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## SPENDING WHERE IT MATTERS: EXPLORING THE RELATIONSHIP BETWEEN INSTITUTIONAL EXPENDITURES AND STUDENT RETENTION RATES AT THE CALIFORNIA STATE UNIVERSITY

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RATES AT THE CALIFORNIA STATE UNIVERSITY

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A Dissertation  
Presented to the  
Faculty of  
California State University,  
San Bernardino

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In Partial Fulfillment  
of the Requirements for the Degree  
Doctor of Education  
in  
Educational Leadership

---

by  
Matias Gabriel Farre

June 2019

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June 2019

Approved by:

Dr. Edna Martinez, Committee Chair, Education

Dr. Nancy Acevedo-Gil, Committee Member

Dr. James E. Smith, Committee Member

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## ABSTRACT

It is anticipated that there will be a shortage of 1.1 million college-educated workers in California by 2030 (Johnson, Bohn, & Cuellar Mejia, 2016). Within this context, the California State University (CSU) is the principal source of skilled workers in the state, producing more career-ready candidates than any other single institution (“California State University 2018 Fact Book“, n.d.).

This study examined the relationship between student retention rates and institutional expenditures across the different functional categories of instruction, student services, academic support, and instructional support at the CSU. With the exception of student grants and scholarships, these selected expenditures represent the system’s four largest individual expense categories. This study also sought to reveal the existence of similarities between institutions across the CSU based on institutional characteristics that emerged from the literature as predictors of student success including faculty composition, socioeconomic status of student population, and institutional selectivity (Bailey, Calcagno, Jenkins, Kienzl, & Leinbach, 2005; Ehrenberg & Zhang, 2005a, 2005b; Gansemer-Topf & Schuh (2006); Terenzini, Cabrera, & Bernal, 2001; Titus, 2006b). The sample utilized in this study is the entire population of the CSU, which is comprised of 23 campuses. Data for this study were drawn from the IPEDS database, managed by the National Center for Education Statistics (NCES).

This quantitative, non-experimental, correlational study used panel data analysis to determine if the selected institutional expenditures influence retention rates and also to examine the extent to which institutional expenditures contribute to the prediction of retention rate. Multidimensional Scaling (MDS) cluster analysis was performed for exploratory purposes and to reveal groups with similar institutional characteristics.

This study found that instructional, academic support, and institutional support expenditures were positively correlated with student retention rates. This finding suggests that increases in both dollar amounts and proportion of expenditures allocated to each functional category would result in higher retention rates. However, there was an exception: student services expenditures were found to be negatively correlated with student retention rates, implying that allocating funds to student services activities would not result in higher student retention. This study also found that the CSU institutions can be grouped in six different clusters based on similarities of institutional characteristics, suggesting that the criteria to allocate funds from the CSU system to individual campuses should account for these differences to effectively support student success.

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## CHAPTER ONE

### INTRODUCTION

#### Problem Statement

It is anticipated that there will be a shortage of 1.1 million college-educated workers in California by 2030 (Johnson et al., 2016). Within this context, the California State University—among its twenty-three campuses—is the principal source of skilled workers in the state, producing more career-ready candidates than any other single institution (“California State University 2018 Fact Book”, n.d.). As pressure to maximize graduation rates and support an increasing number of college graduates continues to rise, the CSU needs to find ways to both improve student success rates and effectively allocate resources in a way that anticipates fluctuations in funding and other external factors.

#### Purpose Statement

The purpose of this study was to examine the relationship between student retention rates and institutional expenditures across different functional categories as defined by the National Association of Colleges and Universities Business Officers (NACUBO) for the California State University (CSU). Specifically, this study examined institutional expenditures related to instruction, student services, academic support, and instructional support. These expenditure categories were selected because they have been widely examined in previous

studies (Bailey et al., 2005; Gansemer-Topf & Schuh, 2006; Hamrick, Schuh, Shelley, & Mack, 2004; Ryan, 2004) and also because they account for more than 60% of the overall expenditure categories in the CSU (“California State University Financial Statements 2016”, n.d.). In addition, with the exception of student grants and scholarships, these selected expenditures represent the four largest individual expense categories in the CSU system (“California State University Financial Statements 2016”, n.d.). This study also sought to reveal institutional practices involving allocation of resources that influence student success, controlling for institutional characteristics including faculty composition, socioeconomic status of student population, and institutional selectivity.

### Research Questions

This study was guided by the following research questions:

1. What is the relationship between student retention rates and institutional expenditures across the functional categories of instruction, academic support, student services, and institutional support?
2. What is the relationship between student retention rates and the proportion of institutional expenditures as a total of core expenses for instruction, academic support, student services, and institutional support?
3. What is the level of similarity among various institutions, based on socioeconomic status of students, institutional selectivity, faculty

composition, and institutional expenditures?

### Significance of the Study

By better understanding the relationship between financial and student success measures, Board of Trustees and educational administrators at CSU and beyond may find better ways to allocate resources and enhance their ability to develop strategies to improve student success outcomes within any aggregate level of available financial resources, especially in environments of increased enrollment and limited funding.

### Theoretical Underpinnings

For this study, I adopted a critical quantitative approach to the research (Nuñez, 2009; Stage, 2007; Stage & Wells, 2014). Although similar to typical positivistic research in terms of methods, critical quantitative research differs in the motivation for the research (Stage, 2007). Critical researchers focus on equity issues, using data to characterize educational processes to expose inequities and to “identify social or institutional perpetuation of systematic inequities in such processes and outcomes” (Stage, 2007, p.10).

Motivated by these goals, this study not only examined the relationship between expenditures and retention rates, but also sought to reveal institutional practices related to allocation of resources that either support or fail to address student needs.



According to Tabachnick and Fidell (2007), it is difficult to determine causality in non-experimental correlational research. Tabachnick and Fidell (2007) cautioned that although variables may be related, the cause of their relationship might be unclear. This research focused on understanding the relationship between institutional expenditures and student retention, which is aligned with Astin's Input-Environment-Output framework (1977, 1993). This study used Astin's I-E-O framework but with a critical bent, analyzing institutional variables to expose inequities in educational processes (Nuñez, 2009; Stage, 2007; Stage & Wells, 2014). According to Astin (1993),

In the I-E-O model, inputs refer to the characteristics of the student at the time of initial entry to the institution; environment refers to the various programs, policies, faculty, peers, and educational experiences to which the student is exposed; and outcomes refers to the student's characteristics after exposure to the environment. Change or growth in the student during college is determined by comparing outcome characteristics with input characteristics. The basic purpose of the model is to assess the impact of various environmental experiences by determining whether students grow or change differently under varying environmental conditions (p. 7).

A key consideration in utilizing the I-E-O involves the selection of measures to assess Input, Environment, and Outcome. Astin (1993) provides examples of selected measures that include student admissions tests scores (Input),

institutional characteristics such as type and size (Environment), and student persistence defined as staying in college versus dropping out (Output). This framework has been applied by other similar studies (El Fattal, 2014; Ryan, 2004), in which institutional expenditures or resources were operationalized as variables that shape the environment. In exploring how the outcomes are affected by the environment, Astin (1993) contends that it is important to control for the input characteristics for students, or results may be biased.

#### Assumptions

Most of the data analyzed in this study were self-reported by institutions within the CSU system as required by NACUBO. Absence of formal audit, it is assumed that data used in this research are accurate and free from error; all data were drawn from the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS).

#### Delimitations

This study used institutional variables that are reported for slightly different time periods: fiscal year and academic year. A fiscal year covers the period beginning July through June of the next year, while an academic year covers the period beginning in September and ending in June of the next year. This study did not account for the gap between reported years, which could potentially impact results depending on the amount of expenditures allocated to summer

sessions.

Although this study explored the relationship between several institutional financial variables and student retention rates, it is not intended to be an exhaustive exploration of all institutional characteristics and their associated relationships to student outcomes. This study set out to identify significant institutional variables with a focus on financial expenditures and other independent variables identified by the review of the literature that have been found to influence student outcomes such as retention rates in public higher education institutions.

### Summary

The CSU is the largest producer of college graduates in California. As such, the CSU plays a key role in addressing the anticipated shortage of 1.1 million college-educated workers in California expected by 2030 (Johnson et al., 2016). It is therefore crucial for policy makers and educational administrators at CSU to enhance their ability to develop strategies to improve student success outcomes within any aggregate level of available financial resources, with a special consideration to environments of increased enrollment and limited funding.

Adopting a critical quantitative approach to the research (Nuñez, 2009; Stage, 2007; Stage & Wells, 2014), the purpose of this study was to examine the relationship between student retention rates and institutional expenditures across

the functional categories related to instruction, student services, academic support, and instructional support. Furthermore, this study sought to reveal the presence of clusters within the CSU that may inform practices involving allocation of resources that influence student success, controlling for institutional characteristics including faculty composition, socioeconomic status of student population, and institutional selectivity.

The following chapter examines the literature related to this study and reviews the research associated with the financial context of higher education in the U.S. and specifically in California. In addition, Chapter Two presents findings from previous studies in the areas of allocation of institutional expenditures and student success.

## CHAPTER TWO

### LITERATURE REVIEW

#### Introduction

In this chapter, I present literature associated with the financial context of U.S. higher education which includes revenue streams, resource allocation strategies, cost trends, and funding methodologies. In addition, I describe the structure and financial condition of public higher education in California, along with the prominent role of the California State University (CSU) in addressing the anticipated shortage of college graduates. Finally, I provide an extensive review of empirical studies that have explored the relationship between institutional expenditures across functional classifications (i.e., instruction, student services, academic support, institutional support, etc.) and student achievement outcomes such as graduation and retention rates. In the conclusion of this chapter, I summarize the review of the literature and highlight major findings that lay the foundation for my research design and support the significance of my study.

#### Financial Context of Higher Education: State Support and Tuition and Fees

Public higher education institutions in the U.S. are funded from federal, state, and local sources. These revenue streams include federal, state, and local appropriations, student tuition and fees, endowments, federal, state, and local grants, and other enterprise operations (Ma, Baum, Pender, & Welch, 2016).

Among these revenue sources, state appropriations (though on the decline) and student tuition and fees have consistently been the two largest funding sources for public colleges and universities, prompting a number of studies to analyze these variables over time and to examine the relationship between state funding, tuition, and other non-financial institutional variables including student success measures (Andersen, 1985; Johnson, Cook, Murphy, & Weston, 2014; Ma et al., 2016; Skolnick, 1986; Titus, 2009; Zhang, 2009).

As described earlier, state support and student tuition and fees represent the most significant sources of revenue for public higher education institutions (Kena et al., 2016). The importance of these two inextricably related financial variables has been highlighted by the National Association of Colleges and Universities Business Officers (NACUBO) (Archibald & Feldman, 2004) and the American Association of State Colleges and Universities (AASCU) among other organizations (Harnisch & Opalich, 2017). In fact, AASCU listed both state support and tuition and fees as a top state policy issues for 2017, noting that state funding and affordability of public higher education institutions will likely face close scrutiny by lawmakers given anticipated tight budgets and expected tuition increases in the near future (Harnisch & Opalich, 2017).

State governments invest in public higher education for numerous reasons. Higher education has been proven to benefit states in areas such as increased tax revenue, greater productivity, increased workforce flexibility, decreased crime rate, and increased community service (Fatima & Paulsen,

2004; Ma et al., 2016; Titus, 2009; Vedder, 2004). According to Ma et al. (2016), higher levels of education are associated with increased compensation, higher likelihood of employment, wider access to healthcare and retirement plans, and healthier lifestyles. Furthermore, studies have indicated that personal income growth is associated with the proportion of the population holding a college degree (Fatima & Paulsen, 2004; Vedder, 2004). For instance, in 2015, the national median earnings of individuals with bachelor's degrees working full time were 67% higher than those with only a high school diploma. Employees holding a bachelor's degree paid 91% more in taxes, but secured after-tax incomes that were 61% higher than those of high school graduates. In addition, unemployment rates for holders of bachelor's degrees have been steady at about half of those with only high school degrees (Ma et al., 2016). In summary, states have and continue to support higher education for the public good, to realize the social returns associated with a college-educated population (Titus, 2009).

Yet, despite the benefits of higher education for individuals and society, the share of revenues provided by states for colleges and universities has declined over time. Adjusting for inflation, state appropriations per full-time equivalent student in fiscal year 2014-15 were 8% lower than they were in fiscal year 2004-05, and 11% lower than they were three decades earlier (Ma et al., 2016). Reductions in state support for higher education are partially explained by growing needs in other government areas. During the last few decades, states have experienced fluctuations in economic activity and increasing costs

associated with entitlements such as Medicaid (Titus, 2009) and with corrections, driven by an increase in the number of people incarcerated (Stullich, Morgan, & Schak, 2016). In relation to other government sectors, “spending for higher education served as the balance wheel of state budgets, decreasing disproportionately relative to other areas when state revenues drop and increasing at a faster pace than other budget categories when state revenues rise” (Titus, 2009, p. 441). Interestingly, Titus (2009) analyzed panel data from 49 states for the period 1992-2004 and concluded that higher education did not compete with the K-12 sector in securing state funding based on the fact that increases in state appropriations for higher education did not deteriorate the state support for K-12 education during the studied period.

According to Baum, Pender, and Welch (2016), state and local appropriations across the U.S. accounted for 30% of total revenues at public four-year institutions in fiscal year 2013-14. Although this percentage was 9% lower than a decade earlier, state and local appropriations constituted the second largest funding source at public higher education institutions. Net tuition revenues, some of which originated from federal and state financial aid sources, accounted for 29% and 41% of total revenues in Fiscal Year 2003-04 and Fiscal Year 2013-14 respectively, making tuition and fees the largest revenue stream for public higher education institutions (Ma et al., 2016).

As stated previously, state support and tuition and fees constitute the largest sources of funds for four-year public colleges and universities in the U.S.



(Kena et al., 2016). Moreover, these two revenue streams are interrelated in a way that changes in state appropriations influence the level of institutional tuition fees. According to a survey conducted by Andersen (1985), when state support declines, higher education institutions become more dependent on tuition revenues and more likely to become customer-oriented, increasing their attention to attracting and retaining students while expanding their fundraising efforts. Although this study was conducted several decades ago, these findings still ring true. Seeking to further examine the financial environment of state higher education, Titus (2009) applied a theoretical framework based on the principal-agent model (Hownack, 1993) and production function (Hopkins, 1990). In exploring decisions made at the institutional level and drawing from state-level data covering 49 states for the period 1992 to 2004, Titus (2009) found that tuition increases at four-year public institutions were negatively correlated with prior year changes in state appropriations. Specifically, Titus (2009) discovered that a decrease of \$100 in per capita state higher education appropriation was countered by a tuition increase of \$8.60 in the subsequent year.

Similarly, Johnson, Cook, Murphy, and Weston (2014) analyzed revenue and expenditure trends in California, and showed evidence that tuition increases were the result of significant reductions in state support to the University of California (UC) and the CSU. Overall, state appropriations allocated to UC and CSU decreased by \$2 billion, or around 30%, between fiscal years 2007-2008 and 2012-2013. Adjusting for inflation, state support per full-time equivalent

student (FTE) dropped during this same period from more than \$16,000 to about \$10,000 at UC, and from almost \$9,000 to less than \$6,000 at CSU (Johnson et al., 2014). As with most public higher education across the U.S., the cost of attendance at UC or CSU is subsidized by state appropriations, which make up for the gap between the costs incurred by these institutions and the tuition charged their students. While costs have been somewhat contained by restricting enrollment growth, the reduction in state support during the period 2007-2012 prompted UC and CSU to increase tuition fees (Johnson et al., 2014). Notably, revenues from tuition increases between the period 2002-2012 did not entirely offset the lost revenues from a declining state support, resulting in a minimal net loss of funds to cover the core operational and instructional activities of the UC and CSU (Johnson et al., 2014). It should be noted that although tuition remained stable from 2012 thru 2017, other mandatory campus-based fees went up by more than 30% at CSU and 20% at UC during the same period, and both universities raised tuition for the 2017–18 academic year (Johnson, Jackson, & Cuellar Mejia, 2017). More recently, state funding for both UC and CSU has increased, allowing these institutions to keep tuition fees f (Xia, 2018).

Although most educational costs for institutions were once covered by state general funds, decreases in state funding resulted in costs being passed on to students in the form of tuition and fees, forcing students to rely more on federal, state, institutional, and private grants (Johnson et al., 2014). Furthermore, more students than ever rely on loans. In the period from 2000-

2012, not only did the proportion of full-time freshmen taking loans in California increase by 7%, from 28% to 35%, but the average loan amount also increased from around \$3,000 to \$6,985 for the first college year (Johnson, Jackson, & Cuellar Mejia, 2017). Notably, both the percentage of freshmen taking loans and the dollar amount of the loans has experienced a modest decline since 2012 (Johnson et al., 2017). While state support and tuition fees have been found to be negatively correlated, a few studies described in the next section have sought to determine if these revenue streams influence degree production.

### Effects of State Funding

Since the beginning of the 21st century, there have been widespread calls for degree production across the nation, and yet, the number of bachelor's degrees awarded differ significantly by state (National Center for Public Policy and Higher Education, 2006).

Discounting the importance of public funding, Skolnick (1986) argued that there is little evidence regarding the negative effects of reduced state funding. In his rhetorically titled publication "If the cut is so deep, where is the blood?", Skolnick posed the questions: "If universities are being as badly damaged by funding limitations as they claim, why can't researchers uncover evidence of that damage? Why can't spokespersons for the universities communicate that damage effectively to governments?" (Skolnick, 1986, p. 436). Motivated by the limited amount of research in the area of public policy finances and student outcomes, Titus (2009) explored the influence of state higher education funding

policies on the production of postsecondary degrees using annual state-level panel data of 49 states for the period of 1992 to 2004. Countering Skolnick's argument, the study found that the number of baccalaureate degrees awarded within a state is positively correlated with the state funding for higher education (Titus, 2009). For example, a 10% increase in state appropriations to public higher education institutions resulted in a three percent rise of bachelor's degrees awarded (Titus, 2009). This finding indicates that for every 10% increase in per capita appropriation to higher education institutions, bachelor's degree production rises by three percent.

Exploring variables similar to those used by Titus (2009), Zhang (2009) examined the relationship between state funding and graduation rates at four-year public institutions. Zhang (2009) collected data on graduation rates for eight cohorts entering in academic years 1991-1992 to 1998-1999 at four-year institutions, as reported in IPEDS, and obtained descriptive statistics for each cohort from College Board data. Using different panel models including between institutions estimator, fixed effects, and random effects, Zhang (2009) found public institutions with greater state funding have higher graduation rates ( $p < 0.01$ ). Specifically, Zhang (2009) asserted that a 10% increase in state funding resulted in a 0.7% increase in graduation rates. Although small, the study confirmed a positive link held across public institutions that experienced either increases or reductions in state funding. In this study, Zhang (2009) assumed that financial variables were relevant only during the first four years of study,

neglecting to acknowledge potential changes to internal allocation of resources across various functions and programs. Having presented the nature and characteristics of the most significant revenue sources for public higher education, in the next section, I describe research associated with how these revenues are spent, and factors affecting internal allocation of resources which ultimately influence student success outcomes.

### Spending Trends

Higher education institutions are not immune to external economic factors which may influence the internal allocation of funds and the number of degrees awarded (Desrochers & Hurlburt, 2016). In a recent report issued by the American Institutes for Research (AIR), an examination of college and university spending was conducted during one of the most difficult economic periods in decades (Desrochers & Hurlburt, 2016). The financial consequences of the 2008 recession were extensive, impacting the institutional budgetary environment and college affordability for students. Notably, this financial crisis brought about an opportunity for colleges and universities to reexamine their approach to student success and resource allocation (Desrochers & Hurlburt, 2016). The report issued by AIR to explore college and university expenditures drew data from the Delta Cost Project database covering the period from 1987 to 2013. This database included institutional averages for public and private nonprofit four-year institutions and public community colleges, organized on the basis of the 2010 Carnegie Classification, which is a framework used for research purposes to

identify groups of similar institutions. The Delta Cost Project database was compiled from publicly available data reported to the federal government through the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS), and administered by the National Center for Education Statistics (NCES).

Some of the important variables analyzed in the report issued by AIR included education and related (E&R) expenditures, defined as “expenditures related only to the core academic mission: instruction, student services, and a prorated share of administration and operations and maintenance.” (Desrochers & Hurlburt, 2016, p. 2). “E&R excludes spending on sponsored research, public service, auxiliaries, and other operations” (Desrochers & Hurlburt, 2016, p. 2). Desrochers and Hurlburt (2016) found that among public four-year colleges and universities, E&R spending rose, on average, by two to three percent from 2012 to 2013. This increase constituted the largest since the beginning of the start of the economic downturn in 2008. In addition, data from 2013 suggested that higher education institutions started to recover from the steep declines in funding experienced during the 2008 financial crisis. Given the sharp increase in enrollment brought about by the 2008 recession, degree productivity—number of degrees awarded per 100 FTE enrolled students—increased across all types of colleges and universities (Desrochers & Hurlburt, 2016). Remarkably, there were significant reductions in state and local support during the period 2008-2013, which means that higher education institutions were able to do more with less

during this period, a situation that, according to Desrochers and Hurlburt (2016), may not be sustainable. The report also indicated that within E&R expenditures, instructional spending per FTE increased at a lower rate than other expenditure categories like student services and academic support. Interestingly, the analysis of spending trends revealed that during this same period, the number of administrative positions increased slightly more than faculty positions (Desrochers & Hurlburt, 2016).

### Implications for Faculty

Budget constraints and associated requirements to reduce costs can influence the faculty composition at colleges and universities (Bettinger & Long, 2010; Zhang, 2009). Studies have shown that mounting financial pressures faced by public higher education institutions have resulted in an increase in the proportion of adjunct or non-tenure-track faculty (NTTF) and a decrease in the proportion of tenure and tenure-track faculty (Zhang, 2009). For example, the most recent headcount data from the CSU system indicated that almost 60% of faculty were NTTF (“CSU Systemwide Human Resources”, n.d.).

There is also evidence that increased usage of adjunct faculty negatively impacts graduation rates at four-year institutions, especially at public master’s universities (Ehrenberg & Zhang, 2005a, 2005b). Controlling for other variables, a 10% increase in the proportion of part-time faculty was found to be correlated with a 3% reduction in graduation rates at public master’s institutions (Ehrenberg & Zhang, 2005a, 2005b). Nevertheless, it should be noted that higher education

institutions, not adjunct faculty, should be held primarily responsible for the poor student success outcomes associated with increased reliance on adjunct faculty. To highlight this point, Kezar (2013) studied the influence of institutional policies and practices on the performance of non-tenure-track faculty (NTTF). Conducting a multi-case study, Kezar (2013) interviewed over 100 NTTF at three four-year public universities and identified several institutional activities that were detrimental to the NTTF capacity and opportunity to perform. Specifically, Kezar (2013) mentioned unhealthy practices that included deficient hiring practices, faculty turnover due to low compensation packages, poor communication of information and required training, absence of a formal onboarding process, and inconsistent departmental support from the staff and chair. In relation to physical and financial resources, Kezar (2013) observed that NTTF were less likely to secure adequate office space, administrative support, and class materials, which, in turn, negatively impacted graduation rates. Burke and Minassians (2001) have shown how graduation rates are increasingly being used to measure institutional accountability.

### Accountability

Since the beginning of the 21st century, governments, legislative bodies, and the public in most parts of the globe have increased their interest in learning how higher education institutions utilize public resources and evaluate the results of their teaching and research practices (Bailey et al., 2005; Salmi, 2009; Sanford & Hunter, 2013; Spellings, 2006). In a report issued by the Commission on the



Future of Higher Education appointed by former Secretary of Education Margaret Spellings, accountability is cited as vital to the much needed reforms in higher education. According to Spellings (2006), “Colleges and universities must become more transparent about cost, price, and student success outcomes, and must willingly share this information with students and families” (p. 4). Spellings (2006) also highlighted recommendations to make colleges and universities more accessible, affordable, and accountable while maintaining high quality education. These recommendations included streamlining pathways from high schools to college, simplifying regulations around financial aid applications and programs, and improving the reporting of institutional financial measures and student outcomes to the general public (Spellings, 2006). Sanford and Hunter (2013) underscored this need for new accountability measures, arguing, “The public is no longer willing to accept peer-review and accreditation as satisfactory forms of accountability” (p. 4).

Although colleges and universities have always experienced some level of accountability, it has intensified significantly over recent years. As Lane (2007) pointed out, “Performance audits, purchase approvals, building inspections, personnel approval, and budget reports represent a cadre of formal procedures implemented by the states to oversee the functions and decision making of public colleges and universities” (p. 618). In addition, various stakeholders, including policymakers, have increasingly judged the performance of higher education institutions by their student outcomes, such as graduation rates (Bailey et al.,

2005). Likewise, higher education institutions have also been pressured to find new ways to manage limited institutional resources in order to achieve more aggressive degree productivity goals—all while meeting the needs of a shifting demographic student population.

These challenges are amplified for Minority Serving Institutions (MSIs), given that many of their students are underprepared and need additional resources and support to succeed in college (Institute for Higher Education Policy, 2011). The Symposium on Financial Literacy and College Success at Minority-Serving Institutions, where participants include university presidents and chief student affairs personnel, produced a brief that emphasized the need to evaluate and examine the relationship between institutional fiscal management and student success at MSIs. The brief also highlighted the specific set of challenges that MSIs face in supporting the most underserved students in higher education, and provided an overview of various assessment tools that connect institutional finances with student outcomes measures, including the Composite Financial Index (CFI), Financial Indicators Tool (FIT), and the Financial Responsibility Test (FRT) (Institute for Higher Education Policy, 2011). Although there is some indication that these tools may help assess the academic quality of institutions as measured by the U.S. News & World Report, there is no evidence supporting the effectiveness of these tools in improving student success outcomes through internal allocation of resources (Montanaro, 2013).

Minority-Serving Institutions (MSIs) encompass a diverse group of colleges and universities. MSIs include Historically Black Colleges and Universities (HBCUs), Tribal Colleges and Universities (TCUs), Hispanic-Serving Institutions (HSIs), and Asian American and Native American Pacific Islander–Serving Institutions (AANAPISIs), and they play a significant role in providing access to higher education for a growing number of underrepresented students across the U.S. (Stuber, 2016). In 2011, MSIs enrolled 25% of all undergraduate students in the U.S., including a disproportionately large number of low-income students and students of color (Stuber, 2016). Currently, 21 of 23 campuses in the CSU system are recognized as HSIs, enrolling more than 25% of undergraduate full-time equivalent Latino students (“California State University 2018 Fact Book”, n.d.). MSIs play an essential part in serving and retaining students of color who are more likely than their white counterparts to come from low socioeconomic status families, depend on financial aid to attend college, and be first-generation college students (Merisotis & McCarthy, 2005). Students of color bring a valuable set of social and cultural wealth to colleges and universities, and, as stated by Conrad and Gasman (2015), the challenge “is to provide them with access to institutions that understand and value their experiences and resources, challenging them with the obligation and opportunity to learn what really matters to them, and getting them to a degree” (p. 19). It is within this context that performance-based funding has emerged as a viable

alternative to address the accountability challenges faced by higher education institutions.

### Impacts of Performance-Based Evaluation and Funding

Performance-based funding is a method in which funding is connected to desired outcomes. Whenever specific goals are met, institutions are awarded additional funds from designated sources (Murphy et al., 2014). Performance-based methodologies have spread across the U.S. because colleges and universities are being asked to do more with less (Institute for Higher Education Policy, 2011). In a recent report, the Public Policy Institute of California (PPIC) stated that performance-based evaluation and performance-based funding could improve the efficiency in the delivery of higher education, while highlighting the importance of establishing clear goals when institutionalizing performance-based models (Johnson, 2017). Since first implemented in Tennessee in 1979, performance-based models have been adopted by twenty-five states as of 2014 (Murphy, Cook, Johnson, & Weston 2014). Although established with varying characteristics, performance-based models are similar in that they all establish measures associated with student success such as retention rate, graduation rate, and job placement. The majority of states applying performance-based methods use retention and graduation rates as indicators of success for performance-based funding (Burke & Minassians, 2001).

In California, performance-based funding offers the opportunity to influence higher education practices so that they align with state priorities

(Murphy et al., 2014). Although other states have been utilizing it for decades, California has limited experience with performance-based funding (Murphy et al., 2014). In what was considered a modified version of performance-based funding, California's budget enacted for 2014-2015 included a \$50 million designation for Awards for Innovation in Higher Education (Murphy et al., 2014). These awards were aimed at increasing the number of bachelor's degrees awarded in the state, allowing more students to complete their studies within four years, and streamlining the process to transfer within the state's educational system (California Department of Finance, 2015). In contrast with other performance-based funding approaches, California awarded funds based on applications that pledged to create cost-effective and innovative approaches to deliver quality higher education rather than requiring the use of actual performance measures to demonstrate progress towards goals (Murphy et al., 2014).

It should be noted that performance-based funding may result in unintended consequences. Specifically, critics of this approach have indicated that performance-based funding may impact negatively access and quality of education. According to Murphy et al. (2014), an institution rewarded merely by the number of degrees produced may decide to implement institutional policies that restrict access to minority students. This concern is shared by Umbricht, Fernandez, and Ortagus (2017), who claim that performance-based models will prompt colleges and universities to change their admissions policies in favor of students that are deemed more likely to graduate and to enroll fewer students

that have lower ACT or SAT scores and/or lower GPAs, and are hence perceived as less likely to graduate. Regrettably, students that are seen as less likely to graduate are largely represented by racial minorities or lower income families (Umbricht, Fernandez & Ortagus, 2017). Another unintended consequence of performance-based funding may involve higher education institutions that choose to loosen graduation requirements in order to meet performance measure goals (Murphy et al., 2014).

Supporters of performance-based funding, including Shulock and Moore (2007), assert that incorporating performance-based funding means investing in success. However, not all performance-based models have been successful in improving student success. Some studies have suggested that performance funding has not been significantly effective for increasing associate's or baccalaureate degree completions, and that it may even have had negative effects in some states (Sanford & Hunter, 2011; Tandberg & Hillman, 2013). Sanford and Hunter (2011) examined the influence of changes in performance-based funding policies on student retention and 6-year graduation rates in the state of Tennessee; drawing data from public four-year institutions for the period from 1995-2009, they found that performance funding had no influence on graduation and retention rates. In a more comprehensive study, Tandberg and Hillman (2013) reviewed the production of degrees in 25 states that adopted performance funding models between the years of 1990 and 2010. Applying a quasi-experimental research design and considering a number of variables

including tuition fees, distribution of enrollment across institutions granting four and two-year degrees, state policies and economic factors such as unemployment rate, Tandberg and Hillman (2013) concluded that performance funding programs had little to no effect on graduation rates. Notably, Tandberg and Hillman (2013) found more cases of performance-based funding producing negative results on degree completions and considerably more cases where performance funding programs had no significant effect on the production of degrees. Positive effects were only observed for some states only seven years after implementation, and this only applied to four-year degrees, whereas no positive impact was observed for two-year degrees (Tandberg & Hillman, 2013).

When presented with various performance measure outcomes, higher education institutions may pay more attention to institutional accomplishments that contribute to their prestige than on student success measures. Jongbloed and Vossensteyn (2001) explored the funding process for higher education institutions and the extent to which the dollar amount of grants given to universities was influenced by their performance. Interested in global practices, Jongbloed and Vossensteyn analyzed governmental policies on higher education funding of eleven countries that belong to the Organization for Economic Co-operation and Development (OECD) countries: Australia, Belgium, Denmark, France, Germany, Japan, The Netherlands, New Zealand, Sweden, United Kingdom, and the United States (2001). Jongbloed and Vossensteyn (2001) concluded that teaching and research grant funding resulted in universities

focusing more on research outcomes (i.e. number of research publications) than on teaching outcomes (i.e. number of graduates), implying that performance-based funding may sometimes contribute to activities not directly associated with student achievement measures (Jongbloed & Vossensteyn, 2001).

Performance funding has also been studied at selective universities across the globe. Based on case studies and in-depth interviews with higher education administrators and professors, Liefner (2003) analyzed six institutions regarded as prestigious, internationally recognized research universities. The investigation included universities from the United States (Massachusetts Institute of Technology [MIT], University of Texas at Austin [UT Austin]), Switzerland (Swiss Federal Institute of Technology [ETH Zurich], University of Basel), the Netherlands (University of Twente), and Great Britain (University of Bristol). Similar to Umbricht, Fernandez and Ortagus (2017), Liefner (2003) also found that while performance-based funding is likely to produce positive change, it can also bring about unintended consequences. Specifically, Liefner (2003) posited that tying performance to funding can alter the behavior of faculty, prompting them to work harder and increase productivity, as measured by a number of publications. In contrast with performance-based funding, Liefner (2003) indicated that stable budgets not linked to performance provide faculty with more flexibility to think, conduct research, and take risks. Liefner (2003) stressed that when external performance measures influence the internal allocation of budgets, it is important to understand that the long-term success of



the institution depends on the qualifications, aptitudes, and motivations of employees, which, in turn, influence student outcomes.

### California Higher Education

In California, economic pressures to improve the production of college graduates have mounted in anticipation of future demands. According to Johnson, Bohn, and Cuellar Mejia (2016) from the Public Policy Institute of California (PPIC), the higher education system in California is failing to produce the skilled workers required to meet the future economic needs of the state, particularly in the fields of technology and healthcare. Specifically, Johnson et al. (2016) have argued that if existing trends in population, graduation rates, and demand for skilled workers remain, California will face a shortage of 1.1 million college-educated workers by 2030. The population trends contributing to the projected college graduation deficit include a large number of Baby Boomers with college degrees reaching retirement age, and young adults graduating from college at insufficient rates to close the gap (Johnson, 2017). Furthermore, Johnson (2017) warned that without improvements in the educational system, personal incomes and associated tax revenues will decline, and more Californians will rely on welfare, negatively affecting economic growth, economic mobility, and inequality. Johnson et al. (2016) also called for new investments to reverse the situation, aimed at measuring and identifying policies and programs that contribute to student success.

Californians have expressed concerns about the need to produce more bachelor's degrees and have identified key challenges and solutions to this problem. Baldassare, Bonner, Kordus, and Lopes (2016) from the PPIC conducted a survey including 1711 adult residents of California via landlines and cellphones that were selected using computer generated random samples, reaching regions that accounted for 90% of the state population. According to the survey, the vast majority of respondents agreed that the state's higher education system was vital to the economic prosperity of the state over the next few decades and about half of Californians indicated that a college degree was essential to succeed in today's job market (Baldassare et al., 2016). From the survey findings, almost half of respondents recognized that the state was not producing the required number of college educated workers to meet the future economic demands, while the majority believed affordability was a major problem. Most Californians agreed that the state funding for California's higher education institutions is not adequate, while half of surveyed adults stated that solutions to the financial challenges include not only increases in state support but also more efficient use of existing funds (Baldassare et al., 2016). To address the needs of the state, there are current efforts to revisit the California Master Plan for higher education which lays out the existing higher education structure in California.

## California Master Plan

After World War II, veterans benefiting from the G.I. Bill and the large Baby Boomer generation reaching college age created public pressure to expand enrollment capacity of higher education institutions (Callan, 2009). In an effort to address the rapidly growing enrollments and the lack of coordination between the state's colleges and universities, a committee called the Master Plan Survey Team created the California Master Plan for Higher Education. In 1960, the California Legislature passed the Donahoe Act which adopted recommendations from the California Master Plan. The Donahoe Act defined a framework in which Junior Colleges, State Colleges, and the University of California, would play clearly delineated roles in terms of mission and admission policy, avoiding unnecessary and wasteful competition among themselves (California State Department of Education, 1960).

The organizational provisions of the Master Plan were straightforward. Public junior Colleges –now known as the California Community Colleges (CCC)- would be open to all Californians who would benefit from attendance, offering instruction up to the 14th grade level, including vocational programs and courses for transfer to baccalaureate-granting institutions (Callan, 2009). The state colleges –now known as the California State University (CSU)- would offer both undergraduate and graduate programs through master's degrees and could participate in joint doctoral degree programs with the University of California, and their students would be admitted from the top third of high school graduates

(Callan, 2009). Lastly, the University of California would be designated as the state's primary agency for state-supported research and retaining the sole authority to offer doctoral degrees, offering professional degree programs such as Medicine, Law and Dentistry. Students attending the UC would be admitted from the top eighth of California high school graduates (Callan, 2009).

It is important to note that not all the recommendations of the California Master Plan were incorporated into statute through the 1960 Donahue Act, which has been amended by various bills over the years (Boilard, 2009). Some parts of the Master Plan such as eligibility pool targets have been embraced by governments and higher education institutions, even though these provisions were never adopted in statute. Most notably, the recommendation to endorse the long-established principle that higher education should be tuition free to all residents of the state has in effect been ignored (Boilard, 2009). Other parts of the Master Plan have changed through enacted legislation. For instance, in 2005, Senate Bill (SB) 724 enabled the CSU to offer doctoral degrees in Education and a few other designated fields (Carroll, 2017). In 2014, SB850 gave CCCs authority to begin a pilot that consisted of developing and offering baccalaureate programs at no more than fifteen community colleges across California, and limited to only one program at each site (Carrol, 2017). Eventually, only twelve colleges were authorized to offer baccalaureate degrees. Most recently in 2017, the Assembly Select Committee on the Master Plan for Higher Education in California was formed and convened with the purpose of reviewing the Master

Plan and making sure that it still meets the needs of students in the 21st Century economy (Gordon, 2017). As indicated previously, the biggest issue in meeting the needs of higher education is related to funding (Baldassare et al., 2016).

### State Funding

Although Californians agree that higher education is a priority (Baldassare et al., 2016), the proportion of state support allocated to higher education in California has declined over the past four decades (Cook, 2017). At first glance, the State of California has recently demonstrated a strong commitment to higher education by making it its third largest priority after K-12 education and health and human services (California Department of Finance, 2017) and reinvesting in higher education considerably more than any other state in the nation since the end of the economic recession in 2009 (Cook, 2017). In fiscal year 2016-17, California allocated 12% of its total budget to higher education, which accounts for over \$12 billion distributed to UC, CSU, and the California Community Colleges (CCC). However, paying a closer look at the trends, state appropriations for higher education decreased from 18% of the total state budget in fiscal year 1976-77, to 12% of the total budget by fiscal year 2016-17. This reduction translates to a 25%, or \$2,000 reduction in funding, from about \$11,000 to slightly less than \$9,000 per student at the CSU (Cook, 2017). To offset these budget cuts, the CSU responded by raising tuition fees, which have tripled over the past two decades. It should be noted that the consequences of higher tuition fees have not evenly affected the total student population, as tuition fees for

around 50% of CSU students are covered by state, federal, institutional grants, or a combination of them (Cook, 2017).

Legislation has also influenced the way California distributes funds across public higher education institutions. Enacted in 1988, Proposition 98 required that a minimum proportion of the state budget be distributed to K-14 education. While each of the three higher education systems in the state used to receive a similar percentage of state appropriation, Proposition 98 shifted the allocation to about 60% to CCC and around 40% to UC and CSU (Cook, 2017).

In California, the proposed Governor's budget for 2017-2018 released at the beginning of 2017 indicated that the state faced budget constraints due to lower than expected revenue growth (California Department of Finance, 2017). Although the Governor's proposal included overall increases for higher education, it did not fully address the budget needs of the UC and CSU, prompting the UC regents to approve the first tuition increase after a six-year freeze in late January 2017, and the CSU to follow with a tuition increase of 5%, or about \$270 for in-state students in March 2017 (Watanabe, 2017). Regardless of the source, funding is required to promote completion.

In California, public higher education plays a key role in producing college graduates. Three out of four bachelor's degrees are awarded by the CSU and the UC (Johnson, 2017). However, the number of Californians that complete their bachelor's degree in four years is low. Although increasing access could help close the projected college degree shortage by 2030, California needs to work on

improving the proportion of students that are retained and ultimately graduate (Jackson, Cook & Johnson, 2016). Only 61% of UC students and 16% of CSU students graduate in 4 years, with students at private for-profit institutions exhibiting worse graduation rates (Jackson et al., 2016). Several factors contribute to poor graduation rates, some of which are intrinsically related to institutional financial resources such as limited course availability (Jackson et al., 2016). For example, a survey of department chairs in the CSU conducted in 2013 found that 1,294 courses across the system were identified as “bottleneck courses,” or high demand classes with limited availability. Overall, the survey concluded that most courses were required general education, laboratory, or upper-level classes needed to complete specific majors (Jackson & Cook, 2016). The survey also highlighted a connection between bottleneck courses and financial resources. Causes identified for the bottleneck courses included lack of funding to hire faculty, not enough qualified faculty, and inadequate space for facilities dedicated to lecture courses and labs (Kiss, 2014). Furthermore, recommendations to reduce the number of bottleneck courses included a better allocation of resources (Kiss, 2014).

Although some students have access to the CSU system, they do not have access to specific programs. A CSU program or a campus is deemed impacted when the number of qualified applications exceeds the number of available seats during the initial application period. Impaction prompts programs and campuses to utilize supplemental admission criteria to screen applicants

("Impaction at the CSU", n.d). CSU data show that seventeen out of twenty-three campuses are experiencing some level of impaction for first-time freshman and upper division programs (California State University, 2017). Moreover, six CSU campuses -Fresno, Fullerton, Long Beach, San Diego, San Jose, and San Luis Obispo- are impacted for all programs, making it more difficult for students to get accepted and limiting the number of much needed college graduates in California. It should be noted that limited funding resulting in reduced course availability and impacted programs are at odds with the goals to increase the number of classes per student and reduce time to graduation. The challenge to increase the production of bachelor's degrees with insufficient resources is very much present at the CSU, which is the focus of this study.

#### Relevance of California State University

The CSU is the largest and one of the most diverse university systems in the nation. With 23 campuses serving more than 480,000 students, the CSU is also the state's principal source of skilled workforce in California, producing more career-ready candidates than any other single institution ("California State University 2018 Fact Book", n.d.). However, the CSU is trailing similar universities in four-year graduation rates and has larger graduation gaps between underrepresented students and peers (Jackson & Cook, 2016). Faced with increased pressures to help address the predicted shortage of college graduates, the CSU has established aggressive goals to improve graduation rates. Described as the Graduation Initiative 2025, CSU seeks to increase its six-



year graduation rate to 60% and cut by half the graduation gap between underrepresented minorities and their peers (Jackson & Cook, 2016). Although the CSU is already close to achieving the system-wide graduation goals (Jackson & Cook, 2016), there is a wide variance in graduation rates across campuses, ranging from 35 percent to 76 percent. Given the different institutional characteristics, the CSU Graduation Initiative 2025 includes different goals set for each campus in the system based on top graduation rates at similar universities across the nation (Jackson & Cook, 2016).

Jackson and Cook (2016) examined graduation rate trends across the CSU for the period 2001-2015. In their study, Jackson and Cook (2016) suggested that improvements in graduation rates were not mainly driven by student characteristics, suggesting that the programs implemented by individual campuses also influence graduation rates. In addition, Jackson and Cook (2016) highlighted common approaches to improve student graduation rates. These strategies included advising and support services through high-impact practices, establishment of student success centers aimed at reducing administrative and logistical barriers faced by students, and increasing the number of advisors (Jackson & Cook, 2016). Time to graduation can be also shortened by adopting specific strategies and plans, including the creation of state grants specifically targeted for students willing to take more classes per term (Jackson et al., 2016). Other alternatives to shorten graduation rates include linking funding to student outcomes through performance-based funding models. As states increase their

contributions to higher education, there is an opportunity to tie funding sources with student outcomes such as dropout, graduation, and transfer rates (Jackson et al., 2016). Nevertheless as noted earlier, performance-based approaches have shown to have little to no effect on graduation rates across the nation (Tandberg & Hillman, 2013).

All of these initiatives require funds to materialize, increasing the challenge to achieve institutional goals with limited resources. Ultimately, departments within colleges and universities find themselves competing for internal allocations of financial resources in a zero-sum game (Abe & Watanabe, 2015). It is within this context that resource allocation becomes critical in ensuring that dollars are spent efficiently, and in a manner that best supports institutional goals.

### Resource Allocation and Student Success

The resource allocation process is central to student success, evidenced by a number of studies that revealed the influence of varying expenditures patterns on student retention and graduation rates (Ryan, 2004; Hamrick, Schuh, Shelley, & Mack, 2004; Bailey et al., 2005; Gansemer-Topf & Schuh, 2006). In other words, the manner in which colleges and universities decide to allocate available funds across expenditures categories such as instruction, student services, academic support, and institutional support, has a direct impact on student success outcomes.

Massy (1996) described three keys to effective resource allocation. First, understanding the system of incentives that guides the spending in colleges and universities. Second, recognizing and managing the diversity of intrinsic values within higher education. Lastly, Massy (1996) acknowledged that managing the complexity presented by colleges and universities is another essential requirement for effective allocation of resources. In contrast with for-profit enterprises, public colleges and universities follow a unique set of incentives when it comes to raising and spending money. To explain the behavior of higher education institutions, Massy (1996) cited what is widely known in literature as the Bowen's Law: "universities will raise all the money they can and spend all the money they raise" (p. 4).

Although U.S. colleges and universities have established a prominent reputation around the globe, policy makers and the general public have started to question the cost of education and the associated impact on tuition and taxpayers in general (Massy, 1996). Furthermore, Massy (1996) pointed out that stakeholders have begun wondering why public colleges and universities cannot manage their costs more effectively to reduce the burden on students and taxpayers. Within this context, resource allocation becomes relevant not to only issues of access, but also to student outcomes. As posed by Massy (1996), "Isn't it obvious that one just puts the money where it will do the most good? Can't informed people, who know the academic disciplines and their institutions strengths and weaknesses, simply decide what programs need funding the

most?” (p. 3). Financial decisions at public higher education institutions may seem straightforward but they actually involve a great level of complexity influenced by different interpretations of institutional mission (Massy, 2016).

The process to allocate resources is inherently complex and varies across institutions. Common practices to allocate funds tend to be driven mainly by historical allocation patterns, performance goals, or enrollment figures (Ryan, 2004). Notably, none of these approaches rely on empirical research linking financial resources and the achievement of institutional and student goals, such as student retention and degree attainment, which are commonly used measures for student success outcomes.

#### Student Success Outcomes

According to Núñez and Elizondo (2012), it is more common to find students rather than institutions as unit of analysis for longitudinal studies that seek to predict student outcomes such as retention rates. Núñez and Elizondo (2012) pointed out that college completion, which is usually used as an assessment measure for performance based funding at colleges and universities, was identified as one of the key issues facing higher education by the American Association of State Colleges and Universities. Choosing a metric to assess college completion has proven to be challenging. The proportion of full-time first time students who graduate from the same institution within 6 years -cohort graduation rate- is a common measure used by higher education institutions given federal and state reporting requirements. However, this metric puts less

selective colleges at a disadvantage given their larger proportion of transfer and low socioeconomic status students who are considered less likely to complete their degrees (Nunez & Elizondo, 2012).

### Measuring Success

Student retention rate is a key measure of institutional performance and one of the most cited statistics associated with student success (Voigt & Hundrieser, 2008). For the last three decades, student retention has been an important metric in US higher education institutions, mainly due to its impact on financial resources and graduation rates (Lau, 2003). The National Center for Education Statistics (“NCES 2018-2019 Glossary Results”, n.d.) defines student retention rate as:

A measure of the rate at which students persist in their educational program at an institution, expressed as a percentage. For four-year institutions, this is the percentage of first-time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions this is the percentage of first-time degree/certificate-seeking students from the previous fall who either re-enrolled or successfully completed their program by the current fall.

Retention of students is a concern for educators across all segments of higher education (Murtaugh, Burns, & Schuster, 1999). Although the US has made significant progress on the percentage of students enrolling in higher

education, the national conversation has shifted from college enrollment to college completion (Ma, Pender, & Welch, 2016). The percentage of students who enroll in college right after graduating from high school increased from 51% in 1975 to 69% in 2015 (Ma, Pender, & Welch, 2016). However, completion rates vary considerably across different socioeconomic status (SES) groups.

Considering students that enrolled in college right after graduating from high school in 2004, graduation rates within eight years ranged from 15% for low SES groups to 81% for high SES students. Gaps between completion rates of students with different SES need to be addressed by devoting more resources to both students and the institutions that they attend (Ma, Pender & Welch, 2016). It should be noted that there is an intimate relationship between SES and race. According to Reeves, Rodrigue, and Kneebone (2016), African Americans and Hispanics experience higher levels of multidimensional poverty - low income, lack of education, no health insurance, poor living area and jobless family- than their White counterparts. Unfortunately, these poverty dimensions are perpetuated by systemic policies.

Studies on student retention have focused on precollege characteristics of students, causes of students departing from school (Astin, 1993; Tinto, 1993), description and evaluation of programs designed to improve student retention (Boudreau & Kromrey, 1994; Glass & Garrett, 1995; Reyes, 1997), and teaching techniques (Dougherty et al., 1995; Moore & Miller, 1996). Despite their limitations, the most widely applied models for undergraduate student attainment

are Tinto's (1993) Student Integration Model and Bean's (1985) Student Attrition Model. Much of the research on student retention and persistence has been based on social and academic integration of traditional college students (Pascarella & Terenzini, 1991; Tinto, 1993). It should be noted that Tinto's theory has been subject to criticism for failing to include experiences of minority groups. As Rendón, Jalomo, and Nora (2000) pointed out, Tinto's theory is "based on full-time, traditional-age, residential, middle-class, white male students" (p. 142).

In exploring demographic and academic factors associated with student retention, Murtaugh et al. (1999) conducted a study of 8,867 first-time freshmen enrolled between 1991 and 1995 at Oregon State University. Using a methodology known as survival analysis, which is appropriate for responses tied to the occurrence of an event such as withdrawal from school, Murtaugh et al. (1999) focused on demographic and academic variables. Murtaugh et al. (1999) found a significant independent relationship between student retention and demographic and academic variables including age, ethnicity, race, high school and first-quarter academic performance. Additionally, Murtaugh et al. (1999) found a superior predictive measure on high school GPA than SAT scores. Yet, limited research has been conducted to identify institutional factors that influence student retention rates.

In contrast with other models that focus on the traditional student experiences such as Tinto (1975) and Bean (1983), Thomas and Bean (1988) sought out to produce a model to predict student retention using the institution as

the unit of analysis. Using ordinary least squares path analysis, Thomas and Bean (1988) examined private institutions offering a liberal arts curriculum and with traditional admissions standards for entering undergraduates. Institutional data were provided by administrators from the schools participating in the study, and questionnaires were completed by students at 118 schools meeting the criteria for inclusion in the study. There were 49 items on the questionnaire which asked for such information as enrollment, size of endowment, and tuition. The study found that the most important determinant of retention is the institutional financial viability, defined as the school's capacity to financially support activities associated with admissions and recruitment practices, academic and educational integration activities, and social integration activities (Thomas & Bean, 1988). The model offered by Thomas and Bean (1988) that identifies institutional variables associated with retention rates has limitations. Their definition of financial viability is too broad, and existing reporting requirements of financial expenditures for colleges and universities do not specifically identify these activities individually but rather across multiple expenditure functions, rendering the model impractical. Additionally, the sample utilized by Thomas and Bean (1988) in their study is limited to private institutions with a maximum total enrollment of 5,000, failing to include larger institutions and public colleges and universities, thus making the model inadequate for public institutions.

In a more recent study, Lau (2003) conducted a review of existing literature to distinguish institutional elements that affect student retention. Using



Tinto's (1987) model of institutional departure, Lau (2003) offered a framework that depicts how institutional actors—administrators, faculty, and students—play roles that individually and collectively support the learning environment and influence student retention. It should be noted that Lau (2003) conducted a very limited review of the literature and failed to reveal basic information about her research design, including methodology and the characteristics of students and institutions included in her study. Ultimately, studies on student retention are important in that they offer institutions key insights into factors that may help advance students towards graduation.

#### Student and Institutional Factors Impacting Production of Bachelor's Degrees

Some of the factors influencing college graduation rates include students' financial condition, lack of engagement, insufficient preparation, and poor academic performance (Jackson & Cook, 2016). As discussed earlier, insufficient preparation and poor academic performance may be the result of practices grounded in traditional student populations (Rendón et al., 2000). Research studies also contend that low socioeconomic status students (SES) are less likely to graduate from four-year institutions than other students (Bailey, Calcagno, Jenkins, Kienzl, & Leinbach, 2005; Terenzini, Cabrera, & Bernal, 2001; Titus, 2006b). For example, Titus (2006b) examined the effect of the financial context of higher education institutions on graduation rates of low SES students by examining data of over 5,776 students attending 400 four-year institutions. Using student and institutional level data drawn from the 1996-2001 Beginning

Postsecondary Students (a longitudinal database sponsored by NCES), from Fall 1995 Institutional Characteristics (IC) Enrollment Survey and from fiscal year 1996 IPEDS finance surveys, Titus (2006b) concluded that low SES groups are less likely to graduate than high SES groups. He also found that graduation rates are positively correlated to institutional financial aspects, including tuition revenue as a percentage of total revenue and total education and general expenditures per FTE student, suggesting that the source and level of financial resources contribute to an environment supportive of student success (Titus, 2006b).

Studies exploring the relationship of institutional financial characteristics and student success measures have also been conducted at community colleges. Bailey, Calcagno, Jenkins, Kienzl, and Leinbach (2005) explored institutional measures that influence the success of low-income and minority students at community colleges. In a study that included student, institutional, and financial characteristics extracted from IPEDS, Bailey et al. (2005) used projected three-year graduation rates for the community colleges in the sample using a grouped logistic regression method. Bailey et al. (2005) found that higher graduation rates were positively associated with instructional and student services expenditures. Moreover, lower graduation rates were associated with bigger institutions, and institutions with a large percentage of part-time faculty and a large percentage of minority students. Furthermore, Bailey et al. (2005) posited that individual student characteristics appear to be more relevant than institutional measures to retention and graduation rates at community colleges.

In addition to student traits, institutional characteristics and funding levels have also been found to be associated with college degree completion. Comparing high school cohorts of 1972 and 1992, Bound, Lovenheim, and Turner (2010) sought to explore the reason why the proportion of college graduates decreased from 45 percent in 1970 to under 40 percent in 1990. Analyzing changes in the Math test scores of entering students and the characteristics of institutions including funding per student and faculty-student ratio, Bound et al. (2010) found that although both student and institutional factors are important in explaining changes in graduation rates, the institutional characteristics are the most important. Specifically, the decrease in graduation rates was explained by lower institutional funding, largely because of a shift in the number of students attending community colleges as the initial institution and also changes in student-faculty ratio (Bound et al., 2010). This finding counters that of Bailey et al. (2005) who asserted that student characteristics appear to be more relevant than institutional measures in explaining retention and graduation rates. Ultimately, institutions need to determine how to spend money to better support student success.

### Institutional Expenditures and Student Success

Colleges and universities are subject to scrutiny in part due to questions related to how they spend money and whether they achieve desired student outcomes (Pike, Kuh, McCormick, Ethington, & Smart, 2011). Previous studies exploring the relationship between institutional expenditures and student

graduation and retention rates observed inconsistent findings (Bailey et al., 2005; Crisp, Doran & Reyes, 2016; Gansemer-Topf & Schu, 2006; Hamrick, Schuh, Shelley, & Mack, 2004; Pike, Kuh, McCormick, Ethington, & Smart, 2011; Ryan, 2004; Scott, Bailey, & Kienzl, 2006 ; Titus, 2006a; Webber & Ehrenberg, 2010; Zhang, 2009).

According to national data, about 25% of all first-year students do not come back to the same institution the second year (Ryan, 2004). Prompted by the limited research conducted on the effect of institutional expenditures on students, Ryan (2004) set out to examine the impact of institutional expenditures on six-year cohort graduation rates at 363 Carnegie classified Baccalaureate I and II institutions. Applying a non-experimental, applied research design using ordinary least-squares (OLS) regression method, Ryan (2004) collected data based on IPEDS expenditures for different functional areas as reported by institutions for fiscal year 1996. Ryan (2004) concluded that the institutional level and internal allocation of financial expenditures influence degree attainment. In addition, he found a significant relationship between instructional and academic support expenditures and cohort graduation rates. However, Ryan (2004) was unable to find a positive or significant effect for student services and institutional support expenditures. Given the contrast between academic support and institutional support results, Ryan (2004) suggested that not all administrative and support expenditures offer similar contributions to student success. Regarding the impact of institutional characteristics on student success

measures, Ryan (2004) found a positive relationship between institutional size and graduation rates.

In the same vein, Hamrick, Schuh, Shelley, and Mack (2004) developed a model to explore financial resource allocation decisions as predictors of student graduation rates. Using least squared statistical models, Hamrick et al. (2004) found that instructional, library, and academic support expenditures were significantly related to graduation rates. Hamrick et al. (2004) used institutional variables that included enrollment and financial information along with graduation rates derived from the IPEDS survey, conducted by the National Center for Education Statistics (NCES) for the years 1997 and 1998. Examining financial variables across 444 public four-year institutions, Hamrick et al. (2004) posited that although instructional expenditures had a strong positive relationship with graduation rates, it was not possible to determine the influence of the instruction mix (full professors and adjuncts) given the aggregate nature of the available data. Considered an acceptable practice by Dickmeyer (1996) and Woodard and von Destinon (2000), Hamrick et al. (2004) assumed that internal resource allocation remained fairly constant over time, which may not hold true for certain groups of institutions.

Research conducted on community colleges also demonstrated that graduation rates for students with similar characteristics vary depending on the institutional characteristics, the allocation of funds across expenditure categories, and the composition of faculty (Bailey et al. 2005). Bailey et al. (2005) found that

instructional and student services expenditures were positively associated with academic performance, retention and completion rates, while a greater percentage of part-time faculty correlated with lower student graduation rates.

Narrowing the focus on a specific student success measure, Titus (2006a) sought to understand the effect of the financial context of higher education institutions on student persistence. Titus defined persistence as being enrolled or having graduated three years after first joining the college or university. Using a hierarchical generalized linear modeling (HGLM), which is a multilevel approach that allows for analysis of both student and institutional level variables, the study used student and institutional level data drawn from the 1996-1998 Beginning Postsecondary Students (a longitudinal database sponsored by NCES), from Fall 1995 Institutional Characteristics (IC) Enrollment Survey, and from fiscal year 1996 IPEDS finance surveys. With a sample of 4591 first-time, full time, undergraduate students attending 367 four-year institutions, Titus (2006a) concluded that the average institutional persistence rate was influenced positively by the proportion of institutional revenue derived from tuition and affected negatively by the percentage of expenditures allocated to administration. In addition, Titus (2006a) asserted that persistence was impacted by not only the levels but also the patterns of expenditures, suggesting that future studies should investigate the degree to which allocation of resources influence student persistence from a resource dependency theory perspective. Titus's (2006a) study was novel in that it used resource dependency theory as a framework,

drawing from Bean's (1990) attrition model and Berger-Milem's (2000) organizational behavior –student outcome college impact model.

Taking a broader perspective, Gansemer-Topf and Schuh (2006) examined the relationship between retention and graduation rates, institutional selectivity, and expenditures associated with instruction, academic support, institutional support and institutional grants. The study applied a multiple regression analysis, sampling 466 private baccalaureate institutions drawing data from IPEDS for the period 1997 through 2002. Using Berger's (2001-2002) theory of organizational behavior which includes resource allocation, Gansemer-Topf and Schuh (2006) concluded that the amount of institutional expenditures and selectivity of institutions significantly predicted retention rates. Most notably, while expenditures associated with instruction and institutional grants were positively correlated with retention rates, student services expenditures negatively contributed to first-year retention rates (Gansemer-Topf & Schuh, 2006). Explanations offered for the negative correlation between student services expenditures and student retention included the close student-faculty relationship typically observed at small size private institutions, and the fact that student services expenditures are often used for administrative activities (Gansemer-Topf & Schuh, 2006). Similarly, Scott, Bailey, and Kienzl (2006) studied 1676 public and private four-year colleges to determine differences in performance between public and private institutions. Drawing from 1991 IPEDS expenditure data and using six-year graduation rate as the dependent variable, Scott et al. (2006)

found that, although small, instructional expenditures per student had a positive correlation with graduation rates.

Using more current data, Webber and Ehrenberg (2010) focused on assessing the effect of instructional, academic support, student services, and research expenditures on undergraduate student's graduation rates, and how these relationships varied across different types of institutions. Using a panel of 4 years (2002-2006) data for 1,161 colleges and universities collected from IPEDS, the study utilized an educational function production approach, a variety of econometric methods including unconditional quantile regression and simulation of reallocation of expenditures across the various categories. Webber and Ehrenberg (2010) found that among the various expenditure categories, student services was the only expenditure category that had a statistically positive correlation with retention and graduation rates. For institutions with lower admissions test scores and a large number of Pell eligible students (family income of below \$50,000 annually), this relationship became even more significant. Further analyzing institutions with these characteristics, Webber and Ehrenberg (2010) ran simulations in which funds were reallocated from instructional to student services, resulting in improved retention and graduation rates. The same simulations suggested modest increases in retention and graduation rates for institutions with high admissions test scores and lower levels of Pell Grant funds, suggesting that an appropriate balance of expenditures had been achieved at these institutions (Webber & Ehrenberg, 2010).



Likewise, Pike, Kuh, McCormick, Ethington, and Smart (2011) sought to explore whether money mattered to achieve student outcomes at colleges and universities. Pike et al. (2011), examined the relationship between institutional expenditures, student engagement, and self-reported learning outcomes using institutional data from IPEDS and College Board, along with responses from more than 65,000 students attending 171 public higher education institutions who completed the National Survey of Student Engagement (NSSE). Pike et al. (2011) found that while the combined institutional expenditures (instruction, academic support, institutional support, and student services) did not demonstrate a strong influence on overall learning outcomes, they did produce a positive and significant relationship with first-year students' cognitive outcomes and two student engagement benchmarks.

More recently, Crisp, Doran, and Reyes (2016) sought to identify the institutional and financial conditions that predict student graduation rates. Focusing on 412 four-year broad access institutions (BAIs), defined as non-profit accredited colleges and universities that admit at least 80% of applicants, Crisp et al. (2016) applied a Bayesian model averaging approach drawing data from IPEDS for the period 2001-2015. Crisp et al. (2016) concluded that institutional expenditures and revenues, along with other institutional and student body characteristics, were predictors of graduation rates. Specifically, Crisp et al. (2016) found a moderate positive relationship between graduation rates and a

composite variable that included instructional, academic, student support, and institutional expenditures.

Although the studies that explored the relationship between institutional expenditures and student success measures were inconsistent, most of the studies found that instructional expenditures are positively correlated with some measure of student performance such as retention or graduation rates (Bailey et al., 2005; Gansemer-Topf & Schuh, 2006; Hamrick et al., 2004; Ryan, 2004; Scott et al., 2006). A few other studies that aggregated instructional expenditures with other expenditure categories also found a positive correlation between the combined institutional expenditures and graduation rates or other student success benchmark (Crisp et al., 2016; Pike et al., 2011). Notably, a few studies found that investing in student services may have a positive, neutral or even negative effect on student outcomes (Gansemer-Topf & Schuh, 2006; Ryan, 2004; Webber and Ehrenberg, 2010).

### Summary

Public higher education institutions in the U.S. rely on several revenue streams, including federal, state, and local sources to fund their operations. Listed as top state policy issues for 2017 (Harnisch & Opalich, 2017), state appropriations and student tuition and fees represent the two largest revenue sources for public colleges and universities (Kena et al., 2016). Given that state support for higher education has declined over the last three decades (Ma et al.,

2016), it is important to note that decreases in state appropriations has been found to produce increases in tuition fees, both at the national level (Titus, 2009) and in California (Johnson et al., 2014). In addition, changes in state support directly affect the production of bachelor's degrees. Challenging the claim by Skolnick (1986) that reduced state funding causes no harm to public higher education institutions, Titus (2009) and Zhang (2009) found that increases in state funding are positively correlated with increases in graduation rates.

While higher institutions receive funding from different sources, they also spend across multiple areas. This internal allocation of financial resources can influence faculty composition (Bettinger & Long, 2010; Zhang, 2009) which, in turn, may impact graduation rates (Ehrenberg & Zhang, 2005a, 2005b). As the level of accountability experienced by colleges and universities has increased in recent years, performance-based funding methodologies have emerged across the nation (Murphy et al., 2014); however, the positive impact of performance-based funding is yet to be observed (Murphy et al., 2014; Umbricht et al., 2016).

In California, there are mounting pressures to improve the production of college graduates because it is anticipated that there will be a shortage of 1.1 million college educated workers by 2030 (Johnson et al., 2016). To address the needs of the state, there are current efforts to revisit the California Master Plan for higher education (Gordon, 2017). However, state funding is in decline, having decreased from 18% of the total state budget in 1976 to 12% of the total state budget in 2016. As a result, both the CSU and the UC have responded by raising

student tuition to offset the budget shortages (Watanabe, 2017). Notably, the CSU is the largest university system in the nation and the largest producer of skilled workers in California (CSU, 2017). Given this role, the CSU has undertaken a number of initiatives aimed at improving graduations rates which require appropriate funding and effective allocation of resources to materialize.

Unlike private enterprises, universities have a unique approach to raising and spending money, partly described by what is known as Bowen's law: "Universities will raise all the money they can and spend all the money they raise" (Massy, 1996, p. 4). Although higher education institutions utilize multiple strategies to allocate funds internally, none of these methodologies rely on research linking financial and student outcomes measures such as student retention.

Student retention is one of the most cited measures associated with student success (Voigt & Hundrieser, 2008). Research on student retention has focused on precollege characteristics of students, causes of students departing from school (Astin, 1993; Tinto, 1993), description and evaluation of programs designed to improve student retention (Boudreau & Kromrey, 1994; Glass & Garrett, 1995; Reyes, 1997), and teaching techniques (Dougherty et al., 1995; Moore & Miller, 1996). Notably, the notion that student characteristics are more relevant than institutional measures in explaining student retention (Bailey et al., 2005) has been countered in a more recent study by Bound et al. (2010). Furthermore, a number of studies have explored the relationship between

institutional expenditures across functional classifications (i.e. instruction, student services, academic support, institutional support, etc.) and student achievement outcomes such as graduation and retention rates.

Taken together, the majority of the studies that explored the relationship between institutional expenditures and student success measures found that instructional expenditures are positively correlated with some measure of student performance such as retention or graduation rates (Bailey et al., 2005; Gansemer-Topf & Schuh, 2006; Hamrick et al., 2004; Ryan, 2004; Scott et al., 2006). A few studies that aggregated instructional expenditures with other expenditure categories also found a positive correlation between the combined institutional expenditures and graduation rates or other student success benchmark (Crisp et al., 2016; Pike et al., 2011). Notably, a few studies found that investing in student services may have a positive, neutral or even negative effect on student outcomes (Gansemer-Topf & Schuh, 2006; Ryan, 2004; Webber and Ehrenberg, 2010).

The literature presented in this chapter covered the financial context of higher education at a national and state level, with a focus on California public higher education, exploring institutional factors that influence student success. Building on previous research, this study seeks to explore the relationship between student success measures and institutional expenditures, focusing on the CSU and incorporating specific variables that emerged in the literature as relevant to student success including the socioeconomic status of students,

institutional selectivity, and faculty composition. The following chapter describes the selected the research design and methodology for this study.

## CHAPTER THREE

### RESEARCH DESIGN AND METHODOLOGY

#### Introduction

This chapter presents a comprehensive description of this study's research design, including the research methods employed. I begin by introducing the purpose and significance of this inquiry, along with the research questions and conceptual framework that guided the study. The remainder of this chapter discusses how data was collected and prepared for analysis and provides information related to the research sample, selected variables, delimitations, and strategies used to ensure reliability and validity. Lastly, key definitions and the positionality of the researcher are also described.

#### Purpose of the Study

The purpose of this study is to examine the relationship between student retention rates and institutional expenditures across different functional categories as defined by the National Association of Colleges and Universities Business Officers (NACUBO) for the California State University (CSU). Specifically, this study examined expenditures related to instruction, student services, academic support, and institutional support. These expenditure categories were selected because they have been widely examined in previous studies (Bailey et al., 2005; Gansemer-Topf & Schuh, 2006; Hamrick, Schuh,

Shelley, & Mack, 2004; Ryan, 2004), and also because they account for more than 60% of the overall expenditure categories in the CSU (CSU, 2017). In addition, with the exception of student grants and scholarships, these selected expenditures represent the four largest individual expense categories in the CSU system (CSU, 2017). This study also sought to reveal institutional practices involving allocation of resources that influence student success, controlling for institutional characteristics including faculty composition, socioeconomic status of student population, and institutional selectivity.

### Significance of the Study

It is anticipated that there will be a shortage of 1.1 million college educated workers in California by 2030 (Johnson et al., 2016). Within this context, the CSU is the principal source of skilled workforce in the state producing more career-ready candidates than any other single institution (CSU, 2018). As pressures to improve the production of college graduates continues to rise, the CSU needs to find ways to improve student success rates and have a plan to effectively allocate resources anticipating fluctuations in funding and other external factors.

By better understanding the relationship between financial and student success measures, Board of Directors members and educational administrators at CSU and beyond may find better ways to allocate resources and enhance their ability to develop strategies to improve student success outcomes within any aggregate level of available financial resources, especially in environments of



increased enrollment and limited funding.

This study examined the CSU and was be guided by the following research questions.

### Research Questions

1. What is the relationship between student retention rates and institutional expenditures across the functional categories of instruction, academic support, student services, and institutional support?
2. What is the relationship between student retention rates and the proportion of institutional expenditures as a total of core expenses for instruction, academic support, student services, and institutional support?
3. What is the level of similarity among various institutions, based on socioeconomic status of students, institutional selectivity, faculty composition, and institutional expenditures?

### Research Design

This study had an emphasis on quantitative data collection and methods, and adopted a critical quantitative approach to research (Nuñez, 2009; Stage, 2007; Stage & Wells, 2014). Although similar to typical positivistic research in terms of methods, critical quantitative research differs in the motivation for the research (Stage, 2007). Critical researchers focus on equity issues, using data to

characterize educational processes to expose inequities and to “identify social or institutional perpetuation of systematic inequities in such processes and outcomes” (Stage, 2007, p.10). Motivated by these goals, this study not only examined the relationship between expenditures and retention rates, but will also sought to reveal institutional practices related to allocation of resources that either support or fail to address student needs.

This quantitative, non-experimental, correlational study was guided by research questions rather than hypotheses in order to identify, explain, or predict how variables influence outcomes. A panel analysis was used to determine if the selected independent variables influence retention rates and also to examine the extent to which independent variables contribute to the prediction of retention rate.

As a non-experimental study, this research examined one group: the CSU system. According to Tabachnick and Fidell (2007), it is difficult to determine causality in non-experimental correlational research. Tabachnick and Fidell (2007) caution that although variables may be related, the cause of their relationship may be unclear. The underlying research focused on understanding the relationship between institutional expenditures and student retention, which is aligned with Astin’s Input-Environment-Output framework (1977, 1993). According to Astin (1993),

In the I-E-O model, inputs refer to the characteristics of the student at the time of initial entry to the institution; environment refers to the

various programs, policies, faculty, peers, and educational experiences to which the student is exposed; and outcomes refers to the student's characteristics after exposure to the environment. Change or growth in the student during college is determined by comparing outcome characteristics with input characteristics. The basic purpose of the model is to assess the impact of various environmental experiences by determining whether students grow or change differently under varying environmental conditions. (p. 7)

A key consideration in utilizing the I-E-O involves the selection of measures to assess Input, Environment, and Outcome. Astin (1993) provides examples of selected measures that include student admissions tests scores (Input), institutional characteristics such as type and size (Environment), and student persistence defined as staying in college versus dropping out (Output). In exploring how the outcomes are affected by the environment, Astin (1993) contends that it is important to control for the input characteristics for students, or results may be biased.

### Data Preparation and Analysis

For this study, data were analyzed applying descriptive, inferential, and correlational statistics. In general, descriptive statistics are used to describe a set of data (Howell, 2008). Specifically, descriptive statistics are employed to describe characteristics that are common to the selected sample and to

summarize these characteristics on variables that measure central tendency and variability including mean and standard deviation (Mertens, 2010). Inferential statistics are used to compare differences between groups and to determine if sample data points vary significantly from each other or population values (Mertens, 2010). Meanwhile, correlational statistics are applied to describe the strength and direction of the relationship between independent and dependent variables (Mertens, 2010).

Multiple regression analysis was conducted using RStudio open source statistical software and IBM Statistical Package for the Social Sciences (SPSS) version 23 to identify the best combination of predictors of the dependent variable (Mertler & Vannatta, 2005). For this study, a panel data analysis was conducted to explore the relationship between institutional expenditures (independent variables) and student retention rate (dependent variable).

To apply multiple regression methods correctly, three general assumptions must be met: a) normality, b) linearity, and c) homoscedasticity (Mertler & Vannatta, 2005). Failure to meet at least one of these assumptions may lead to biased results (Kennedy & Bush, 1985). Normality refers to the extent to which observations in the sample for a given variable are distributed normally (Mertler & Vannatta, 2005). In this study, each variable was tested for normality through the use of histograms and examined after normalization. The linearity assumption denotes a linear relationship between variables (Mertler & Vannatta, 2005) and was assessed through the examination of residual plots.

Finally, homoscedasticity assumes that the variability in scores for one continuous variable is approximately the same at all values for another continuous variable (Mertler & Vannatta, 2005). According to Tabachnick and Fidell (2007), if the assumption of multivariate normality is met, then two variables must be homoscedastic. Of note, failure to achieve homoscedasticity may weaken but will not invalidate the study (Tabachnick & Fidell, 2007).

Data were scanned for univariate and multivariate outliers. Multivariate outliers were identified by using the Mahalanobis distance. The Mahalanobis distance is used to identify unusual combinations of two or more variables (Mertler and Vanatta, 2001).

R, a language and environment for statistical computing and graphics operated through RStudio, was used to conduct Multidimensional Scaling (MDS) cluster analysis. Cluster analysis was performed for exploratory purposes and to reveal insights into the structure of the dataset. Since there are many varying institutional characteristics across the CSU, clustering the characteristics helped reveal latent groups and other important characteristics in the data (Attewell, Monaghan, & Kwong, 2015).

### Research Sample

The sample utilized in this study is the entire population of the California State University (CSU), which is the largest and one of the most diverse university systems in the U.S. With 23 campuses serving more than 480,000

students, the CSU is also the largest producer of bachelor's degrees in California ("California State University 2018 Fact Book", n.d.). Of note, more than half of CSU students are students of color, about one third of students are the first to attend college in their families, 80% of students receive some type of financial aid, and roughly half of CSU undergraduate students are Pell grant recipients ("California State University 2018 Fact Book", n.d.). The 23 CSU institutions vary in size, program offerings, and institutional type based on the Carnegie Classification. The Carnegie Classification of Institutions of Higher Education categorizes colleges and universities based on doctoral and master degrees awarded, level of research activities, and program size (Indiana University, 2018). In addition, 21 of 23 CSUs are currently recognized by the Department of Education as Hispanic Serving Institutions (HSIs), enrolling more than 25% of undergraduate full-time equivalent Latino students. Table 1 identifies all CSU campuses with their MSI designation and Carnegie classification.

Table 1. Institution Names, MSI Designation, and Carnegie Classification

Institution Name	MSI Designation	Carnegie Classification
California Polytechnic State University-San Luis Obispo	HSI	Master's Colleges & Universities: Larger Programs
California State Polytechnic University-Pomona		Master's Colleges & Universities: Larger Programs
California State University Maritime Academy	HSI	Baccalaureate Colleges: Diverse Fields
California State University-Bakersfield		Master's Colleges & Universities: Larger Programs
California State University-Channel Islands	HSI	Master's Colleges & Universities: Small Programs
California State University-Chico	HSI	Master's Colleges & Universities: Larger Programs
California State University-Dominguez Hills	HSI	Master's Colleges & Universities: Larger Programs
California State University-East Bay	HSI	Master's Colleges & Universities: Larger Programs
California State University-Fresno	HSI	Doctoral Universities: Moderate Research Activity
California State University-Fullerton	HSI	Doctoral Universities: Moderate Research Activity
California State University-Long Beach	HSI	Master's Colleges & Universities: Larger Programs
California State University-Los Angeles	HSI	Master's Colleges & Universities: Larger Programs
California State University-Monterey Bay	HSI	Master's Colleges & Universities: Medium Programs
California State University-Northridge	HSI	Master's Colleges & Universities: Larger Programs
California State University-Sacramento	HSI	Master's Colleges & Universities: Larger Programs
California State University-San Bernardino	HSI	Master's Colleges & Universities: Larger Programs
California State University-San Marcos	HSI	Master's Colleges & Universities: Medium Programs
California State University-Stanislaus	HSI	Master's Colleges & Universities: Larger Programs
Humboldt State University	HSI	Master's Colleges & Universities: Medium Programs
San Diego State University	HSI	Doctoral Universities: Higher Research Activity
San Francisco State University	HSI	Doctoral Universities: Moderate Research Activity
San Jose State University	HSI	Master's Colleges & Universities: Larger Programs
Sonoma State University	HSI	Master's Colleges & Universities: Larger Programs

## Data Collection

This study used data sets for the period 2005-2014 containing information grouped by institutional characteristics, enrollment, retention rates, finance, and human resources. This data is made publicly available by the Integrated Postsecondary Education Data System (IPEDS), which is the main source of information for U.S. Colleges, Universities, and technical and vocational institutions. IPEDS is managed by the National Center for Education Statistics (NCES), the primary federal entity located within the U.S. Department of Education charged with collecting and analyzing statistical data related to education in the U.S. and other nations. NCES requires institutions (IPEDS Keyholder Handbook 2018-19, n.d.) to complete IPEDS surveys:

The completion of all IPEDS surveys, in a timely and accurate manner, is mandatory for all institutions that participate in or are applicants for participation in any Federal financial assistance program authorized by Title IV of the Higher Education Act (HEA) of 1965, as amended. The completion of the surveys is mandated by 20 USC 1094, Section 487(a)(17) and 34 CFR 668.14(b)(19) (p.3)

According to Muijs (2011), key advantages to examining existing data sets include convenience, accessibility, and the fact that in some cases data have demonstrated reliability and validity.



## Time Period

The time period under examination was 2005 thru 2014. One of the reasons driving this selection is the fact that an accounting pronouncement (GASB 68) implemented in fiscal year 2015-16 drastically changed the manner in which institutional expenses are reported to IPEDS due to the inclusion of a pension liability (NCES, 2018). Although more recent data are available, it would necessitate adjustments to account for this accounting pronouncement that are not readily available at the individual institutional level. Of note, there were other changes in the forms used to report financial information to IPEDS starting in 2002 and ending in 2004. In addition, the 2005-2014 period includes the financial crisis of 2008, which negatively impacted the institutional budgetary environment for public higher education, making the findings of this study particularly relevant in terms of anticipating the impact of reduced state funding.

## Validity and Reliability

The quality of data, determined using the concepts of validity and reliability, should be given significant consideration given that findings and conclusions are only as good as the data from which they are derived (Punch, 2003).

Three major kinds of validity are considered to help ensure a robust study: construct validity, internal validity, and external validity (Creswell, 2014; Mertens, 2010). Construct validity is the extent to which variables represent the

phenomenon being examined (Creswell, 2014). For this study and as described in the variables section, I operationalized constructs such as socioeconomic status of students and institutional selectivity in a manner that ensures, to the greatest extent possible, that variables characterize the phenomena they were set out to represent. Internal validity refers to the fact that changes detected in the dependent variable are due to the influence of the independent variable, and not to some other unintended variables (Mertens, 2010). To address internal validity, my research design adhered to a reproducible, and widely recognized I-E-O conceptual framework (Astin, 1977, 1993). External validity, or generalizability, denotes the extent to which findings from one study can be applied to a different situation (Mertens, 2010). For my study, the analysis included the total population of the CSU comprised of 23 institutions. Given the unique characteristics of the CSU, no attempt was made to generalize the results to another university system or larger group of higher education institutions. Finally, reliability refers to the extent to which scores are free of measurement error (Muijs, 2004).

### Ethical Considerations

This study analyzed publicly available information that includes financial, socioeconomic, and student outcome measures. This information is aggregated at an institutional level and does not include or consider human subjects or any other individualized student information.

## Variables

The relationship between dependent and independent variables was studied analyzing expenditure and student retention trends across several years, and considering the influence of institutional selectivity, faculty composition, and socioeconomic status of the student population.

Expenditures were examined from two perspectives: a) expenditures per Full Time Equivalent (FTE) students associated with each category (instruction, student services, academic support and institutional support), and b) proportion of institutional expenditures allocated to each category (instruction, student services, academic support and institutional support), as a percentage of total core expenses.

The nominal amount of institutional expenditures vary significantly by institution; hence, for comparability purposes across institutions, institutional expenditures were analyzed using FTE as student unit to account for institutional size and enrollment at individual institutions. For example, an institution that spends \$1 Million on instruction with an enrollment of 10,000 students will effectively allocate \$10,000 per student, whereas another institution that spends the same amount on instruction with an enrollment of 20,000 students will end up spending \$5,000 on each student.

This study also examined the percentage of funds allocated to each expenditure category. By doing this, the study will provide a more comprehensive perspective on how institutions allocate funds. For example, while an expense

category such as instruction may have increased from the previous year leading to the reasoning that institutions are allocating more funds toward instructional activities, it is also possible that the change in instruction as a proportion of total core expenditures may have decreased. In this example, the more accurate conclusion would be that institutions are effectively prioritizing other areas such as student services or academic services.

### Control Variables

Organizational activities and associated outcomes are influenced by the characteristics of each institution and, hence, are likely to vary (Pfeffer & Salancik, 1978). These differences across institutions were accounted for by controlling for institutional variables found to be associated with student retention and graduation rates, including institutional selectivity, faculty composition, and socioeconomic status of students (Gansemer-Topf & Schuh, 2006; Ma, Pender & Welch, 2016).

Admission rates were used as a proxy for institutional selectivity, with low admission rates representing institutions with a larger proportion of students with high GPA and ACT or SAT scores.

The percentage of financial aid recipients who are awarded Pell Grants (family income of below \$50,000 annually), were used to capture socioeconomic status of students, with larger percentages representing a higher proportion of students coming from low socioeconomic backgrounds.

### Dependent Variable

The dependent variable for this study was student retention rate. This is a good measure of student success, not only because it is one of the most cited measures associated with student success (Voigt & Hundrieser, 2008), but also because it can be more directly influenced by activities or programs that occur in a single year as opposed to, for example, graduation rates that may be influenced by a series of efforts spanning multiple years.

As it relates to four-year institutions, student retention rate is defined as the percentage of first-time bachelor's (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall ("NCES 2018-2019 Glossary Results", n.d.). This study focused on full-time, first-time retention rates.

### Delimitations

Although my study explored the relationship between several institutional variables and student success outcomes, it was not the purpose of my study to conduct an exhaustive exploration of all institutional characteristics and their associated relationship with student outcomes. Rather, this study set out to identify significant institutional variables with a focus on financial expenditures and other independent variables identified by the review of the literature that have been found to influence student outcomes such as retention rates in public higher education institutions.

## Definitions

As indicated earlier, this study relied on data drawn from IPEDS.

Therefore, this study uses the definitions of key terms presented in the IPEDS survey and also included in the NCES Postsecondary Education Facilities Inventory and Classification Manual (Cyros & Korb 2006). The key terms and categories used in this study are defined as follows:

*Student retention* - The percentage of first-time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall (“NCES 2018-2019 Glossary Results”, n.d.).

*Instruction* - This category includes all activities that are part of an institution’s instructional program. Included are credit and noncredit courses for academic, vocational, and technical instruction; remedial and tutorial instruction; regular, special, and extension sessions; and community education. Includes departmental research and sponsored instruction (“NCES 2018-2019 Glossary Results”, n.d)

*Academic Support* - This category includes support services for the institution’s primary missions: instruction, research, and public service. Examples include: libraries, museums and galleries; educational media services; academic computing services; ancillary support; academic administration; academic personnel development; and course and curriculum development (“NCES 2018-2019 Glossary Results”, n.d)

*Student Services* - This category includes admissions and registrar offices and those activities whose primary purpose is to contribute to the student's emotional and physical well-being and to his or her intellectual, cultural, and social development outside the context of the formal instructional program. Examples include: student services administration; social and cultural development; counseling and career guidance; financial aid administration; student admissions; student records; and student health services ("NCES 2018-2019 Glossary Results", n.d)

*Institutional Support* - This category includes 1) central executive-level activities concerned with management and long-range planning of the entire institution, such as the governing board, planning and programming, and legal services; 2) fiscal operations, including the investment office; 3) administrative data processing; 4) employee personnel and records; 5) logistical activities that provide procurement, storerooms, printing, and transportation services to the institution; 6) support services to faculty and staff that are not operated as auxiliary enterprises; and 7) activities concerned with community and alumni relations, including development and fundraising. Examples include: executive management; fiscal operations general administration and logistical services; administrative computing services; and public relations/development ("NCES 2018-2019 Glossary Results", n.d)

*Core expenses* - Core expenses are broadly defined as associated with the essential education activities of the institution. For institutions reporting under

the Governmental Accounting Standards Board (GASB) like the CSU, core expenses include those designated for instruction, research, public service, academic support, student services, institutional support, operation and maintenance of plant, depreciation, scholarships and fellowships, interest and other operating and non-operating expenses. It should be noted that core expenses do not include expenses for auxiliary enterprises such as dormitories and bookstores, hospitals, and independent operations (“NCES 2018-2019 Glossary Results”, n.d).

*Tenure density* - Tenure-track FTE divided by total instructional FTE.

Tenure density includes instructional faculty but excludes coaches, counselors, and librarians. It also includes active faculty but excludes faculty on leave (“NCES 2018-2019 Glossary Results”, n.d).

#### Positionality of the Researcher

I currently serve as the Director of Financial Services and Controller at California State University San Bernardino, providing support to the campus in the area of Administrative and Financial Services. Among other tasks, I am responsible for the recording and reporting of financial information in adherence with CSU, federal, and state requirements, and I also oversee the issuance of audited financial statements and corresponding IPEDS reporting.

As a member of various financial committees and groups comprised of finance administrators representing all CSU campuses and charged with



creating, analyzing and implementing financial policies and accounting pronouncements, I possess a strong understanding of how financial information is consolidated and reported across the CSU system. My expertise and knowledge in fiscal matters at the CSU enhances my ability to interpret financial information and identify potential pitfalls and limitation in the selection and analysis of financial variables.

### Summary

This quantitative, non-experimental, correlational study sought to explore the relationship between student retention rates and institutional expenditures in the functional categories of instruction, academic affairs, student affairs, and institutional support. This study also examined the existence of similarities between institutions across the CSU. The dependent variable of this study was student retention rate, and the independent variables were institutional expenditures across functional categories and the proportion of institutional expenditures across functional categories as a percentage of core expenses. Other variables used in this study included institutional selectivity, socioeconomic status of students, and faculty composition. Data for this study was drawn from the IPEDS database, managed by NCES. Multiple regression, panel data and MDS cluster analysis were performed to answer research questions.

The next chapter offers an overview of the methodology, research sample, and statistical analyses. Chapter Four also presents and explains the findings from this study.

## CHAPTER FOUR

### RESULTS

#### Introduction

The purpose of this study was to examine the relationship between student retention rates and institutional expenditures in the functional categories of instruction, academic support, student services, and institutional support. This study had two goals: a) to understand the relationship between student retention and the level and proportion of institutional expenditures across functional classifications, and b) to explore the level of similarity among CSU institutions based on institutional characteristics including socioeconomic status of students, institutional selectivity, and faculty composition.

This chapter provides a brief review of the methodology, research sample, selected variables, and descriptive, inferential, and correlational statistics relevant to the research questions. This chapter also presents and explains the findings from this study. Questions one and two are addressed with a regression model using a panel design. Question three is addressed with multidimensional scaling. To facilitate the presentation for the reader, findings are organized by research question.

*Research Question 1: What is the relationship between student retention rates and institutional expenditures across the functional categories of instruction, academic support, student services, and institutional support?*

The independent variables for this research question were institutional expenditures for instruction (Instr\_FTE), academic support (Acad\_FTE), student services (Stud\_FTE), and institutional support (InstSup\_FTE). The dependent variable for this research question was first year student retention rate (Ret\_Rate). These variables were drawn from IPEDS for the period 2005-2014. As a reminder, this selection was driven by various factors, including an accounting pronouncement (GASB 68) implemented in fiscal year 2015-2016, which drastically changed the manner in which institutional expenses are reported to IPEDS due to the inclusion of a pension liability (“Financial Accounting for Local and State School Systems”, n.d.). Although more recent data are available, adjustments would need to be made in order to account for this pronouncement, those of which are not readily available at the individual institutional level. Of note, there were other changes in the forms used to report financial information to IPEDS starting in 2002 and ending in 2004. In addition, the 2005-2014 period includes the financial crisis of 2008, which negatively impacted the institutional budgetary environment, making the findings of this study particularly relevant in terms of anticipating the impact of reduced state funding. Given that student retention rate is defined as percentage of first-time bachelor’s degree-seeking undergraduates from the previous fall who are again enrolled in the current fall, data were organized and aligned to account for the one-year lag between institutional expenditures and retention rates.

## Data Screening

Multivariate outliers were identified using Mahalanobis distance indicated by chi-square values that are significant at  $p < 0.001$  with the respective degrees of freedom. Since there are four variables being examined for analysis,  $df = 4$ . Based on the Chi-Square distribution table, the critical value for chi-square at  $p < 0.001$  for  $df = 4$  is 18.467. According to Mertler and Vanatta (2001), the Mahalanobis distance is used to identify unusual combinations of two or more variables.

Univariate outliers were identified using Box plots, which revealed that three out of the 23 CSU campuses had outliers for either one or more dependent variables. Coincidentally, student enrollment at these institutions rank lowest in the CSU system, which support the extreme values given that FTE expenditures are more sensitive to changes at institutions with lower enrollment. These three institutions are not named in order to protect their identities. Based on results from Mahalanobis distance and Box plots, data associated with three institutions were removed for the purposes of addressing research question one.

To assess univariate normality, histograms, Q-Q Plots, and descriptive statistics were reviewed for each variable. Although the dependent variable (Ret\_Rate) exhibited a normal distribution (Skewness =  $-0.321$ , Kurtosis =  $0.066$ ), transformations were computed to determine if histograms and Q-Q Plots were more normal. None of the transformations led to more normal distributions and, hence, the dependent variable was not transformed. Tests of Normality

Kolmogorov-Smirnov and Shapiro-Wilk revealed significance for Stud\_FTE and InstSup\_FTE, indicating possible non-normal distributions for these two independent variables. Square root transformation and natural log (ln) transformations were performed to produce more normal distributions for these dependent variables. After exploring different variable transformations, histograms, and Q-Q plots, none of the independent variables were transformed.

As George Box famously noted: "...the statistician knows...that in nature there never was a normal distribution, there never was a straight line, yet with normal and linear assumptions, known to be false, he can often derive results which match, to a useful approximation, those found in the real world" (JASA, 1976, Vol. 71, 791-799). Therefore, the normality assumption will never be exactly true when one is working with real data.

A recommended approach to check for multivariate normality involves examining bivariate scatterplots to verify that they are approximately elliptical (Mertler & Vannatta, 2005). It should be noted that verifying "normality on each of the variables separately is a necessary but not sufficient condition for multivariate to hold" (Stevens, 1992, p.245). To determine multivariate normality, scatterplots were created to illustrate the relationships between variables, where non-elliptical shapes imply a failure to meet normality and linearity. Most plots produced for this analysis displayed oval shapes as shown in Figure 1 below.

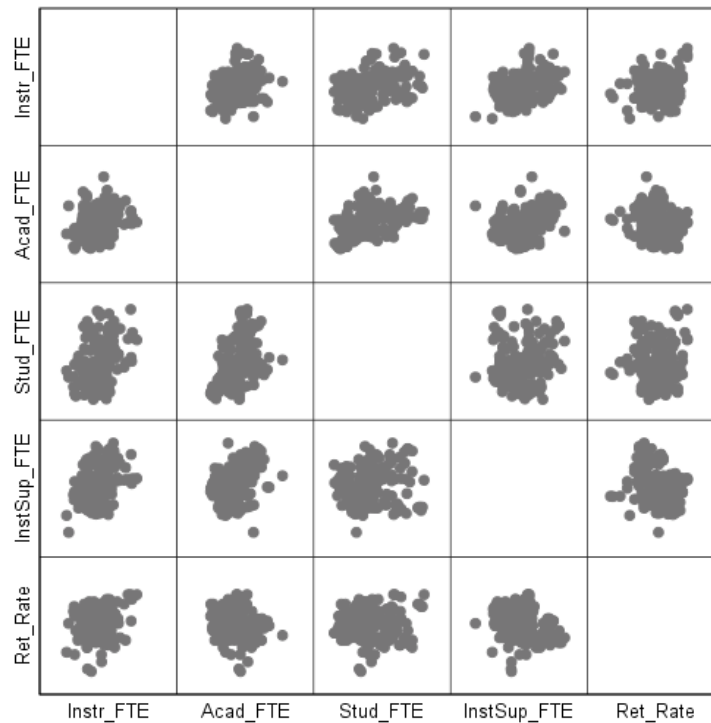


Figure 1. Institutional Expenditures and Retention Rate

Since the use of bivariate scatterplots is fairly subjective, residual plots were created and homoscedasticity in the model was confirmed (Mertler & Vannatta, 2005). Homoscedasticity is the “assumption that the variability in scores for one continuous variable is roughly the same at all values of another continuous variable” (Mertler & Vannatta, 2005, p. 34). Homoscedasticity is related to the normality assumption because when the assumption of multivariate normality is met, then the variables must be homoscedastic (Tabachnick & Fidell, 1996). Importantly, a violation of the assumption of homoscedasticity will not prove fatal to an analysis (Tabachnick & Fidell, 1996).

Multicollinearity, or potential high intercorrelations among independent

variables, was examined by producing a correlation matrix for the predictor variables and calculating variance inflation factors (VIFs). According to Mertler and Vannatta (2005), VIF greater than 10 can be a cause for concern. For this study, VIF<1.6 for all independent variables indicates an absence of multicollinearity.

Table 2. RQ1 Correlation Matrix

		Instr_FTE	Acad_FTE	Stud_FTE	InstSup_FTE
Instr_FTE	Pearson Correlation	1	.303**	.332**	.386**
	Sig. (2-tailed)		.000	.000	.000
	N	180	180	180	180
Acad_FTE	Pearson Correlation	.303**	1	.471**	.415**
	Sig. (2-tailed)	.000		.000	.000
	N	180	180	180	180
Stud_FTE	Pearson Correlation	.332**	.471**	1	.137
	Sig. (2-tailed)	.000	.000		.067
	N	180	180	180	180
InstSup_FTE	Pearson Correlation	.386**	.415**	.137	1
	Sig. (2-tailed)	.000	.000	.067	
	N	180	180	180	180

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Table 2 shows Pearson correlation values between independent variables, with the highest correlation of 0.471 between Acad\_FTE and Stud\_FTE, further confirming the absence of multicollinearity.



## Descriptive Statistics

Table 3. RQ1 Descriptive Statistics for Main Variables

	Minimum	Maximum	Mean	SD
Instr_FTE	\$4266	\$7195	\$5546.92	530.291
Acad_FTE	\$849	\$2723	\$1508.52	339.546
Stud_FTE	\$902	\$2587	\$1558.67	386.465
InstSup_FTE	\$589	\$2448	\$1543.34	366.960
Ret_Rate	61%	93%	80.83%	6.135
Pell_Perc	9%	76%	41.89%	15.840
Admit_Perc	11%	86%	58.35%	17.322

Table 3 provides descriptive statistics for the main variables used to answer research question 1. The mean Instructional expenditures per FTE (Instr\_FTE) were \$5,546.92, which was much higher than the mean institutional expenditures per FTE for Academic Support (Acad\_FTE) of \$1,508.52, Student Services (Stud\_FTE) of \$1,558.67, and Institutional Support (InstSup\_FTE) of \$1,543.34. Student Retention rates (Ret\_Rate) ranged from a minimum of 61% to a maximum of 93%, with a mean of 80.83 %. The percentage of students receiving Pell grants (Pell\_Perc) ranged from a minimum of 9% to a maximum of 76%, with a mean of 41.89%. The percentage of students admitted (Admit\_Perc) ranged from a minimum of 11% to a maximum of 86%, with a mean of 58.35%. Appendix A shows charts displaying heterogeneity across institutions.

## Panel Analysis

Panel data refers to the pooling of observations on a cross-section of units or institutions over several time periods (Baltagi, 2008). The advantages of using panel data include the ability to control for individual heterogeneity, statistical efficiency due to more information, a temporal dimension that enables dynamic adjustment, and better and more detailed data that allow researchers to model individual behaviors and identify effects (Baltagi, 2008). Specifically, this study used panel data to control for the unmeasured heterogeneity that is intrinsic to the institutional characteristics within the CSU such as student demographics, institutional selectivity, and other historical and contextual factors.

Baltagi (2008) formulates panel regression as follows:

$$Y_{it} = \alpha + X_{it} \beta + u_{it} \quad i=1, \dots, N; t = 1, \dots, T$$

In this formula,  $Y$  is the dependent variable and  $X$  the independent variables, with  $i$  denoting institutions (cross-section dimension), and  $t$  denoting time (time-series dimension):

$$u_{it} = \mu_i + v_{it}$$

where  $\mu_i$  denotes the unobservable individual-specific effect and  $v_{it}$  denotes the remainder disturbance.

Different panel data models were analyzed including pooling, institutional fixed effects, and institution and time fixed effects. Multiple tests were performed to identify the need for time-fixed effects and the existence of cross-sectional dependence or contemporaneous correlation. According to Baltagi (2008), cross-

sectional dependence is a problem in macro panels with a time series longer than the time frame of this study, but not a significant issue in micro panels with fewer years and a large number of cases. The Breusch-Pagan LM test of independence and Pasaran CD test are used to test whether the residuals are correlated across entities, which may lead to biased test results (Torres-Reyna, 2010). Breusch-Pagan LM ( $p < 0.05$ ) and Pasaran CD ( $p < 0.05$ ) results suggested potential cross-sectional dependence. The Breusch-Pagan test detected the presence of heteroskedasticity ( $p < 0.01$ ), and, as recommended by Torres-Reyna (2010), was accounted for using robust errors displayed in Table 5. The use of robust standard errors did not change coefficient estimates, but because the standard errors were changed, the test statistics provide reasonably accurate p values (Williams, 2015).

Table 4. RQ1 Estimates for Student Retention Rates (t statistics in parenthesis)

	Pooling (between-institution)	Institutional and time fixed effects (within-institution)
Instr_FTE	0.00177 (2.49) **	0.00142 (2.02)*
Acad_FTE	-0.00087 (-0.76)	0.00317 (3.04)***
Stud_FTE	-0.00426 (-4.22) ***	-0.00665 (-4.76)***
InstSup_FTE	-0.00419 (-4.07) ***	0.00094 (0.95)
Pell_Perc	-0.24526 (-11.03) ***	
Admit_Perc	-0.08039 (-4.29) ***	
Number of Observations	180	180
R <sup>2</sup>	0.54	0.16

\*Significant at 10%; \*\* significant at 5%; \*\*\*significant at 1%

Table 5. RQ1 Estimates for Student Retention Rates (standard errors in parenthesis)

	Standard Error	Robust Standard Error
Instr_FTE	0.00142 (0.00070)**	0.00142 (0.00099)
Acad_FTE	0.00317 (0.00104)***	0.00317 (0.00130)**
Stud_FTE	-0.00665 (0.00139)***	-0.00665 (0.00160)***
InstSup_FTE	0.00094 (0.00108)	0.00094 (0.00134)

\*Significant at 10%; \*\* significant at 5%; \*\*\*significant at 1%

Turning first to the control variables in the pooling model, results indicated that a 10% increase in the selectivity of an institution would lead to a 0.8% higher retention rate. Admission rates was used as a proxy for institutional selectivity, with low admission rates representing institutions with a larger proportion of students with high GPA and ACT or SAT scores. Similarly, results suggested that an institution with the proportion of low socioeconomic status students that is 10% higher than others would lead to 2.4% lower student retention rates. As noted earlier, there is an intimate relationship between SES and race. According to Reeves, Rodrigue, and Kneebone (2016), African Americans and Hispanics experience higher levels of multidimensional poverty - low income, lack of education, no health insurance, poor living area and jobless family- than their

White counterparts. The effect of both control variables, institutional selectivity and socioeconomic status of students, was significant ( $p \leq 0.01$ ). According to the pooling model, instructional expenditures per FTE was the only independent variable that positively correlated with student retention rates ( $p \leq 0.05$ ), whereas academic support, student services, and institutional support expenditures per FTE displayed a negative association with student retention rates. This means that, considering a pooling approach, only additional investments in the functional category of instruction would lead to improvements in retention rates. For example, an increase in instructional expenditures per FTE in the amount of \$1000 would result in a 1.77% increase in student retention rates. The pooling model explains the variation of student retention rates across or between institutions and accounted for 54% of the variance in student retention rate. However, Zhang (2009) determined that this model is not useful for policy makers. A better model to obtain estimates within institutions on the influence of independent variables on the dependent variable is the fixed effects model. For the purposes of this study, both institutional and time fixed effects were calculated, controlling for the unobservable characteristics of each institution and considering each year as a separate cross-sectional sample. The fixed effects model accounted for 16% of the variance in student retention rate. Because the fixed effects model controls for all institutional characteristics, Pell\_Perc and Admit\_Perc were not included in this model as control variables. Results from the second model differ significantly from the first model with the exception of

Instructional expenditures that were similar in direction and magnitude. Overall, results from the fixed effects model indicated that expenditures across functional categories positively correlated with student retention rates, with the exception of expenditures associated with student services. For example, the model suggested that an increase in instructional expenditures per FTE in the amount of \$1000 would result in a 1.42% increase in student retention rates. Positive correlations were also observed for academic support expenditures and institutional expenditures, where increases of \$1000 would result in 3.1% and 0.9% increases in student retention rates respectively. Notably, student services expenditures were negatively correlated with student retention rates, suggesting that increases in this expenditure category would result in a reduction of student retention rates. This means that an increase in student services expenditures per FTE in the amount of \$1000 would result in a 6.6% reduction in student retention rates. It is important to note that the student services expenditure category is comprised of a wide range of activities, from career services to technical support, including a number of administrative activities that rarely influence student retention (Gansemer-Topf & Schuh, 2006). Also, the use of resources may overlap across different expenditure categories, as in cases where faculty members serve as advisors to students. This finding is further discussed in Chapter Five.

*Research Question 2: What is the relationship between student retention*

*rates and the proportion of institutional expenditures as a total of core expenses for instruction, academic support, student services, and institutional support?*

In contrast with research question 1 that sought to understand the relationship between expenditures per FTE and student retention rates, research question 2 intends to uncover the influence of internal allocation of resources at the institutional level, focusing on the proportion of expenditures as a total of core institutional expenses.

The independent variables for this research question were institutional proportion of expenditures for instruction (Instr\_Perc), academic support (Acad\_Perc), student services (Stud\_Perc), and institutional support (InstSup\_Perc). The dependent variable for this research question was first year student retention rate (Ret\_Rate). These variables were drawn from IPEDS for the period 2005-06 to 2013-14. As in research question 1, data were organized and aligned to account for the one-year lag between institutional expenditures and retention rates as reported by IPEDS.

#### Data Screening

Outliers were identified using Mahalanobis distance and Box plots which revealed 20 extreme cases. Two out of the 23 CSU campuses displayed outliers for more than one dependent variable and were excluded from the analysis. To assess univariate normality, histograms, Q-Q plots, and descriptive statistics were reviewed for each variable. As indicated previously, the dependent variable



(Ret\_Rate) exhibited a normal distribution (Skewness =-.321, Kurtosis =.066) and was not transformed. Independent variables displayed normal skewness and kurtosis values within -0.3 and 0.6. Although tests of normality Kolmogorov-Smirnov and Shapiro-Wilk revealed significance, after further exploring different variable transformations, histograms, and Q-Q plots, I decided not to transform independent variables.

To determine multivariate normality, scatterplots were created to illustrate relationships between variables. Most plots displayed elliptical shapes as seen in Figure 2. Residual plots were also examined to confirm homoscedasticity of the model.

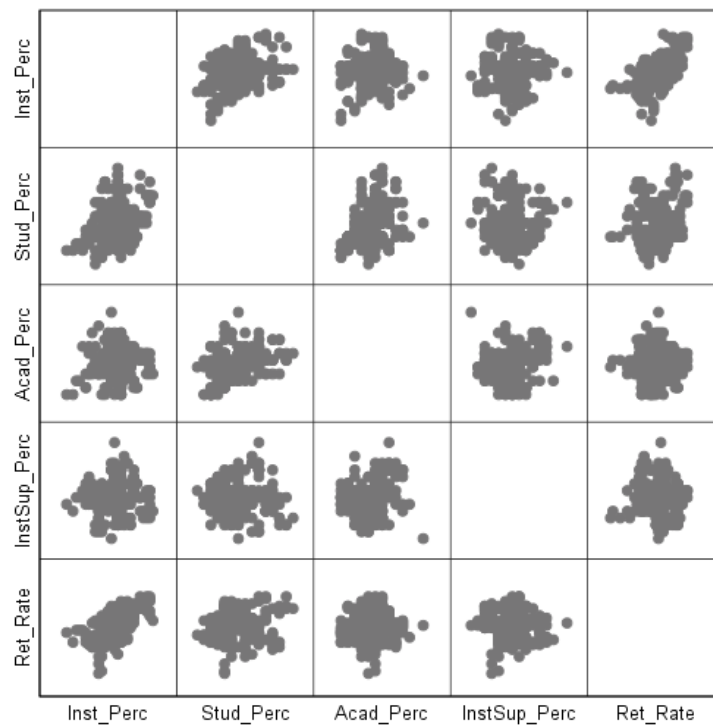


Figure 2. Proportion of Institutional Expenditures and Retention Rate

Multicollinearity was examined by producing a correlation matrix for the predictor variables and calculating VIF. For this study,  $VIF < 1.4$  for all independent variables indicating absence of multicollinearity.

Table 6. RQ2 Correlational Matrix

		Inst_Perc	Stud_Perc	Acad_Perc	InstSup_Perc
Inst_Perc	Pearson Correlation	1	.348**	.086	.058
	Sig. (2-tailed)		.000	.242	.425
	N	189	189	189	189
Stud_Perc	Pearson Correlation	.348**	1	.377**	-.004
	Sig. (2-tailed)	.000		.000	.956
	N	189	189	189	189
Acad_Perc	Pearson Correlation	.086	.377**	1	.156*
	Sig. (2-tailed)	.242	.000		.032
	N	189	189	189	189
InstSup_Perc	Pearson Correlation	.058	-.004	.156*	1
	Sig. (2-tailed)	.425	.956	.032	
	N	189	189	189	189

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Table 6 shows Pearson correlation values between independent variables, with the highest correlation of 0.377 between Acad\_Perc and Stud\_Perc, supporting the absence of multicollinearity.

### Descriptive Statistics

Table 7 provides descriptive statistics for the main variables used to answer research question 2. The mean for the proportion of Instructional Expenditures as a total of core expenses (Instr\_Perc) was 42.43%, significantly

higher than the mean proportion of Academic Expenditures as a total of core expenses (Acad\_Perc) of 11.49%, Student Services (Stud\_Perc) of 11.94%, and Institutional Support (InstSup\_Perc) of \$11.89%. Student Retention rates (Ret\_Rate) ranged from a minimum of 61% to a maximum of 93%, with a mean of 80.83 %. The percentage of students receiving Pell grants (Pell\_Perc) ranged from a minimum of 9% to a maximum of 76%, with a mean of 41.41%. The percentage of students admitted (Admit\_Perc) ranged from a minimum of 11% to a maximum of 86%, with a mean of 57.87%.

Table 7. RQ2 Descriptive Statistics for Main Variables

	Minimum	Maximum	Mean	SD
Instr_Perc	27%	54%	42.43%	5.01
Acad_Perc	7%	19%	11.49%	2.19
Stud_Perc	6%	20%	11.94%	2.89
InstSup_Perc	6%	20%	11.89%	2.39
Ret_Rate	61%	93%	80.83%	6.135
Pell_Perc	9%	76%	41.41%	15.78
Admit_Perc	11%	86%	57.87%	17.39

### Panel Analysis

A panel data analysis was conducted to determine the magnitude and the direction of the relationship between the independent variables and student

retention rates. As described earlier, Baltagi (2008) formulates panel regression as follows:

$$Y_{it} = \alpha + X_{it} \beta + u_{it} \quad i=1, \dots, N; t = 1, \dots, T$$

with  $i$  denoting institutions (cross-section dimension), and  $t$  denoting time (time-series dimension)

$$u_{it} = \mu_i + v_{it}$$

where  $\mu_i$  denotes the unobservable individual-specific effect and  $v_{it}$  denotes the remainder disturbance.

Table 8 shows results for different panel data models analyzed including pooling, and institution and time fixed effects. Multiple tests were performed to identify the need for time-fixed effects, and existence of cross-sectional dependence. Breusch-Pagan LM ( $p < 0.05$ ) and Pasaran CD ( $p < 0.05$ ) results suggested potential cross-sectional dependence. The Breusch-Pagan test detected presence of heteroskedasticity ( $p < 0.01$ ), and, as recommended by Torres-Reyna (2010), was accounted for using robust errors as displayed in Table 9. The use of robust standard errors did not change coefficient estimates, but because the standard errors were changed, the test statistics provide reasonably accurate p values (Williams, 2015).

Table 8. RQ2 Estimates for Student Retention Rates (t statistics in parenthesis)

	Pooling	Institutional and time fixed effects
Instr_Perc	0.58574 (8.97) ***	0.02123 (0.22)
Acad_Perc	0.08915 (0.60)	0.17982 (1.31)
Stud_Perc	-0.45292 (-3.69)***	-0.66350 (-3.84)***
InstSup_Perc	-0.37316 (-2.96) ***	0.02156 (-0.13)
Pell_Perc	-0.18173 (-8.44)***	
Admit_Perc	-0.06004 (-3.52) ***	
Number of Observations	189	189
R <sup>2</sup>	0.57	0.09

\*Significant at 10%; \*\* significant at 5%; \*\*\*significant at 1%

Table 9. RQ2 Estimates for student retention rates (standard errors in parenthesis)

	Standard Error	Robust Standard Error
Instr_Perc	0.02123 (0.094679)***	0.02123 (0.159297)
Acad_Perc	0.17982 (0.137141)	0.17982 (0.203123)
Stud_Perc	-0.66350 (0.172404)***	-0.66350 (0.214554)***
InstSup_Perc	0.02156 (0.159490)	0.02156 (0.192469)

Turning first to the control variables in the pooling model, results indicated that a 10% increase in the selectivity of an institution would lead to a 0.6% higher retention rate. Similarly, results suggested that an institution with the proportion of low socioeconomic status students that is 10% higher than others would display 1.8% lower student retention rates. As expected, these results are similar from those obtained in research question 1, with small differences attributable to the slightly larger number of observations.

The pooling model accounted for 57% of the variance in student retention rate. As indicated earlier, the pooling model explains the variation of student retention rates across or between institutions, but according to Zhang (2009), this model is not the most suitable for policy makers. A better model to obtain estimates within institutions on the influence of independent variables on the

dependent variable is the fixed effects model. For the purposes of this research question and following the same approach used in research question 1, both institutional and time fixed effects were calculated, controlling for the unobservable characteristics of each institution and considering each year as a separate cross-sectional sample. Because fixed effects controls for all institutional characteristics, Pell\_Perc and Admit\_Perc were not included in this model as control variables.

Similar results were observed between the pooling and fixed effects models in terms of the direction of estimates. Of note, the fixed effects model accounted for only 9% of the variance in retention rate. Overall, results from the fixed effects model indicated that the percentage of Instruction, Academic Support, and Institutional Support expenditures were positively correlated with student retention rates, while the percentage of Student Services was negatively associated with student retention rates. According to the fixed effects model, an increase in proportion of Instructional expenditures of 10 percentage points would result in a 0.2 percentage point increase in retention rates. A positive correlation was also observed for the proportion of academic support and institutional expenditures, where increases of 10 percentage point would result in 1.7% and 0.2% increases in student retention rates respectively. In the same way as in research question 1, the proportion of student services expenditures was negatively correlated with student retention rates, indicating that a 10% increase in the proportion of this expenditure category would lead to a 6.6% drop

in student retention rates. As noted earlier, the student services expenditure category is broad and includes a number of administrative activities that do not influence student retention (Gansemer-Topf & Schuh, 2006). This finding is further discussed in Chapter Five.

*Research Question 3: What is the level of similarity among various institutions, based on socioeconomic status of students, institutional selectivity, faculty composition, and institutional expenditures?*

To address the similarity between CSU institutions, a Multidimensional Scaling (MDS) cluster analysis was conducted. MDS analyzes pairwise comparison data, defined as perceived relatedness between two items of a group, and mathematically converts this perceived relatedness among items into a visual representation of distance, which is called configuration (Stalans, 1995). This data analysis technique was performed mainly for exploratory purposes to reveal insights into the structure of the dataset. Since there are many varying institutional characteristics across the CSU, clustering was intended to identify latent groups in the data, given important characteristics (Attewell, Monaghan, & Kwong, 2015). For the purposes of this study, institutional characteristics included variables identified in the literature review as associated with student success, including institutional expenditures, faculty composition, socioeconomic status of the student population, and institutional selectivity.



Given that MDS can only analyze individual cross-sections of the panel data, the most recent year within the sample (2013-2014) was selected. Institutional expenditures per FTE across the previously analyzed categories (instruction, student services, academic support, and institutional support), were consolidated into a single variable calculated as the total institutional expenditures per FTE across functional categories. Faculty composition was operationalized as tenure density, defined as tenure-track FTE divided by total instructional FTE as reported by the CSU. Data were standardized into z scores to make variables comparable. Given the exploratory nature of MDS and after several iterations of the analysis, one institution that revealed itself as an outlier was excluded. Table 10 shows descriptive statistics for the selected variables before transformation.

### Descriptive Statistics

Table 10. RQ3 Descriptive Statistics for Main Variables

	Minimum	Maximum	Mean	SD
TotalExp_FTE	\$9274	\$14963	\$10875.51	\$1645.85
Tenure_Perc	37.7%	68.4%	57.36 %	7.58
Ret_Rate	73%	93%	83.55 %	5.28
Pell_Perc	13%	73%	51.68%	14.49
Admit_Perc	31%	82%	58.50%	14.97

As indicated in Table 10, institutional expenditures per FTE (TotalExp\_FTE) ranged from \$9,274 to \$14,963, with a mean of \$10,875.51. The mean tenure density (Tenure\_Perc) was 57.36%, with a minimum of 37.7% and a maximum of 68.4% across the sample. Retention rate (Ret\_Rate) ranged from 73% to 93%, considerably better than in previous years as reported for research question 1. The proportion of low socioeconomic status students (Pell\_Perc) ranged from 13% to 73%, with a mean of 51.68%. Finally, institutional selectivity (Admit\_Perc) ranged from 31% to 82%, with a mean of 58.50%.

#### Clustering Distance Measures

Observations were clustered into groups using Euclidean distance, which defines how the similarity of two elements ( $x, y$ ) is calculated and will determine the shape of the clusters. Euclidean distance can be formulated as:

$$d_{euc}(x, y) = \sqrt{\sum_{i=1}^n (x_i - y_i)^2}$$

where,  $x$  and  $y$  are two vectors of length  $n$ .

An existing iterative algorithm available in the R statistical package was utilized to group data into clusters in a way that institutions in the same cluster were as similar as possible, while institutions from other clusters were as dissimilar as possible. In k-means clustering, a center or centroid is calculated for each cluster that corresponds to the mean of points associated with that cluster. The Elbow method was employed to identify the optimal number of clusters. The

plot of the curve displayed in Figure 3 revealed a bend between 5 and 8 clusters.

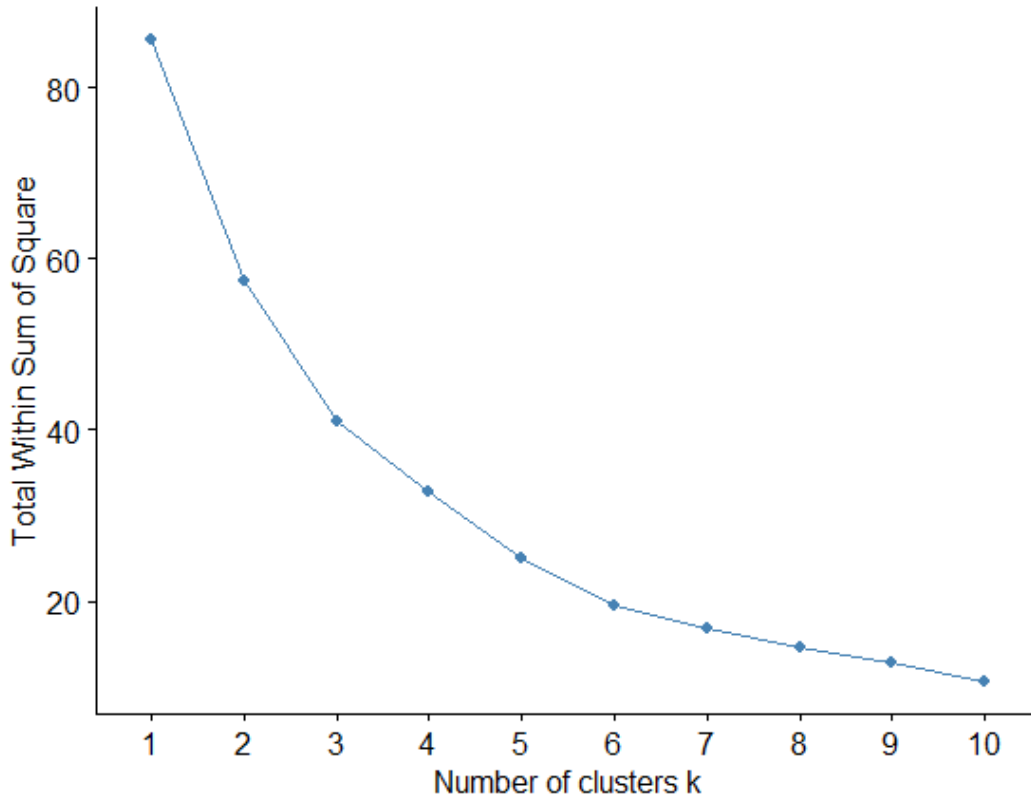


Figure 3. Optimal number of clusters

Several other  $k$  values were examined, and it was determined that six clusters were the most appropriate for the purposes of this study. This means that CSU institutions can be classified in six homogenous groups with similar institutional attributes associated with the socioeconomic status of students, institutional selectivity, faculty composition, and institutional expenditures.

A cluster plot (Figure 4) and a cluster dendrogram (Figure 5) were produced to further understand and help visualize the level of similarity and

relative distance between institutions.

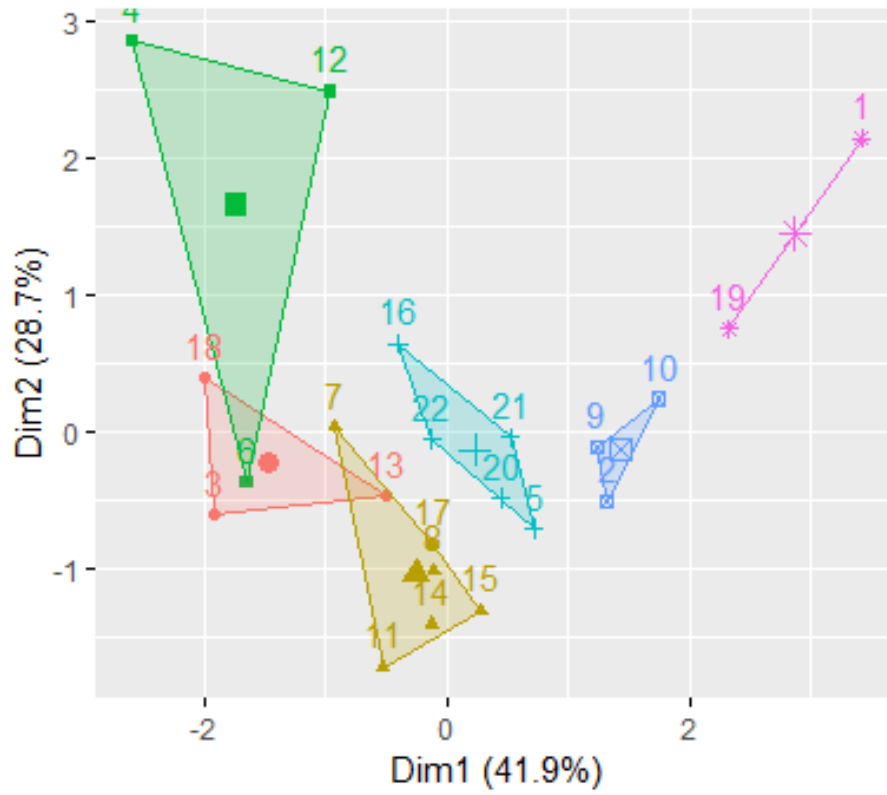


Figure 4.Cluster Plot

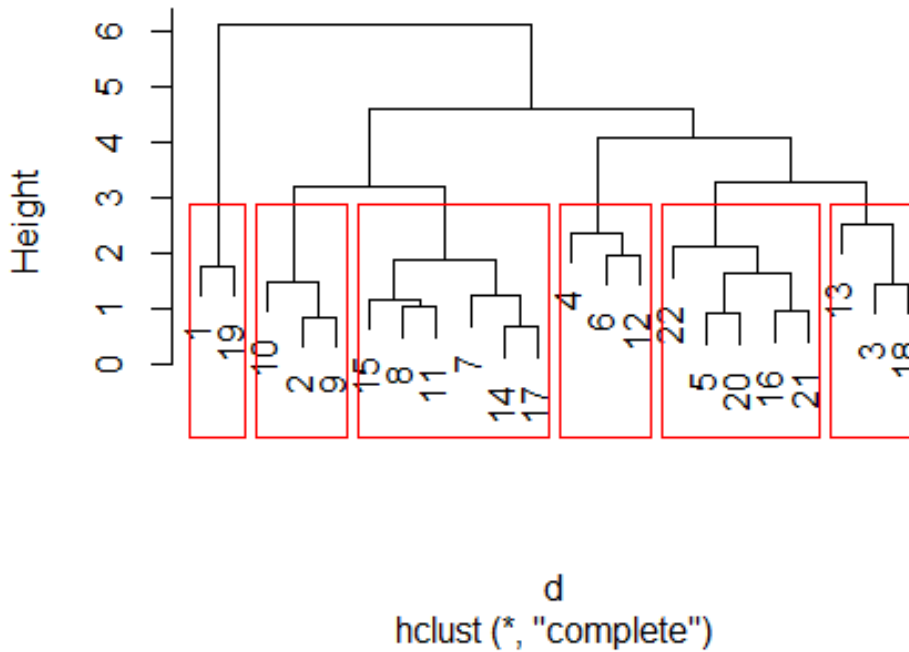


Figure 5. Cluster Dendrogram

In the cluster dendrogram depicted in Figure 4, the vertical axis represents the distance or dissimilarity between clusters, while the horizontal axis represents the institutions numbered from 1 to 22. Red rectangles identify clusters of similar institutions. “Each joining (fusion) of two clusters is represented on the graph by the splitting of a vertical line into two vertical lines. The vertical position of the split, shown by the short horizontal bar, gives the distance (dissimilarity) between the two clusters” (NCSS Statistical Software, 2018, p. 445-2). The dendrogram shows multiple splits with the corresponding horizontal lines positioned at different heights, suggesting that, overall, the CSU is comprised of a heterogeneous group of institutions. The dendrogram also helps visualize and

support the selection of six optimal clusters given the proximity of institutions enclosed in each of the six red rectangles. Notably, the size of clusters varies. The smallest cluster accounts for only two institutions, while the largest cluster includes six institutions, suggesting that there may be additional outliers such as institutions labeled 1 and 19, and also that there are subgroups of fairly large number of institutions with similar institutional attributes as indicated by the cluster comprised of institutions labeled 15, 8, 11, 7, 14, and 17. Results indicated that the clustering produced in this analysis explained 77.2% of the variance in the data. Given that the variance explained is a statistic used to assess the “goodness of fit” of the clustering solution, the 77.2% supports the selection of 6 clusters as optimal for this study.

### Summary

This chapter presented the results of this study. A panel analysis was used to address research questions one and two, looking to understand the relationship between student retention and the level and proportion of institutional expenditures across functional classifications. Multidimensional scaling techniques were utilized to answer research question three, seeking to explore the level of similarity among CSU institutions based on institutional attributes including socioeconomic status of students, institutional selectivity, and faculty composition. Results from this study indicated that, overall, both the level and proportion of institutional expenditures are positively correlated with student

retention rates, suggesting that increases in dollar amount or proportion of expenditures allocated to each functional category would result in higher retention rates. Nevertheless, student services expenditures emerged as an exception, with results suggesting that further allocation of funds to student services activities would not result in higher student retention. Results from this study also indicated that the CSU is comprised of a heterogeneous group of campuses. Specifically, the CSU can be grouped in 6 different clusters based on similarities of institutional characteristics that were found to influence retention rate, implying that allocation of funds from the system to individual campuses may need to account for these differences to effectively support student success.

The next chapter provides an overview and interpretation of findings, offers recommendations for educational leaders and policy makers, highlights study limitations, and concludes with a summary of this study.

## CHAPTER FIVE

### RECOMMENDATIONS AND CONCLUSIONS

#### Introduction

In this chapter, I discuss the key findings of this study and their implications for researchers and administrators alike. I offer concrete recommendations for educational leaders based on these findings as well as recommendations for future research. Lastly, I discuss the policy implications of this research and offer some next steps for higher education policies related to student retention in the CSU.

#### Overview

The purpose of this study was to examine the relationship between student retention rates and institutional expenditures across the different functional categories of instruction, student services, academic support, and instructional support at the California State University (CSU). These functional categories account for more than 60% of CSU's overall expenditures, and, with the exception of student grants and scholarships, these selected expenditures represent the system's four largest individual expense categories. This study also sought to reveal institutional practices involving resource allocation practices that influence student retention, controlling for institutional characteristics that emerged in the literature review as relevant to student success including faculty



composition, socioeconomic status of student population, and institutional selectivity. Faculty composition was operationalized as tenure density, defined as tenure-track FTE divided by total instructional FTE as reported by the CSU. The percentage of financial aid recipients who are awarded Pell Grants (family income of below \$50,000 annually) was used to capture the socioeconomic status of students, with larger percentages representing a higher proportion of students coming from low socioeconomic backgrounds. Admission rates were used as a proxy for institutional selectivity, with low admission rates representing institutions with a larger proportion of students with high GPA and ACT or SAT scores. The sample utilized in this study is the entire population of the CSU, which is comprised of 23 campuses and serves more than 480,000 students, making it the largest and one of the most diverse university systems in the U.S. (CSU, 2018).

This study found that instructional, academic support, and institutional support expenditures were positively correlated with student retention rates. This finding suggests that increases in both dollar amounts and proportion of expenditures allocated to each functional category would result in higher retention rates. However, there was an exception: student services expenditures were found to be negatively correlated with student retention rates, implying that allocating funds to student services activities would not result in higher student retention. It should be emphasized that these are the results of a theoretical model, not to be considered a guide or a formula, but rather a framework to

understand the influence of aggregate expenditures on student retention rates.

This study also found that the CSU institutions can be grouped in six different clusters based on similarities of institutional characteristics that include socioeconomic status of the student population, the composition of faculty, and the institutional selectivity. This finding implies that the CSU is not a homogenous system but rather a large and diverse array of campuses with different needs, an important consideration for educational leaders that want to support student success.

### Interpretation of Findings

Overall, this study found a direct relationship between institutional expenditures and student retention rates. The aggregated institutional expenditures categories for instruction, academic support, and institutional support were found to be positively correlated with student retention rates. Increases in dollar amounts and proportions of expenditures allocated to each functional category resulted in higher retention rates for the period 2005-2014.

However, there were exceptions. Specifically, dollar amounts and the percentage of expenditures allocated to the student services functional category did not positively correlate with student retention rates. Since this finding is complex and seems to contradict the majority of the existing literature and long history of activities typically associated with student affairs (Astin, 1993; Jackson & Cook, 2016; Kuh, 2008; Seidman, 2005) I will elaborate on this finding in the next section.

## Student Services and Retention

Unlike other expenditure categories, this study found that there is a negative relationship between student retention rates and expenditures associated with the functional category of student services which, broadly speaking, includes a wide range of activities from career services to technical support. This finding suggests that retention rates would not improve by increasing the allocation of funds to student services programs, which aligns with similar findings from previous studies that found no or negative relationship between student services expenditures and retention and graduation rates (Gansemer-Topf, 2006; Ryan 2004).

Yet, this finding may seem counterintuitive. According to Astin (1993) “investment in student services is a more critical environmental factor than the investment in instruction” (p. 331). As it relates to Hispanic students, research suggests that these students “often bring significant baggage to college with them, and the need to provide more services than usual makes the student services component of any successful minority recruiting and retention program a priority” (Seidman, 2005, p. 20). A few considerations can explain this seemingly unexpected finding. First, it is important to keep in mind that the student services expenditure category is broad. The National Center for Education Statistics (NCES) defines this expenditure category as “activities whose primary purpose is to contribute to the student’s emotional and physical well-being and to his or her intellectual, cultural, and social development outside the context of the formal

instructional program” (NCES Survey Materials, 2018, p. 31). Specifically in California, student services activities are associated with the Student Services Administration, Social and Cultural Development, Counseling and Career Guidance, Financial Aid Administration, Student Health Services, Student Services Information Technology, Student Admissions, and Student Records (California Budget, 2018). Therefore, it should be noted that the student services category includes a significant number of administrative activities that have an indirect or no impact on student success. For instance, the Admissions office typically interacts with students prior to attending the institutions. Likewise, the Registrar’s Office and Financial Aid Office typically provide administrative services that hardly ever influence student retention (Gansemer-Topf & Schuh, 2006).

In addition, Gansemer-Topf and Schuh (2006) pointed out that while institutions may allocate resources in the specific areas of instruction, academic support, or student affairs, the use of these resources may overlap. For example, there may be cases where faculty members serve as advisors to students, or student affairs staff may hold faculty appointments for first year experience courses. Furthermore, smaller institutions may have a harder time separating expenditures across different functional categories.

It is also important to understand that the negative relationship between student retention rates and student services expenditures does not negate the critical role of student services in general. With respect to student retention rates

specifically, we should not discount student services programs that are closely linked and even collaborate with instructional activities. Moreover, this finding should not be interpreted as encouragement to further dichotomize the activities associated with different expenditure categories such as instruction and student services; activities and services within these different categories are important when it comes to student success. For example, a number of High-Impact Educational Practices (HIPS) include support from both student services and instructional activities. HIPS are teaching and learning practices that improve student retention and lead to successful learning (Kuh, 2008). These practices include First-Year Seminar Experiences, Common Intellectual Experiences, Learning Communities, Writing Intensive Courses, Collaborative Assignments and Projects, Undergraduate Research, Diversity/Global Learning, ePortfolios, Service Learning/Community-Based Learning, Internships, Capstone Courses and Projects (Kuh, 2008). For instance, a number of universities have adopted first-year seminar experiences into their curriculums, programs that bring groups of students together with faculty or staff on a regular basis to focus on first-year programs for incoming freshman (Kuh, 2008). Many of these practices have been adopted by institutions across the CSU, which has been committed to HIPS since joining the American Association of Colleges and Universities (AAC&U) LEAP Initiative and Compass Project in 2008 (O'Donnell, Hecsh, Underwood, Loker, Trechter, David & White, 2011).

### Institutional Support Expenditures

This study also found that both the amount and proportion of institutional support expenditures are positively correlated with student retention rates. Institutional expenditures include 1) central executive-level activities concerned with management and long-range planning of the entire institution, such as the governing board, planning and programming, and legal services; 2) fiscal operations, including the investment office; 3) administrative data processing; 4) employee personnel and records; 5) logistical activities that provide procurement, storerooms, printing, and transportation services to the institution; 6) support services to faculty and staff that are not operated as auxiliary enterprises; and 7) activities concerned with community and alumni relations, including development and fundraising. Examples include: executive management; fiscal operations general administration and logistical services; administrative computing services; and public relations/development (NCES, 2018).

This finding differs from similar studies which found a negative relationship between institutional support expenditures and student retention and graduation rates (Gansemer-Topf 2006; Ryan 2004; Titus, 2006a; Webber & Ehrenberg, 2010). As reported by the State of California, Institutional Support expenditures include Executive Management, Fiscal Operations, Public Relations/Development, General Administration, and Administrative Information Technology (California Budget, 2018). Given its inherent administrative nature, decades ago there were claims that this expenditure category was the most

unlikely to impact student success in a positive manner (Astin & Scherreri, 1980; Blau; 1973). In a more recent study, Ryan (2004) contrasted academic and institutional support expenditures categories, suggesting that not all administrative and support expenditures offer contributions to student success. Nevertheless, the positive relationship between institutional expenditures and student retention found in this study may suggest that these functions have evolved and become more integrated with core activities. Furthermore, this finding may suggest that administrative functions such as fiscal operations, budgeting, and information technology, play a key role in influencing allocation of resources and student experiences on campus, functions that are directly related to the retention of students.

#### Instructional and Academic Support Expenditures

Previous studies found that instructional expenditures were, indeed, positively correlated with some measure of student performance such as retention or graduation rates (Bailey et al., 2005; Gansemer-Topf & Schuh, 2006; Hamrick et al., 2004; Ryan, 2004; Scott et al., 2006). Aligned with these findings, this study concluded that the amount and proportion of instructional expenditures were positively correlated with student retention rates.

Notably, Bailey et al. (2005) found that, even though the aggregate instructional expenditures were positively correlated with graduation rates, institutions with a large percentage of part-time faculty were associated with lower graduation rates. This is particularly relevant as budget constraints and

mounting pressures to reduce costs have influenced the faculty composition at higher education institutions (including CSU), resulting in an increase in the proportion of adjunct or non-tenure-track faculty (NTTF) and a decrease in the proportion of tenure and tenure-track faculty (Zhang, 2009). For instance, recent headcount data from the CSU indicated that almost 60% of faculty were NTTF in 2017 (CSU Human Resources, 2017). There is also evidence that increased usage of adjunct faculty negatively impacts graduation rates at four-year institutions, especially at public master's universities (Ehrenberg & Zhang, 2005a, 2005b). Controlling for other variables, a 10% increase in the proportion of part-time faculty was found to be correlated with a three percent reduction in graduation rates at public master's institutions (Ehrenberg & Zhang, 2005a, 2005b).

As such, the onus should be placed on higher education institutions with regard to poor student success outcomes associated with increased reliance on adjunct faculty. As pointed out by Kezar (2013), when it comes to NTTF, institutions are responsible for deficient hiring practices, faculty turnover due to low compensation packages, poor communication of information and required training, absence of a formal onboarding process, and inconsistent departmental support from staff and supervisors. A heavy reliance on NTTF could hinder the positive influence of instructional expenditures on retention rate, and may also explain why other expenditure categories such as academic support and institutional support exhibited a higher positive correlation with student retention,



given that these expenditures categories support activities that were found to influence the performance of NTTF (Kezar, 2013) such as hiring practices, training, and compensation packages.

Also aligned with previous studies (Gansemer-Topf & Schuh, 2006; Hamrick et al., 2004; Ryan, 2004), in this study, the academic support expenditure category was found to be positively correlated with student retention rate, both on the level and proportion of funding. The academic support expenditure category includes “services for the institution’s primary missions: instruction, research, and public service. Examples: Libraries, Museums and Galleries, Educational Media Services, Academic Computing Services, Ancillary Support, Academic Administration, Academic Personnel Development, and Course and Curriculum Development” (NCES, 2018).

Put simply, this finding suggests that investment in academic support activities would result in higher student retention rates. To explain this finding, Gansemer Topf and Schuh (2006) noted that this expenditure category may include academic advising activities, which has been identified as a way to improve student retention. Academic advising services, particularly involving the early development of an academic plan, can improve student success (Hannover Research, 2014). This claim has been supported by studies which found that academic advising influence student retention (King, 1993; Pascarella & Terenzini, 2005; Wheatley, 2018). Of note, King (2008) identified three approaches associated with academic advising and counseling: decentralized

models, centralized models, and shared models. In decentralized models, advising offices may reside in the academic units, whereas in centralized models, there is only one central advising office, optimizing advisor resources and coordination. Shared models include a combination of central advising offices and faculty advisors or academic unit advising offices. Although no one of these approaches have been found to be the most effective (Fricker, 2015), they offer an insight on the complexities associated with allocating resources for academic support activities.

### Institutional Grouping

The third research question of this study was intended to explore an assumption: that not all 23 institutions in the CSU system are alike, and that these institutions could be grouped in a way to facilitate allocation of resources. The clustering approach was selected because it helps reveal latent groups and other important characteristics in the data (Attewell, Monaghan, & Kwong, 2015). This study concluded that the CSU institutions can be grouped in six different clusters based on institutional characteristics that include socioeconomic status of the student population, the composition of faculty, and the institutional selectivity. These institutional characteristics emerged from the literature as predictors of student retention (Bailey, Calcagno, Jenkins, Kienzl, & Leinbach, 2005; Ehrenberg & Zhang, 2005a, 2005b; Gansemer-Topf and Schuh (2006); Terenzini, Cabrera, & Bernal, 2001; Titus, 2006b). Despite the mixed findings presented in the previous sections regarding the influence on institutional

expenditures on retention rates, clustering institutions is a good place to start when planning for allocation of resources across the largest university system in the nation. This means that resource allocation practices at the system wide level should consider that certain groups of institutions may require additional financial support in order to meet common goals such as Graduation Initiative 2025. Moreover, the finding that a single university system is comprised of six clusters of similar institutions offers a roadmap by which to support student retention across such a large and varied array of campuses. It's also an important consideration for educational leaders that want to support student success and spend where it matters, a topic I turn to in detail in the next section.

### Recommendations for Educational Leaders

Launched in 2016 after the culmination of a first phase of the CSU's Graduation Initiative in 2015, CSU Graduation Initiative 2025 seeks to increase the system's retention rates, graduation rates, and equity gaps for underrepresented minorities and Pell-eligible students (CSU, 2018). Specifically, the Graduation Initiative 2025 aims at increasing the freshman 4-year graduation rate from 19% to 40%, the freshman 6-year graduation rate from 57% to 70%, the transfer 2-year graduation rate from 31% to 45%, and the transfer 4-year graduation rate from 73% to 85% (CSU, 2018)—all while cutting the graduation gap between underrepresented minorities and their peers in half (Jackson & Cook, 2016).

In order to attain these ambitious goals, the CSU adopted a multi-faceted approach that impacts a wide range of activities and functions including academic programs, enrollment management, student engagement, financial aid, and administrative services. Specific strategic initiatives consist of hiring more tenure-track faculty and academic advisors to make new course sections available and support student success, increasing online offerings, and expanding student advising (CSU, 2018). It should be stressed that the CSU (2018) claims that increased and continuous state funding is vital to invest in programs that support student success and increase completion rates. Nevertheless, this study found that not all investments across functional expenditures influence student success measures such as retention rates in the same manner.

Although the CSU is already close to achieving the system-wide graduation goals (Jackson & Cook, 2016), there is a wide variance in graduation rates across campuses, ranging from 35 percent to 76 percent. Given the different institutional characteristics, the CSU Graduation Initiative 2025 includes different goals set for each campus in the system based on top graduation rates at similar universities across the nation (Jackson & Cook, 2016). Initiatives and programs like the Graduation Initiative have demonstrated to be effective, positively influencing student retention and graduation rates in the CSU (Smith, 2018). Yet, the level of success associated with improvements in retention and graduation rates is not consistent across the CSU system.

The findings from this study suggest that, although the CSU is one system, it is comprised of institutions with widely varying institutional characteristics that have been proven to influence student retention and graduation rates. These institutional characteristics include the socioeconomic status of the student population, the campus selectivity, and the proportion of tenure and tenure track faculty. These findings support the existing approach taken by the CSU to take into account the unique characteristics of each campus. It is therefore important for leaders to acknowledge these institutional differences and consider the uniqueness of each CSU institution when establishing goals and, most importantly, when allocating financial resources to support those goals.

As indicated in budget memos issued by the CSU (2018), the socioeconomic status of the student population at each individual campus currently plays a role in the distribution of funds across the CSU. In 2018, around \$35 million or 5% of the total pool of funds available for State University Grant (SUG) were redistributed across CSU campuses based on the proportion of students with an estimated family contribution (EFC) of less than \$4000. General Fund appropriations are typically distributed across campuses based on enrollment. For example, a one-time allocation of \$120 million designated to the CSU in the 2018 California Budget Act was distributed based on criteria using the marginal cost for enrollment associated with revenues derived from state support or general fund. Specifically, criteria for allocation across CSU Campuses include average unit load, acceptance and enrollment of transfer students, and capacity

to grow (CSU, 2018). Furthermore, the process for allocation of resources across campuses may call for additional criteria based on CSU policy changes. For example, it is anticipated that effective FY 2019-2020 a new policy will require CSU campuses to redirect not admitted but CSU eligible applicants to other campuses where they will be offered admission (CSU, 2018). If implemented, this policy could potentially increase the number of first time freshman at several campuses with capacity to admit more students. Over time, the criteria for allocation of funding will need to support the costs associated with the increased enrolment resulting from redirected students. The fact that the CSU has started to take the uniqueness of its campuses into account when allocating funds from various sources, including state support, is a step in the right direction. But there is also follow through required in the future, and a need to continue monitoring changes in the institutional characteristics of each CSU campus and their associated impact on student success.

An important consideration associated with student success is institutional selectivity, operationalized as admissions rate for the purposes of this study. This variable is intrinsically related to the prestige of each campus, a characteristic that can result in both positive and negative outcomes for the institutions and its students. According to O'meara (2007), one of the reasons institutions strive to achieve greater prestige is to bring in more financial resources, which may result in additional investments on student success and retention. Yet, it is not clear that allocating expenditures to increase prestige always pays off. For example,

changes in institutional selectivity can impact the composition of the student population. In a study of a top-ranked research university, Shaw and LeChasseur (2005) found that as the institution was striving to gain prestige, the student characteristics changed, resulting in a decrease in the percentage of local and racial and ethnic minority students. Given that part of the mission of the CSU is “to encourage and provide access to an excellent education to all who are prepared for and wish to participate in collegiate study” (CSU, 2018), it is important for its educational leaders to understand that striving for selectivity may counter the mission of the CSU, effectively reducing access to students who are prepared and willing to be admitted.

#### Improved Financial Reporting

Financial audit reports for higher education institutions in the US are prepared in accordance with Generally Accepted Accounting Principles (GAAP). These accounting principles are implemented by the Financial Accounting Standards Board (FASB) for private institutions and by the Governmental Accounting Standards Board (GASB) for public institutions like the CSU (Hannover Research, 2014).

Although higher education institutions are required to produce financial reports in accordance with FASB and GASB, different interpretations of these accounting principles have led to inconsistent financial reporting across higher education institutions. According to a co-sponsored survey by the Association of Governing Boards of Universities and Colleges (AGBUC) and the National

Association of College and University Business Officers (NACUBO), less than 25 percent of CFOs reported using a standard cost methodology that would allow benchmarking comparisons with other institutions (Hannover Research, 2014). Simply put, existing reporting requirements may lend themselves to inconsistent recording of financial activities across higher education institutions.

As previously noted, this study relied on data drawn from IPEDS, with broad definitions for institutional expenditures in the categories of instruction, academic support, student services, and institutional support (NCES, 2018). When it comes to budget reporting at the state level, the CSU identifies several programs and activities itemized under each expenditure category as follows:

- Instruction: General Academic Instruction, Vocational/Technical Instruction, Community Education, Preparatory/Remedial Instruction, Instructional Information Technology
- Academic Support: Libraries, Museums and Galleries, Educational Media Services, Ancillary Support, Academic Administration, Academic Personnel Development, Course Curriculum Development, Academic Support Information Technology
- Institutional Support: Executive Management, Fiscal Operations, Public Relations/Development, General Administration, Administrative Information Technology
- Student Services: Student Services Administration, Social and Cultural Development, Counseling and Career Guidance, Financial Aid



Administration, Student Health Services, Student Services Information Technology, Student Admissions, Student Records (California Budget, 2018)

Given my current role as Director of Financial Services and Controller at one of the CSU campuses, I can attest to the significant improvements achieved in the areas of data integrity and compliance in relation to financial reporting across the CSU. These improvements were the result of enhanced documentation, stronger collaboration between campuses, expanded training opportunities, and the implementation of information system auditing tools that are able to identify potential errors in the recording and reporting of activities. It is within this context that the CSU should continue with its ongoing efforts to maintain data integrity for financial reporting purposes. In addition, the existing reporting requirements based on aggregate functional categories should be reviewed to ensure that it still meets the needs of decision makers. Findings from this study suggest that institutional programs and activities could be grouped in different ways to better assess the influence of expenditures on mission related goals such as student success. For example, the student services expenditure category could be reorganized to focus mainly on student support activities, excluding administrative cost centers such as financial aid administration, student admissions, and student records. Similarly, the academic support expenditure category could be redefined by excluding Academic Administration. Finally, all administrative activities along with information technology support could be

consolidated under the institutional support expenditure category, resulting in a more intuitive and consistent structure for financial statements readers and researchers.

### Next Steps for Educational Reform

Results of this study suggest that the majority of expenditures across functional categories are positively correlated with student retention rates. These expenditures are funded from federal, state, and local appropriations, student tuition and fees, endowments, federal, state, and local grants, and other enterprise operations (Ma, Baum, Pender, & Welch, 2016). Of note, state support and tuition fees constitute the largest sources of funds for four-year public colleges and universities in the U.S. (Kena et al., 2016). Yet, public higher education in California has experienced a decline in state support. Although this pattern has reversed in the past few years, adjusting for inflation, state appropriations per full-time equivalent student in fiscal year 2014-15 were 8% lower than they were in fiscal year 2004-05, and 11% lower than they were three decades earlier (Ma et al., 2016). Reductions in state support for higher education are partially explained by growing needs in other government areas (Titus, 2009). This means that California needs to find new revenue streams. According to Baldassare et al. (2018), a potential source of funds could come from a change in Proposition 13 associated with a split-tax roll. This would result in property taxes for commercial properties being taxed at market value, while

residential properties would continue to be subject to limited taxation. Another alternative for raising funds for higher education could consist of issuing construction bonds (Baldassare et al., 2018)

As the newly-elected Governor Gavin Newsom took office in January 2019, a recent poll by PPIC indicated that most Californians believe that higher education should be a high priority for the governor (Baldassare, Bonner, Dykman, & Lopes, 2018). Furthermore, more than half of the survey respondents think that the new governor needs to change course from his predecessor Jerry Brown, suggesting an opportunity for changes in higher education policies (Baldassare et al., 2018). Regarding funding, affordability continues to be highlighted as a problem for students taking on large amounts of debt at California public higher education institutions, and the majority of Californians are supportive of increasing the funding levels for both the CSU and UC. Specifically, the majority of Californians support a minimum level of state funding for CSU and the University of California, similar to what community colleges receive under Proposition 98 passed in 1988 (Baldassare et al., 2018). Addressing the sentiments of Californians and the need to prioritize public higher education, Governor Newsom made a strong statement in his first budget released in January 2019. Hailed by Cal State Chancellor Timothy P. White as a “bold investment” (Watanabe, 2019), the Governor’s budget (“Higher Education,” n.d.) proposed a \$300 million ongoing General Fund increase for CSU. This includes \$193 million for operational costs, \$62 million for enrollment growth of two

percent, and \$45 million to continue the efforts of the Graduation Initiative 2025. The Budget also proposes \$247 million one-time General Fund for the CSU to help address its deferred maintenance backlog and to improve and expand on-campus child care centers (p. 52)

The additional \$300 million baseline funding constitutes an 8 percent increase from the prior year that would allow to enroll 7,000 additional students (Watanabe, 2019). Although Gov. Newsom funding increases were provided with the expectation that “tuition will remain flat, access will be increased, and time to degree will improve” (Watanabe, 2019), additional ongoing funding will most likely be required to continue a path towards increased access, cost-efficiencies, and student success, all much needed to meet the needs of California’s economy.

### Recommendations for Future Research

As indicated previously, this study analyzed expenditure activities for the period 2005 to 2014. The decision to choose the period was motivated by the implementation of an accounting pronouncement (GASB 68) that changed the accounting treatment of certain activities effective in 2015. These activities included significant account balances such as pension liabilities (NCES, 2018). Since institutional financial expenditures reported across functional categories are released and made publicly available by IPEDS, a recommendation for future research would be to include more recent data. Analyzing data reported for a

time period that includes years before and after 2015 would require adjustments to account for the GASB 68 accounting changes that, as of the date of this study, are not publicly available at the individual institutional level.

This study analyzed institutional expenditures aggregated at the functional expenditures of instruction, academic support, institutional support, and student services. These aggregated financial variables were utilized because they are made publicly available by IPEDS, the review of the literature noted other studies analyzing similar expenditure categories, and the reporting is consistent across CSU institutions. As noted earlier, each expenditure category consists of several distinct programs or activities that may influence retention rates in different ways. Therefore, a recommendation for future research would be to explore the relationship between student retention rates and expenditures associated with specific programs or activities within the functional categories of instruction, academic support, student services, and institutional support. Given These specific programs and activities could focus on HIPS given their positive influence on retention rates (Kuh, 2008).

Finally, this study would benefit from the perspectives of university leaders and administrators as it relates to allocation of financial resources at the system and institutional level. Qualitative approaches such as case studies could uncover the rationale behind allocation of resources and help explain the findings of this study. This could be accomplished by focusing on resource allocation practices that take place at the institutional, division, college, and program levels

that exist within each aggregate expenditure category addressed in this study. Qualitative approaches may also bring to light other institutional characteristics and environmental factors that may influence retention rates and other measures of student success.

### Limitations of Study

A limitation of this study is associated with the selected sample size, restricted by the number of institutions in the CSU system. To answer the first two research questions, a panel analysis was conducted for more than 20 institutions across 9 years. Given that panel analysis in this study was in essence a multiple regression analysis that controlled for variables associated with each institution and year of study, the amount of variance explained by the model was rather small, specifically accounting for less than 17% of the variance in retention rate. Nonetheless, panel analysis proved to be the most appropriate methodology given the longitudinal nature of the data, and although modest, the variance explained by the panel analysis model captures most accurately the direction and size of the relationship between institutional expenditures and student retention rates. Finally, most of the variables examined in this study were drawn from IPEDS and rely on self-reported data from each institution. Although there are some controls in place to identify errors, it is conceivable that some of the self-reported data is incorrect.

## Conclusions

California is expected to experience a shortage of over a million college educated workers in California by 2030 (Johnson et al., 2016). Among the three public higher education systems in California, the CSU not only serves the largest number of students, but also stands out as the main producer of career-ready candidates (CSU, 2018). Given the history of decreased state support and expected fluctuations in state funding, the CSU needs to develop plans and goals around student success, strategically allocating resources in areas that have the greatest positive impact on students.

In order to identify effective strategies for allocation of resources, a panel analysis was conducted to explore the relationship between student retention rates and institutional expenditures in the functional categories of instruction, student services, academic support, and instructional support. This longitudinal study analyzed institutional expenditures for the period 2005-2014. These expenditures were drawn from IPEDS for all 23 campuses in the CSU. Adopting a critical quantitative approach to research (Nuñez, 2009; Stage, 2007; Stage & Wells, 2014), and using Astin's Input-Environment-Output framework (1977, 1993), this study also sought to reveal institutional practices related to allocation of resources that influence student retention. To accomplish this, cluster analysis was performed for exploratory purposes to reveal insights into the varying institutional characteristics across the CSU.

This study found that instructional, academic support, and institutional

support expenditures were positively correlated with student retention rates, suggesting that increases in dollar amounts and the proportions of expenditures allocated to each functional category would result in higher retention rates. However, student services expenditures were found to be negatively correlated with student retention rates, implying that allocating funds to student services activities would not result in higher student retention (though, as stated earlier, some degree of nuance is needed when interpreting this particular finding). It should be emphasized that these are the results of a theoretical model, not to be considered a guide or a formula, but rather a framework to understand the influence of aggregate expenditures on student retention rates.

This study also found that the CSU institutions can be clustered in 6 small groups based on institutional characteristics that include socioeconomic status of the student population, the composition of faculty, and the institutional selectivity, for the purposes of refining the allocation of funds and interpreting student success.

Recommendations for educational leaders include changing the existing financial reporting requirements and adopting new considerations when allocating financial resources. In the area of financial reporting, this study concluded that institutional programs and activities could be grouped in different ways to better assess the influence of expenditures on mission-related goals such as student success. For example, the student services expenditure category could be reorganized to focus mainly on student support activities,



excluding administrative cost centers such as financial aid administration, student admissions, and student records. Similarly, the academic support expenditure category could be redefined by excluding Academic Administration, and administrative activities, along with information technology support could be consolidated under the institutional support expenditure category, resulting in a more intuitive and consistent structure for financial statement readers and researchers.

Regarding the allocation of resources, findings from this study suggested that institutional characteristics such as socioeconomic status of the student population, campus selectivity, and faculty composition should factor into the formulas used to allocate resources across the CSU. Although existing distribution of funds already account for the socioeconomic status of the student population, leaders should acknowledge that campus selectivity and faculty composition are also important when allocating financial resources to support student success. While the percentage of adjunct faculty has been found to influence retention rates, special consideration should also be given to the percentage of faculty of color and what that means for student retention

Finally, policy makers should include public higher education (and specifically the work of the CSU as the largest system in the state) as a priority when budgeting for the future. Recent polling (Baldassare et al., 2018) indicated that Californians are ready for governor-elect Newsom to take action during his term in office, suggesting an opportunity for changes in higher education policy at

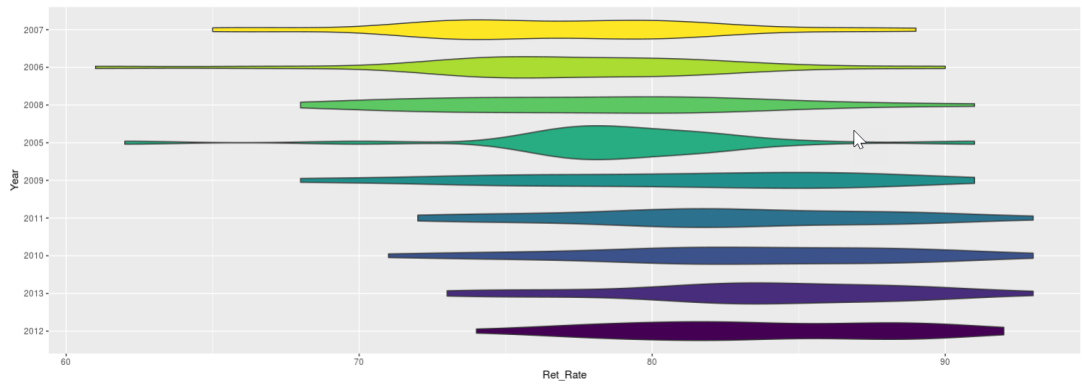
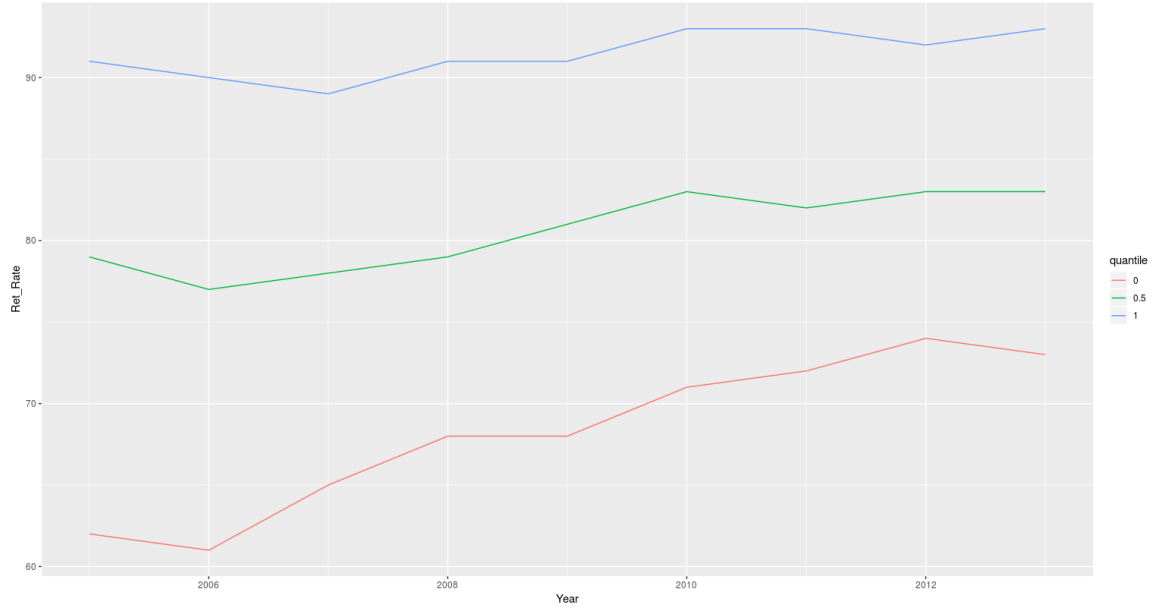
the state level. Regarding funding, affordability continues to be highlighted as challenging for students taking on large amounts of debt at California public higher education institutions, and the majority of Californians are supportive of increasing the funding levels for both the CSU and UC. Specifically, the majority of Californians support a minimum level of state funding for CSU, similar to what community colleges perceive under proposition 98 passed in 1988 (Baldassare et al., 2018). Clearly, the most recent budget proposal indicates that Governor Newsom has listened and is committed to support public higher education, but it is important to understand that, although a step in the positive direction, more funding is needed to meet the economic needs of the state.

The CSU is comprised of campuses with very different institutional characteristics, and the allocation of financial resources across aggregate expenditure categories has a direct influence on student success. California public higher education must become a priority to meet the future needs of the state. Within this context, the CSU should be front and center in strategies to plan for the prosperity of California, driving higher education leaders and policy makers' strategies to effectively allocate financial resources, and spend where it matters.

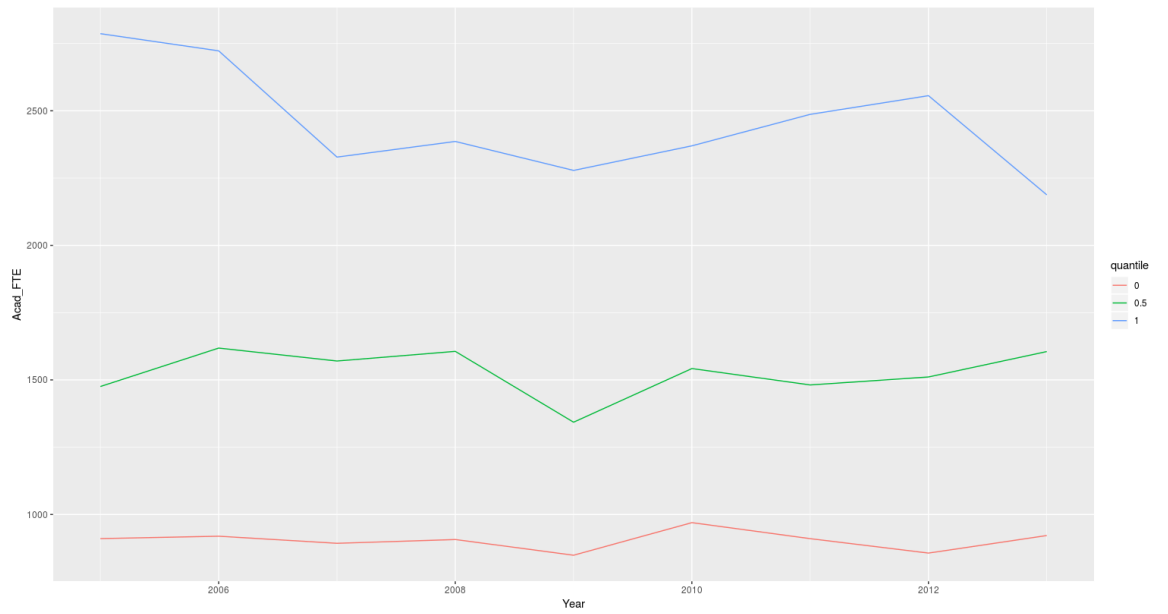
APPENDIX A  
DATA CHARTS

# HETEROGENEITY ACROSS YEARS

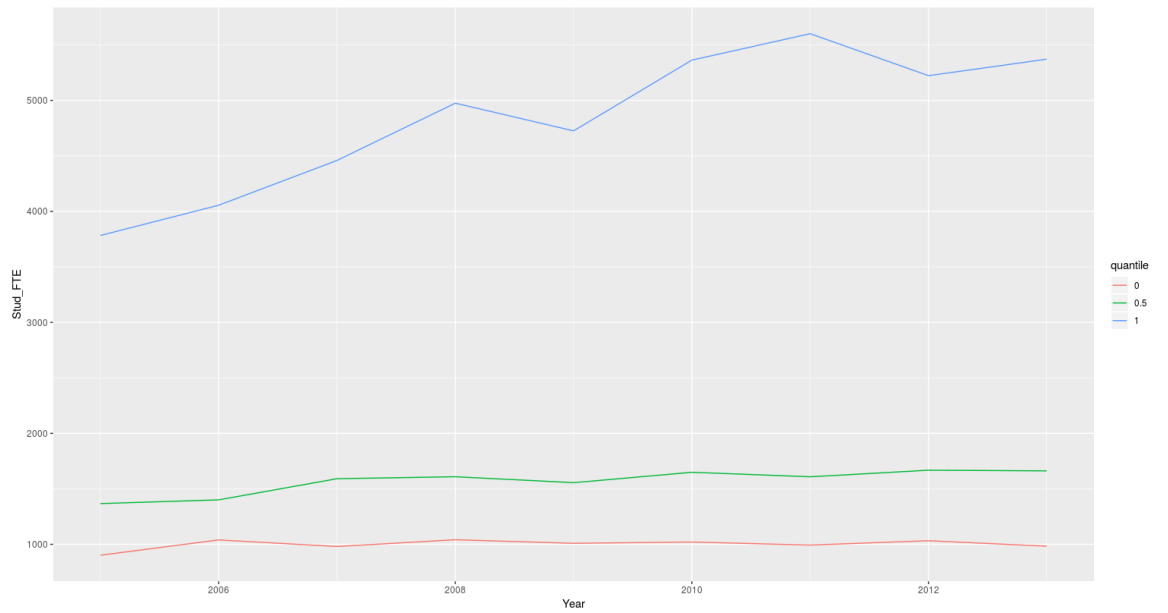
## Retention Rate



## Academic Support Expenditures



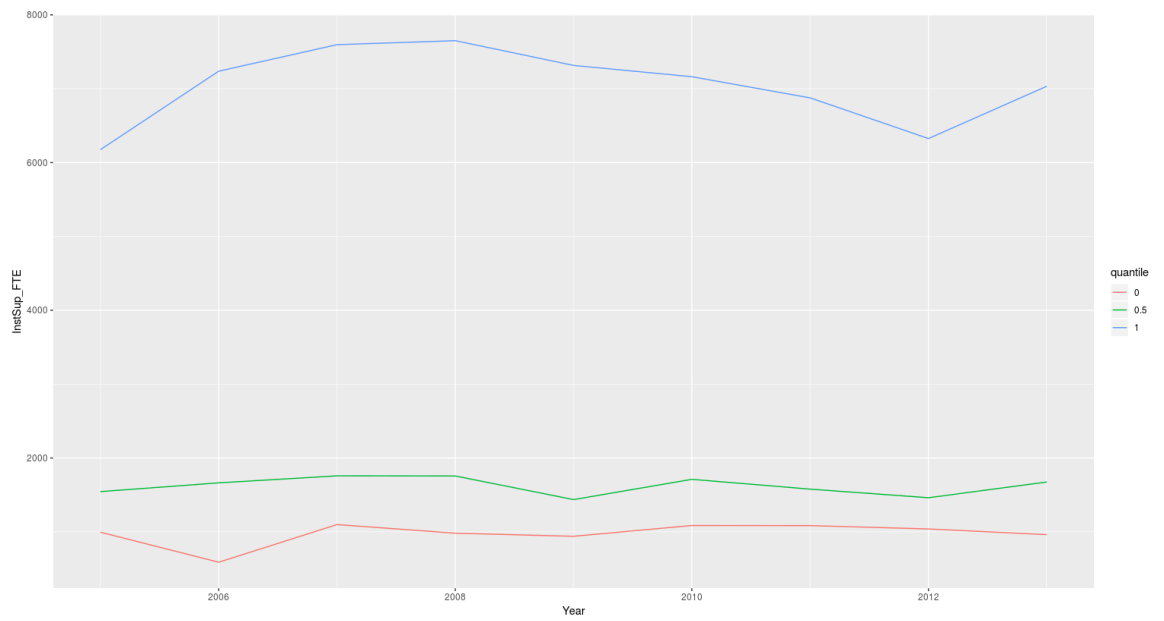
## Student Services Expenditures



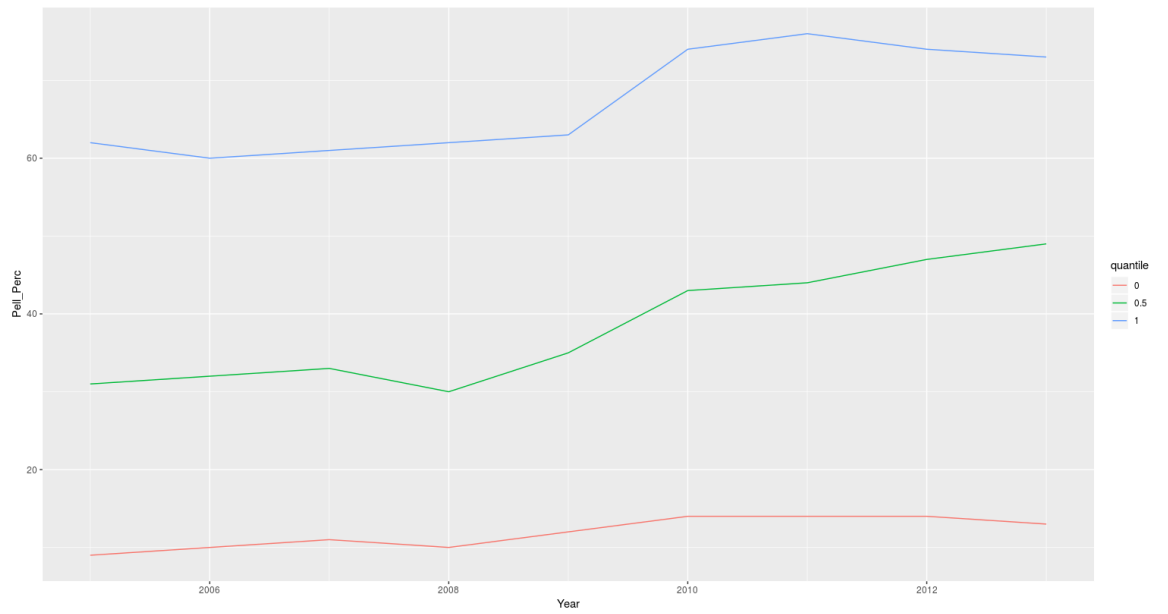
## Instructional Expenditures



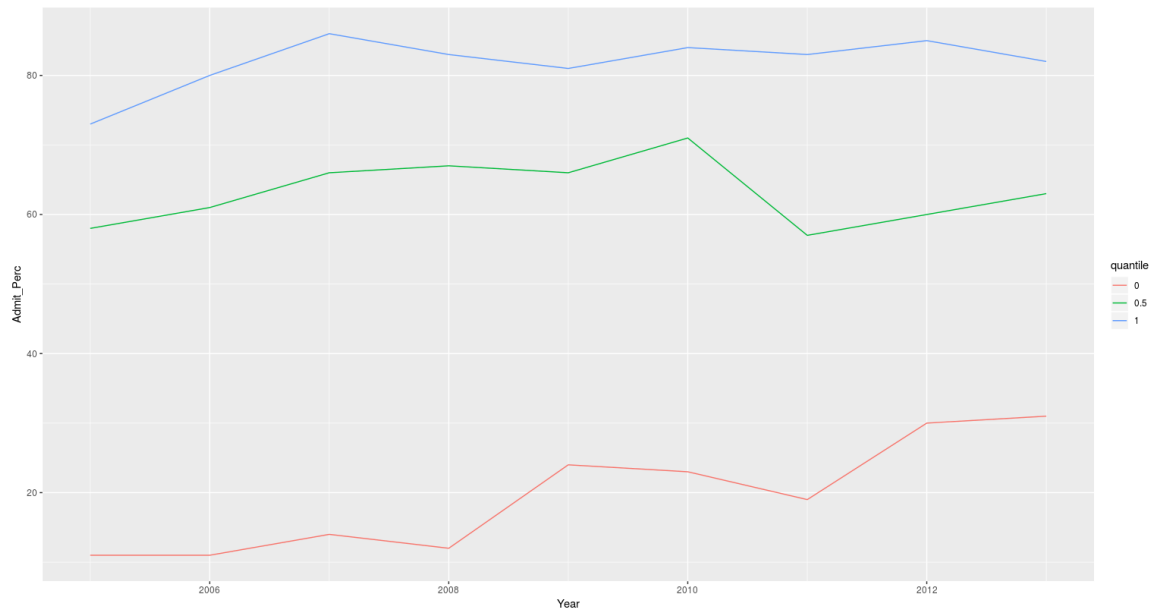
## Institutional Support Expenditures



## Pell Recipients

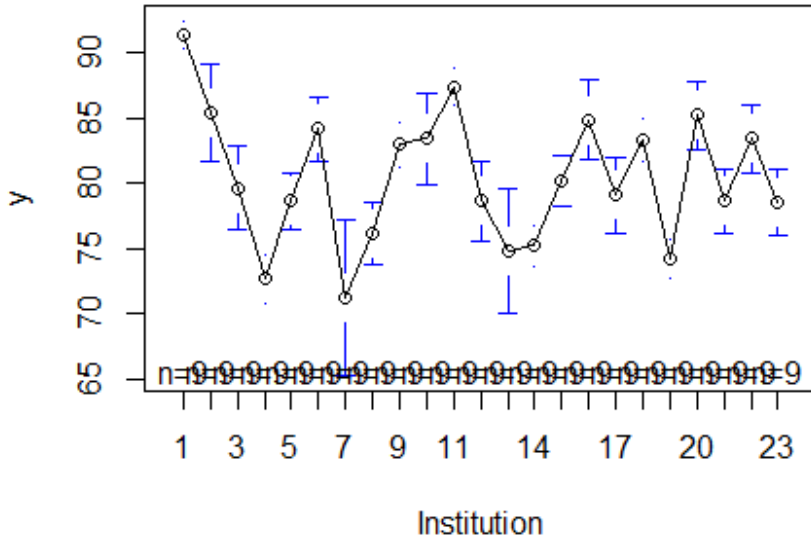


## Admission Rates

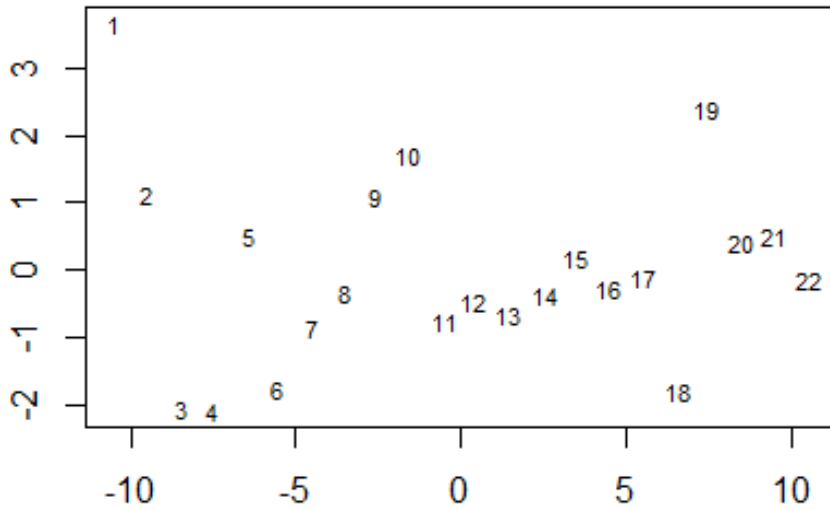


# HETEROGEINEITY ACROSS INSTITUTION

## Retention Rates



## Multidimensional Scaling





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