tier 1A adjusted residuals (positive or negative	2014 - 2018, Tier 1B adjusted residuals (positive or negative	2014 - 2018, Tier 2 adjusted residuals (positive or negative
High Tradition	Yes	8	2014 (2), 2014 (1B), 2018 (2), 2017 (2), 2017 (1B)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Mixed	Yes	9	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), **2016 (-)**, 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

Nontrad	Yes	5	2014 (2), 2014 (1A), 2014 (1B), 2017 (2), 2018 (2)	2014 (-), 2015 (-), **2016 (+),** 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

Table 12 explains that all the dominant student type groups had significant chi-square test results. Mixed Traditional and Nontraditional had the largest number of adjusted residual cells (9) that had an absolute value that exceeded 3, indicating that the observed value was significantly higher or lower than expected. All three groups had 2014 Tier 2 as the largest residuals cell. Two of the groups, Traditional and Mixed had 2014 Tier 1B as the second-largest residual cell, whereas Nontraditional had 2014 Tier 1A as its second-largest along with 2014 Tier1B as its third. This was one of only two groups where 2014 had the three largest tiers.

In reviewing adjusted values between 2014 – 2018, both High Traditional and Mixed, Tier 1A started negative (less than expected) in 2014, turned positive in 2017 and stayed positive, whereas Nontraditional started negative in 2014, turned positive in 2016, and stayed positive. Tier 1B over the same time had both High Traditional and Nontraditional start negative in 2014, turn positive in 2016, and stay positive, whereas Mixed started negative in 2014, turned positive in 2017, and stayed positive. All of the groups' Tier 2s started positive (more than expected), turned negative in 2016, and stayed.

Undergraduate Classification

Table 13
Overview of Dominant Student Type Residuals

	Chi-Square Test for Independence Significant Yes or No	Adjusted residual cells with an absolute value that exceeded 3	Cells with the 5 largest adjusted residuals (largest to smallest)	2014 - 2018, Tier 1A adjusted residuals (positive or negative	2014 - 2018, Tier 1B adjusted residuals (positive or negative	2014 - 2018, Tier 2 adjusted residuals (positive or negative)
High Part-time	Yes	8	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Mixed Full-time and Part-time	Yes	8	**2014 (2), 2017 (2), 2014 (1B), 2017 (1B), 2016 (2)**	**2014 (-), 2015 (+), 2016 (+), 2017 (+), 2018 (-)**	**2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (-)**	**2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (+)**

Table 13 shows that both Undergraduate Classification groups had significant chi-square results, which was followed by calculating residuals. Both groups had eight adjusted residual cells with an absolute value greater than three, indicating a significant positive or negative difference between what was observed and what was expected. Four of High Part-time's largest residual cells came from two years 2014 and 2018. Both Tier 1A and 1B in 2014 had less than expected FTEs while Tier 2 had greater than expected. The opposite took place in 2018 where both Tier 1A and 1B in 2018 had greater than expected FTEs while Tier 2 had less than expected. Between 2014-2018, High Part-time Tier 1A adjusted residuals start negative indicating less than expected FTEs, turn positive in 2017, and stay. Tier 1B started negative, turned positive in 2016 and stayed. Tier 2,

meanwhile, started positive, indicating greater than expected FTEs, turned negative in 2016, and stayed.

Mixed Full-time and Part-time had all three tiers in 2017 with adjusted residual cells, all having absolute values over 3. This was the only group with these results. The cells with the largest residuals were 2014 Tier 2, 2017 Tier 2, 2014 Tier 1B, 2017 Tier 1B, 2016 Tier 2. This was one of the only groups where 2018 had one of the largest adjusted residuals.

When looking at adjusted residuals by tier over a five year period, Tier 1A's adjusted residuals started negative in 2014, turned positive in 2015, stayed positive for 2016 and 2017, and turned negative in 2018. Tier 1B's adjusted residuals started negative for 2014 and 2015, turned positive for 2016 and 2017, and returned to negative for 2018. Tier 2's adjusted residuals started positive in 2014 and 2015, turned negative for 2016 and 2017, and returned to positive in 2018.

Size of Institution

Table 14
Overview of Size of Institution Residuals

	Chi-Square Test for Independence Significant Yes or No	Adjusted residual cells with an absolute value that exceeded 3	Cells with the 5 largest adjusted residuals (largest to smallest)	2014 - 2018, Tier 1A adjusted residuals (positive or negative	2014 - 2018, Tier 1B adjusted residuals (positive or negative	2014 - 2018, Tier 2 adjusted residuals (positive or negative
Small	Yes	10	**2014(2), 2014 (1B), 2018 (2), 2017 (2), 2014 (1A)**	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

Med	Yes	8	2014(2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Large	Yes	8	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

Table 14 expresses that all the Size of Institutions groups had significant chi-square results, which I followed with calculating residuals. The Small Institutional group had ten of fifteen adjusted residual cells with an absolute value that exceeded-3, indicating a significant positive or negative difference between what was observed and what was expected. The other two groups had eight adjusted residual cells with an absolute value that exceeded 3. All the groups' largest three adjusted residuals cells were 2014 Tier 2, 2014 Tier 1A, 2018 Tier 2. Both Medium and Large institutions 2018 Tier 1B and s 2017 Tier 2. The Small institutional size groups differ from the other groups with 2017 Tier 2 and 2014 Tier 1A being its next two largest.

All the Institutional Size groups followed a similar tier positive or negative adjusted residual pattern over the years of the study. Tier 1A's adjusted residuals started negative in 2014, turned positive in 2016, and stayed positive for the Small and Medium groups. The Large group is slightly different; its adjusted residuals tuned positive in 2017 and then stayed positive. Tier 1B's adjusted residuals started negative, turned positive in 2016, and stayed positive, whereas Tier 2's adjusted residuals started positive in 2014, turned negative in 2016, and stayed negative.

Locale

Table 15
Overview of Locale Residuals

	Chi-Square Test for Independence Significant Yes or No	Adjusted residual cells with an absolute value that exceeded 3	Cells with the 5 largest adjusted residuals (largest to smallest)	2014 - 2018, Tier 1A adjusted residuals (positive or negative	2014 - 2018, Tier 1B adjusted residuals (positive or negative	2014 - 2018, Tier 2 adjusted residuals (positive or negative
City	Yes	7	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Suburb	Yes	9	2014(2), 2018 (2), 2014 (1B), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Town	Yes	7	2014 (2), 2014 (1B), 2014 (1A), 2017 (2), 2018 (2)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Rural	Yes	6	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

Table 15 provides an overview of the residuals for the Locale institutional groups. The group with the largest number of adjusted residual cells with significant absolute values greater than -3 was Suburb (9). Three of the four groups' largest adjusted residuals cells came from the same tier and year, 2014 Tier 2 and Tier 1B, 2018 Tier 1B and Tier 2, along with 2017 Tier 2, but might have differed on ordinal ranking.

The Locale groups followed a similar tier positive or negative adjusted residual pattern over the years of the study. Tier 1A's adjusted residuals started negative (less than expected) in 2014, turned positive in 2017, and stayed positive for the City and Suburb groups. While the Town and Rural groups' adjusted residuals turned positive in 2016 and then stayed positive. All the groups' Tier 1Bs' adjusted residuals started negative, turned positive in 2016, and stayed positive, whereas all the groups' Tier 2s' adjusted residuals started positive (greater than expected) in 2014, turned negative in 2016, and stayed negative.

Summary

Table 16
Summary of Residuals

	Chi-Square Test for Independence Significant Yes or No	Adjusted residual cells with an absolute value that exceeded 3	Cells with the 5 largest adjusted residuals (largest to smallest)	2014 - 2018, Tier 1A adjusted residuals (positive or negative	2014 - 2018, Tier 1B adjusted residuals (positive or negative	2014 - 2018, Tier 2 adjusted residuals (positive or negative
Aggregate	Yes	12	2018 (1B), 2017 (1B), 2016 (1B), 2018 (2), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (-), 2017 (-), 2018 (-)
Regions						
Region 1	Yes	**3**	**2014 (2), 2014 (1A), 2018 (1A),** 2017 (2), 2018 (2)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

Region 2	Yes	5	2014 (2), 2018 (2), 2014 (1B), 2018 (1B), 2014 (1A)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Region 3	Yes	6	2014 (2), 2014 (1B), 2018 (2), 2017 (2), 2017 (1B)	**2014 (-),** **2015 (+),** **2016 (-),** **2017 (+),** **2018 (+)**	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Region 4	Yes	7	2014 (2), 2014 (1B), 2018 (2), 2017 (2), 2018 (1B)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	**2014 (-),** **2015 (+),** **2016 (+),** **2017 (+),** **2018 (+)**	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Region 5	Yes	6	**2014 (2),** **2018 (2),** **2014 (1B),** **2018 (1B),** **2014 (1A)**	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Region 6	Yes	**4**	2014 (1B), 2018 (1B), 2018 (2), 2014 (2),	**2014 (+),** **2015 (-),** **2016 (-),** **2017 (-),** **2018 (+)**	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Disciplinary Focus						
High Transfer	Yes	8	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Mixed	Yes	12	2014 (2), 2014 (1B), 2018 (2), 2017 (2), 2018 (1B)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Dominant Student Type						

High Trad	Yes	8	2014 (2), 2014 (1B), 2018 (2), 2017 (2), 2017 (1B)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Mixed Trad and NonTrad	Yes	9	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), **2016 (-)**, 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Nontrad	Yes	5	2014 (2), 2014 (1A), 2014 (1B), 2017 (2), 2018 (2)	2014 (-), 2015 (-), **2016 (+),** 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Undergrad Classification						
High Part-time	Yes	8	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Mixed Full-time and Part-time	Yes	8	**2014 (2), 2017 (2), 2014 (1B), 2017 (1B), 2016 (2)**	**2014 (-), 2015 (+), 2016 (+), 2017 (+), 2018 (-)**	**2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (-)**	**2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (+)**
Size of Institution						
Small	Yes	10	**2014(2), 2014 (1B), 2018 (2), 2017 (2), 2014 (1A)**	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Med	Yes	8	2014(2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

Large	Yes	8	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Locale						
City	Yes	7	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Suburb	Yes	9	2014(2), 2018 (2), 2014 (1B), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (-), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Town	Yes	7	2014 (2), 2014 (1B), 2014 (1A), 2017 (2), 2018 (2)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)
Rural	Yes	6	2014 (2), 2014 (1B), 2018 (2), 2018 (1B), 2017 (2)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (-), 2015 (-), 2016 (+), 2017 (+), 2018 (+)	2014 (+), 2015 (+), 2016 (-), 2017 (-), 2018 (-)

Table 17

2014 -2018 Comparison of Proportionalities

Group	Description	Tier 1A (%)	Tier 1B (%)	Tier 2 (%)
Aggregate	Proportionality percentage point change	1.17	3.18	-4.35
	Percentage change	7.78	14.18	-6.96
Region				
1	Proportionality percentage point change	2.05	1.18	-3.23
	Percentage change	12.20	4.73	-5.54
2	Proportionality percentage point change	1.44	3.13	-4.57
	Percentage change	9.96	14.17	-7.21
3	Proportionality percentage point change	1.10	3.39	-4.49
	Percentage change	7.79	14.81	-7.13

4	Proportionality percentage point change	1.51	3.25	-4.76
	Percentage change	11.03	14.29	-7.48
5	Proportionality percentage point change	1.98	3.63	-5.60
	Percentage change	12.99	16.42	-8.93
6	Proportionality percentage point change	-0.32	3.52	-3.20
	Percentage change	-1.71	19.10	-5.08
Disciplinary Focus				
High Transfer	Proportionality percentage point change	0.92	3.80	-4.72
	Percentage change	7.38	16.07	-7.40
Mixed	Proportionality percentage point change	1.47	2.75	-4.22
	Percentage change	8.96	12.63	-6.83
Dominant Student Type				
High Trad	Proportionality percentage point change	1.37	2.54	-3.91
	Percentage change	8.31	11.45	-6.37
Mixed	Proportionality percentage point change	0.91	3.49	-4.40
	Percentage change	6.42	15.39	-6.98
High Nontrad	Proportionality percentage point change	2.66	2.67	-5.33
	Percentage change	15.55	12.61	-8.64
Undergraduate Characteristics				
High part-time	Proportionality percentage point change	1.13	3.32	-4.45
	Percentage change	8.38	14.30	-7.02
Mixed	Proportionality percentage point change	0.36	1.43	-1.78
	Percentage change	2.13	6.59	-2.89
Institutional Size				
Small	Proportionality percentage point change	1.65	2.85	-4.50
	Percentage change	9.44	13.51	-7.33
Medium	Proportionality percentage point change	1.41	2.88	-4.29
	Percentage change	9.62	12.17	-6.94
Large	Proportionality percentage point change	1.01	3.58	-4.60
	Percentage change	7.33	16.25	-7.17
Locale				
City	Proportionality percentage point change	1.20	3.19	-4.39
	Percentage change	8.05	13.96	-7.04
Suburb	Proportionality percentage point change	1.34	3.53	-4.88
	Percentage change	10.20	15.87	-7.55
Town	Proportionality percentage point change	1.52	2.13	-3.65
	Percentage change	9.10	9.77	-5.94
Rural	Proportionality percentage point change	0.71	3.56	-4.27
	Percentage change	4.23	15.94	-7.02

This chapter presented the results of the analyses of two research questions which sought to examine Fall FTE hourly enrollment data at North Carolina community colleges after a 2014 policy change to specify tier-based enrollment funding. This study utilized five years of Fall FTE hourly enrollment data (2014-2018) for all 58 North Carolina community colleges. I assembled enrollment profiles for Fall FTE in the aggregate and by specific CC institutional groupings related to institutional size, classification, and location. After enrollment profiles were created, a chi-square test for independence was conducted to determine if enrollment profile by tier was dependent on the year. In every case (aggregate and grouping), chi-square was statistically significant, indicating that enrollment profiles were dependent on the year. As recommended in the literature (Sharpe, 2015), posthoc analyses were conducted to determine the nature of these significant relationships. Residuals were calculated for each tier by year cell combination, along with a comparison of 2014 and 2018 changes in proportionalities for each tier, Tier 1A, 1B, and 2. A detailed description of the results as outlined in this chapter and additional supporting data and tables are provided in Appendix B-V.

The results from research question 1, which looked at the aggregate enrollment at North Carolina community colleges, found that between the years 2014 and 2018 enrollment profiles had changed. Residual results (Table 16) show that observed FTE hours in Tier 1A, which is the newest tier created with the 2014 policy change, started less than expected and end greater than expected. Tier 1B residuals started and stayed positive, illustrating greater than expected enrollment across all years, while Tier 2's observed enrollment started and stayed less than expected.

Similar results can be seen by comparing enrollment profiles for 2014 and 2018 (Table 17). Over the five years, the proportionality of the Tier 1 FTE enrollment grew by 7.78% for Tier 1A and 14.73% for Tier 1B, while Tier 2's proportionality decreased by 6.96%. By using both residual and comparative analysis, the data illustrates that over the years of the study FTE hourly enrollment is moving out of Tier 2 into Tiers 1A and 1B.

The results from research question 2 (Table 16), which looked at the response to the 2014 policy change within specific institutional grouping categories, found that 15 of the 20 groups had similar residuals, showing changes in observed versus expected FTE. Hours were reversed for Tiers 1A and 1B as they moved from lower than expected to higher than expected over time, and Tier 2 moved in the opposite direction, i.e., higher than expected to lower expected.

In the comparison of 2014 and 2018 enrollment profiles (Table 17), the results are similar, demonstrating an increase in FTE enrollment proportionality for Tiers 1A and 1B and a decrease for Tier 2 illustrating that over the duration of the study FTE hourly enrollment is moving out of Tier 2 into Tiers 1A and 1B.

CHAPTER 5: DISCUSSION, CONCLUSIONS, & RECOMMENDATIONS

This chapter provides a discussion of the findings from the study. The purpose of the study was to evaluate how the implementation of tiered funding to promote economic development, or what could be referred to as the creation of Tier 1A, is associated with enrollment behavior at North Carolina community colleges. This study used a causal-comparative research design to examine how a funding policy change in 2014 that provided higher levels of funding for enrollment in programs aligned with economic development affected enrollment behavior at North Carolina community colleges from 2014 to 2018. This study also included additional institutional characteristics to determine whether there are differences in enrollment patterns. Chapter 5 begins with a summary of the findings, followed by a discussion of the findings related to previous literature, conclusions and implications, and recommendations for future practice and research.

Summary of Findings

This study used a causal-comparative research design to examine FTE hourly enrollment data at North Carolina community colleges. Data for this study begins in 2014 after a policy change by the state to use tier funding to promote economic development. This study employed five years of Fall FTE hourly enrollment data for all 58 North Carolina community colleges. The Fall FTE enrollment data were used to assemble enrollment profiles for aggregate North Carolina community colleges and enrollment profiles for specific community colleges within institutional groupings related to institutional size, classification, and location. The following are the two research questions that guided this study:

1. Has the overall proportion of enrollment by program tier (tiered enrollment profile) changed over time across all 58 NCCCs since the introduction of the 2014 tiered funding policy?

2. Has the tiered enrollment profile within specific CC institutional groupings related to institutional size, classification, and location changed over time since the introduction of the 2014 tiered funding policy?

To answer research question 1, Fall FTE hours were sorted by Tier year and Tier level. Following this, was a summation for Fall FTE hours by tier level for each year to create a tiered enrollment profile using proportionalities. Upon review of the FTE enrollment proportionalities over the five years since the policy change took place, the percentage of FTE hours in Tier 2 had decreased while Tier 1A and 1B have increased. These changes in proportionalities illustrate the movement in FTE enrollment out of Tier 2 into higher-paying Tier 1A and 1B.

Using a chi-square test of independence, the results found that time had a significant influence on enrollment profiles (tier proportionalities) when looking at aggregate FTE hours. After the significant chi-square test residuals were calculated, evaluation of positive and negative adjusted residuals cells results showed Tier 2 FTE enrollment starting greater than expected and moved to less than expected, while Tier 1B was greater than expected over time. Tier 1A began less than expected and ended greater than expected. The movement in positive to negative adjusted residual cells in Tier 2 and the opposite in Tier 1A represents an enrollment decrease in Tier 2 and an increase in Tier 1A. This change can also be seen when comparing between 2014 and 2018 Fall FTE

hours per tier. Increases in proportionality were seen for Tiers 1A and 1B, with Tier 2 decreasing.

In summary, aggregate Fall FTE hours showed a significant response to time. The courses that the state provides higher enrollment dollars for, Tier 1A and Tier 1B, increased in proportional size between 2014 and 2018, while the lower-paying curriculum courses, Tier 2, decreased. Also, adjusted residuals for Tier 1A and 1B were greater than expected in the later years of the study while Tier 2 estimates were less than expected, illustrating a movement in enrollment out of Tier 2 into Tier 1A and 1B.

The results from research question 2, which looked at the response to the 2014 policy change within specific institutional grouping categories: Geographical Region, Disciplinary Focus, Dominant Student Type, Undergraduate Classification, Size of Institution, and Locale, found that 15 of the 20 groups had similar residuals. The residuals results showed that enrollment moved from Tier 2 into Tier 1A and 1B. A comparison analysis of enrollment profiles for the first year of the study, 2014, and the last year, 2018, had the same results.

Four of the institutional groups did not have similar residual or comparison results like the ones mentioned above. The outlier groups included three regions (Regions 3, 4, and 6) and one undergraduate profile type (Mixed Full-Time and Part-Time). Residuals results for Tier 1A deviated from the norm in Region 3 which comprises the North Central counties of North Carolina that include the metropolitan areas of Greensboro, Raleigh, and Winston-Salem. Enrollment for this group’s economic development tier, 1A, did not show enrollment moving into the tier like other groups. This group’s

enrollment would go back and forth from greater than expected to less than expected enrollment.

Region 4 is comprised of the Southcentral counties of North Carolina and includes the metropolitan area of Charlotte along with a large military base in Fayetteville. This group's Tier 1B residuals results started negative but turned positive in 2015. What makes this different from there rest of the residuals results is that the positive or greater than expected enrollment numbers started a year earlier than other groups, possibly showing a quicker response time to changes in policy.

Finally, Region 6, which is the Northeastern counties of North Carolina, had greater than expected enrollment in the new economic development tier, 1A. In the first year of the policy change, there was less than expected enrollment for the next three years, only to turn greater than expected for the final year of the study. This differs from the norm because in other groups it took two or three years before Tier 1A enrollment increases could be seen in the residual data. Another interesting observation about this region came when comparing 2014 and 2018 proportionality enrollment profiles. This is the only group that saw a decrease in Tier 1A proportionality.

One of the undergraduate enrollment types (Mixed Full-Time and Part-Time) was different from the rest. This group had less than expected Tier 1A FTE enrollment in 2014, greater than expected in 2015, 2016, and 2017, followed by less than expected FTE enrollment in 2018. Based on the data, Tier 1A began to increase in the middle years of the study but saw a decrease in enrollment in the last year. What makes this different than other groups is that typically once Tier 1A enrollment started to increase it continued. Tier 1B adjusted residuals started negative for 2014 and 2015, turned positive for 2016

and 2017, and returned to negative for 2018. Again, in the majority of the institutional groups, once Tier 1B turned to greater than expected enrollment, it remained for the rest of the study. Tier 2 had unusual results from the other groups as well. The adjusted residuals started positive in 2014 and 2015, turned negative for 2016 and 2017, and returned to positive in 2018. These results differed from the other groups because Tier 1A and 1B's enrollment decreased in 2018 compared to other groups where there were increases. These groups's Tier 2 enrollments in 2018 was greater than expected as opposed to other groups who had less than expected for this tier at this time.

In summary, this section attempted to provide a summary of the results along with some other observations. The 2014 policy change within specific institutional grouping categories, i.e., Geographical Region, Disciplinary Focus, Dominant Student Type, Undergraduate Classification, Size of Institution, and Locale, saw that the majority of the groups had increases in Tier 1A and 1B enrollment and decreases in Tier 2 enrollment. There were a couple of institutional groups, which were discussed above, that did not follow the same enrollment patterns as the others. These groups with minority results provide many opportunities for future research. One observation of these differing groups is that two of the regions that had different results had six of the state's largest cities.

Discussion

This research supports previous higher education research that has used Resource Dependency Theory (RDT). RDT examines the environment that surrounds an organization and provides resources for the organization's survival (Pfeffer & Salancik, 2003). The theory assumes that the environment provides the organization with critical recourses. "Criticality measures the ability of the organization to continue functioning in

the absence of the resource or in the absence of the market for the output" (Pfeffer & Salancik 2003, p. 46). Due to the dependence on the resource for survival, the provider of the resource has significant power over the organization. (Pfeffer & Salancik, 2003).

The present study was interested in the 2014 state policy change that created a new economic development tier: 1A. Starting in 2014, community colleges received additional money for students enrolled in Tier 1A courses. This study looked at how the new policy has changed FTE enrollment over time. Similar to Fowles' (2014) study, which found that tuition dollars heavily influence institutional expenditures, the results from the present study have shown that aggregate Tier 1A Fall FTE enrollment has increased along with the majority of specific institution groups over time. It appears that enrollment in courses that provided a higher payout from the state, Tier 1A, have seen enrollment increases while lower funded curriculum courses are on the decline.

Since there has been little research on tiered funding to date, performance funding was used quite heavily as an example of a funding change instituted by state governments in an attempt to achieve results. Some PF studies have been able to show a slight to significant influence on expenditure patterns and the composition of their student body (e.g., Kelchen & Stedrak, 2016; Rabovsky, 2012). However, the majority of studies have shown that a change to a PF model has resulted in little change in stated objectives (Hillman, 2016). An unintended consequence that has developed from the implication of PF is the increase in selectively among state colleges and universities (Colbeck, 2002; Umbricht, Fernandez, and Ortagus, 2015).

Whereas PF is causing unintended consequences of hindered student access, tiered funding is a newer version of enrollment funding that attempts to supplement

higher cost courses that might also help achieve economics outcomes (Mulling Baime, & Honeyman, 2015; Manning & Costa, 2014). This relates back to the observation made in chapter two of this study that when states started to fund enrollment in the 1950s this also coincided with a major increase in enrollment (Cohen, Brawer & Kisker, 2014). This study has shown that at least in the state of North Carolina, using tiered funding does have an impact on enrollment, and that when North Carolina created Tier 1A and provided additional funding for enrollment in these courses, enrollment proportionalities changed with students moving out of lower funded courses into a higher funded course.

A goal for North Carolina's tiered funding model is to incentivize colleges with higher enrollment dollars for programs and courses that might have been too expensive to offer at previous funding levels and help close that state's skills gap (Program Evaluation Division, 2016). For a college to decide to offer one of these courses or programs, they are going to need to figure out a break-even point or how many students will have to enroll before the program pays for itself. One way to help figure out the break-even point is to establish a per-unit cost to educate a student or conduct a "data and unit cost studies" (Mullin, Baime & Honeyman, 2015, p. 2015; Manning & Crosta, 2014).

Funding this way does present some complications like estimating accurate operational costs and the extensive portfolio of courses and programs that are offered by community colleges (The Century Foundation Working Group, 2019), but there is some help available for colleges to get started. The Century Foundation has established eight recommendations, or a framework, "estimating the cost of a community college education" (The Century Foundation Working Group, 2019, p. 2), along with Manning and Costa (2014), who provide a formula for figuring program costs.

Based on results from this present study it appears that tiered funding in North Carolina is having an impact on community college course enrollment. With that being said, if state outcomes and course tier allocation are properly defined, this funding model can be used to help advance desired higher education initiatives.

After a review of the literature on community college funding and the results from this study, three observations were discussed above. First, this study is in line with Resource Dependency Theory and previous higher education literature on this topic. Second, in comparison to the literature on Performance Funding, which struggles to find significant results, tier funding of North Carolina community colleges is having a significant influence on enrollment behavior. Finally, the results from this study might influence states and colleges to implement a new way of analyzing course and program operational costs that focuses on how to achieve desired outcomes.

Conclusions and Implications

The results from this study show that enrollment profiles for both the North Carolina Community College aggregate and specific institutional community college groups are dependent on time.

Over the five years since the funding policy change to promote economic development, lower funded general education Tier 2 FTE proportionality decreased, while in most cases higher funded courses tied to programs in priority economic development areas, Tier 1A, FTE proportionality increased. Similar aggregate results were documented in another study done by The North Carolina General Assembly's Program Evaluation Division (2016). This study focused on just Fall FTE enrollment, extended the timeline to 2018 and created specific institutional groups.

The results of this study had multiple implications. First, this study confirmed that tier enrollment profiles and time are dependent on each other. Second, though the results from this study cannot definitively say, it appears that this study supports the preface of Resource Dependency Theory. It is demonstrated that by the State of North Carolina providing additional money for certain targeted courses, FTE enrollment in those courses has been increasing over time.

The results show that certain groups, given certain institutional factors have had stronger responses than others. By comparing the changes in enrollment profiles between 2014 and 2018, what is shown is that all Tier 2 proportionalities had decreased and nineteen of the twenty specific institutional groups saw Tier 1A, courses tied to programs in priority economic development areas, proportionalities increase. Region 5, the Southeastern counties, had the largest decrease in Tier 2, and colleges with a high non-traditional student population had the largest increase in Tier 1A. By reviewing the residuals of all the years and tiers, the groups that stood out were Region 3 (the Northcentral counties that included the major metropolitan areas of Raleigh, Greensboro, and Winston-Salem), Region 4 (the Southcentral counties with Charlotte and Fayetteville), the Northeastern counties in Region 6, and colleges that had a mixed student population of full-time and part-time. Results from this study provide a starting point for future researchers and policymakers to go deeper and study what is motivating these results, and whether the changes in enrollment are helping to achieve the goal of the economic development policy.

Information that can be gathered from this study is as follows. First, as more time passes from the creation of Tier 1A, the proportionality of Tier 1A Fall FTE enrollment

has grown among the aggregate of North Carolina community colleges along with the majority of specific community college institutional groups. Second, over the five years of this study the proportionality of Fall FTE enrollment in "curriculum courses in high-cost areas such as health care, technical education, lab-based science, and college-level math courses" (NCCCS, 2018c, p. 15), or what is called Tier 1B, has grown among the aggregate of North Carolina community colleges along with the majority of specific community college institutional groups. Third, as more time passes, the proportionality of Tier 2 Fall FTE decreases among the aggregate of North Carolina community colleges along with specific community college institutional groups. Finally, after performing a chi-square test for independence, the results show that the aggregate of North Carolina community colleges along with all specific institutional groups have significant results when measuring their dependency between time and enrollment profiles.

Recommendations for Future Practice

This study provides strong evidence for the North Carolina Community College System's dependence on state money, and demonstrates that when states change how large portions of the money will be allocated, community colleges will respond. It is my recommendation that North Carolina do away with base and performance funding and make community college funding 100 percent tiered enrollment funding. The reason is that the data from this study shows that tiered funding is effective in influencing community college performance. Since the state has moved to a tiered funding model, enrollment is moving out of lower-paying and into higher-paying courses. If designed properly, these higher-paying courses should be the ones that not only have a higher operational cost but should also help close the state's skills gap and earn students that

complete these courses and programs higher wages (Program Evaluation Division, 2016).

Simplicity is a benefit of enrollment-based funding (Mullin, Baime, & Honeyman, 2015). Granted, tiered enrollment funding is a little more complex, but using tiered funding as the sole formula for community colleges could save the state money through lower administrative costs. The current system requires colleges and the system office to keep track of three different funding programs each with their formula. A tiered funding model would allow for the elimination of the base and performance funding models along with all the oversite and administration costs. For other states that are heavily dependent on state or local money, I would recommend that policymakers in those states establish goals and objectives for their community colleges and fund enrollment using a tiered system that incentivizes enrollment in programs and courses that help achieve intended ends.

North Carolina community colleges receive 59 percent of their revenue from the state and the results from this study show that when the state changed the funding policy community colleges responded (Program Evaluation Division, 2016). If other states' community colleges have a large dependence on state or local money, tiered funding can influence behavior.

Community colleges are firms that employ resources in an attempt to create value for users. State community colleges are nonprofit institutions, but even nonprofits need to have more revenue coming in than expenses going out to keep operating. This study helps illustrate that this is true by showing that when the state changed funding policies, community college student enrollment responded with students moving from lower

funded to higher funded courses. Tiered funding appears to be the best option for colleges and states because it funds colleges on their primary function of educating students as well as incentivize colleges to offer the courses that are going to meet student demand, maximize enrollment, and if properly organized, help pursue state outcomes. A possible argument against tiered funding is that it focuses on enrollment and not completion, but if a college's goal is to maximize revenue, it makes sense for colleges to not only attract new students every year but also retain the ones they already have to maximize enrollment.

Recommendation for Future Research

This study had various limitations, and additional research is needed to advance the knowledge of tier funding and using tier funding to promote economic development. First, this study focused on North Carolina community college's curriculum courses, which are made up of Tier 1A, 1B, and 2. The state also uses tier funding for occupational courses. There could be benefits derived from applying this study and focusing on the occupational courses to see if enrollment profiles and time are responding similarly.

Second, the policy change to incentivize courses and programs that promote economic development took place in 2014, limiting the data to five years. During the five year period in which this study took place, total Fall FTE enrollment decreased over 8000 FTEs, or 9 percent (Table 5). Conducting the study again in another five years or during a time of growing enrollment might provide additional results.

Third, this study used Fall FTE enrollment because summer enrollment did not receive state funding until 2016, which could result in possible increases in enrollment

that might not be attributed to any incentivizing of Tier 1A courses. Using year-round enrollment data after 2016 might give a different perspective on tier funding.

Fourth, this study was focused on how an economic development policy change influenced North Carolina community college tier enrollment profiles. This study could also be used to evaluate enrollment behavior in other states like Ohio or Massachusetts who are using tier funding but do not have an economic development policy.

Finally, it was mentioned earlier that one reason performance funding (PF) was not having the influence it was thought to was that the portion of PF was small when looking at the relative size of a community college's overall budget. For example, in North Carolina PF represents 2 percent of a community college's overall state revenue. Tiered funding for all tiers accounts for 83 percent of the state revenue a college receives (Program Evaluation Division, 2016). This could be why it appears that this funding model is influencing FTE behavior while PF has had little effect.

One possible follow-up study could be to confirm whether the change in enrollment behavior is a relatively elastic or inelastic response. It would be helpful to test to see if the change in FTE enrollment and the change in funding produces a relatively elastic or inelastic number and compare those result to other goods and services in the economy to create a context of how responsive these enrollment changes are to changes in funding.

This study looked at the changes in enrollment over time. The reason that the state started to fund courses that promoted economic development was to help fill the state skills gap and earn course and program completers higher wages. Results from this study provide a starting point for future researchers and policymakers to go deeper and study

what is motivating these results or if the changes in enrollment are helping to achieve the goal of the economic development policy. Based on the results from this study, future researchers and policymakers should begin with colleges that have high nontraditional and a mix of full-time and part-time enrollment, and reside in the central and eastern region of the state.

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APPENDIX A

Explanation of Data Received

From: Eisnaugle, Eva
Sent: Monday, December 2, 2019 9:51 AM
To: Davis, Marc
Subject: Enrollment Data for Study
Attachments: Copy of Davis_FTE_Fall2014to2018.xlsx

Marc,
I think it might be better to use the National Center for Education Statistics because it serves as the USDOE's data repository. Those Carnegie classifications any other group would use are pulled from the NCES site.
I already have the data attached in the spreadsheet I am sending you now, but if you want to go into the site to know the steps or to figure out how to cite the site or explain how the data was obtained:
https://nces.ed.gov/ipeds/use-the-data
If you go to the site and chose "Compare Institutions" you can use the browse groups filter (EZ groups) to select the following parameters:
State: NC
Sector: public, 2-year
Highest degree: Associates
Basic Carnegie: Associate Colleges (select just the first 9 that are associate colleges- not any of the others)

What those filters do is select the 58 NCCCS all as one group, then I added the variables from 2014 for degree of urbanization, basic Carnegie (to get what it was in 2014 in case it has changed), size and setting, and undergraduate enrollment profile. All of these variables are reported to IPEDS from colleges on a survey that is called "Institutional Characteristics".

INFO ABOUT SPREADSHEET ATTACHED:
I think I have everything you need, but do let me know if that is not the case. There are several sheets:

Sheets 1-2 are just pivot tables I used to do some spot checking. I wanted to see that totals looked right for fall term sums by college and also to make sure the correct tier amount was being used for each year. Everything looks good but I am leaving them here because they are handy and you might want to look at some summary data.

SHEET 3 (FTEData_bySubject_58NCCCS): this is the one you want to import into whatever you are using. This is all the data the system office sent to me with the FTE amounts added and then with the additional codes added in. So it is all the data you want in one spot. FYI: Column E, Curr ICR Calculated Budget FTE, those are the FTE **hours**, not dollars. I added the tier amounts for each budget year and then added columns I and J to hold the actual dollars earned. The system office holds FTE hours earned by subject and then by college so I added to their data (columns A, C-E are the original system office data). I used the values that came from IPEDS for

the Carnegie so there are “numbers” in those fields. If SPSS thinks these are continuous data then it may be wise to put their label on it so it knows they are categories.

Sheet 4 (Labels): this has the labels for the Carnegie classifications and for the trustee region, prosperity zones (which are the NC Commerce and NC LEAD zones), and also a new one called county distress tier (this is in system office data but I do not know right now how those were determined). The Basic Carnegie classification only had 7 levels in 2014, they do have 9 levels after 2015. The 2017 basic Carnegie is included in the data set because it was used to select the group of college’s from the IPEDS Data Center.

Sheet 5: this is a directory of each college’s contact info. I needed it to get all the service areas to know which counties went with which school for the trustee regions. I just left it in in case you needed anything off of it.

Sheet 6 (NCCCS_SO_OrigData): this is the original data set sent to me from the system office before I did anything to it. I always save original data in my files somewhere in case I have to go back to it.

Have fun and call me or stop by if you have questions about where some of the additional info added to your dataset came from.

Eva

Eva Gifford, Ed.D., Executive Director for Institutional Research & Planning
Mitchell Community College
500 W. Broad St., Statesville, NC 28677
(704) 978-1344 office

APPENDIX B

Region 1

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	1799.876	2680.9092	6252.0994	10732.8846
2015	1751.0371	2565.716	5737.3093	10054.0624
2016	1799.8423	2681.2021	5573.8554	10054.8998
2017	1750.2451	2601.6319	5320.7955	9672.6725
2018	1763.8522	2452.3841	5158.0025	9374.2388

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	16.77%	24.98%	58.25%
2015	17.42%	25.52%	57.06%
2016	17.90%	26.67%	55.43%
2017	18.09%	26.90%	55.01%
2018	18.82%	26.16%	55.02%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	2.05	1.18	-3.23
Percentage change	12.202%	4.734%	-5.543%

Test Statistics	
Chi-square statistic	38.3523291
Df	8
Critical value	15.5073131
p-value	6.4797E-06

Region 1 Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	1799.88	2680.91	6252.1	10732.9
	Exp	1907.15	2792.87	6032.87	
	Column %	20.30%	25.63%	20.46%	
	Row %	16.77%	24.98%	58.25%	
	Res	107.276	111.957	-219.23	
	Std. Res	-2.4565	-2.1185	2.82256	
	Adj. Res	**-3.0577**	-2.6898	**5.11912**	
2015	Obs	1751.04	2565.72	5737.31	10054.1
	Exp	1786.53	2616.23	5651.31	
	Column %	19.75%	24.53%	18.77%	
	Row %	17.42%	25.52%	57.06%	
	Res	35.4933	50.5099	-86.003	
	Std. Res	-0.8397	-0.9875	1.14404	
	Adj. Res	-1.0363	-1.2431	2.05712	
2016	Obs	1799.84	2681.2	5573.86	10054.9
	Exp	1786.68	2616.44	5651.78	
	Column %	20.30%	25.63%	18.24%	
	Row %	17.90%	26.67%	55.43%	
	Res	-13.163	-64.758	77.9214	
	Std. Res	0.31141	1.26602	-1.0365	
	Adj. Res	0.38432	1.5937	-1.8637	
2017	Obs	1750.25	2601.63	5320.8	9672.67
	Exp	1718.76	2516.98	5436.93	
	Column %	19.74%	24.87%	17.41%	
	Row %	18.09%	26.90%	55.01%	
	Res	-31.485	-84.65	116.134	
	Std. Res	0.75944	1.68727	-1.575	
	Adj. Res	0.93278	2.11387	**-2.8186**	
2018	Obs	1763.85	2452.38	5158	9374.24
	Exp	1665.73	2439.33	5269.18	
	Column %	19.90%	23.45%	16.88%	
	Row %	18.82%	26.16%	55.02%	
	Res	-98.121	-13.059	111.18	
	Std. Res	2.40415	0.26441	-1.5316	
	Adj. Res	**2.94198**	0.33004	**-2.7309**	
Marginals		8864.85	10459.6	30564.3	49888.8

APPENDIX C

Region 2

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	1584.31	2422	6947.09	10953.3951
2015	1525.51	2329.67	6274.6	10129.7734
2016	1605.95	2388.85	6058.41	10053.2159
2017	1569.81	2431.15	5947.84	9948.8011
2018	1572.31	2495.58	5817.69	9885.5843

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	14.46%	22.11%	63.42%
2015	15.06%	23.00%	61.94%
2016	15.97%	23.76%	60.26%
2017	15.78%	24.44%	59.78%
2018	15.91%	25.24%	58.85%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.44	3.13	-4.57
Percentage change	9.963%	14.168%	-7.211%

Test Statistics

Chi-square statistic	60.4953518
Df	8
Critical value	15.5073131
p-value	3.7262E-10

Region 2 Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	1584.31	2422	6947.09	10953.4
	Exp	1688.63	2593.2	6671.57	
	Column %	20.16%	27.01%	20.35%	
	Row %	14.46%	22.11%	63.42%	
	Res	104.318	171.201	-275.52	
	Std. Res	-2.5386	-3.3619	3.37316	
	Adj. Res	**-3.1152**	**-4.1797**	**6.62607**	
2015	Obs	1525.51	2329.67	6274.6	10129.8
	Exp	1561.65	2398.21	6169.91	
	Column %	19.41%	25.98%	18.38%	
	Row %	15.06%	23.00%	61.94%	
	Res	36.1437	68.5403	-104.68	
	Std. Res	-0.9146	-1.3996	1.33273	
	Adj. Res	-1.111	-1.7224	2.59141	
2016	Obs	1605.95	2388.85	6058.41	10053.2
	Exp	1549.85	2380.08	6123.28	
	Column %	20.44%	26.64%	17.74%	
	Row %	15.97%	23.76%	60.26%	
	Res	-56.1	-8.7701	64.8701	
	Std. Res	1.42501	0.17977	-0.829	
	Adj. Res	1.72934	0.22102	-1.6104	
2017	Obs	1569.81	2431.15	5947.84	9948.8
	Exp	1533.75	2355.36	6059.69	
	Column %	19.98%	27.11%	17.42%	
	Row %	15.78%	24.44%	59.78%	
	Res	-36.057	-75.785	111.842	
	Std. Res	0.92069	1.56155	-1.4368	
	Adj. Res	1.11589	1.91746	-2.7875	
2018	Obs	1572.31	2495.58	5817.69	9885.58
	Exp	1524.01	2340.39	6021.18	
	Column %	20.01%	27.83%	17.04%	
	Row %	15.91%	25.24%	58.85%	
	Res	-48.305	-155.19	203.49	
	Std. Res	1.23735	3.2078	-2.6224	
	Adj. Res	1.49854	**3.93588**	**-5.084**	
Marginals		7857.9	8967.08	34145.8	50970.8

APPENDIX D

Region 3

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	3494.69	5680.71	15622.6	24798.0099
2015	3523.93	5760.94	14508.9	23793.773
2016	3364.02	5906.06	14127.2	23397.2611
2017	3397.85	6036.96	13478.1	22912.943
2018	3467.63	6003.95	13355.7	22827.2431

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	14.09%	22.91%	63.00%
2015	14.81%	24.21%	60.98%
2016	14.38%	25.24%	60.38%
2017	14.83%	26.35%	58.82%
2018	15.19%	26.30%	58.51%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.10	3.39	-4.49
Percentage change	7.792%	14.815%	-7.130%

Test Statistics	
Chi-square statistic	145.993538
Df	8
Critical value	15.5073131
p-value	1.3416E-27

Region 3 Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	3494.69	5680.71	15622.6	24798
	Exp	3633.08	6190.3	14974.6	
	Column %	20.26%	25.55%	19.97%	
	Row %	14.09%	22.91%	63.00%	
	Res	138.382	509.591	-647.97	
	Std. Res	-2.2958	-6.4769	5.29516	
	Adj. Res	-2.7971	**-8.0944**	**10.2913**	
2015	Obs	3523.93	5760.94	14508.9	23793.8
	Exp	3485.95	5939.61	14368.2	
	Column %	20.43%	25.91%	18.54%	
	Row %	14.81%	24.21%	60.98%	
	Res	-37.979	178.676	-140.7	
	Std. Res	0.64325	-2.3184	1.17377	
	Adj. Res	0.77948	-2.8818	2.26902	
2016	Obs	3364.02	5906.06	14127.2	23397.3
	Exp	3427.86	5840.63	14128.8	
	Column %	19.50%	26.56%	18.06%	
	Row %	14.38%	25.24%	60.38%	
	Res	63.8363	-65.432	1.5953	
	Std. Res	-1.0903	0.85617	-0.0134	
	Adj. Res	-1.3185	1.06201	-0.0259	
2017	Obs	3397.85	6036.96	13478.1	22912.9
	Exp	3356.9	5719.73	13836.3	
	Column %	19.70%	27.15%	17.23%	
	Row %	14.83%	26.35%	58.82%	
	Res	-40.953	-317.22	358.177	
	Std. Res	0.70684	4.19448	-3.045	
	Adj. Res	0.85255	**5.18962**	**-5.8589**	
2018	Obs	3467.63	6003.95	13355.7	22827.2
	Exp	3344.35	5698.34	13784.6	
	Column %	20.10%	27.00%	17.07%	
	Row %	15.19%	26.30%	58.51%	
	Res	-123.29	-305.61	428.898	
	Std. Res	2.13186	4.04851	-3.6531	
	Adj. Res	2.57018	5.00676	**-7.0257**	
Marginals		17248.1	22236.5	78244.6	117729

APPENDIX E

Region 4

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	2843.5932	4736.19	13236.401	20816.1818
2015	2888.9122	5130.19	12469.509	20488.6142
2016	2950.5493	5181.32	12261.651	20393.5239
2017	3021.603	5283.91	12239.389	20544.9033
2018	3029.8824	5194.49	11751.468	19975.8415

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	13.66%	22.75%	63.59%
2015	14.10%	25.04%	60.86%
2016	14.47%	25.41%	60.13%
2017	14.71%	25.72%	59.57%
2018	15.17%	26.00%	58.83%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.51	3.25	-4.76
Percentage change	11.034%	14.291%	-7.484%

Test Statistics	
Chi-square statistic	120.03345
Df	8
Critical value	15.5073131
p-value	3.26E-22

Region 4 Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	2843.59	4736.19	13236.4	20816.2
	Exp	3000.58	5198.21	12617.4	
	Column %	19.30%	23.99%	19.54%	
	Row %	13.66%	22.75%	63.59%	
	Res	156.991	462.022	-619.01	
	Std. Res	-2.866	-6.4082	5.5108	
	Adj. Res	-3.4715	**-7.9942**	**10.6334**	
2015	Obs	2888.91	5130.19	12469.5	20488.6
	Exp	2953.37	5116.41	12418.8	
	Column %	19.61%	25.99%	18.41%	
	Row %	14.10%	25.04%	60.86%	
	Res	64.4538	-13.784	-50.67	
	Std. Res	-1.186	0.1927	0.45468	
	Adj. Res	-1.4337	0.23991	0.87558	
2016	Obs	2950.55	5181.32	12261.7	20393.5
	Exp	2939.66	5092.66	12361.2	
	Column %	20.02%	26.25%	18.10%	
	Row %	14.47%	25.41%	60.13%	
	Res	-10.89	-88.66	99.5506	
	Std. Res	0.20086	1.24239	-0.8954	
	Adj. Res	0.24267	1.54587	-1.7232	
2017	Obs	3021.6	5283.91	12239.4	20544.9
	Exp	2961.48	5130.47	12453	
	Column %	20.51%	26.77%	18.07%	
	Row %	14.71%	25.72%	59.57%	
	Res	-60.123	-153.45	213.569	
	Std. Res	1.10481	2.14228	-1.9138	
	Adj. Res	1.33601	2.66806	-3.6867	
2018	Obs	3029.88	5194.49	11751.5	19975.8
	Exp	2879.45	4988.36	12108	
	Column %	20.56%	26.31%	17.35%	
	Row %	15.17%	26.00%	58.83%	
	Res	-150.43	-206.13	356.563	
	Std. Res	2.80338	2.91854	-3.2404	
	Adj. Res	3.3783	3.62224	-6.2205	
Marginals		14734.5	19740.5	67744	102219

APPENDIX F

Region 5

all FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	1990.75	2890.96	8205.88	13087.5821
2015	2043.56	2964.12	7644.31	12651.9891
2016	2003.83	3015.29	7208.69	12227.8112
2017	2080.1	2987.74	6999.6	12067.4353
2018	2032.05	3040.55	6751.11	11823.7011

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	15.21%	22.09%	62.70%
2015	16.15%	23.43%	60.42%
2016	16.39%	24.66%	58.95%
2017	17.24%	24.76%	58.00%
2018	17.19%	25.72%	57.10%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.98	3.63	-5.60
Percentage change	12.986%	16.417%	-8.934%

Test Statistics	
Chi-square statistic	103.20247
Df	8
Critical value	15.5073131
p-value	9.44E-19

Region 5 Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	1990.75	2890.96	8205.88	13087.6
	Exp	2147.52	3152.15	7787.91	
	Column %	19.61%	25.61%	20.30%	
	Row %	15.21%	22.09%	62.70%	
	Res	156.778	261.193	-417.97	
	Std. Res	-3.3831	-4.6522	4.73625	
	Adj. Res	**-4.1673**	**-5.7947**	**9.06033**	
2015	Obs	2043.56	2964.12	7644.31	12652
	Exp	2076.05	3047.24	7528.7	
	Column %	20.13%	26.26%	18.91%	
	Row %	16.15%	23.43%	60.42%	
	Res	32.492	83.1164	-115.61	
	Std. Res	-0.7131	-1.5057	1.33238	
	Adj. Res	-0.8745	-1.8672	2.53751	
2016	Obs	2003.83	3015.29	7208.69	12227.8
	Exp	2006.45	2945.07	7276.29	
	Column %	19.74%	26.71%	17.84%	
	Row %	16.39%	24.66%	58.95%	
	Res	2.61528	-70.217	67.6014	
	Std. Res	-0.0584	1.29387	-0.7925	
	Adj. Res	-0.0713	1.59762	-1.5028	
2017	Obs	2080.1	2987.74	6999.6	12067.4
	Exp	1980.13	2906.45	7180.86	
	Column %	20.49%	26.46%	17.32%	
	Row %	17.24%	24.76%	58.00%	
	Res	-99.972	-81.289	181.262	
	Std. Res	2.24664	1.50783	-2.139	
	Adj. Res	2.73891	1.85881	-4.0498	
2018	Obs	2032.05	3040.55	6751.11	11823.7
	Exp	1940.14	2847.74	7035.82	
	Column %	20.02%	26.93%	16.70%	
	Row %	17.19%	25.72%	57.10%	
	Res	-91.913	-192.8	284.715	
	Std. Res	2.08669	3.61296	-3.3943	
	Adj. Res	2.53771	**4.44308**	**-6.4107**	
Marginals		10150.3	11289.5	40418.8	61858.5

APPENDIX G

Region 6

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	1796.44	1773.24	6064.25	9633.9293
2015	1567.84	1652.07	5459.84	8679.7509
2016	1551.25	1767.44	5265.25	8583.9427
2017	1484.78	1724.8	5009.91	8219.4878
2018	1473.13	1762.04	4802.74	8037.9196

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	18.65%	18.41%	62.95%
2015	18.06%	19.03%	62.90%
2016	18.07%	20.59%	61.34%
2017	18.06%	20.98%	60.95%
2018	18.33%	21.92%	59.75%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	-0.32	3.52	-3.20
Percentage change	-1.715%	19.099%	-5.077%

Test Statistics	
Chi-square statistic	47.7843456
Df	8
Critical value	15.5073131
p-value	1.09E-07

Region 6 Residuals

		Column		
	Tier1A	Tier1B	Tier2	Marginals
Obs	1796.44	1773.24	6064.25	9633.93
Exp	1757.67	1937.63	5938.63	
Column %	22.82%	21.03%	21.35%	
Row %	18.65%	18.41%	62.95%	
Res	-38.773	164.392	-125.62	
Std. Res	0.92482	-3.7346	1.63009	
Adj. Res	1.15034	**-4.6809**	**3.04746**	
Obs	1567.84	1652.07	5459.84	8679.75
Exp	1583.58	1745.72	5350.45	
Column %	19.91%	19.59%	19.22%	
Row %	18.06%	19.03%	62.90%	
Res	15.7437	93.6515	-109.4	
Std. Res	-0.3956	-2.2414	1.49556	
Adj. Res	-0.4855	**-2.7719**	2.75868	
Obs	1551.25	1767.44	5265.25	8583.94
Exp	1566.1	1726.45	5291.39	
Column %	19.70%	20.96%	18.54%	
Row %	18.07%	20.59%	61.34%	
Res	14.8516	-40.987	26.1357	
Std. Res	-0.3753	0.98644	-0.3593	
Adj. Res	-0.46	1.21829	-0.6619	
Obs	1484.78	1724.8	5009.91	8219.49
Exp	1499.61	1653.15	5066.73	
Column %	18.86%	20.46%	17.64%	
Row %	18.06%	20.98%	60.95%	
Res	14.8289	-71.649	56.8206	
Std. Res	-0.3829	1.76221	-0.7983	
Adj. Res	-0.467	2.16548	-1.4631	
Obs	1473.13	1762.04	4802.74	8037.92
Exp	1466.48	1616.63	4954.8	
Column %	18.71%	20.90%	16.91%	
Row %	18.33%	21.92%	59.75%	
Res	-6.6514	-145.41	152.058	
Std. Res	0.17369	3.61641	-2.1602	
Adj. Res	0.21129	**4.43301**	**-3.9496**	
	7873.44	8431.51	28401.3	44706.3

APPENDIX H

Disciplinary Focus-High Transfer

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	3798.78	7194.51	19425.0812	30418.3694
2015	3797.05	7528.78	18434.2907	29760.1263
2016	3836.62	7768.19	18336.5357	29941.3533
2017	3922.14	8142.48	18089.153	30153.7736
2018	3980.05	8148.11	17551.7166	29679.8801

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	12.49%	23.65%	63.86%
2015	12.76%	25.30%	61.94%
2016	12.81%	25.94%	61.24%
2017	13.01%	27.00%	59.99%
2018	13.41%	27.45%	59.14%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	0.92	3.80	-4.72
Percentage change	7.38%	16.07%	-7.40%

Test Statistics	
Chi-square statistic	181.933
Df	8
Critical value	15.5073
p-value	4.04E-35

Disciplinary Focus-High Transfer Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	3798.78	7194.51	19425.1	30418.4
	Exp	3922.07	7867.02	18629.3	
	Column %	19.65%	24.85%	19.11%	
	Row %	12.49%	23.65%	63.86%	
	Res	123.291	672.516	-795.81	
	Std. Res	-1.9687	-7.5822	5.83055	
	Adj. Res	-2.3625	**-9.4537**	**11.5087**	
2015	Obs	3797.05	7528.78	18434.3	29760.1
	Exp	3837.2	7696.78	18226.1	
	Column %	19.64%	26.01%	18.13%	
	Row %	12.76%	25.30%	61.94%	
	Res	40.1475	167.999	-208.15	
	Std. Res	-0.6481	-1.9149	1.54178	
	Adj. Res	-0.7756	-2.381	3.03491	
2016	Obs	3836.62	7768.19	18336.5	29941.4
	Exp	3860.57	7743.65	18337.1	
	Column %	19.84%	26.84%	18.04%	
	Row %	12.81%	25.94%	61.24%	
	Res	23.9444	-24.542	0.59776	
	Std. Res	-0.3854	0.27889	-0.0044	
	Adj. Res	-0.4616	0.34704	-0.0087	
2017	Obs	3922.14	8142.48	18089.2	30153.8
	Exp	3887.96	7798.59	18467.2	
	Column %	20.29%	28.13%	17.79%	
	Row %	13.01%	27.00%	59.99%	
	Res	-34.184	-343.89	378.074	
	Std. Res	0.54823	3.89414	-2.7821	
	Adj. Res	0.65719	4.84995	**-5.4854**	
2018	Obs	3980.05	8148.11	17551.7	29679.9
	Exp	3826.85	7676.03	18177	
	Column %	20.59%	28.15%	17.26%	
	Row %	13.41%	27.45%	59.14%	
	Res	-153.2	-472.08	625.282	
	Std. Res	2.47648	5.38828	-4.6378	
	Adj. Res	2.9628	**6.69758**	**-9.1263**	
Marginals		19334.7	28947.6	101671	149954

APPENDIX I

Disciplinary Focus-Mixed to Predominant Career and Technical

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	9816.87	12989.5	36903.2	59709.6074
2015	9503.73	12873.9	33660.2	56037.8367
2016	9438.82	13172	32158.5	54769.3013
2017	9382.26	12923.7	30906.5	53212.4694
2018	9358.81	12800.9	30085	52244.6483

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	16.44%	21.75%	61.80%
2015	16.96%	22.97%	60.07%
2016	17.23%	24.05%	58.72%
2017	17.63%	24.29%	58.08%
2018	17.91%	24.50%	57.58%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.47	2.75	-4.22
Percentage change	8.96%	12.63%	-6.83%

Test Statistics	
Chi-square statistic	281.597
Df	8
Critical value	15.5073
p-value	3.38E-56

Disciplinary Focus- Mixed to Predominant Career and Technical Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	9816.87	12989.5	36903.2	59709.6
	Exp	10277.2	14011.4	35421	
	Column %	20.67%	25.66%	20.75%	
	Row %	16.44%	21.75%	61.80%	
	Res	460.317	1021.95	-1482.3	
	Std. Res	-4.5407	-8.6335	7.87584	
	Adj. Res	-5.6374	**-10.793**	**14.9204**	
2015	Obs	9503.73	12873.9	33660.2	56037.8
	Exp	9645.21	13149.8	33242.8	
	Column %	20.01%	25.43%	18.93%	
	Row %	16.96%	22.97%	60.07%	
	Res	141.477	275.907	-417.38	
	Std. Res	-1.4406	-2.406	2.28922	
	Adj. Res	-1.7735	-2.9826	4.30045	
2016	Obs	9438.82	13172	32158.5	54769.3
	Exp	9426.87	12852.2	32490.3	
	Column %	19.87%	26.02%	18.08%	
	Row %	17.23%	24.05%	58.72%	
	Res	-11.956	-319.82	331.779	
	Std. Res	0.12314	2.82112	-1.8407	
	Adj. Res	0.15117	3.48711	-3.4479	
2017	Obs	9382.26	12923.7	30906.5	53212.5
	Exp	9158.9	12486.8	31566.7	
	Column %	19.75%	25.53%	17.38%	
	Row %	17.63%	24.29%	58.08%	
	Res	-223.35	-436.88	660.227	
	Std. Res	2.33382	3.90959	-3.716	
	Adj. Res	2.85494	4.81562	**-6.9364**	
2018	Obs	9358.81	12800.9	30085	52244.6
	Exp	8992.32	12259.7	30992.6	
	Column %	19.70%	25.29%	16.92%	
	Row %	17.91%	24.50%	57.58%	
	Res	-366.49	-541.16	907.648	
	Std. Res	3.86475	4.8875	-5.1557	
	Adj. Res	4.71748	**6.00713**	**-9.6029**	
Marginals		47500.5	50625.9	177848	275974

APPENDIX J

Dominant Student Type-High Traditional

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	3871.85	5227.41	14458.9482	23558.2049
2015	3772.92	5103.16	13254.0232	22130.109
2016	3661.64	5190.27	12735.3955	21587.3082
2017	3585.95	5146.53	11991.0236	20723.499
2018	3675.66	5106.61	11866.4228	20648.6951

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	16.44%	22.19%	61.38%
2015	17.05%	23.06%	59.89%
2016	16.96%	24.04%	58.99%
2017	17.30%	24.83%	57.86%
2018	17.80%	24.73%	57.47%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.37	2.54	-3.91
Percentage change	8.31%	11.45%	-6.37%

Test Statistics	
Chi-square statistic	98.3307
df	8
Critical value	15.5073
p-value	9.36E-18

Dominant Student Type - High Traditional Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	3871.85	5227.41	14458.9	23558.2
	Exp	4026.12	5588.6	13943.5	
	Column %	20.85%	26.19%	20.62%	
	Row %	16.44%	22.19%	61.38%	
	Res	154.271	361.189	-515.46	
	Std. Res	-2.4313	-4.8315	4.36525	
	Adj. Res	-3.0172	**-6.0428**	**8.28318**	
2015	Obs	3772.92	5103.16	13254	22130.1
	Exp	3782.06	5249.82	13098.2	
	Column %	20.32%	25.57%	18.90%	
	Row %	17.05%	23.06%	59.89%	
	Res	9.13381	146.654	-155.79	
	Std. Res	-0.1485	-2.0241	1.36122	
	Adj. Res	-0.1828	-2.5105	2.56154	
2016	Obs	3661.64	5190.27	12735.4	21587.3
	Exp	3689.29	5121.05	12777	
	Column %	19.72%	26.00%	18.16%	
	Row %	16.96%	24.04%	58.99%	
	Res	27.6541	-69.224	41.5701	
	Std. Res	-0.4553	0.96734	-0.3678	
	Adj. Res	-0.5586	1.19608	-0.6899	
2017	Obs	3585.95	5146.53	11991	20723.5
	Exp	3541.67	4916.13	12265.7	
	Column %	19.31%	25.78%	17.10%	
	Row %	17.30%	24.83%	57.86%	
	Res	-44.28	-230.4	274.676	
	Std. Res	0.74406	3.28596	-2.4801	
	Adj. Res	0.90836	**4.04297**	**-4.6296**	
2018	Obs	3675.66	5106.61	11866.4	20648.7
	Exp	3528.88	4898.39	12221.4	
	Column %	19.80%	25.58%	16.92%	
	Row %	17.80%	24.73%	57.47%	
	Res	-146.78	-208.22	355.002	
	Std. Res	2.47085	2.9751	-3.2112	
	Adj. Res	3.01519	3.65894	**-5.9918**	
Marginals		18568	19961.2	70118.6	108648

APPENDIX K

Dominant Student Type-Mixed Traditional and Nontraditional

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	8211.8	13058.2	36338.3	57608.2165
2015	7965.35	13393.8	33805.2	55164.3034
2016	8002.21	13775.9	33034	54812.0898
2017	8077.04	13946.1	32363	54386.1388
2018	8077.68	13927.7	31244.3	53249.6183

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	14.25%	22.67%	63.08%
2015	14.44%	24.28%	61.28%
2016	14.60%	25.13%	60.27%
2017	14.85%	25.64%	59.51%
2018	15.17%	26.16%	58.68%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	0.91	3.49	-4.40
Percentage change	6.42%	15.39%	-6.98%

Test Statistics	
Chi-square statistic	295.319
df	8
Critical value	15.5073
p-value	4.08E-59

Dominant Student Type - Mixed Traditional and Nontraditional Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	8211.8	13058.2	36338.3	57608.2
	Exp	8442.59	14254.8	34910.8	
	Column %	20.36%	25.15%	19.86%	
	Row %	14.25%	22.67%	63.08%	
	Res	230.795	1196.65	-1427.4	
	Std. Res	-2.5118	-10.023	7.63974	
	Adj. Res	-3.0577	**-12.513**	**14.84**	
2015	Obs	7965.35	13393.8	33805.2	55164.3
	Exp	8084.43	13650.1	33429.8	
	Column %	19.75%	25.80%	18.48%	
	Row %	14.44%	24.28%	61.28%	
	Res	119.089	256.298	-375.39	
	Std. Res	-1.3245	-2.1937	2.05311	
	Adj. Res	-1.6034	-2.7236	3.9659	
2016	Obs	8002.21	13775.9	33034	54812.1
	Exp	8032.82	13562.9	33216.4	
	Column %	19.84%	26.53%	18.05%	
	Row %	14.60%	25.13%	60.27%	
	Res	30.6069	-212.96	182.357	
	Std. Res	-0.3415	1.82865	-1.0006	
	Adj. Res	-0.4131	2.26855	-1.9312	
2017	Obs	8077.04	13946.1	32363	54386.1
	Exp	7970.39	13457.5	32958.2	
	Column %	20.03%	26.86%	17.69%	
	Row %	14.85%	25.64%	59.51%	
	Res	-106.64	-488.61	595.251	
	Std. Res	1.19451	4.21191	-3.2788	
	Adj. Res	1.44347	5.22009	**-6.3224**	
2018	Obs	8077.68	13927.7	31244.3	53249.6
	Exp	7803.83	13176.3	32269.5	
	Column %	20.03%	26.83%	17.08%	
	Row %	15.17%	26.16%	58.68%	
	Res	-273.85	-751.37	1025.22	
	Std. Res	3.09996	6.54573	-5.7072	
	Adj. Res	3.73645	**8.09176**	**-10.977**	
Marginals		40334.1	51916.5	182970	275220

APPENDIX L

Dominant Student Type-High Nontraditional

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	1532	1898.43	5531.12	8961.5554
2015	1562.51	1905.76	5035.27	8503.5506
2016	1611.6	1974.01	4725.65	8311.2566
2017	1641.41	1973.52	4641.67	8256.6052
2018	1585.52	1914.71	4525.99	8026.215

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	17.10%	21.18%	61.72%
2015	18.37%	22.41%	59.21%
2016	19.39%	23.75%	56.86%
2017	19.88%	23.90%	56.22%
2018	19.75%	23.86%	56.39%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	2.66	2.67	-5.33
Percentage change	15.55%	12.61%	-8.64%

Test Statistics	
Chi-square statistic	79.9704
df	8
Critical value	15.5073
p-value	4.96E-14

Dominant Student Type-High Nontraditional Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	1532	1898.43	5531.12	8961.56
	Exp	1690.29	2059.63	5211.63	
	Column %	19.31%	24.67%	20.93%	
	Row %	17.10%	21.18%	61.72%	
	Res	158.29	161.199	-319.49	
	Std. Res	-3.8501	-3.552	4.42557	
	Adj. Res	**-4.8183**	**-4.4298**	**8.18407**	
2015	Obs	1562.51	1905.76	5035.27	8503.55
	Exp	1603.91	1954.37	4945.28	
	Column %	19.70%	24.76%	19.05%	
	Row %	18.37%	22.41%	59.21%	
	Res	41.3961	48.6023	-89.998	
	Std. Res	-1.0336	-1.0994	1.27979	
	Adj. Res	-1.2847	-1.3617	2.35048	
2016	Obs	1611.6	1974.01	4725.65	8311.26
	Exp	1567.64	1910.17	4833.45	
	Column %	20.31%	25.65%	17.88%	
	Row %	19.39%	23.75%	56.86%	
	Res	-43.958	-63.839	107.797	
	Std. Res	1.11024	1.46065	-1.5505	
	Adj. Res	1.37598	1.80399	-2.8396	
2017	Obs	1641.41	1973.52	4641.67	8256.61
	Exp	1557.33	1897.61	4801.66	
	Column %	20.69%	25.64%	17.56%	
	Row %	19.88%	23.90%	56.22%	
	Res	-84.084	-75.912	159.996	
	Std. Res	2.13071	1.74263	-2.3089	
	Adj. Res	2.63856	2.15051	**-4.2251**	
2018	Obs	1585.52	1914.71	4525.99	8026.22
	Exp	1513.87	1844.66	4667.68	
	Column %	19.99%	24.88%	17.12%	
	Row %	19.75%	23.86%	56.39%	
	Res	-71.644	-70.051	141.695	
	Std. Res	1.84133	1.63101	-2.074	
	Adj. Res	2.27248	2.00594	**-3.7823**	
Marginals		7933.04	7695.68	26430.5	42059.2

APPENDIX M

Undergraduate Characteristics-High Part-Time

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	6219.59	10725.9	29270.3105	46215.7739
2015	6110.63	11019.1	27402.5567	44532.2971
2016	6191.45	11363.8	27054.2143	44609.5053
2017	6372.07	11658.2	26624.4416	44654.7566
2018	6395.41	11630.8	25820.134	43846.3014

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	13%	23%	63%
2015	14%	25%	62%
2016	14%	25%	61%
2017	14%	26%	60%
2018	15%	27%	59%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.13	3.32	-4.45
Percentage change	8.38%	14.30%	-7.02%

Test Statistics	
Chi-square statistic	238.0462
Df	8
Critical value	15.50731
p-value	5.87E-47

Undergraduate Characteristics-High Part-Time Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	6219.59	10725.9	29270.3	46215.8
	Exp	6459.67	11643.4	28112.7	
	Column %	19.88%	24.92%	19.57%	
	Row %	13.46%	23.21%	63.33%	
	Res	240.08	917.495	-1157.6	
	Std. Res	-2.9871	-8.5028	6.90395	
	Adj. Res	-3.6154	**-10.62**	**13.4499**	
2015	Obs	6110.63	11019.1	27402.6	44532.3
	Exp	6224.36	11219.2	27088.7	
	Column %	19.53%	25.60%	18.33%	
	Row %	13.72%	24.74%	61.53%	
	Res	113.738	200.131	-313.87	
	Std. Res	-1.4416	-1.8894	1.90701	
	Adj. Res	-1.7367	-2.3489	3.69767	
2016	Obs	6191.45	11363.8	27054.2	44609.5
	Exp	6235.16	11238.7	27135.7	
	Column %	19.79%	26.40%	18.09%	
	Row %	13.88%	25.47%	60.65%	
	Res	43.7058	-125.14	81.4389	
	Std. Res	-0.5535	1.18047	-0.4944	
	Adj. Res	-0.6669	1.46784	-0.9588	
2017	Obs	6372.07	11658.2	26624.4	44654.8
	Exp	6241.48	11250.1	27163.2	
	Column %	20.37%	27.09%	17.81%	
	Row %	14.27%	26.11%	59.62%	
	Res	-130.59	-408.14	538.738	
	Std. Res	1.65301	3.84801	-3.2688	
	Adj. Res	1.99197	4.78535	**-6.3403**	
2018	Obs	6395.41	11630.8	25820.1	43846.3
	Exp	6128.48	11046.4	26671.4	
	Column %	20.44%	27.02%	17.27%	
	Row %	14.59%	26.53%	58.89%	
	Res	-266.93	-584.34	851.268	
	Std. Res	3.40975	5.55971	-5.2125	
	Adj. Res	4.09969	**6.89847**	**-10.088**	
Marginals		31289.1	43039.5	149530	223859

APPENDIX N

Undergraduate Characteristics–Mixed Full-Time and Part-Time

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	7256.33	9378.89	26715.99	43351.2209
2015	7047.08	9306.33	24393.63	40747.0432
2016	6952.54	9495.94	23160.90	39609.3744
2017	6809.21	9333.07	22117.39	38259.6821
2018	6855.57	9247.95	23997.89	40101.4109

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	16.74%	21.63%	61.63%
2015	17.29%	22.84%	59.87%
2016	17.55%	23.97%	58.47%
2017	17.80%	24.39%	57.81%
2018	17.10%	23.06%	59.84%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	0.36	1.43	-1.78
Percentage change	2.13%	6.59%	-2.89%

Test Statistics	
Chi-square statistic	157.6368
Df	8
Critical value	15.50731
p-value	4.99E-30

Undergraduate Characteristics–Mixed Full-Time and Part-Time Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	7256.3343	9378.8934	26715.9932	43351.2
	Exp	7491.79077	10032.2192	25827.21098	
	Column %	20.78%	25.89%	20.41%	
	Row %	16.74%	21.63%	61.63%	
	Res	235.456469	653.325755	-888.782224	
	Std. Res	-2.7203063	-6.5227581	5.530400775	
	Adj. Res	-3.3748457	**-8.1239878**	**10.51639582**	
2015	Obs	7047.0802	9306.3333	24393.6297	40747
	Exp	7041.74682	9429.56758	24275.72879	
	Column %	20.18%	25.69%	18.63%	
	Row %	17.29%	22.84%	59.87%	
	Res	-5.3333754	123.234283	-117.900908	
	Std. Res	0.06355679	-1.2690702	0.756712677	
	Adj. Res	0.07821033	-1.5677965	1.427274055	
2016	Obs	6952.5392	9495.9371	23160.8981	39609.4
	Exp	6845.13929	9166.29143	23597.94368	
	Column %	19.91%	26.21%	17.69%	
	Row %	17.55%	23.97%	58.47%	
	Res	-107.39991	-329.64567	437.0455803	
	Std. Res	1.2981138	3.44310722	-2.84504836	
	Adj. Res	1.59180159	4.23866012	**-5.34736745**	
2017	Obs	6809.2129	9333.075	22117.3942	38259.7
	Exp	6611.89067	8853.94938	22793.84204	
	Column %	19.50%	25.76%	16.89%	
	Row %	17.80%	24.39%	57.81%	
	Res	-197.32223	-479.12562	676.4478411	
	Std. Res	2.4266837	5.0919118	-4.48049037	
	Adj. Res	2.96341695	**6.24255445**	**-8.38647281**	
2018	Obs	6855.5721	9247.9459	23997.8929	40101.4
	Exp	6930.17114	9280.15715	23891.08261	
	Column %	19.63%	25.53%	18.33%	
	Row %	17.10%	23.06%	59.84%	
	Res	74.599041	32.2112491	-106.81029	
	Std. Res	-0.8961099	-0.334372	0.691027259	
	Adj. Res	-1.1005153	-0.4122556	1.30078111	
Marginals		34920.7387	36225.6317	130922.3611	202069

APPENDIX O

Institutional Size–Small

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	3750.7432	4519.868	13166.8457	21437.4569
2015	3747.419	4418.6648	11990.018	20156.1018
2016	3744.6874	4634.9179	11419.74	19799.3453
2017	3734.1649	4618.9886	11128.5945	19481.748
2018	3654.0432	4567.1185	10861.5094	19082.6711

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	17.50%	21.08%	61.42%
2015	18.59%	21.92%	59.49%
2016	18.91%	23.41%	57.68%
2017	19.17%	23.71%	57.12%
2018	19.15%	23.93%	56.92%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.65	2.85	-4.50
Percentage change	9.44%	13.51%	-7.33%

Test Statistic	
Chi-square statistic	128.1241869
Df	8
Critical value	15.50731306
p-value	6.92E-24

Institutional Size–Small Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	3750.74	4519.87	13166.8	21437.5
	Exp	3995.73	4881.15	12560.6	
	Column %	20.13%	25.37%	20.73%	
	Row %	17.50%	21.08%	61.42%	
	Res	244.987	361.286	-606.27	
	Std. Res	-3.8757	-5.1712	5.40958	
	Adj. Res	**-4.8479**	**-6.4364**	**10.1073**	
2015	Obs	3747.42	4418.66	11990	20156.1
	Exp	3756.9	4589.4	11809.8	
	Column %	20.11%	24.80%	18.88%	
	Row %	18.59%	21.92%	59.49%	
	Res	9.47928	170.733	-180.21	
	Std. Res	-0.1547	-2.5202	1.6583	
	Adj. Res	-0.1919	-3.1116	3.07343	
2016	Obs	3744.69	4634.92	11419.7	19799.3
	Exp	3690.4	4508.17	11600.8	
	Column %	20.10%	26.01%	17.98%	
	Row %	18.91%	23.41%	57.68%	
	Res	-54.285	-126.75	181.036	
	Std. Res	0.8936	1.88777	-1.6808	
	Adj. Res	1.10629	2.32551	-3.1082	
2017	Obs	3734.16	4618.99	11128.6	19481.7
	Exp	3631.21	4435.85	11414.7	
	Column %	20.04%	25.92%	17.52%	
	Row %	19.17%	23.71%	57.12%	
	Res	-102.96	-183.14	286.095	
	Std. Res	1.7086	2.7497	-2.6778	
	Adj. Res	2.1111	3.38061	**-4.9421**	
2018	Obs	3654.04	4567.12	10861.5	19082.7
	Exp	3556.82	4344.99	11180.9	
	Column %	19.61%	25.63%	17.10%	
	Row %	19.15%	23.93%	56.92%	
	Res	-97.222	-222.13	319.354	
	Std. Res	1.63017	3.36991	-3.0202	
	Adj. Res	2.00921	4.1329	**-5.5602**	
Marginals		18631.1	17819.3	63507	99957.3

APPENDIX P

Institutional Size–Medium

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	4965.0597	8018.1767	20928.1663	33911.4027
2015	4835.4497	8030.4551	19201.0298	32066.9346
2016	4863.0755	8103.6978	18470.962	31437.7353
2017	4867.1632	8175.1944	18130.1915	31172.5491
2018	4886.1646	8074.4223	17484.1156	30444.7025

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	14.64%	23.64%	61.71%
2015	15.08%	25.04%	59.88%
2016	15.47%	25.78%	58.75%
2017	15.61%	26.23%	58.16%
2018	16.05%	26.52%	57.43%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.41	2.88	-4.29
Percentage change	9.62%	12.17%	-6.94%

Test Statistic	
Chi-square statistic	153.448151
Df	8
Critical value	15.50731306
p-value	3.74016E-29

Institutional Size–Medium Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	4965.06	8018.18	20928.2	33911.4
	Exp	5206.53	8615.09	20089.8	
	Column %	20.33%	25.56%	20.27%	
	Row %	14.64%	23.64%	61.71%	
	Res	241.47	596.915	-838.39	
	Std. Res	-3.3465	-6.4311	5.91502	
	Adj. Res	-4.1007	**-8.0921**	**11.2599**	
2015	Obs	4835.45	8030.46	19201	32066.9
	Exp	4923.34	8146.51	18997.1	
	Column %	19.80%	25.60%	18.60%	
	Row %	15.08%	25.04%	59.88%	
	Res	87.8929	116.055	-203.95	
	Std. Res	-1.2526	-1.2858	1.47971	
	Adj. Res	-1.5238	-1.6061	2.79625	
2016	Obs	4863.08	8103.7	18471	31437.7
	Exp	4826.74	7986.66	18624.3	
	Column %	19.92%	25.84%	17.89%	
	Row %	15.47%	25.78%	58.75%	
	Res	-36.336	-117.03	153.37	
	Std. Res	0.52301	1.30957	-1.1238	
	Adj. Res	0.63464	1.63176	-2.1185	
2017	Obs	4867.16	8175.19	18130.2	31172.5
	Exp	4786.02	7919.29	18467.2	
	Column %	19.93%	26.07%	17.56%	
	Row %	15.61%	26.23%	58.16%	
	Res	-81.139	-255.9	337.039	
	Std. Res	1.17284	2.87559	-2.4802	
	Adj. Res	1.42171	3.57935	**-4.6704**	
2018	Obs	4886.16	8074.42	17484.1	30444.7
	Exp	4674.28	7734.39	18036	
	Column %	20.01%	25.74%	16.93%	
	Row %	16.05%	26.52%	57.43%	
	Res	-211.89	-340.04	551.924	
	Std. Res	3.09921	3.86644	-4.1097	
	Adj. Res	3.74618	**4.79905**	**-7.7171**	
Marginals		24416.9	31364.4	103252	159033

APPENDIX Q

Institutional Size–Large

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	4783.72	7645.95	22233.3	34662.9888
2015	4717.91	7953.58	20903.4	33574.9266
2016	4667.68	8201.55	20604.3	33473.574
2017	4703.07	8272	19736.9	32711.9459
2018	4798.65	8307.45	19291.1	32397.1548

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	13.80%	22.06%	64.14%
2015	14.05%	23.69%	62.26%
2016	13.94%	24.50%	61.55%
2017	14.38%	25.29%	60.34%
2018	14.81%	25.64%	59.55%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.01	3.58	-4.60
Percentage change	7.33%	16.25%	-7.17%

Test Statistic	
Chi-square statistic	199.0360523
Df	8
Critical value	15.50731306
p-value	1.01995E-38

Institutional Size-Large Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	4783.72	7645.95	22233.3	34663
	Exp	4918.51	8390.51	21354	
	Column %	20.21%	25.16%	19.72%	
	Row %	13.80%	22.06%	64.14%	
	Res	134.789	744.559	-879.35	
	Std. Res	-1.9219	-8.1284	6.01757	
	Adj. Res	-2.331	**-10.098**	**11.8764**	
2015	Obs	4717.91	7953.58	20903.4	33574.9
	Exp	4764.12	8127.14	20683.7	
	Column %	19.93%	26.17%	18.54%	
	Row %	14.05%	23.69%	62.26%	
	Res	46.2079	173.554	-219.76	
	Std. Res	-0.6695	-1.9252	1.52805	
	Adj. Res	-0.8086	-2.3819	3.00345	
2016	Obs	4667.68	8201.55	20604.3	33473.6
	Exp	4749.74	8102.6	20621.2	
	Column %	19.72%	26.99%	18.27%	
	Row %	13.94%	24.50%	61.55%	
	Res	82.0574	-98.951	16.8939	
	Std. Res	-1.1906	1.09928	-0.1176	
	Adj. Res	-1.4376	1.3596	-0.2311	
2017	Obs	4703.07	8272	19736.9	32711.9
	Exp	4641.67	7918.24	20152	
	Column %	19.87%	27.22%	17.50%	
	Row %	14.38%	25.29%	60.34%	
	Res	-61.4	-353.76	415.157	
	Std. Res	0.90123	3.97548	-2.9245	
	Adj. Res	1.08508	4.90292	**-5.7297**	
2018	Obs	4798.65	8307.45	19291.1	32397.2
	Exp	4597	7842.04	19958.1	
	Column %	20.27%	27.34%	17.11%	
	Row %	14.81%	25.64%	59.55%	
	Res	-201.65	-465.41	667.059	
	Std. Res	2.97419	5.25554	-4.7218	
	Adj. Res	3.57673	**6.474**	**-9.2401**	
Marginals		23671	30389.8	112760	166821

APPENDIX R

Locale-City

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	4520.06	6943.48	18936.2	30399.7672
2015	4400.58	7172.4	17813.8	29386.809
2016	4367.61	7232.15	17272.8	28872.5376
2017	4453.38	7435.55	16994.6	28883.4893
2018	4523.14	7328.14	16302.8	28154.0883

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	14.87%	22.84%	62.29%
2015	14.97%	24.41%	60.62%
2016	15.13%	25.05%	59.82%
2017	15.42%	25.74%	58.84%
2018	16.07%	26.03%	57.91%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.20	3.19	-4.39
Percentage change	8.05%	13.96%	-7.04%

Test Statistic	
Chi-square statistic	150.119
Df	8
Critical value	15.5073
p-value	1.9E-28

Locale –City Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	4520.06	6943.48	18936.2	30399.8
	Exp	4645.57	7534.75	18219.5	
	Column %	20.30%	25.44%	19.70%	
	Row %	14.87%	22.84%	62.29%	
	Res	125.51	591.264	-716.77	
	Std. Res	-1.8414	-6.8116	5.31025	
	Adj. Res	-2.249	**-8.4938**	**10.2355**	
2015	Obs	4400.58	7172.4	17813.8	29386.8
	Exp	4490.77	7283.68	17612.4	
	Column %	19.76%	26.28%	18.53%	
	Row %	14.97%	24.41%	60.62%	
	Res	90.1926	111.283	-201.48	
	Std. Res	-1.3459	-1.3039	1.51815	
	Adj. Res	-1.6366	-1.6189	2.91344	
2016	Obs	4367.61	7232.15	17272.8	28872.5
	Exp	4412.18	7156.22	17304.1	
	Column %	19.62%	26.50%	17.97%	
	Row %	15.13%	25.05%	59.82%	
	Res	44.5742	-75.932	31.3573	
	Std. Res	-0.6711	0.8976	-0.2384	
	Adj. Res	-0.8142	1.11193	-0.4565	
2017	Obs	4453.38	7435.55	16994.6	28883.5
	Exp	4413.85	7158.93	17310.7	
	Column %	20.00%	27.25%	17.68%	
	Row %	15.42%	25.74%	58.84%	
	Res	-39.527	-276.62	316.147	
	Std. Res	0.59496	3.26933	-2.4029	
	Adj. Res	0.7219	4.05021	**-4.6014**	
2018	Obs	4523.14	7328.14	16302.8	28154.1
	Exp	4302.39	6978.14	16873.6	
	Column %	20.32%	26.85%	16.96%	
	Row %	16.07%	26.03%	57.91%	
	Res	-220.75	-350	570.746	
	Std. Res	3.36547	4.18979	-4.3938	
	Adj. Res	4.07084	**5.17439**	**-8.3877**	
Marginals		22264.8	27291.3	96140.6	145697

APPENDIX S

Locale–Suburb

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	3320.62	5614.56	16291.3	25226.4874
2015	3253.93	5594.37	14964.5	23812.7948
2016	3299.34	5818.31	14810.2	23927.868
2017	3283.57	5833.12	14027	23143.725
2018	3370.56	5991.98	13872.4	23234.8971

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	13.16%	22.26%	64.58%
2015	13.66%	23.49%	62.84%
2016	13.79%	24.32%	61.90%
2017	14.19%	25.20%	60.61%
2018	14.51%	25.79%	59.70%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.34	3.53	-4.88
Percentage change	10.20%	15.87%	-7.55%

Test Statistic	
Chi-square statistic	153.56
Df	8
Critical value	15.5073
p-value	3.5E-29

Locale–Suburb Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	3320.6245	5614.5557	16291.3072	25226.4874
	Exp	3493.57752	6098.6101	15634.29974	
	Column %	20.09%	25.71%	20.12%	
	Row %	13.16%	22.26%	64.58%	
	Res	172.953015	484.05445	-657.007461	
	Std. Res	-2.9261255	-6.1983883	5.254496225	
	Adj. Res	-3.5499857	**-7.7218196**	**10.43623569**	
2015	Obs	3253.9271	5594.374	14964.4937	23812.7948
	Exp	3297.7974	5756.844	14758.15343	
	Column %	19.69%	25.62%	18.48%	
	Row %	13.66%	23.49%	62.84%	
	Res	43.8702972	162.46997	-206.340271	
	Std. Res	-0.7639388	-2.1413166	1.698509521	
	Adj. Res	-0.9199303	-2.6477953	3.348447025	
2016	Obs	3299.3395	5818.3112	14810.2173	23927.868
	Exp	3313.73371	5784.6634	14829.47089	
	Column %	19.96%	26.65%	18.29%	
	Row %	13.79%	24.32%	61.90%	
	Res	14.394208	-33.647793	19.25358507	
	Std. Res	-0.2500512	0.4424025	-0.15810616	
	Adj. Res	-0.3012916	0.5473723	-0.31187887	
2017	Obs	3283.5652	5833.1216	14027.0382	23143.725
	Exp	3205.13895	5595.0935	14343.49254	
	Column %	19.87%	26.71%	17.32%	
	Row %	14.19%	25.20%	60.61%	
	Res	-78.426252	-238.02808	316.454336	
	Std. Res	1.38528149	3.1821784	-2.64230894	
	Adj. Res	1.66233614	3.9211418	**-5.1909105**	
2018	Obs	3370.5565	5991.9833	13872.3573	23234.8971
	Exp	3217.76523	5617.1348	14399.99711	
	Column %	20.39%	27.44%	17.13%	
	Row %	14.51%	25.79%	59.70%	
	Res	-152.79127	-374.84854	527.6398106	
	Std. Res	2.69352715	5.0014785	-4.39699886	
	Adj. Res	3.23376207	**6.165841**	**-8.64215778**	
Marginals		16528.0128	21834.75	80983.01	119345.7723

APPENDIX T

Locale–Town

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	2715.89	3552.05	10006.9	16274.8085
2015	2706.54	3523.38	9139.71	15369.6309
2016	2704.51	3722.02	8795.77	15222.3102
2017	2700.79	3611.8	8597.6	14910.1908
2018	2643.99	3479.27	8399.11	14522.3692

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	16.69%	21.83%	61.49%
2015	17.61%	22.92%	59.47%
2016	17.77%	24.45%	57.78%
2017	18.11%	24.22%	57.66%
2018	18.21%	23.96%	57.84%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	1.52	2.13	-3.65
Percentage change	9.10%	9.77%	-5.94%

Test Statistic	
Chi-square statistic	74.2971
Df	8
Critical value	15.5073
p-value	6.8E-13

Locale–Town Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	2715.89	3552.05	10006.9	16274.8
	Exp	2873.55	3815.66	9585.6	
	Column %	20.16%	24.98%	20.59%	
	Row %	16.69%	21.83%	61.49%	
	Res	157.663	263.609	-421.27	
	Std. Res	-2.9412	-4.2675	4.30282	
	Adj. Res	**-3.6543**	**-5.3341**	**8.05241**	
2015	Obs	2706.54	3523.38	9139.71	15369.6
	Exp	2713.73	3603.44	9052.47	
	Column %	20.09%	24.78%	18.80%	
	Row %	17.61%	22.92%	59.47%	
	Res	7.18373	80.057	-87.241	
	Std. Res	-0.1379	-1.3336	0.91693	
	Adj. Res	-0.1701	-1.6545	1.70317	
2016	Obs	2704.51	3722.02	8795.77	15222.3
	Exp	2687.72	3568.9	8965.7	
	Column %	20.08%	26.17%	18.10%	
	Row %	17.77%	24.45%	57.78%	
	Res	-16.799	-153.12	169.922	
	Std. Res	0.32403	2.56315	-1.7946	
	Adj. Res	0.39911	3.17604	-3.3293	
2017	Obs	2700.79	3611.8	8597.6	14910.2
	Exp	2632.61	3495.72	8781.86	
	Column %	20.05%	25.40%	17.69%	
	Row %	18.11%	24.22%	57.66%	
	Res	-68.187	-116.07	184.261	
	Std. Res	1.32895	1.96321	-1.9663	
	Adj. Res	1.63271	2.42646	**-3.6386**	
2018	Obs	2643.99	3479.27	8399.11	14522.4
	Exp	2564.13	3404.8	8553.44	
	Column %	19.63%	24.47%	17.28%	
	Row %	18.21%	23.96%	57.84%	
	Res	-79.861	-74.469	154.329	
	Std. Res	1.57711	1.27623	-1.6687	
	Adj. Res	1.9315	1.57241	-3.0782	
Marginals		13471.7	14221.1	48606.5	76299.3

APPENDIX U

Locale–Rural

Fall FTE Hours

Year	Tier 1A	Tier 1B	Tier 2	Total Fall FTE
2014	3059.09	4073.91	11093.9	18226.9137
2015	2939.73	4112.55	10176.4	17228.7283
2016	2903.98	4167.69	9616.27	16687.9388
2017	2866.66	4185.71	9376.47	16428.8379
2018	2801.17	4149.6	9062.4	16013.1738

Fall FTE Proportionalities

Year	Tier 1A	Tier 1B	Tier 2
2014	16.78%	22.35%	60.87%
2015	17.06%	23.87%	59.07%
2016	17.40%	24.97%	57.62%
2017	17.45%	25.48%	57.07%
2018	17.49%	25.91%	56.59%

Tier Variance between 2014 and 2018

	Tier 1A	Tier 1B	Tier 2
Proportionality percentage point change	0.71	3.56	-4.27
Percentage change	4.23%	15.94%	-7.02%

Test Statistic	
Chi-square statistic	97.8169
Df	8
Critical value	15.5073
p-value	1.2E-17

Locale–Rural Residuals

			Column		
Row(Year)		Tier1A	Tier1B	Tier2	Marginals
2014	Obs	3059.09	4073.91	11093.9	18226.9
	Exp	3139.75	4458.26	10628.9	
	Column %	20.99%	25.11%	20.62%	
	Row %	16.78%	22.35%	60.87%	
	Res	80.6634	384.358	-465.02	
	Std. Res	-1.4396	-5.7564	4.51054	
	Adj. Res	-1.7864	**-7.2294**	**8.43962**	
2015	Obs	2939.73	4112.55	10176.4	17228.7
	Exp	2967.8	4214.11	10046.8	
	Column %	20.18%	25.35%	18.92%	
	Row %	17.06%	23.87%	59.07%	
	Res	28.0708	101.563	-129.63	
	Std. Res	-0.5153	-1.5645	1.29331	
	Adj. Res	-0.6347	-1.9502	2.40191	
2016	Obs	2903.98	4167.69	9616.27	16687.9
	Exp	2874.65	4081.83	9731.46	
	Column %	19.93%	25.68%	17.88%	
	Row %	17.40%	24.97%	57.62%	
	Res	-29.335	-85.853	115.189	
	Std. Res	0.54714	1.34378	-1.1677	
	Adj. Res	0.67123	1.6684	-2.1599	
2017	Obs	2866.66	4185.71	9376.47	16428.8
	Exp	2830.02	4018.46	9580.36	
	Column %	19.67%	25.80%	17.43%	
	Row %	17.45%	25.48%	57.07%	
	Res	-36.64	-167.25	203.894	
	Std. Res	0.68875	2.63844	-2.0831	
	Adj. Res	0.84334	3.26957	**-3.8459**	
2018	Obs	2801.17	4149.6	9062.4	16013.2
	Exp	2758.41	3916.79	9337.97	
	Column %	19.22%	25.57%	16.85%	
	Row %	17.49%	25.91%	56.59%	
	Res	-42.759	-232.81	275.572	
	Std. Res	0.81414	3.72	-2.8517	
	Adj. Res	0.99386	**4.59585**	**-5.249**	
Marginals		14570.6	16226.2	53788.7	84585.6