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UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

# THE RELATIONSHIP BETWEEN STATE COLLEGE READINESS POLICY AND STUDENT OUTCOMES: A MULTILEVEL GROWTH MODEL

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy

Rachel Christeson

College of Education and Behavioral Sciences
Department of Leadership, Policy, and Development:
Higher Education and P-12 Education

December 2019

This Dissertation by: Rachel Christeson

Entitled: *The Relationship Between State College Readiness Policy and Student Outcomes: A Multilevel Growth Model*

has been approved as meeting the requirement for the Degree of Doctor of Philosophy in College of Education and Behavioral Sciences in Department of Leadership, Policy, and Development: Higher Education and P-12 Education.

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## ABSTRACT

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This study examined whether policies related to college readiness have a relationship with student outcomes of college-going, student retention rates, and graduation rates for the overall state population as well as the rates specifically for European American and non-European American students. Specifically, a multilevel modeling approach was employed to determine whether significant relationships exist between the presence of state college readiness policies and change in student outcomes over time when controlling for state- and institutional-level factors. Several policies were considered, including: (a) the existence of a college-readiness definition, (b) a requirement for students to take college-prepatory courses in order to receive a high school diploma, (c) course-credit requirements for a high school diploma that align with a state's postsecondary admissions policies, (d) the alignment of high school assessments with postsecondary academic expectations, and (e) the use of high school assessments in postsecondary admissions and placement decisions. In addition, I examined whether the relationship between policies and student outcomes is the same at 2- and 4-year institutions within a state.

Data used in this study were pulled from several existing data sets, including IPEDS and data gathered by *Education Week* in their annual *Quality Counts* reports.

Multilevel growth modeling was used to examine relationships between variables at both the institution- and state-level (or in the case of Research Question 1, state-level only), and to model longitudinal changes in outcomes over the study period of interest. Results of this study show that college-going rates have not changed over the years included, while both retention and graduation rates have seen measurable growth. None of the state policies related to college readiness were found to significantly relate to student outcomes, with one exception. Requirements for students to take college-preparatory classes had a negative relationship with graduation rates at 2-year institutions, though this may more accurately reflect the exclusion of transfer students in the graduation rate metric. Significant differences were found in student outcomes between the 2- and 4-year sectors, as well as in the graduation rates for European American and non-European American students. Given these findings, policymakers and administrators should continue to focus on improving college-going behavior, exploring other types of policies targeting P-20 alignment, and addressing the gaps in graduation rates for students from different populations.

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# CHAPTER I

## INTRODUCTION

A large number of students are completing high school unprepared for college level coursework and without necessary skills to compete in the workforce (Sparks & Malkus, 2013; Whinnery & Pompelia, 2018). State governments are trying to address this issue through college readiness policies. However, there is often not consensus between K-12 and postsecondary education on what it means to be college ready. Because of this, students may forego attending college, or enter the postsecondary system underprepared and requiring additional remedial coursework, which extends their time to degree. Students who are not prepared may struggle to complete, potentially incurring student debt along the way. State level college readiness initiatives include a variety of policies addressing both the K-12 and postsecondary systems, as well as the links between them, but little is known about which of these policies have a positive relationship with student outcomes. Without an understanding of which policies, or combination of polices, actually result in increased student outcomes, policy makers are largely left to set policies based on anecdotal evidence or political whims.

The purpose of this study is to understand which, if any, components of state-level college readiness initiatives have a positive relationship with student outcomes. Specifically, I examined if the presence of each of five policies related to college readiness has a correlation with state level college-going rates. In addition, I considered whether the presence of multiple policies is related to student outcomes. These policy

areas include a state defined definition of college-readiness; a requirement that all high school students take a college-preparatory curriculum; a requirement that course credits required for a high school diploma are aligned with the postsecondary system; state high school assessments that are aligned with the postsecondary system; and the use of statewide high school assessment results in admission, placement, or scholarship decisions in the state postsecondary system. In addition, I analyzed whether the presence of each of the policies has a relationship with institutional level outcome measures including fall to fall retention rates, graduation rates (within 150% time); and graduation rates for European American (White) students compared to those from non-European American groups (defined as African American, Hispanic, Asian, Pacific Islander, American Indian/Alaska Native, and two or more races). While many differences may exist among those populations as well, it was necessary to group them due to the low number of students in each group at many institutions. In order to identify the relationship between policy and outcomes, hierarchical linear modeling was used, and included several control variables at both the state and institutional level. This attempts to account for other factors that have been shown to influence the student outcomes identified above.

## Background

Over the past decade, there has been a push nationally to increase the number of Americans with some form of postsecondary education. This is driven by many factors including a need to remain competitive globally as well as to enhance economic opportunity here in the U.S. (Callan, Finney, Kirst, Usdan, & Venezia, 2006; Duncheon, 2015; Lumina Foundation, n.d.). While educational attainment has been increasing (U.S.

Department of Education, 2017), the U.S. currently ranks 10th in the world in the percentage of 25-34-year-old adults with a postsecondary education (associates degree or greater), at 47.5% (OECD, 2018). Among all adults 25 years and older, 33.4% have at least a bachelor's degree, with average earnings $30,000 greater than that of individuals with only a high school diploma (U.S. Census Bureau, 2017). Significant gaps exist when examining wages and educational attainment by gender and race /ethnicity, demonstrating that increased educational attainment is a social justice issue as well. Women with only a high school diploma make on average $15,000 less than their male counterparts, and only 16.4% of the Hispanic population and 23.3% of the Black population 25 years or older have a bachelor's degree (compared to 37.3% of Whites and 55.9% of Asians; U.S. Census Bureau, 2017).

Workforce development and the so-called "skills gap" has also become a significant factor in the need to increase educational attainment nationally (Berrett, 2017). The Education Commission of the States (ECS) tracked trends in State of the State addresses given by governors and found that in 2018, "in at least 23 states, governors noted that there aren't enough skilled workers to fill current workforce gaps, let alone meet anticipated workforce demands" (Whinnery & Pompelia, 2018, p. 3). Employers in many fields are increasingly seeking individuals with a college degree for positions that used to require a high school diploma (Burning Glass Technologies, 2014), putting greater pressure on the higher education sector to produce more graduates with the skills needed to meet business demands (Berrett, 2017).

To address these issues, ambitious goals for increased educational attainment have been set in both the public and nonprofit sector. As of 2018, 41 states have set goals for

postsecondary educational attainment, with several of the remaining others planning to in the current or upcoming years (Lumina Foundation, 2018). These goals range from 42% for the state of Louisiana, to 70% educational attainment within 4-6 years for Iowa, Minnesota and Washington (Lumina Foundation, 2016). The Lumina Foundation (n.d.), a significant funder of higher education initiatives, has also set a goal that "60% of Americans hold degrees, certificates or other high-quality postsecondary credentials by 2025" (para. 1).

In order to meet this goal, our country needs to produce more students at the secondary level who are college and career ready (Callan et al., 2006). Experts at the Educational Policy Improvement Center (EPIC) have defined college and career readiness as "[a] student who . . . can qualify for and succeed in entry-level, credit bearing college courses leading to a baccalaureate or certificate, or career pathway-oriented training programs without the need for remedial or developmental coursework" (Conley, 2012, p.1). This definition implies that students must be able to complete high school with a level of rigor that prepares them for postsecondary education or training programs. This is a challenge given the current state of education in our country. In 2015-16, the national public high school graduation rate was 84% (U.S. Department of Education, 2018b). As with the attainment goal, there are wide differences among states (ranging from 69% in DC to 91% in Iowa), and of more concern, by ethnic/racial groups, with African American and Latinx students graduating high school at significantly lower rates than European American or Asian American students (U.S. Department of Education, 2018b). Of those who do graduate high school and enroll in higher education, 20% reported *taking* remedial coursework while in college– many more may still require

it to be academically successful (Sparks & Malkus, 2013). Clearly, there is much work to be done in order to meet the identified educational attainment goals.

In order to be considered college ready, students must exhibit cognitive strategies, content knowledge, learning skills and techniques, and knowledge and skills on how to make the transition between K-12 and higher education (Chamberlin & Plucker, 2008; Conley, 2012; Darling-Hammond, Wilhoit, & Pittenger, 2014). The responsibility for providing students with these abilities often falls to the public secondary education system (Donnelly, 2017; Duncheon, 2015; Kirst & Venezia, 2001); however, schools in many states are not currently held accountable for areas outside of content knowledge, often measured through standardized assessments (Callan et al., 2006; Darling-Hammond et al., 2014). In today's culture of accountability, this often leaves college readiness as a lower priority (Darling-Hammond et al., 2014). In order to more effectively support college readiness, there needs to be increased collaboration between K-12 and higher education, preferably with support from state and federal legislatures (Callan et al., 2006; Glancy et al., 2014; Rochford, O'Neill, Gelb, & Ross, 2007). Many states have attempted to address this issue through initiatives that bridge the K-12 and postsecondary sector. These initiatives go by many names (P-16, K-16, etc.), but for the purposes of this study I will use the all-encompassing term "P-20."

## Statement of the Problem

Many states have begun to address these issues through college readiness initiatives that encompass a wide range of policies. One fundamental component is the creation of a statewide college and career readiness definition. These definitions include elements addressing academic knowledge, students' skills, and assessment scores, with

the hope of addressing the gap between high school and the expectations of higher education or the needs of an employer (Glancy et al., 2014). Having a statewide definition and consensus around key college and career readiness concepts can drive alignment efforts between high schools and the higher education system (Glancy et al., 2014; Walsh, 2009). In many states, policymakers also hope an identified definition of college and career readiness can help to break down silos between higher education and the workforce and increase understanding of what skills are needed for in-demand jobs (Mishkind, 2014).

The Education Commission of the States (ECS) has identified nine other primary ways in which states are using policy to address college readiness (Glancy et al., 2014). These policies are grouped into three "anchors;" high school policies, higher education policies, and bridge policies. High school policies include the adoption of rigorous academic content standards and state requirements for the offering of advanced coursework; use of CCR assessments; high school graduation requirements that are aligned with college admissions requirements; and accountability measures that include college and career readiness as an indicator of school performance. Higher education policies include the presence of statewide admissions requirements; statewide requirements for remedial education and placement; statewide articulation and transfer agreements; and a statewide attainment goal and performance funding model. In addition to a statewide definition of what it means to be college and career ready, ECS also identified the presence of a data sharing system and high school feedback reports as a bridge policy found in many states.

While much is understood about what college readiness is and why it is (or should be) important to educators, little is understood about what role state policy can effectively play in increasing college readiness. There is little research or available knowledge on why many states have not addressed this issue at the state level, or have only addressed certain components of the policies identified above (for example, neglecting a longitudinal data system, or not aligning graduation and entrance requirements; Glancy et al., 2014; Mishkind, 2014). In states where policy has been enacted, there continues to be a need to identify effective policy components and best practices. This study hopes to address this need.

## Scope of the Study

Several public data sources were in the scope of this study. The dependent variables are five dichotomous indicators of whether a state has each of the policies identified by *Education Week* in their 2010 survey (Education Week, 2011). Outcome variables were calculated for the years 2011-2017, using data from the National Center for Education Statistics (NCES), including the Integrated Postsecondary Educational Data System (IPEDS), and the Western Interstate Commission for Higher Education (WICHE). Control variables at the institutional level were also gathered from IPEDS, and state level variables were compiled from *Education Week's Quality Counts* annual reports. Control variables were gathered for the years 2011-2017.

## Research Questions

This study seeks to examine the following research questions:

Q1 What is the relationship between state college readiness policy and the change in statewide college-going rates when controlling for state-level covariates?

Q2 What is the relationship between state college readiness policy and the change in institutional retention rates when controlling for state-and institutional-level covariates?

Q2a Is there a difference in the relationship between state college readiness policy and the change in institutional retention rates at 2-year institutions compared to 4-year institutions when controlling for state-and institutional-level covariates?

Q3 What is the relationship between state college readiness policy and the change in institutional graduation rates when controlling for state-and institutional-level covariates?

Q3a Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates 2-year institutions compared to 4-year institutions when controlling for state-and institutional-level covariates?

Q4 What is the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students and non-European American students when controlling for state-and institutional-level covariates?

Q4a Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students compared to non-European American students at 2-year institutions when controlling for state-and institutional-level covariates?

Q4b Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students compared to non-European American students at 4-year institutions when controlling for state-and institutional-level covariates?

These questions intend to address if college readiness policies (to include a state defined definition of college-readiness; a requirement that all high school students take a college-preparatory curriculum; a requirement that course credits required for a high school diploma are aligned with the postsecondary system; state high school assessments that are aligned with the postsecondary system; and the use of statewide high school assessment results in admission, placement, or scholarship decisions in the state

postsecondary system) have an impact on the policy goals identified by ECS as common across many states. The first research question examining college-going rates addresses the policy goal of "increasing the number of high school graduates entering postsecondary institutions" (Glancy et al., 2014, p. 15). The remaining research questions examining retention and graduation rates address the policy goal of "achieving statewide higher education credential attainment goals" (Glancy et al., 2014, p. 36). The sub-research questions examine whether or not the policy impacts have the same relationship with outcomes at 2-year institutions or 4-year institutions, since institutions in these sectors often have different behaviors and motivations. Given that many states have an explicit goal of closing equity gaps in attainment, the fourth question addresses whether these policies impact the graduation rates of European American (white) students in the same way they do non-European American students, and whether these impacts are the same at 2- and 4-year institutions. Answers to each of these questions will help state policy makers better leverage resources by understanding which policies have the greatest impact (if any) on bringing about their desired goals.

## Significance of the Study

This study is of significance for the higher education field in three primary ways. First, this research fills an important gap in the college readiness literature by providing a quantitative analysis of college readiness policy outcomes. There have been very few studies done on the impact of college readiness policies, and those that do exist often focus on a singular program or institution, rather than looking at a state's entire college readiness initiative, as I propose. Other research around college readiness policy has been qualitative in nature and has often been based on expert opinion. In an era of increasing

claim for accountability from educational institutions, we should also be asking states to be increasingly accountable for policies and their outcomes. While I do not make claims around policy effectiveness in this study, I do think it is important to gain a better understanding of how policies relate to student outcomes, and think a quantitative analysis provides a baseline for future, more in-depth research.

The second important contribution this study makes is to the literature around state level policy and its relationship with postsecondary student outcomes. Much of the higher education literature on state level indicators and student completion focuses on finance policy, with many studies examining how differing policies on appropriation and financial aid relate to student outcomes. This research primarily examines baccalaureate granting institutions, creating a gap in the literature around the policy impacts on the public postsecondary sector as a whole and the 2-year sector specifically, which this study hopes to address. There are also several studies related to state level policy and K-12 outcomes, particularly around assessment. This study makes a unique contribution by examining a new area of higher education policy and providing insight on ways state policy can contribute to student outcomes.

The third way this study is significant is practical in nature. Results of this research provide important information for educators, state administrators, and legislators that can be used to further state attainment goals. Having an understanding of which components of college readiness policy have the strongest relationships with student outcomes allows states to make more informed decisions about their own college readiness strategies. States with less comprehensive initiatives may choose to adopt policies shown to closely correlate with positive outcomes, or to focus more resources on

the implementation of those policies versus others. Advocates for certain policies may also be able to use these results to make a stronger argument with the public or legislature when competing for in-demand resources. Finally, administrators at individual school districts, schools, or higher education institutions may choose to adopt their own policies at the local level given the lack of overarching state policy.

## Theoretical Frameworks

Two theoretical frameworks were used to guide the proposed study. These frameworks provide an understanding of the influence states and institutions have on student outcomes. The first framework is principal-agent theory, which is helpful in understanding behavior in hierarchical or contractual relationships. Because public higher education institutions are responsible to the states that fund them and authorize them to grant degrees, principal-agent theory argues that they are acting as agents of the state (the principal) in carrying out a state's higher education agenda. Principal-agent theory maintains that principals use rewards and sanctions to motivate agents to behave in ways that align with the principal's goals. In this study, I examined the ways in which state policies on college readiness influence student outcomes; while states (the principals) may determine the policies, they rely on the higher education institutions and K-12 schools to implement these policies and bring about the desired outcomes (college-going, student persistence, and graduation).

The second theoretical framework guiding this study is Berger and Millem's 2000 theory on the influence of organizational behavior on student outcomes. This conceptual model proposes that institutional structural--demographic and organizational characteristics impact student outcomes, because the campus environment influences

student behavior. When conducting a multi-institution study of student outcomes, the impact of these characteristics must be considered. Given that this study examined institutional level retention and graduation as the outcome measure, Berger and Millem's (2000) theory argued that institutional level characteristics must be included to understand the true impact of state policy.

## Terms and Definitions

There are two important issues related to language usage in the present study worth addressing. First, while the relationship between the secondary and postsecondary systems goes by many names (K-20, P-14, etc.), I use the all-inclusive term "P-20" through this study. Second, when discussing racial and ethnic identifies, I use the terms European American, African American, Latinx, and Asian American to reflect our modern understanding of group identify and composition. However, when specifically referring to variables or measures from secondary data sources, the specific terms used by those sources were reflected. For example, in the IPEDS data collection, the terms "White," "Black," "Hispanic," and "Asian" are used to identify race/ethnicity.

# CHAPTER II

# REVIEW OF THE LITERATURE

This chapter discusses several key themes in the literature related to the present study. Topics discussed include college readiness policy; policy related to P-20 alignment; the relationship between state policy and student outcomes; and state and institutional factors influencing student outcomes. This chapter also provides an overview of the theoretical perspectives to be used in this study, which include principal agent theory and Berger and Millem's (2000) conceptual model for researching organizational impact on student outcomes.

## College and Career Readiness Policy

### History of College and Career Readiness Initiatives

The ideas of college and career readiness have been around at least since the 1920s, though for most of the 20th century these were separate concepts, and very often, separate educational tracks for students (ACT, 2006; Conley & McGaughy, 2012). College-bound students were enrolled in more rigorous academic coursework (ACT, 2006), while students not identified as college-bound were referred to vocational education or job training programs, or what we would now call career readiness opportunities (Conley & McGaughy, 2012). This began to change in the early 2000s, as the need for knowledge workers and "the creative class" (Conley & McGaughy, 2012, p. 28) increased. As the skills needed in the new economy changed, so did the distinction

between whether a student needed college or career skills; i.e., to be successful in the 21st century, those skills often overlapped in the areas of communication, use of technology, and problem-solving (Conley & McGaughy, 2012). There were also public calls to discontinue the delineation of college and career readiness--at a 2005 summit on the state of American high schools, Bill Gates (2005) encouraged governors and CEOs to ensure all of their students were college and career ready: "I ask the governors and business leaders here to become the top advocates in your states for the belief that every child should take courses that prepare him for college--because every child can succeed, and every child deserves the chance." Gates argued that regardless of their postsecondary intentions, all students need the same advanced skills and education to succeed.

In 2006, ACT published the results of a study that found that there was no difference in the level of mathematics or reading readiness a student needed to be successful in college-level courses or workforce training. A primary conclusion of this report was that all students should face the same academic expectations, no matter what their intended goal is for life after high school (ACT, 2006). This report was highly influential and led many in the secondary and postsecondary sectors to the conclusion that college and career readiness were indeed the same thing and should be treated as such by policy makers and education leaders (Conley & McGaughy, 2012). This issue has continued to be explored as researchers and others have further defined exactly what those 21st century skills are and what it truly means to be college and career ready (Chamberlin & Plucker, 2008; Conley, 2012; Darling-Hammond et al., 2014; Mishkind, 2014).

**What It Means to Be College Ready**

While there is not one nationally recognized definition of college readiness, researchers and states have identified several components that are commonly used. These skills can be grouped into the four keys identified by David Conley (2012) of the Educational Policy Improvement Center: key cognitive strategies; content knowledge; learning skills and techniques; and transition knowledge and skills. These keys can also be referred to in a simpler way: think (cognitive), know (content), act (learning skills) and go (transition knowledge; Darling-Hammond et al., 2014). This section will discuss the types of skills that fall into each of those four keys.

Conley (2012) identified cognitive strategies as problem formulation, research, interpretation, communication, and precision and accuracy. Specific skills that fall into this "bucket" include developing hypotheses, problem solving, identifying sources, evaluating conflicting viewpoints, and critical thinking (Conley, 2012; Glancy et al., 2014; Mishkind, 2014). Content knowledge, or the "know" key, is easier to measure, and includes technical knowledge and skills, especially in the core areas of English and math (ACT, 2006; Conley, 2012; Mishkind, 2014).

Conley's (2012) third key, learning skills and techniques, include an ownership of learning and a knowledge of how to learn. These can include the ability to set goals, persistence or "grit," the ability to motivate oneself, time management, study skills, and the ability to collaborate and work in teams (Conley, 2012; Mishkind, 2014). The use of technology would also fall into the area of learning skills. Duncheon (2015) identified very similar skills in a category she calls non-cognitive academic factors, and specifically

highlights the need for "help-seeking, motivation, goal-setting, time management, self-efficacy, self-regulation, study skills, and task completion" (p. 8).

Finally, the key of transition knowledge and skills is defined as skills "necessary to navigate successfully the transition to life beyond high school" (Conley, 2012, p. 2). Students should have awareness of postsecondary programs and costs (Duncheon, 2015), understand what it takes to become a college student, have an awareness of career opportunities and what they require, and be able to act as a self-advocate (Conley, 2012). Students also need to have the self-esteem and social-emotional skills to build relationships with others and get along in diverse settings (Duncheon, 2015). This is often a set of skills that privileged students are more likely to have, especially as they identify role models in their desired careers or academic paths (Conley, 2012). One other knowledge area not specifically addressed in Conley's four keys is the concept of citizenship and community involvement, which is present in several state definitions (Glancy et al., 2014; Mishkind, 2014).

**College Readiness as Policy**

As mentioned earlier, state and federal lawmakers began to take more notice of college readiness based on two primary forces: a need to improve readiness of high school students, and a need to decrease remediation needs, which would increase graduation rates in higher education (Davis & Hoffman, 2008; Glancy et al., 2014). In a landmark report on college readiness policies published by the National Center for Public Policy and Higher Education, David Spence (2009), President of the Southern Regional Education Board, suggested seven steps or components that, when combined and done

well, would make up a “comprehensive and systematic statewide college readiness initiative” (p. 39). The seven steps are as follows:

1. Statewide college/career readiness standards. There needs to be one set of standards focused on key learning skills in reading, writing, and mathematics that is accepted by both K-12 and postsecondary institutions.

2. Common and consistent application of readiness standards. Curriculum, especially college prep, should be driven by these identified standards.

3. Readiness assessments in high school (11th grade). Students should be given feedback on their progress, and students who need additional help should be targeted before the senior year.

4. School curriculum. Curriculum should target the identified standards as far back as at least 8th grade, and should continue through senior year, especially for those students identified as not college ready.

5. Teacher development. Teachers need to understand the standards and how to teach them effectively, and teacher prep programs need to incorporate the core standards.

6. School accountability. Performance on the standards, as measured on the college readiness assessment, should be incorporated into the state school accountability programs.

7. Postsecondary education accountability for the application of the standards. Postsecondary institutions need to be involved in each of the other steps and need to incorporate the standards into their admission and placement policies, as well as be held accountable for increasing retention and remediation.

Many of the components identified by Spence rely heavily on alignment between the K-12 and postsecondary systems, which led to the creation of policies and statewide definitions hoping to address a larger goal: "[h]ow can states use a definition to drive alignment efforts from high school to higher education?" (Glancy et al., 2014, p. 46). The Education Commission of the States, a non-profit organization devoted to tracking state policy on education, identified six main ways in which states are attempting to address this goal using policy (Glancy et al., 2014):

- Aligning Common Core State Standards with other college and career readiness standards.
- Increasing collaboration between the K-12 and higher ed systems.
- Addressing remediation needs for both college students and those entering the workforce.
- Unifying policies in order to create a more seamless and transparent system.
- Communicating the competencies graduates need to be college and career ready.
- Providing a benchmark for high school teachers on what students should know.

This study will focus on several specific policies that exemplify these ideas, including the presence of a college readiness definition; a requirement that all high school students take a college-preparatory curriculum to earn a diploma; the alignment of course credits required for a diploma with the postsecondary system; the alignment of state high school assessments and the postsecondary system; and the use of statewide high school assessment results for admission, placement, or scholarship decisions in the postsecondary system. These specific policies have been chosen because the presence of

these policies in states has been tracked as far back as 2008 by *Education Week,* providing a comprehensive data source to use when measuring the variables of interest.

## P-20 Policy Partnerships and Alignment

One of the biggest challenges in implementing college and career readiness policy is the fractured nature of K-12 and postsecondary education systems in our country (Rochford et al., 2007; Venezia, Callan, Finney, Kirst, & Usdan, 2005). To address this disconnect, many states have developed partnerships or initiatives aimed at connecting their early education, K-12, and higher education systems, with the ultimate goal being "to provide every student with the skills and knowledge they need to succeed as citizens and workers" (Krueger & Rainwater, 2003, p. 5). These initiatives go by many names (P-16, K-16, etc.), but for the purposes of this study I will use the all-encompassing term "P-20." In this section, I will discuss the history of P-20 policy partnerships and alignment, as well activities associated with P-20 systems, including P-20 councils.

**History of P-20 disconnect**. In most states, P- or K-12 and higher education are separate sectors, with their own government entities. Each has its own levers for finance and accountability, and often their own governance systems, state boards and legislative committees (Donnelly, 2017; Kirst & Venezia, 2001). Historically, the high school sector has not focused on preparing students for college, because college was seen as an option only for elite students (Donnelly, 2017). K-12 has traditionally been open to all and standardized, while "[h]igher education has emphasized selectivity, diverse missions, and standards which vary among programs and institutions" (Davis & Hoffman, 2008, p. 127). State higher education began to grow significantly after World War II, but still had little to do with the K-12 sector, largely due to community colleges splitting off from K-

12 and developing their own local boards as enrollment swelled (Kirst, Usdan, Evans, & Valent, 2011). In fact, it was only in the late 1970's that all states had their own governance structures set up to coordinate the higher education institutions within their own state (Kirst et al., 2011).

In the 1980s, the publication *of A Nation at Risk* began a national debate on reform in the K-12 sector; by the early 2000s, this had shifted to include higher education as well. Many organizations began to call for expanded participation and improved degree completion in the higher education sector (Davis & Hoffman, 2008). In 2001, the Education Commission of the States and National Council of State Legislatures published a report that introduced the concept of P-20 legislation as a crucial component of the needed reform efforts (Van de Water & Rainwater, 2001). Identification of P-20 alignment as an issue was formalized in 2003 with reauthorization of the Higher Education Act and furthered by the Spellings Commission in 2006 (Davis & Hoffman, 2008). The fundamental thread throughout the decade was the acknowledgement that the issue was with the system as a whole, rather than with an individual school or program (Davis & Hoffman, 2008).

Pre-college outreach programs popped up all over the county as a common response to the issue; however, these were often only at the local or program level, rather than statewide (Venezia et al., 2005). Statewide efforts began to emerge in a variety of ways, including executive order, interagency collaboration, and legislative mandate (Chamberlin & Plucker, 2008; Rochford et al., 2007). P-20 initiatives also began to see increased support from national organizations such as the National Governor's Association, the Bill and Melinda Gates Foundation, the Education Commission of the

States, the National Association of System Heads, and the American Diploma Project (Rochford et al., 2007). The federal government also began to invest in P-20 issues, and in 2007 the America COMPETES Act authorized grants to improve alignment and to establish P-20 data systems (Davis & Hoffman, 2008). Unfortunately, these efforts have not been enough to resolve the issue, and a lack of P-20 alignment continues to be a challenge across the country.

**Activities associated with P-20 initiatives**. Overall, P-20 initiatives or systems have as their goal to increase student achievement while reducing gaps found within subgroups of the population (Chamberlin & Plucker, 2008; Donnelly, 2017). For these efforts to be successful, they need to include multiple strategies, and incorporate best practices, borrowing ideas from other states and programs when relevant (Rochford et al., 2007). In this section, I will discuss several of the strategies that state P-20 systems have used or are currently using, with a focus on the development of P-20 councils.

At the highest level, successful P-20 initiatives emphasize the overall alignment within a state, rather than focusing on institution or school level programs (Rochford et al., 2007). Systemwide governance structures are often a part of an initiative's directive, as well as budget issues that cross both the K-12 and higher education sector (Davis & Hoffman, 2008; Donnelly, 2017; Kirst et al., 2011). Cross sector data systems are a key activity; the introduction or development of statewide longitudinal data systems (SLDS) is a focus in nearly every documented P-20 initiative, and has a history of federal financial support (Davis & Hoffman, 2008; Donnelly, 2017; Kirst & Venezia, 2001). Currently, many states do not have the ability to effectively share data between their K-12

and higher education systems, making it very difficult to track student outcomes and evaluate program effectiveness.

Academic issues related to curriculum are also a common activity associated with P-20 efforts. One of the biggest issues addressed is the alignment between high school and postsecondary assessment, specifically through aligning high school graduation requirements with college admissions (Chamberlin & Plucker, 2008; Davis & Hoffman, 2008; Donnelly, 2017; Kirst & Venezia, 2001). The use of a meaningful high school exit exam that can be used for college placement and student advising is often a part of these efforts (Rochford et al., 2007). Other curricular changes associated with P-20 efforts include enhanced college preparation efforts in the high school curriculum, including expanded high school course offerings (Chamberlin & Plucker, 2008) and dual credit programs, which allow students to earn college credits while still enrolled in high school (Davis & Hoffman, 2008; Kirst & Venezia, 2001; Rochford et al., 2007). Teacher preparation programs and early childhood education often become a focus of P-20 efforts as well, as initiatives often try to expand collaboration among those training and supervising the educators themselves (Chamberlin & Plucker, 2008; Kirst et al., 2011).

P-20 councils have become one of the most common ways in which a P-20 initiative begins. The first council was created by Zell Miller, governor of Georgia, in 1995, with other early efforts taking place in Florida, North Carolina, Oregon, and Texas (Chamberlin & Plucker, 2008; Donnelly, 2017; Krueger & Rainwater, 2003; Rochford et al., 2007). Councils have been created in a variety of ways, with many being established through executive order or legislation, and others created organically through inter-agency agreement (Chamberlin & Plucker, 2008). Membership on the council is often

dependent on how it was established, but can include representatives from K-12, higher education, business and community leaders, other state agencies, such as workforce development or labor, and state legislators (Chamberlin & Plucker, 2008; Donnelly, 2017).

Originally, councils were developed to focus on discrete issues, such as teacher preparation or college admissions policies, though the mission often grew to incorporate the many other activities discussed above (Donnelly, 2017). Specific responsibilities of the council in many states include reviewing high school graduation standards, college and career readiness expectations, pathways for high school and postsecondary alignment, and improving teacher professional development (Chamberlin & Plucker, 2008; Donnelly, 2017). In a 2017 study examining P-20 councils across three states, Rippner found that councils played an important role, as they provided a dedicated collaborative space for education agency leaders and facilitated collaboration between K-12 and higher education in ways not previously allowed. As of 2016, there are active P-20 councils in 18 states, down from 38 in 2008 (Donnelly, 2017; Rippner, 2017). This decrease is the number of state councils would be an interesting area for further study.

## Factors Influencing P-20 Education Policy and Associated Challenges Policy Levers and Actions Affecting P-20 Effectiveness

In order to understand the landscape for college and career readiness policy, it is important to understand what factors affect and drive P-20 policies, especially when it comes to the reforms discussed previously. In 2003, the Ewing Marion Kauffman Foundation funded the Partnerships for Student Success, a project aimed at better understanding the “state-level policies, programs, and governance structures that connect

K-12 and postsecondary education" in four states (Callan et al., 2006, p. v). The result of this initiative was a 2005 report, "The Governance Divide: A Report on a Four-State Study on Improving College Readiness and Success," which identified primary actions, structures, and policy levers that can bring about change in a P-20 system (Venezia et al., 2005). This work was then expanded upon in the 2006 report "Claiming Common Ground: State Policymaking for Improving College Readiness and Success," which provides greater detail on specific areas where college readiness policy can be effective (Callan et al., 2006). Both of these reports were widely cited and have been considered landmark pieces of research in identifying how to shape P-20 reform (Perna, Klein, & McLendon, 2014).

**Factors Influencing P-20 Policy**

The first finding from "The Governance Divide" is that for there to be sustainable P-20 reform, there needs to be state-level leadership and collaboration (Venezia et al., 2005). Without an organizational structure that is statewide and centralized, and often driven by an influential state leader, efforts have little chance of overriding the existing divide between K-12 and the postsecondary sector. Other researchers have supported this finding, including Rochford et al. (2007), who noted that "workable P-16 efforts at the state level may be more dependent, at least initially, on leadership and vision" (p. 10). A policy brief published by the Education Commission of the States identified several attributes that states with successful P-20 systems share, among them representation from key stakeholder groups, coordinated initiatives, and integrated reform efforts (Krueger, 2006). Krueger (2006) further explains that "[i]t takes strong leadership to push the P-16

agenda forward," and "P-16 initiatives that are coordinated at the state level are often more successful than multiple individual initiatives" (p. 5).

Research conducted by Perna and Finney (2014) on the relationships between state public policy and higher education performance also supports the need for strong state policy leadership. In case studies conducted across five states, one of which (Georgia) overlaps with "The Governance Divide," the researchers found that "in the absence of state policy leadership and steering, colleges and universities respond to other incentives and act (rationally) to advance their own priorities" (Perna & Finney, 2014, p. 206). For a state trying to encourage the alignment of K-12 and postsecondary goals, this can be detrimental and create additional challenges. Perna and Finney (2014) also noted that the design of a higher education system can influence the level of impact state leadership can have, but regardless of the system structure, state level leadership influences how a higher education system performs.

The second area found to influence P-20 reform is the state culture and history, and the acknowledgement that there is not one set of solutions that will work in every state (Venezia et al., 2005). It is important to understand what, if any, breakdowns currently exist between the educational sectors within a state to successfully move forward with any initiatives. Venezia et al. (2005) suggested several areas in which closer examination may provide a greater understanding of a state's educational culture. These include: academic content standards in both the K-12 and higher education sectors; postsecondary placement exams; the role of college advisors and college preparation programs across the state's institutions; the presence of outreach programs; higher education affordability within the state; the presence of any articulation agreements

between high schools, the community college sector, and 4-year institutions; state data linkages; measures included in accountability systems; and any current mechanisms in place for K-12 and postsecondary collaboration (Venezia et al., 2005).

Perna and Finney (2014) also acknowledge the important role that state context plays in the relationship between policy and performance. They recommend several additional characteristics that are helpful in understanding how to effectively implement change in a state, including "a state's demographic, economic, political, and historical context" (Perna & Finney, 2014, p. 204). Changing demographic trends can have a significant impact on state education policy, as many states are seeing increases in populations that have traditionally been underserved or that have underperformed in our current system (Perna & Finney, 2014). Party control, legislative design, and a state's approach to governance can also have an impact on the effectiveness of any policy efforts, particularly when it relates to overcoming challenges related to P-20 alignment (Perna et al., 2014). As were discussed later, P-20 efforts often face challenges due to a lack of resources and financial support, making them especially vulnerable to political factors.

The third area of impact identified in "The Governance Divide" is incentives for P-20 reform. States need to provide incentives for both the K-12 and higher education sector to ensure collaboration and participation in a P-20 system (Venezia et al., 2005). Incentives often take the form of financial resources or accountability measures that can be used to motivate schools and institutions to act outside of their own self-interests and towards meeting established state goals (Davis & Hoffman, 2008). In the states studied none had significant incentive structures that were found to be effective, but the authors

caution that "[n]onetheless, the long-term success of K-16 reform depends to a large extent on states' abilities to create and sustain incentives for K-12 and postsecondary education systems to collaborate more effectively to meet the needs of students" (Venezia et al., 2005, p. 28).

**Policy Levers**

In addition to these larger areas of policy impact, both reports published by the Partnerships for Student Success identify four policy levers or dimensions as promising areas for states to consider in their P-20 initiatives. These levers include alignment of coursework and assessment; state finance; statewide data systems; and accountability (Callan et al., 2006; Venezia et al., 2005). In "Claiming Common Ground," Callan et al. (2006) go as far as to say that "[i]f states are not using their policy levers in at least these four areas to align K-12 and postsecondary education, they cannot expect significant improvements in college readiness and success" (p. 7).

The first of these policy levers is the alignment of coursework and assessment. Researchers have found that in many states, what students are taught and evaluated on in high school does not match what students are expected to know upon entering college (Callan et al., 2006; Venezia et al., 2005). High school graduation requirements often do not align with college entrance requirements and exit exams or final assessments (often given in 10th grade) do not align with placement exams used at the postsecondary level. This leads to an increased number of students entering college unprepared for college-level work, even though their high school assessment results and diploma may lead them to believe they are (Krueger & Rainwater, 2003; Venezia et al., 2005). Use of the Common Core State Standards is often seen as a potential solution to this issue, but

comes with its own set of issues--mainly, many feel it overemphasizes the use of standardized tests and allows little room for teacher creativity (Perna et al., 2014).

The second policy lever introduced in "The Governance Divide" is finance. According to Venezia et al. (2005), "[s]tate education finance systems must become K-16; this includes the legislative committees and staff functions that oversee finance and budgetary decisions" (p. 30). As discussed earlier, there needs to be incentives for all members of the system to work together. Performance funding that rewards P-20 efforts is one promising policy initiative in this area, as well as funding for dual enrollment to both the K-12 and postsecondary sector (McLendon & Perna, 2014; Venezia et al., 2005). Other finance policies being used support P-20 initiatives to increase postsecondary attainment include merit scholarship programs, college savings plans, prepaid tuition programs, and centralized tuition control (McLendon & Perna, 2014).

The creation or development of a statewide data system that allows students to be tracked from K-12 into higher education is the third recommended policy lever (Callan et al., 2006; Venezia et al., 2005). Data systems were often established for the purposes of financial tracking and to provide reports, and do not have the capability to allow for the tracking of students for use in research and accountability measures (Venezia et al., 2005). At the federal level, statute prohibits the federal government or not-for-profit organizations from maintaining a longitudinal data system, leaving this responsibility up to the states (Kramer et al., 2016). Having linked data systems would allow a state to identify best practices, diagnose areas of weakness within systems, and track students across levels and time to truly understand what the education system looks like within their state (Venezia et al., 2005). Implementing an effective statewide data system is a

significant challenge but can be successfully done with strong state leadership and committed resources (John W. Gardner Center for Youth and Their Communities, Stanford University, 2014).

The final policy lever identified in "The Governance Divide" and "Claiming Common Ground" is accountability. Accountability systems in states are usually focused separately on K-12 or higher education, with little attention paid to the interaction between the two. "To be effective in improving college readiness, states should establish student achievement objectives that require the educational systems to collaborate to achieve them" (Callan et al., 2006, p. 18). Systems should then be held accountable and evaluated based on how well they are meeting these objectives. This can be accomplished through direct regulation requiring institutions and schools to meet specific goals, reporting where systems stand in meeting these goals, or through performance funding measures (Venezia et al., 2005).

**Challenges to P-20 Initiatives**

While there are several policy areas states can use to increase the effectiveness of their P-20 initiatives, there are also several areas of challenge that states have faced as these initiatives have been introduced. The first of these is identifying effective P-20 models. As discussed at the beginning of this paper, many states do not have a clear definition of what college and career readiness is, so it is hard to evaluate whether a system is effective in producing students that are prepared for college or the workforce (Glancy et al., 2014; Van de Water & Rainwater, 2001). It is especially difficult to measure the success of those who don't enter college, as there is little consensus around what it means to have a prepared workforce, or whether or not success should be defined

using traditional metrics such as employment rates or wages (Van de Water & Rainwater, 2001). There is also a lack of research on student outcomes related to P-20 initiatives (Domina & Ruzek, 2012; Donnelly, 2017), largely due to the challenges related to data systems. The research that does exist is often only correlational research or based on expert opinion, rather than quasi-experimental or another more conclusive form of research (Kramer et al., 2016).

The lack of statewide longitudinal data systems with the capability of tracking students through multiple sectors is often cited as one of the biggest challenges associated with P-20 initiatives (Domina & Ruzek, 2012; Krueger & Rainwater, 2003; Perna et al., 2014; Walsh, 2009). Without a statewide, funded mandate, there is little incentive to create such a system, which requires significant time and financial resources, as well as technical knowledge. In many states, there does not exist a student identifier that could be used to match students across sectors, since social security number is not usually collected in K-12 (Walsh, 2009). Conversations around privacy often arise when the issue of a data system is introduced, with many unsure about what is allowed given federal limitations, and many in the community uncomfortable with the idea of individual data being used for research or in other unknown ways. In states where there are data systems in place, these often exclude private schools and institutions, and do not connect to out-of-state colleges, leaving a weakness in the data that may impact any findings (Kramer et al., 2016).

P-20 councils have their own unique set of challenges that have emerged over the years. In many states, there has been a lack of product that has created doubt about the ability for a council to be successful going forward. Councils have had slow or

nonexistent progress or have resulted in initiatives seen as symbolic in nature, rather than impactful or effective (Chamberlin & Plucker, 2008). This may be due to the fact that P-20 councils often have a lack of dedicated financial resources and limited staffing, meaning that any work undertaken has to be done by council members with their own outside jobs and responsibilities (Kirst et al., 2011; Perna & Armijo, 2014; Walsh, 2009). Councils in many states also suffer from a lack of authority, and are established in an advisory capacity only, limiting their ability to bring about meaningful reform (Perna & Armijo, 2014; Walsh, 2009). Finally, sustainability is an ongoing challenge faced by many P-20 councils. Councils often face significant turnover among their membership and find their authority or ability to influence can fluctuate based on changes in state leadership, especially if members are Governor appointed (Perna & Armijo, 2014; Rippner, 2017).

P-20 systems or initiatives face several other challenges that are harder to classify into larger themes. While it is recommended that efforts be driven by strong state leadership, this can also lead to a lack of buy-in from those in the larger education community, especially from those that are "on the ground." As Davis and Hoffman (2008) explained, "[t]he movement involves P-12 teachers, community college instructors, state college and university faculty members, and P-16 education support professionals who serve only to perform specific functions on projects, not as essential players in the process" (p. 128). There are often logistical challenges faced when trying to align systems, including the differences in academic calendars and other systematic differences (Donnelly, 2017). The higher education sector presents its own set of challenges, considering it is a multi-playered system whose members have diverse

missions and interests, and any initiative will require buy-in from selective institutions that have less incentive to collaborate (Donnelly, 2017; Rochford et al., 2007). Finally, there has been a trend in less support for higher education overall, both from the government in terms of financial support and from the larger community in terms of purpose and mission, making the success of any initiative including higher education particularly challenging (McLendon & Perna, 2014).

## College and Career Readiness Policies and Student Outcomes

While the research is limited, there are several key studies that have examined the relationship between college and career readiness and student outcomes. These studies have primarily focused on assessments of college readiness, such as measures included on the SAT and ACT, and student outcomes, rather than specific program elements. However, one study, published in 2014, does examine a specific college and career readiness program, including a discussion of program components that may lead to success.

Bragg and Taylor (2014) published a study based on their 5-year evaluation of college readiness programs introduced under the 2007 Illinois College and Career Readiness Pilot Act. The authors conducted mixed methods research to examine program implementation and student outcomes with two of the seven partnership pilot sites. Legislated elements of the program at all sites included the creation of a system that aligned ACT scores (or an alternative placement exam) with community college courses in developmental and freshman curriculums; a reduction in the need for remediation in math, reading, and writing; the alignment of high school and college curriculums;

additional resources and support to students in their senior year of high school; and the creation of an evaluation process examining readiness intervention strategies.

Data analysis was conducted during field visits over a two- to five-year period, which included interviews and focus groups with administrators, faculty, support personnel, students, and program graduates, as well as classroom observations. Representatives of the partner high schools were also interviewed. Researchers also collected quantitative data; these data had to be captured specifically for this study, due to the lack of a student longitudinal data system (a challenge to most CCR research, as mentioned previously). The researchers found that 40-50% of student participants improved at least one developmental course (meaning they placed into a higher course than they would have before they participated in the program); half of students also showed a gain in their raw assessment scores in math and English. Characteristics of the successful programs included early college placement testing; a summer bridge program; supplementary math modules delivered in the high school; supplementary interventions in math and English, as well as support services provided on the college campus; and alignment of the curriculum from high school to the community college, guided by faculty and leadership from participating schools/institutions.

Additional studies have shown that a relationship exists between measures of college readiness and student outcomes. The Illinois Education Research Council examined the association between ACT's College Readiness Benchmarks and the postsecondary outcomes for the Illinois high school class of 2003. Students were grouped into one of sixteen separate college readiness categories based on scores from the four subjects comprising the ACT (Math, English, Reading, and Science), and 18.4% of the

class of 2003 was found to meet all four of the college readiness benchmarks (Lichtenberger & Dietrich, 2012). 36% of students were found to have missed all of the benchmarks. Results of the study showed that achieving a greater number of college readiness benchmarks led to increased rates of enrolled at more competitive institutions, as well as higher rates of persistence into the third year in college. Students who were identified as meeting the college readiness benchmarks in Math and English (of those who met three or fewer benchmarks) had the highest rates of bachelor's completion.

Analysis of student demographics also resulted in several interesting findings. High income students were more likely to enroll in a 4-year institution than similarly prepared students from other income categories (Lichtenberger & Dietrich, 2012). Female students were also more likely to enroll at a 4-year institution than their male counterparts, and female students who met three of the benchmarks were more likely to complete a bachelor's degree than male students who met all four benchmarks. Finally, European American and Asian American students had higher completion rates than African American students with similar college readiness benchmarks.

A 2013 study published by the College Board created a SAT College Readiness Benchmark, which represents an SAT combined score of 1550 or higher (critical reading section score + mathematics score + writing section score; Mattern, Shaw, & Marini, 2013). Criterion for the benchmark is a 65% chance of obtaining a first-year GPA of 2.67, developed from a panel of education experts and analysis of empirical data. The study examined the relationship between the benchmark and 4- and 6-year graduation rates. Additional analyses were conducted that controlled for gender, ethnicity, best spoken language, household income, and highest parental education. For the 4-year rate analysis,

a sample of 136,789 students was used based on participating colleges and universities; a second data set containing 2.4 million students from the National Student Clearinghouse was used to examine six-year rates.

The study found that of students who were identified as college ready (SAT College Readiness Benchmark of 1550 or greater), 58% graduated within 4 years, compared to 31% of students who were not considered college ready. When looking at differences among gender and race/ethnic groups, similar patterns were found--college-ready students were nearly twice as likely to graduate in 4 years. One finding of interest was that "differences in graduation rate that are typically found in the literature are largely reduced when controlling for college readiness" (Mattern et al., 2013, p. 11). The researchers also found a positive relationship between income and graduation rates, as well as highest parental educational level and graduation rates, even when controlling for college readiness. When examining six-year graduation rates, the authors reported that 69% of those who met the SAT Benchmark graduated within six years, compared to 45% of those not considered college ready. Trends among the student subgroups were similar to those found in the 4-year graduation rate analysis.

These studies provide evidence that students considered college-ready are more likely to graduate from a postsecondary institution. However, given the acknowledged challenges with using SAT or ACT scores as a proxy for college readiness (Jaschik, 2017; Reeves & Halikias, 2017), these studies may more accurately reflect that students who are likely to receive a high score on the SAT or ACT will also do well in college.

Another study worth mentioning used a more comprehensive measure of college readiness. Jobs for the Future conducted a study examining the economic payoff for

closing college readiness and completion gaps. College readiness was measured using a composite variable that included student performance on college admissions and other assessments, high school GPA, and class rank (Vargas, 2013). The study used the National Educational Longitudinal Survey as a data source, and results showed a close correlation between college readiness and college success. Low-income students were found to have lower completion rates in both high school and college, and the author argues that efforts to increase the readiness of this student group will result in higher productivity and a greater return on investment for states.

## Theoretical Framework

This study was guided by two conceptual frameworks: principal-agent theory, and Berger and Millem's 2000 theory on organizational behavior in higher education. These theories provided an understanding of the relationship between state governance, institutional behavior, and student outcomes. Both theoretical frameworks are discussed in depth in the following sections, including other applications in higher education research.

### Principal-Agent Theory

Principal-agent theory is helpful to understand behavior in hierarchical or contractual relationships. This theory argues that principals use rewards and sanctions to ensure that agents behave in a way that aligns with the principal's goals (Tandberg & Hillman, 2014). Principal-agent theory "focuses on the relationship between entities, either individuals or organizations, and can be used to understand motivations behind the activities of actors" (Lane & Kivisto, 2008, p. 142). The principal and agent both work to maximize their own interests, which may often be divergent. In this study, the state is the

principal, while the public institutions within a state are the agents, working to achieve the state's higher education goals. The principals (states), expect the agents (the institutions), to carry out agendas which may not coincide with their institutional mission of the overall objectives of higher education (Auld, 2010).

In higher education, principal-agent theory can help us understand why some institutions may respond differently to legislative actions or administrative initiatives. To be most effective, states need to align their efforts with the mission of their institutions and provide significant enough motivation through rewards and sanctions. If efforts aren't aligned or there is not sufficient motivation, institutions aren't likely to behave in ways the state desires (Tandberg & Hillman, 2014). States also need to be clear about their agendas and policies for institutions to effectively act as agents and bring about the desired outcomes. Fortunately, public institutions are responsible to the states that fund them and authorize them to grant degrees, which gives the states important levers to ensure the institutions behave in ways that align with the state's overall higher education goals (Lane & Kivisto, 2008).

Several studies on the relationship between state policies and student outcomes have used principal-agent theory as a guiding framework. Tandberg and Hillman (2014) used principal-agent theory in their examination of state higher education performance funding policies, and both Abbott (2016) and Liefner (2003) used this theory to guide their studies of state funding. Lane and Kivisto (2008) also provided evidence that principal-agent theory can provide a useful tool for understanding the role of state governance and its impact on university behavior.

## Organizational Behavior in Higher Education

Berger and Millem (2000) provided an important theoretical framework for understanding the role that organizational behavior plays in student outcomes. Their model identifies four characteristic groups that impact student outcomes: student entry characteristics; organizational characteristics, both structural-demographic features and organizational behavior; peer group characteristics; and student experience, including student behavior and perceptions (Berger & Millem, 2000). For the purposes of this study, I will focus on the organizational characteristics identified in their conceptual model.

The Berger and Millem (2000) model proposed that institutional structural-demographic features and organizational behavior influence student outcomes. They argued that in any multi-institution study of college impact, these types of organizational characteristics were important to include and provided a better understanding of how the campus environment may influence student behavior. Structural-demographic features may include "student body size, selectivity, control (public versus private), and location (urban versus rural), to name a few" (Berger & Millem, 2000, p. 310). Organizational behavior can be categorized in five dimensions: bureaucratic, collegial, political, symbolic, and systemic. This model provides a useful framework for understanding the influence organizational characteristics have on student outcomes. In this study, Berger and Millem's (2000) theory guided the development of a model that accounted for differences in institutional outcomes within states that were influenced by the same college readiness policies. Studies using this framework were too numerous to discuss here, but Titus (2004) acknowledged that the Berger and Millem (2000) college impact

model was built on a significant understanding of student development theory and provided an important framework for examining the influence of institutional characteristics on student outcomes.

Given these frameworks, it was important to understand exactly which state and institution level characteristics significantly impacted student outcomes. The following sections discuss research on state and institution level characteristics and their relationships with student persistence and graduation.

## State Factors Influencing Student Outcomes

While there was limited knowledge on the impact college and career readiness policies have on student outcomes, there was a significant amount of research on other types of state policies, primarily related to performance-based funding and financial policy. These studies varied in their outcome measures, but frequently examine the relationship between policy and graduation rates (Abbott, 2016; Kelly & Jones, 2007; Rutherford & Rabovsky, 2014; Shin, 2010; Zhang, 2009); degree productivity, as measured by the number of completions or completions per full-time enrollment (FTE; Kelly & Jones, 2007; Rutherford & Rabovsky, 2014; Tandberg & Hillman, 2014; Titus, 2009; Volkwein & Tandberg, 2008); persistence (Rutherford & Rabovsky, 2014); student preparation (Kelly & Jones, 2007; Volkwein & Tandberg, 2008); and participation (enrollment) in the higher education system (Volkwein & Tandberg, 2008) In addition to the policy variables of interest, these studies include several state level characteristics that have a relationship with student outcomes. In this section, I will provide an overview of these policies and characteristics, which can be grouped into four broad categories:

financial aspects, governance-related factors, state economic condition, and student factors.

**Financial Aspects**

State appropriations to higher education are one of the most recognized factors with a significant relationship to student outcomes (Rutherford & Rabovsky, 2014; Shin, 2010; Tandberg & Hillman, 2014; Titus, 2009; Volkwein & Tandberg, 2008; Zhang, 2009). Titus (2009) found that for every 10% increase in state appropriations, states had a corresponding 3% increase in degree production. Changes in state appropriations over time are also positively related to graduation rates and degree productivity (Shin, 2010; Volkwein & Tandberg, 2008). Titus (2009) also found that state appropriations to K-12 had a negative relationship with higher education outcomes in the public sector, arguing that more spending on K-12 leads to better prepared students who are more likely to enter the private sector within the state.

State aid programs and tuition levels are also related to student outcomes. In a study on the relationship between performance-based funding policy and degree production, Tandberg and Hillman (2014) found that state need-based grant expenditures per student had a positive correlation with degree production. Merit-based aid, however, was not found to have a significant relationship, a finding confirmed in research by Titus (2009). Tandberg and Hillman (2014) also found that public four- and 2-year tuition levels were significantly related to degree production, though Titus (2009) did not find this relationship significant when controlling for enrollment in the private sector.

**Governance-Related Factors**

Governance and accountability related factors are also commonly included in studies of state-level student outcomes, though the research does not support the significance of these factors. Rutherford and Rabovsky (2014), Shin (2010), and Volkwein and Tandberg (2008) have all examined the relationship between higher education state governance structure and student outcomes and found that a consolidated governing board and governance centrality did not have a significant correlation with graduation rates or degree production. Volkwein and Tandberg (2008) also included variables representing state regulatory practices including academic and financial flexibility in their study of state structural characteristics, regulatory practices, and state performance, and found no significant relationship with completion, participation or student preparation. The presence of a performance-based funding policy or accountability system has also been shown to have minimal or no impact on student outcomes in states. Tandberg and Hillman (2014) found that performance funding did not have any significant effect on degree completions until the seventh year of implementation or later, and Rutherford and Rabovsky (2014) found no relationship with performance funding policies and six-year graduation rates, retention rates, and bachelor's degree production. Studies on the impact of performance funding are too numerous to discuss here, but these findings are further confirmed in literature reviews conducted by Dougherty and Reddy (2011) and Li (2014).

**State Economic Conditions**

Research has shown that there are several other factors related to a state's economic conditions that have a relationship with student outcomes. A state's

unemployment rate is frequently included as a control variable in state policy studies, though the evidence is inconclusive on whether the relationship is significant. Abbott (2016), Shin (2010), and Tandberg and Hillman (2014) all found this variable significantly related to student outcomes, while Rutherford and Rabovsky (2014) and Titus (2009) did not. Measures of state wealth are also inconclusive; studies by Tandberg and Hillman (2014) and Volkwein and Tandberg (2008) including the percentage of the state's population below the federal poverty level had contradictory findings. Both studies did find that there was a positive relationship between degree productivity and the share of adults with a bachelor's degree or higher within a state. Other economic factors found to have statistically significant relationships with student outcomes include state tax capacity, per-capita state gross domestic product, total state population, and population growth (Kelly & Jones, 2007; Tandberg & Hillman, 2014; Volkwein & Tandberg, 2008).

**Student Factors**

The final group of state characteristics found in the literature relate to student preparation and enrollment patterns. Kelly and Jones (2007) found that assessment scores including NAEP math scores and average ACT and SAT scores aggregated at the state level were positively correlated with graduation rates and degree production. High school graduation rates also correspond to postsecondary graduation rates (Kelly & Jones, 2007), while Volkwein and Tandberg (2008) found that a growth in the number of high school graduates had a negative relationship with degree production. Finally, studies by Titus (2009) and Volkwein and Tandberg (2008) identified the percent of undergraduates

enrolled in private institutions of the total undergraduate enrollment within a state as positively correlated with degree production.

## Institutional Factors Influencing Student Outcomes

There is a long history in higher education research on the impact colleges have on students, including their likelihood of persistence and graduation. Astin and Oseguera (2012) identified three areas that could explain a student's chance of completing college: "(1) pre-college characteristics of the students; (2) the characteristics of the college that the student attends; and (3) environmental 'contingencies' of attendance" (p. 120). This section will discuss several studies that explore the second item related to college characteristics and the relationship between these characteristics and student outcomes. These studies primarily use persistence and graduation rates as the outcome measure of interest, though one drawback is that the majority of this body of research focuses on first-time, full-time students enrolling at baccalaureate granting institutions only. Characteristics found to have a significant relationship with student outcomes can be grouped into four categories: institution type; faculty; financial; and student profile.

### Institution Type

The type of institution plays a significant role in student outcomes. Astin and Oseguera (2012) and Titus (2004) found that private baccalaurete granting instituions had greater persistence and graduation rates for first-time, full-time students. Institutional mission, identified using the Carnegie classifications, is a significant predictor of graduation rates, with research intensive institutions more likely to have a higher graduation rate (Hamrick, Schuh, & Shelley, 2004; Rutherford & Rabovsky, 2014). Two studies have identified the size of an institution's enrollment as a factor in degree

attainment or graduation rate (Kelly & Jones, 2007; Titus, 2004), though in *How College Affects Students*, Mayhew et al. (2016) found that the majority of the literature does not support this finding. Finally, the presence of a residence hall and the percentage of students living on campus have been found to have a positive relationship with student persistence and graduation in studies by Bridges (2013), Shin (2010), and Titus (2004).

**Faculty**

Two characteristics of an institution's faculty have been identified as related to student outcomes. First, in his study of performance funding policies, Shin (2010) found that faculty-student ratio had a significant positive relationship with persistence and graduation. The second characteristic is the percentage of faculty that are full-time. Rutherford and Rabovsky (2014) found that this characteristic had a significant relationship with graduation rates, but not persistence, while Shin (2010) found significance with both outcomes.

**Financial**

Institutional financial expenditures can have a significant impact on student outcomes. Several studies have identified the amount of instructional expenditures per student as positively related to student persistence and graduation (Hamrick et al., 2004; Mayhew et al., 2016; Rutherford & Rabovsky, 2014; Ryan, 2004; Shin, 2010; Zhang, 2009), though a study by Chen (2012) on institutional characteristics and student dropout did not find this variable significant. Expenditures on student services was also found to significantly relate to persistence (Chen, 2012) and graduation rates (Hamrick et al., 2004; Ryan, 2004). Hamrick et al. (2004) also identified library expenditures as positively related to degree attainment in their study of institutional characteristics at

baccalaureate public institutions. Tuition may also have a significant relationship with student outcomes; both Rutherford and Rabovsky (2014) and Shin (2010) found a statistically significant relationship with persistence and graduation rates, while Mayhew et al. (2016) did not find it to have a strong impact in other literature.

**Student Profile**

Characteristics related to the type of students an institution serves are the most frequent type of variables included as controls in studies of institutional outcomes. The percentage of students that are African American or Latinx has been found to have a significant relationship with both persistence and graduation rates in studies by Kelly and Jones (2007), Ryan (2004), and Zhang (2009), though not by Titus (2004) or Zhang (2009). The percentage of students that are male has similarly contradictory results in the literature, with Zhang (2009) finding the fewer males an institution had, the greater the graduation rate, while Titus (2004) found no significant relationship between the percentage of males and student persistence after three years. The percent of students studying part-time is consistently found to impact persistence and graduation, with institutions with more full-time students having higher rates (Kelly & Jones, 2007; Rutherford & Rabovsky, 2014; Sanford & Hunter, 2011; Zhang, 2009).

The overall preparation level of an institution's students is the most consistent indicator of institutional performance. In the literature, this is often measured by institutional selectivity or median assessment scores of incoming students. Institutional selectivity generally represents the percentage of admissions applications accepted and has been used in several studies as an institutional level control variable (Astin & Oseguera, 2012; Hamrick et al., 2004; Rutherford & Rabovsky, 2014). Another way of

capturing student preparation is by using an institution's median SAT or ACT score for incoming students, which also significantly relates to persistence and graduation rates (Bridges, 2013; Ryan, 2004; Titus, 2004; Zhang, 2009).

# CHAPTER III

# METHODOLOGY

States have continued to set ambitious goals for the educational attainment of their population in order to meet the needs of their local workforces and improve their state economies. To meet these goals, states need to ensure students leave K-12 ready to succeed in college, to increase their college-going population, and to improve the success of students enrolled in their public institutions. Some states have attempted this through the introduction of college readiness policies. In this study, I examined whether these policies have a relationship with student outcomes of college-going, student retention rates, and graduation rates for the overall state population as well as the rates specifically for European American (White) and non-European American students. Analyses were conducted separately for 2- and 4-year institutions, and I also examined whether the relationship between policies and student outcomes is the same for both sectors within a state.

This study consists of analyses of secondary data to address research questions. Specifically, a multilevel modeling approach was employed to determine whether significant relationships exist between the presence of state college readiness policies and change in student outcomes over time when controlling for state- and institutional-level factors. Several policies were considered, including: (a) the existence of a college-readiness definition; (b) a requirement for students to take college-prepatory courses in order to receive a high school diploma; (c) course-credit requirements for a high school

diploma that align with a state's postsecondary admissions policies; (d) the alignment of high school assessments with postsecondary academic expectations; and (e) the use of high school assessments in postsecondary admissions and placement decisions. Student outcomes for analyses included: (a) state level college-going rates; (b) institutional fall-to-fall retention rates; and (c) institutional graduation rates (within 150% of normal time) for all students, and (d) institutional graduation rates for European American (defined in IPEDS as White) students, and (e) institutional graduation rates for non-European American students (which will include the IPEDS identified race/ethnicity categories of Black, Hispanic, Asian, Pacific Islander, American Indian/Alaska Native, and Two or more races). Multilevel growth modeling was used to examine relationships between variables at both the institution- and state-level (or in the case of Research Question 1, state-level only), and to model longitudinal changes in outcomes over the study period of interest. In this chapter, I discuss the research design for this study, data sources, the sample used, data analysis conducted, and limitations of the study.

## Research Design

This study seeks to examine the following research questions:

Q1 What is the relationship between state college readiness policy and the change in statewide college-going rates when controlling for state-level covariates?

Q2 What is the relationship between state college readiness policy and the change in institutional retention rates when controlling for state-and institutional-level covariates?

Q2a Is there a difference in the relationship between state college readiness policy and the change in institutional retention rates at 2-year institutions compared to 4-year institutions when controlling for state-and institutional-level covariates?

Q3 What is the relationship between state college readiness policy and the change in institutional graduation rates when controlling for state-and institutional-level covariates?

Q3a Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates 2-year institutions compared to 4-year institutions when controlling for state-and institutional-level covariates?

Q4 What is the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students and non-European American students when controlling for state-and institutional-level covariates?

Q4a Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students compared to non-European American students at 2-year institutions when controlling for state-and institutional-level covariates?

Q4b Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students compared to non-European American students at 4-year institutions when controlling for state-and institutional-level covariates?

Consistent with the theoretical perspective that institutions are acting as an agent for the state (the principal), this study used two-level multilevel growth models. Multilevel models (also known as hierarchical linear models), are a type of linear mixed model that are able to "handle data where observations are not independent" (Garson, 2013, p. 3). It is most appropriate in cases where the observations cluster based on a grouping variable--in this study, the state. Multilevel models assume that there are cross-level effects, and that cases within a group (often referred to as nested) share characteristics that may explain the variance in outcomes (Garson, 2013; Hox, Moerbeek, & van de Schoot, 2018). This is likely to be the case for models for research questions two through four; public institutions within the same state are more similar to each other

than institutions in other states, since they are governed by many of the same policies, incentives, and financial structures (Abbott, 2016).

Multilevel modeling is also increasingly becoming the preferred method when analyzing longitudinal data (Garson, 2013). A multilevel growth model can be used to describe a pattern of change over time, as well as how that pattern of change may be affected by different characteristics of the observational unit (Greenberg & Phillips, 2013). That is, growth models permit for the analysis of repeated measures, and hold greater power than other modeling techniques used with longitudinal data, such as ANOVA (Hox et al., 2018). This technique also allows for better handling of missing data than other methods, since cases with missing data do not have to be removed from the model (Hox et al., 2018). Multilevel growth modeling is frequently used in education when evaluating student growth: repeated tests, such as an annual assessment, are used as the first level; the individual student is the second level, and the school or district can be used for levels three or greater (Garson, 2013; Giorgio, 2012; Reedy, 2008).

In order to use multilevel growth modeling, the outcome variable needs to be a continuous measure that is collected at multiple time points (Gee, 2014). The outcome should be a consistent measure that is capturing the same construct and using the same scale (Gee, 2014). In the current study, each outcome measure is a continuous variable, captured annually, with no change in the definition or methodology over the study period of interest. Multilevel growth models also require that any level two or higher variables are constant over time (Greenberg & Phillips, 2013). This condition was met by measuring the presence of policy at one point in time.

To address Research Question 1, I built a two-level model. The outcome measure was college-going rate; level 1 was be time and state contextual variables; and level 2 included the five dichotomous policy variables. Research Questions 2 through 4 also used separate two-level models, where the outcome variable is retention rate, graduation rate, European American graduation rate, and non-European American graduation rate; level 1 is time, institutional characteristics, and state contextual covariates; and level 2 is the policy variables. A visualization of the two-level models can be found in Figure 1 below. All variables, data sources, and the models themselves were discussed in greater detail in following sections.

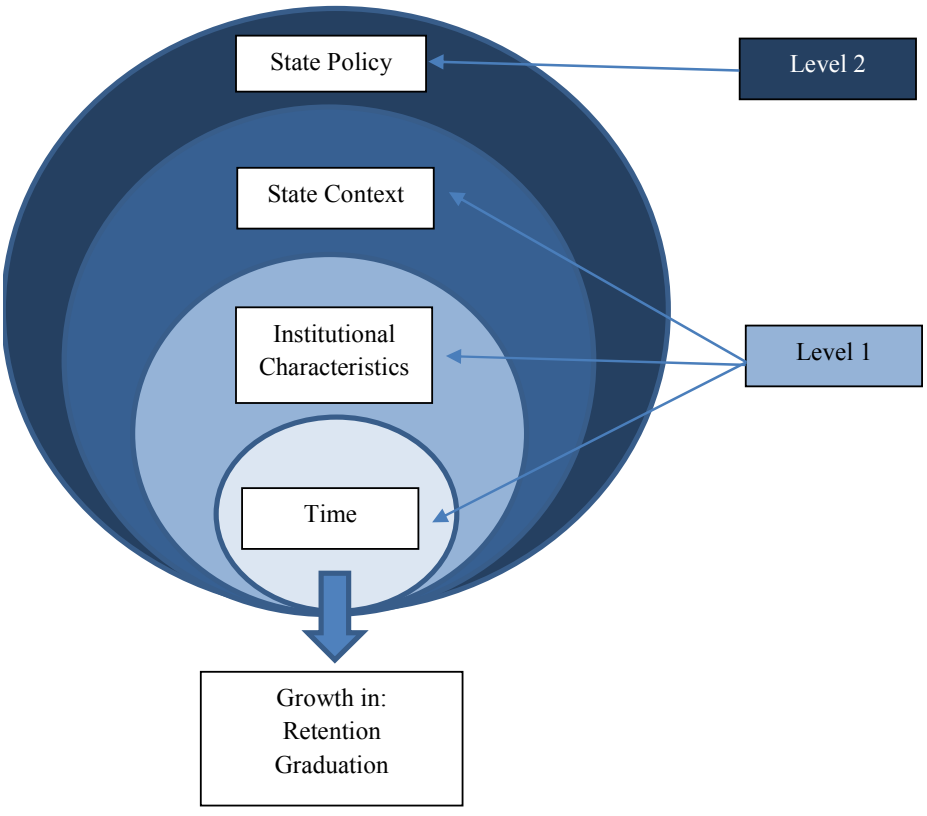


*Figure 1*. Two-level growth model for Research Questions 2-4. (Adapted from Abbott, 2016, p. 55).

## Measures and Data Sources

Given that publicly available datasets only allow college-going rates to be calculated at the state level, the unit of analysis for Research Question 1 is ”state.” Research Questions 2 through 4 were answered using “institution” as unit of analysis. The impact of policy can often take years to be measurable; thus, this study examined a 7-year time period, with calendar year 2010 (or academic year 2010-11), serving as the baseline year. The study period also reflected the methodology used by IPEDS to calculate graduation rate--graduation rates capture students who complete within 150% of normal time, or six years for 4-year institutions, which allows for analyses to consider data from at least one full cohort of students post-baseline year. All outcome measures were continuous variables and were captured for the years 2010 through 2016 (academic years 2010-11 through 2016-17). A summary variable was calculated to represent time, or the number of years (0-6) each value is away from the baseline year (for example, outcome measures for 2014/2014-15 were assigned a value of four and the baseline year were assigned a value of zero).

In this study, the presence of state college readiness policy was captured as five dichotomous variables (yes/no) indicating whether a state had one of the identified policies in place in the baseline year 2010-11. Covariates at the state- and institutional-level were included for years 2010 through 2017 (academic years 2010-11 through 2016-17), excluding the baseline, and controlled for in analyses.

The majority of data to be used in this study was extracted from two existing sources: The U.S. Department of Education’s Integrated Postsecondary Education Data System (IPEDS), and data gathered by *Education Week* as part of *Quality Counts*, their

annual report on the status of public education in the states. *Education Week* compiles data from several different sources as part of their annual reporting. Variables related to state policy are created based on responses to the annual state policy survey conducted by the Editorial Projects in Education (the publisher of Education Week) Research Center. Other data sources used by *Education Week* include the U.S. Census Bureau's American Community Survey and the U.S. Department of Education. Additional data used in this study was gathered from *Knocking at the College Door*, a report produced by the Western Interstate Commission for Higher Education (WICHE). The following sections will discuss the complete list of variables, including their data source, years to be included, and what level of the model they were included in.

**Outcome Measures (Dependent Variables)**

The present study included five primary outcomes and a single level 1 covariate to represent time, i.e., "the number of years post-baseline (2010)." Table 1 includes a complete list of variables used in analyses. All IPEDS data were downloaded in .csv format from the IPEDS Data Center at https://nces.ed.gov/ipeds/use-the-data. WICHE high school projections were downloaded in Excel format from the WICHE site at https://knocking.wiche.edu/data. All files were then imported into SPSS and merged, using state ID as the linking variable.

Table 1

*Outcome and Time Variables*

| Variable Name | Source | Level of Measurement | Years | Description | Variable Code |
|---|---|---|---|---|---|
| | | | Outcome Variables | | |
| College-going Rate | WICHE, IPEDS Fall enrollment | Ratio | 2010; 2012; 2014; 2016 | The number of first-time freshmen directly from high school enrolled anywhere in the U.S. divided by the projected number of high school graduates. Reporting only mandatory in even years. | COLLEGEGOING |
| Retention Rate | IPEDS Fall enrollment | Ratio | 2010-2016 (Fall 09 to Fall 15 cohorts) | Retention rates for first-time degree/certificate seeking students enrolled in fall who return the following fall. | RETENTION |
| Graduation Rate | IPEDS Graduation Rates | Ratio | 2011-2017 (Fall 05 to Fall 11 cohorts) | Completers of any award within 150% of normal program time. | GRAD |
| Graduation Rate--White Students | IPEDS Graduation Rates | Ratio | 2011-2017 (Fall 05 to Fall 11 cohorts) | Completers of any award within 150% of normal program time. | GRADWHITE |
| Graduation Rate--non- White Students | IPEDS Graduation Rates | Ratio | 2011-2017 (Fall 05 to Fall 11 cohorts) | Completers of any award within 150% of normal program time--combined rate for the following race/ethnicities: American Indian/Alaska Native, Asian, Black, Hispanic, Pacific Islander, or Two or More Races. | GRADNONWHITE |
| | | | Level 1 | | |
| Time | | Interval | | Values ranging from 0 - 6, identifying the baseline (2010/2010-11) and subsequent years. | YEAR |

**State college-going rates**. This outcome was calculated using annual counts from two datasets. The numerator is the projected total count of high school graduates in each

state, as produced by WICHE. WICHE develops their projections with a cohort survival ratio method using birth data from the National Center for Health Statistics (Bransberger & Michelau, 2016). Projections were selected as the numerator due to data limitations (reporting lags); the most recently available data on high school graduates from the Department of Education is for the 2009-10 school year. The denominator for calculating the State college-going rates is the total number of first-time freshmen directly from high school from each state that are enrolled anywhere in the U.S in the fall of the same year (e.g., high school graduation year = first-time freshman college enrollment year). This count is captured in the IPEDS Fall Enrollment survey, but institutions are only required to submit these values in even years. Because of this, college-going rates were calculated at four time points: CY 2010, 2012, 2014, and 2016. This calculation was originally developed by Kelly and Jones (2007) and has been published for years prior to 2010 on http://www.higheredinfo.org/.

**Retention rates**. This outcome was also calculated using data available from the IPEDS Fall Enrollment survey but was reported annually. The retention rate is calculated as the percentage of first-time students in a given fall who are still enrolled in the following fall; for 2-year institutions, this also includes students who complete their program in the given year (National Center for Education Statistics, 2019). Retention rates are available for both full- and part-time students; in the current study, the rate for full-time students were used to align with the graduation rate methodology, which only captures full-time students. Retention rates were calculated for each year over the study period (CY 2010-2016).

**Graduation rates**. Data are submitted to IPEDS in the Graduation Rate survey, and are used to measure the percentage of full-time, first-time degree- or certificate-seeking students who complete a program within a time-period equal to one and a half times the normal completion period (150%; i.e., within 6 years for 4-year institutions and 3 years for 2-year institutions). These data are stratified and available by race/ethnicity, gender, and Pell status. The non-White graduation rate was calculated by combining the total and graduate counts for Black, Hispanic, Asian, Pacific Islander, and American Indian/Alaska Native students, as well as those identifying as two or more races, and dividing to create a rate. It was necessary to combine these populations rather than look at the rates for each population individually due to the small number within each population at some institutions. Graduation rates were calculated for each year over the study period (AY 2010-11-2016-17).

**Time**. Finally, a variable representing time over the study period was calculated. Each study year was assigned a numerical value (0-6) representing "years post-baseline" and ranged from zero (CY 2010; school year 2010-2011) to six (CY 2016; school year 2016-2017).

**Policy Factors (Independent Variables)**

Independent variables included in study analyses are the presence of five different policies related to college readiness. These five policies can be found in Table 2.

Table 2

*Policy Factors for Level Two*

| Variable Name | Source | Level of Measurement | Years | Description | Variable Code |
|---|---|---|---|---|---|
| College-Readiness Definition | EPERC (ASPS) | Dichotomous | 2010-11 | State has defined college readiness. | CCRDEF |
| College-Prep Required | EPERC (ASPS) | Dichotomous | 2010-11 | State requires all high school students to take a college-preparatory curriculum to earn a diploma. | CPREQ |
| Course Credits Aligned | EPERC (ASPS) | Dichotomous | 2010-11 | Course credits required for diploma are aligned with postsecondary system. | CCALIGN |
| Aligning High School Assessments | EPERC (ASPS) | Dichotomous | 2010-11 | State high school assessments are aligned with postsecondary system. | HSASSALIGN |
| Postsecondary Decisions | EPERC (ASPS) | Dichotomous | 2010-11 | Statewide high school assessment results used for admission, placement, or scholarship decisions in state postsecondary system. | PSDEC |
| Policy Commitment | EPERC (ASPS) | Interval | 2010-11 | A count (0-5) of the number of policies identified above present in a state. | POLCOUNT |

The variables were calculated using data from the Editorial Projects in Education Annual State Policy Survey (ASPS) conducted in the summer of 2010. Editorial Projects in Education is a non-profit organization that publishes *Education Week*, as well as *Quality Counts*, an annual report discussing issues and challenge facing American public schools. Chief state school officers in all 50 states and Washington, DC participated in the survey. Respondents were asked about the presence of various state policies for the 2010-11 school year and were requested to provide documentation such as "state statutes, administrative rules, or Web links" (Education Week, 2011, para. 2). Survey responses and documentation were reviewed and validated by the Editorial Projects in Education Research Center (EPERC) staff for accuracy, and final survey responses were confirmed

by state officials. In the present study, these variables were coded as zero (not present) or one (present) to indicate whether the state had the policy in place in the baseline year (school year 2010-11). A summary variable of policies was also calculated representing how many of the above policies a state had in place in 2010-11, with values ranging from zero (no policies) to five (all policies). Data used for the creation of these variables is available in .PDF format from *Education Week* at https://www.edweek.org/media/ew/qc/2011/16sos.h30.chance.pdf and was converted to Excel format before being imported into SPSS.

**Institution Level Covariates**

Based on the literature, several covariates were included in models that represent institutional characteristics that have a significant relationship with retention and graduation rates. Table 3 contains the list and description of items.

Table 3

*Institution Level Covariates for Level One (Research Questions 2-4)*

| Variable Name | Source | Level of Measurement | Years | Description | Variable Code |
|---|---|---|---|---|---|
| % Non-White Population | IPEDS Fall enrollment | Ratio | 2010-2016 | Percent of fall enrollees who identify as American Indian/Alaska Native, Asian, Black, Hispanic, Pacific Islander, or Two or More Races. | NONWHITE |
| % Part-time | IPEDS Fall enrollment | Ratio | 2010-2016 | Percent of fall enrollees enrolled part-time. | PARTTIME |
| % Out of state enrollment | IPEDS Fall enrollment | Ratio | 2010-2016 | Percent of fall enrollees enrolled from out-of-state. | OOS |
| Carnegie Classification (2010) | IPEDS Institutional characteristics | Categorical | 2010-11-2016-17 | Carnegie classification using the 2010 categories. | CARNEGIE |
| ACT Composite Percentile | IPEDS Institutional characteristics/Admissions | Interval | 2010-11-2016-17 | Average of the ACT Composite 25th and 75th percentile score | ACT |
| Instructional expenditures | IPEDS Finance | Ratio | 2010-11-2016-17 | Annual expenditures on instruction. | INSEXP |
| Student services expenditures | IPEDS Finance | Ratio | 2010-11-2016-17 | Annual expenditures on student services. | SSEXP |

These data come from IPEDS surveys gathered for the fall of 2010 through 2016, or academic years 2010-11 through 2016-17. NONWHITE, PARTTIME, OOS, CARNEGIE, and ACT were calculated, while the others are existing variables in the IPEDS files. The CARNEGIE variable was calculated by combining the variables for institutional sector and 2010 Carnegie classification in order to identify seven unique categories of institution: Public Doctoral/Research Universities; Public Master's Colleges and Universities; Public Baccalaureate Colleges; Other Public 4-Years; Public 2-Years; Public < 2-Years; and Tribal Colleges. The variable representing ACT Composite incorporated both ACT and SAT data--if a greater percentage of students at an institution

submit SAT scores rather than ACT scores (due to the differences in admissions requirements at institutions), mean of the 25th and 75th percentiles for SAT Critical Reading and Math were converted to the ACT composite scale and used instead. Both the CARNEGIE and ACT variables will not be included in the analyses of 2-year institutions due to a lack of variance in the CARNEGIE variable, and a lack of data for the ACT variable (nearly all 2-year institutions do not report this data). As mentioned previously, IPEDS data was downloaded in .csv format from the IPEDS Data Center at https://nces.ed.gov/ipeds/use-the-data and then imported into SPSS to be linked with other files by IPEDS institution ID and state.

**State Level Covariates**

State level covariates included in the models were gathered from *Quality Counts*, an annual report published by *Education Week*, a division of Editorial Projects in Education. Data were available in .PDF format at the Education Week site and was converted into Excel format before being imported into SPSS. Reports for the years 2012-2018 were used, reflecting data for the CYs 2010-2016. A full listing and description of covariates is found in Table 4. *Quality Counts* uses these 13 indicators as part of their Chance-for-Success Index (CSI), which was first published in 2007. The CSI "surveys a range of social and educational conditions that, taken together, affect a person's prospect of positive outcomes over the course of a lifeline" (Education Week, 2019, para. 2). While several of these covariates are supported by other literature, one major criticism of the CSI is that its indicators do not have a "direct and proven association with the outcome being measured" (Raymond, 2010, p. 80). The proposed study uniquely contributes to this knowledge gap by examining the relationship between

the CSI indicators and the outcome measures (i.e., college-going rates and postsecondary retention and graduation).

Table 4

*State Level Covariates for Level One*

| Variable Name | Source | Level of Measurement | Years | Description | Variable Code |
|---|---|---|---|---|---|
| Family Income | EPERC (ACS) | Ratio | 2010-2016 | Percent of children in families with incomes at least 200% of poverty level. | FAMINCOME |
| Parent Education | EPERC (ACS) | Ratio | 2010-2016 | Percent of children with at least one parent with a postsecondary degree. | PAREDU |
| Parental Employment | EPERC (ACS) | Ratio | 2010-2016 | Percent of children with at least one parent working full time and year-round. | PAREMP |
| Linguistic Integration | EPERC (ACS) | Ratio | 2010-2016 | Percent of children whose parents are fluent English-speakers. | LININT |
| Preschool Enrollment | EPERC (ACS) | Ratio | 2010-2016 | Percent of 3- and 4-year-olds enrolled in preschool. | PREENR |
| Kindergarten Enrollment | EPERC (ACS) | Ratio | 2010-2016 | Percent of eligible children enrolled in kindergarten programs. | KINENR |
| Elementary Reading Achievement | EPERC (DOE) | Ratio | 2010-2016 | Percent of 4th grade public school students "proficient" on NAEP. | ELEMREAD |
| Middle School Mathematics Achievement | EPERC (DOE) | Ratio | 2010-2016 | Percent of 8th grade public school students "proficient" on NAEP. | MSMATH |
| High School Graduation Rate | EPERC (DOE) | Ratio | 2010-2016 | Percent of public high school students who graduate with a diploma. | HSGRAD |
| Young-Adult Education | EPERC (ACS) | Ratio | 2010-2016 | Percent of young adults (18-24) enrolled in postsecondary education or with a degree. | YAEDU |
| Adult Educational Attainment | EPERC (ACS) | Ratio | 2010-2016 | Percent of adults (25-64) with a 2- or 4-year postsecondary degree. | AEATT |
| Annual Income | EPERC (ACS) | Ratio | 2010-2016 | Percent of adults (25-64) with incomes at or above national median. | ANNINC |
| Steady Employment | EPERC (ACS) | Ratio | 2010-2016 | Percent of adults (25-64) in labor force working full time and year-round. | STEEMP |

The Editorial Projects in Education Research Center relies on two secondary data sources when calculating the CSI indicators (Lloyd, 2018). The first was the American Community Survey, an annual data collection by the U.S. Census Bureau that gathers information from households on social, economic, demographic, and housing characteristics (U.S. Census Bureau, 2018). The second is the U.S. Department of Education (DOE). Elementary reading and middle school math achievement are measured using the National Assessment of Educational Progress (NAEP), a congressionally mandated project administered by the DOE (U.S. Department of Education, 2018a). High school graduation rates are calculated by the DOE as the percentage of students from an adjusted cohort of first-time ninth graders who graduate within 4 years with a regular high school diploma (U.S. Department of Education, 2018b).

## Sample

Two independent samples were derived from secondary datasets (described above) for study analyses. Research Question 1, addressing the impact of state policy on college-going rates, used states as the unit of measurement. The analytic file included a sample with data from all 50 states but excluded Washington, DC and the U.S. territories given the study's goal to examine state policy. The use of "state" for Research Question 1 analyses is required to calculate college-going rates given the limitations of the existing available data. Calculating college-going rate for an individual county or school district is challenging based on data availability and inconsistency in data collection across states. To address Research Questions 2 through 4, I defined a second sample at the institutional level from secondary datasets described above. This sample included all public, degree-

granting, Title IV participating institutions within the 50 states. Private and non-Title IV participating institutions were excluded as their behavior is not targeted in state policies on college readiness and P-20 alignment. Similarly, non-degree-granting institutions were excluded given the study's focus on degree production (measured by graduation rate) as a primary outcome. This sample included 1,704 institutions representing all 50 states; 728 4-year institutions were included, and 976 two-year institutions. Analytic files were built in panel data form, with one row representing year/state, or year/institution. Because different institution level covariates were used, this fie was then split into separate files for 2- and 4-year institutions.

## Data Analysis

### Data Preparation and Preliminary Analyses

Four analytic files were prepared for use in this study. The first file was used to answer Research Question 1 at level one, and contained data for the state, year, college-going rate, and state covariates. Each row in the data set represented one state and year. The second and third data set were used for analysis of Research Questions 2-4 level one and contained the institution, year, retention rate, graduation rate, European American graduation rate, non-European American graduation rate, institution characteristics, state, and state characteristics. In these files, each row was unique to institution and year; the second file contained 2-year institutions only, while the third file contained 4-year institutions. Finally, a data set was created for use in level two of all four models and contained the state and policy variables. All files were created in SPSS 19 and imported into HLM 7 for modeling, as HLM 7 is the most flexible software for hierarchical modeling. Calculated variables described above were computed in SPSS.

Descriptive statistics were run for all variables in order to understand the basic features of the data. Before fitting any multilevel growth models, visualizations were created on the outcome measures to determine if there is, in fact, any change in the outcome measures over time. If there appeared to be changes in outcomes over time, the next step was to specify both level-1 and level-2 models. Visualizing the outcome measures also helped to determine if the relationship between outcomes and time is a linear or curvilinear one. If the relationship did not appear to be linear for any of the outcome measures, a quadratic term needed to be added to the corresponding model (Greenberg & Phillips, 2013). This is necessary because modeling data that is quadratic in nature using a linear term can lead to substantially different (and often invalid) inferences (Anderson, 2012).

I also conducted tests for collinearity among the covariates in the model. Pearson coefficients and the variance inflation factor (VIF)/tolerance test were run on all institutional characteristics and state context variables. Pearson coefficients determine if there is a significant relationship between any two variables; that is, if two measures may be measuring the same thing or are closely connected. The VIF /tolerance test determines the overall collinearity in the model, or how many of the included measures are closely related. If any Pearson coefficients were found to be significant, variables were removed from the analyses. The standard for variable removal were a tolerance less than 0.1 and VIF scores greater than 10.

**Specifying Diagnostic Models**

Before fitting the full growth model, two diagnostic models were specified and fit: (a) an unconditional means model or null model and (b) and unconditional growth

model. The unconditional means model is run without any predictor values and allows you to understand if there is variation in a state's outcome, as well as if there is significant variation between states in their outcomes over time (Gee, 2014). Results provided useful information about the overall pattern of growth in the outcome measures and the difference in growth rates between states (Shin & Milton, 2004). The equation for the unconditional means model for Research Question 1 was as follows:

Level 1:

$$\text{COLLEGEGOING}_{ti} = \pi_{0i} + e_{ti}$$

Level 2:

$$\pi_{0i} = \beta_{00} + r_{0i}$$

Where $\pi_{0i}$ is the intercept; $e_{ti}$ represents the level 1 residual error; $\beta_{00}$ represents the overall mean college-going rate across all years and states; and $r_{0i}$ represents the random error term. If there was found to be a difference in the outcome measures, that indicates that a multilevel growth model is an appropriate methodology (compared to a single-level regression model), and further model fitting can resume (Anderson, 2012). If no difference was found, then there is no difference to be explained by the variables of interest or control variables.

The second diagnostic model fitted was an unconditional growth model, which determines whether the time variable is related to the outcome measures. The only covariate to be entered in this model is YEAR. Results of the unconditional growth model show if there is significant variation in the model intercept and growth rates across states. If there was, then it was appropriate to add covariates at the state (and for Research

Questions 2-4, institution) level to help explain that variation. The equation for the unconditional growth model for Research Question 1 was as follows:

Level 1:

$$COLLEGEGOING_{ti} = \pi_{0i} + \pi_{1i}(YEAR_{ti})\ e_{ti}$$

Level 2:

$$\pi_{0i} = \beta_{00} + r_{0i}$$

$$\pi_{1i} = \beta_{10} + r_{1i}$$

**Specifying the Conditional Growth Model**

The level-1 model addressed how outcomes for each state/institution have changed over time, while the level-2 model addressed how change in the outcomes differs among states based on the presence of state policy. In growth modeling, level-1 models are often referred to as a *within-person* model, while level-2 models are referred to as the *between-person* model (or in the present study, *within-state* and *between-state*; Gee, 2014). In the level-1 model, the outcome is a function of the baseline value plus the annual rate of change plus an error term, while controlling for covariates (Garson, 2013). The full conditional model used in the present study to address Research Question 1 is as follows (assuming a linear relationship):

Level 1:

$$\begin{aligned} COLLEGEGOING_{ti} = {} & \pi_{0i} + \pi_{1i}(YEAR_{ti}) + \pi_{2i}(FAMINCOME_{ti}) + \\ & \pi_{3i}(PAREDU_{ti}) + \pi_{4i}(PAREMP_{ti}) + \pi_{5i}(LININT_{ti}) + \\ & \pi_{6i}(PREENR_{ti}) + \pi_{7i}(KINENR_{ti}) + \pi_{8i}(ELEMREAD_{ti}) + \\ & \pi_{9i}(MSMATH_{ti}) + \pi_{10i}(HSGRAD_{ti}) + \pi_{11i}(YAEDU_{ti}) + \\ & \pi_{12i}(AEATT_{ti}) + \pi_{13i}(ANNINC_{ti}) + \pi_{14i}(STEEMP_{ti}) + e_{ti} \end{aligned}$$

Level 2:

$$\pi_{0i} = \beta_{00} + \beta_{01}(\text{CCRDEF}) + \beta_{02}(\text{CPREQ}) + \beta_{03}(\text{CCALIGN}) + \beta_{04}(\text{HSASSALIGN}) + \beta_{05}(\text{PSDEC}) + r_{0i}$$
$$\pi_{1i} = \beta_{10} + \beta_{11}(\text{CCRDEF}) + \beta_{12}(\text{CPREQ}) + \beta_{13}(\text{CCALIGN}) + \beta_{14}(\text{HSASSALIGN}) + \beta_{15}(\text{PSDEC}) + r_{1i}$$
$$\pi_{2i} = \beta_{20} + \beta_{21}(\text{CCRDEF}) + \beta_{22}(\text{CPREQ}) + \beta_{23}(\text{CCALIGN}) + \beta_{24}(\text{HSASSALIGN}) + \beta_{25}(\text{PSDEC}) + r_{2i}$$
$$\pi_{3i} = \beta_{30} + \beta_{31}(\text{CCRDEF}) + \beta_{32}(\text{CPREQ}) + \beta_{33}(\text{CCALIGN}) + \beta_{34}(\text{HSASSALIGN}) + \beta_{35}(\text{PSDEC}) + r_{3i}$$
$$\pi_{4i} = \beta_{40} + \beta_{41}(\text{CCRDEF}) + \beta_{42}(\text{CPREQ}) + \beta_{43}(\text{CCALIGN}) + \beta_{44}(\text{HSASSALIGN}) + \beta_{45}(\text{PSDEC}) + r_{4i}$$
$$\pi_{5i} = \beta_{50} + \beta_{51}(\text{CCRDEF}) + \beta_{52}(\text{CPREQ}) + \beta_{53}(\text{CCALIGN}) + \beta_{54}(\text{HSASSALIGN}) + \beta_{55}(\text{PSDEC}) + r_{5i}$$
$$\pi_{6i} = \beta_{60} + \beta_{61}(\text{CCRDEF}) + \beta_{62}(\text{CPREQ}) + \beta_{63}(\text{CCALIGN}) + \beta_{64}(\text{HSASSALIGN}) + \beta_{65}(\text{PSDEC}) + r_{6i}$$
$$\pi_{7i} = \beta_{70} + \beta_{71}(\text{CCRDEF}) + \beta_{72}(\text{CPREQ}) + \beta_{73}(\text{CCALIGN}) + \beta_{74}(\text{HSASSALIGN}) + \beta_{75}(\text{PSDEC}) + r_{7i}$$
$$\pi_{8i} = \beta_{80} + \beta_{81}(\text{CCRDEF}) + \beta_{82}(\text{CPREQ}) + \beta_{83}(\text{CCALIGN}) + \beta_{84}(\text{HSASSALIGN}) + \beta_{85}(\text{PSDEC}) + r_{8i}$$
$$\pi_{9i} = \beta_{90} + \beta_{91}(\text{CCRDEF}) + \beta_{92}(\text{CPREQ}) + \beta_{93}(\text{CCALIGN}) + \beta_{94}(\text{HSASSALIGN}) + \beta_{95}(\text{PSDEC}) + r_{9i}$$
$$\pi_{10i} = \beta_{100} + \beta_{101}(\text{CCRDEF}) + \beta_{102}(\text{CPREQ}) + \beta_{103}(\text{CCALIGN}) + \beta_{104}(\text{HSASSALIGN}) + \beta_{105}(\text{PSDEC}) + r_{10i}$$
$$\pi_{11i} = \beta_{11} + \beta_{01}(\text{CCRDEF}) + \beta_{112}(\text{CPREQ}) + \beta_{113}(\text{CCALIGN}) + \beta_{114}(\text{HSASSALIGN}) + \beta_{115}(\text{PSDEC}) + r_{11i}$$
$$\pi_{12i} = \beta_{12} + \beta_{01}(\text{CCRDEF}) + \beta_{122}(\text{CPREQ}) + \beta_{123}(\text{CCALIGN}) + \beta_{124}(\text{HSASSALIGN}) + \beta_{125}(\text{PSDEC}) + r_{12i}$$
$$\pi_{13i} = \beta_{13} + \beta_{131}(\text{CCRDEF}) + \beta_{132}(\text{CPREQ}) + \beta_{133}(\text{CCALIGN}) + \beta_{134}(\text{HSASSALIGN}) + \beta_{135}(\text{PSDEC}) + r_{13i}$$
$$\pi_{14i} = \beta_{14} + \beta_{141}(\text{CCRDEF}) + \beta_{142}(\text{CPREQ}) + \beta_{143}(\text{CCALIGN}) + \beta_{144}(\text{HSASSALIGN}) + \beta_{145}(\text{PSDEC}) + r_{14i}$$

In this model, the intercept term $\pi_{0i}$ represents the average college-going rate in baseline year 2010, and the intercept term $\pi_{1i}$ represents the average yearly change in the college-going rate. The terms $\pi_{2\text{-}14}$ represent the coefficients for the predictor variables included

in level 1. The term $e_{ti}$ represents the residual or unexplained variance. At level 2, the level 1 intercepts/coefficients are set as the outcome in several new regression equations with three components: the level 2 intercept $\beta_{00\text{-}14,}$ the level 2 predictors $\beta_{01\text{-}145}$ of the level 1 predictors $\pi_{0\text{-}14,}$ and the level 2 residual variance $r_{0\text{-}14i.}$ As an example of what the level 2 predictors represent, value $\beta_{21}$ refers to the effect of family income (level 1 predictor) in a state with a CCR definition (level 2 predictor) on the college-going rate (outcome). The models used for Research Questions 2-4 also included institution level covariates at level 1, with the associated level 2 equations.

**Explained Variance**

For the unconditional growth and each of the fitted models, a pseudo $R^2$ statistic was calculated to determine the proportion of outcome variance explained by the model. In traditional multiple regression analysis, the proportion of outcome variation that a model explains is shown in terms of $R^2$ or adjusted $R^2$. However, in multilevel growth modeling, "definition of a similar statistic is trickier because total outcome variation is partitioned into several variance components" (Singer & Willett, 2003, p. 102). Instead, a pseudo-$R^2$ statistic was calculated to explain both the proportion of variance explained by time and the proportion explained by the addition of time-varying predictors (state and institutional covariates). This provided an understanding of the within-unit, or level-1, variance explained. The proportion of variance explained by the addition of between-unit, or level-2, variables was not calculated, as the research identifies serious flaws with the use of the pseudo-$R^2$ methodology at this level due to the complicated links among the model's several parts (Singer & Willett, 2003; Snijders & Bosker, 2012).

**Testing for Differences**

In order to answer Research Questions 2a, 3a, 4, 4a, and 4b, several additional steps were necessary. To answer the sub-questions related to differences between 2- and 4-year institutions, the institutional level data file was split into two different files as discussed earlier--one containing 2-year institutions, and one containing 4-year institutions. The outcomes of retention rate, graduation rate, European American graduation rate, and non-European American graduation rate were modeled using each of these individual files. This resulted in eight models: retention rate at 2-year institutions; retention rate at 4-year institutions; graduation rate at 2-year institutions; graduation rate at 4-year institutions; European American graduation rate at 2-year institutions; European American graduation rate at 4-year institutions; non-European American graduation rate at 2-year institutions; and non-European American graduation rate at 4-year institutions.

When differences were found in the unconditional means model and unconditional growth models for each of these scenarios, coefficients from the conditional growth model were compared for differences. The most appropriate method for examining differences in regression coefficients is a z statistic, which compares the estimated difference between two coefficients to the estimated standard error of the difference (Clogg, Petkova, & Haritou, 1995; Paternoster, Brame, Mazerolle, & Piquero, 1998). The formula for calculating a z statistic with regression coefficients is as follows:

$$Z = b_1\text{-}b_2/\sqrt{(SEb_1^2 + SEb_2^2)}$$

where b represented each of the coefficients, and SEb represented the standard error of that coefficients. A z statistic was calculated for any of the 6 level 2 coefficients found

statistically significant in the final models, and results with an absolute value of 2 or greater were considered significantly different at the .05 level.

## Limitations

There were several limitations of the present study. First, as mentioned previously, the outcome measures of retention and graduation rates only include first-time, full-time degree-seeking students. These measures also only capture if students are retained or complete at their original institution, and do not account for students who transfer. Outcomes for students who do not meet these criteria are not included in the present study. In my analysis of the 2016 IPEDS retention file, on average, this cohort represented only 54% of students in the entering class at public 2- and 4-year institutions. This is a commonly identified limitation in studies that use the IPEDS retention and graduation rates (Abbott, 2016; Bridges, 2013; Hamrick et al., 2004; Sanford & Hunter, 2011; Shin & Milton, 2004), but could only be resolved with changes in the federal data collection or access to student level data at institutions (or states, in the presence of a statewide longitudinal data system).

Second, the present study was limited by the availability of consistent data on college readiness policies at the state level. The *Education Week* research center, which conducted the Annual State Policy Survey used as the source for the policy variables in this study, has not conducted the survey or published results since 2012. Prior to that, the survey was conducted on a biennial basis. The Education Commission of the States published a report on state college readiness policies in 2014, but their policies of interest do not directly align with those captured in the ASPS (Glancy et al., 2014). Because of this, the present study considered the policy variables of interest to be time invariant.

However, there was a great likelihood that additional states have added college readiness policies over the period reflected in this study, or that those with policies in place in 2010-11 may have discontinued or adapted their policies. These changes will not be reflected in the study results, though they may have had an impact on the outcome measures of interest. Other studies have addressed this issue by examining the presence of a policy over a several year period and its relationship with one year of outcomes data, or collecting data on a policy at one point in time only, and looking at the impact in one cohort of students (Abbott, 2016; Kelly & Jones, 2007; Shin, 2010). Given the nature of data available to measure college readiness policies, I chose to use the previously discussed methodology.

Third, this study was limited by the dichotomous nature of the policy variables and the use of secondary data. Using secondary data limits the ability to adapt the measures or further clarify exactly what college readiness policy entails in each state. Furthermore, little is known about the degree of policy implementation in each state, or the time period for which each of the policies has been in place. States with a longer period under each policy may have a greater likelihood of increases in student outcomes. Additionally, it may be a combination of policies that contribute to growth in student outcomes, and the current study is not set up to reflect this possibility. Another limitation related to the use of secondary data is the reliance on assessments as a measure of achievement, especially at the K-12 level. These assessments do not necessarily represent achievement, and often are betters measures of socio-economic and demographic characteristics of a district or school.

Fourth, the present study was limited by the nature of secondary system governance. While principal-agent theory appropriately describes the relationship between state and postsecondary institutions, many K-12 districts and schools operate with significant levels of local control, and their behavior may not be as influenced by state level college readiness policies. While they would be required to adopt any state legislated policies, the commitment to these policies and ability to effectively implement them may vary widely across individual schools and districts within a state. The present study is limited in its ability to accurately reflect this variance. Similarly, school districts within a state vary significantly by the socio-economic and demographic variables mentioned previously, and the present study's use of state level outcome variables and covariables will not reflect these differences.

# CHAPTER IV

# RESULTS

The purpose of this study was to determine whether a relationship exists between state college readiness policies and changes in college-going, retention, and graduate rates over a 7- year period. Because there are also lower graduation rates for certain groups of non-European American students, this study also examined whether there is a difference in the relationship between state college readiness policy and graduation rates for European American and non-European American students. Finally, because different types of institutions have unique missions and generally serve different student populations (in terms of demographics, student intent, and student preparation), I also examined whether the relationship between college readiness policy and retention and graduation rates is different at 2- and 4-year institutions. This analysis was extended to also examine differences in European American and non-European American graduation rates in the 2- and 4-year sectors individually.

In this chapter, I begin with descriptive statistics related to all variables included in the models. I will also discuss the results of tests for collinearity among the variables. Following that, I will present the results for each of the research questions. I will discuss results of the diagnostic models, and present full results for each conditional model, identifying significant coefficients. Finally, where appropriate, I will present the results of t-tests related to research questions comparing European American and non-European American outcomes, as well as outcomes at 2- and 4-year institutions.

## Descriptive Statistics and Tests for Collinearity

Table 5 includes counts of how many states had each of the policies of interest in place in academic year 2010-11, as well as how many policies each state had. Overall, the majority of states had a college-readiness definition, and each state on average had 1.6 policies. Ten states had none of the identified college readiness policies, and five states had four of the five policies. No state had all five policies.

Table 5

*Counts of Policy Related Variables*

| Policy | No | Yes | Mean |
|---|---|---|---|
| College readiness definition | 17 | 33 | 0.66 |
| College-prep courses required | 40 | 10 | 0.20 |
| Diploma aligned with postsecondary admissions | 39 | 11 | 0.22 |
| Assessments aligned with postsecondary expectations | 35 | 15 | 0.30 |
| Use of assessments in admissions and placement | 39 | 11 | 0.22 |

| | 0 | 1 | 2 | 3 | 4 | 5 | Mean |
|---|---|---|---|---|---|---|---|
| Number of policies | 10 | 17 | 11 | 7 | 5 | 0 | 1.6 |

Table 6 provides the mean value for college-going rate, retention rate, graduation rate, European American student graduation rate, and non-European American student graduation rate for each year included in the analysis. With the exception of college-going rate, all outcome measures increased over the 7-year period, with some fluctuation across years. Institutions are only required to report residency status of their first-time

students every other year, so college-going rate can only be calculated for the academic years 2010-11, 2012-13, 2014-15, and 2016-17.

Table 6

*Average Outcome Measure by Year*

| | Year | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| COLLEGEGOING | 0.64 | - | 0.63 | - | 0.62 | - | 0.63 |
| RETENTION | 0.64 | 0.63 | 0.63 | 0.64 | 0.65 | 0.65 | 0.66 |
| GRAD | 0.32 | 0.32 | 0.32 | 0.32 | 0.33 | 0.34 | 0.36 |
| GRADWHITE | 0.33 | 0.34 | 0.34 | 0.35 | 0.36 | 0.37 | 0.39 |
| GRADNONWHITE | 0.26 | 0.26 | 0.26 | 0.27 | 0.28 | 0.28 | 0.30 |

Table 7 provides the mean value for the outcome measures of retention and graduation by the subgroups used in the analyses. There are clear differences in the outcomes at 2- and 4-year institutions, as well as for students from different race/ethnicities within those sectors.

Table 7

*Average Outcome Measure by Year by Subgroup*

| | | Year | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| RETENTION | 4-Year Institutions | *0.73* | 0.73 | 0.73 | 0.74 | 0.74 | 0.75 | 0.74 |
| | 2-Year Institutions | *0.58* | 0.57 | 0.56 | 0.58 | 0.58 | 0.59 | 0.60 |
| GRAD | 4-Year Institutions | *0.45* | 0.45 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 |
| | 2-Year Institutions | *0.23* | 0.22 | 0.22 | 0.22 | 0.24 | 0.26 | 0.27 |
| 4-Year Institutions | GRADWHITE | *0.47* | 0.47 | 0.48 | 0.49 | 0.48 | 0.48 | 0.48 |
| | GRADNONWHITE | *0.38* | 0.39 | 0.39 | 0.40 | 0.40 | 0.40 | 0.40 |
| 2-Year Institutions | GRADWHITE | *0.25* | 0.25 | 0.25 | 0.25 | 0.28 | 0.29 | 0.31 |
| | GRADNONWHITE | *0.19* | 0.17 | 0.17 | 0.17 | 0.19 | 0.20 | 0.22 |

Table 8 displays the average value by year for each of the institutional covariates included in the models by sector. Across years, institutions included in the analyses have increased the percentages of non-European American, part-time, and out-of-state students enrolled. Average spending on instructional expenditures and student services (displayed in millions) has also increased.

Table 8

*Average Institutional Variable Values by Year*

| | | Year | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 4-Year Institutions | NONWHITE | .30 | .31 | .33 | .33 | .34 | .35 | .36 |
| | PARTTIME | .23 | .24 | .25 | .25 | .25 | .25 | .27 |
| | OOS | .16 | .16 | .17 | .17 | .17 | .17 | .18 |
| | ACT | 20.77 | 20.77 | 20.76 | 20.79 | 20.91 | 21.05 | 21.14 |
| | INSEXP | $106 | $109 | $112 | $117 | $120 | $123 | $125 |
| | SSEXP | $ 16 | $ 17 | $ 18 | $ 19 | $ 20 | $ 20 | $ 21 |
| 2-Year Institutions | NONWHITE | .34 | .35 | .37 | .37 | .38 | .39 | .39 |
| | PARTTIME | .55 | .56 | .57 | .57 | .58 | .59 | .59 |
| | OOS | .06 | .06 | .07 | .06 | .07 | .06 | .07 |
| | INSEXP | $23 | $24 | $25 | $25 | $26 | $26 | $25 |
| | SSEXP | $ 6 | $ 6 | $ 6 | $ 6 | $ 6 | $ 7 | $ 7 |

Table 9 provides counts for each category of the condensed variable representing Carnegie classifications. The largest number of institutions included represent the public 2-year sector, followed by public master's colleges and universities.

Table 9

*Counts of Institutions by Carnegie Classification by Year*

| | Year | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Public Doctoral/Research Universities | 173 | 174 | 174 | 174 | 174 | 174 | 174 |
| Public Masters Colleges and Universities | 269 | 269 | 268 | 266 | 266 | 264 | 263 |
| Public Baccalaureate Colleges | 126 | 126 | 126 | 124 | 123 | 123 | 123 |
| Other Public 4-Year | 102 | 103 | 111 | 117 | 128 | 139 | 167 |
| Public 2-Year | 961 | 952 | 918 | 918 | 904 | 894 | 870 |
| Tribal Colleges | 32 | 32 | 33 | 33 | 33 | 33 | 33 |

Table 10 represents the average annual value for the state level covariates. Parental education and employment levels have increased over the period of interest, as have high school graduation rates, postsecondary enrollment rates, adult educational attainment and employment levels. No noticeable changes have been made in family income, preschool enrollment, or middle school mathematics achievement during this period.

Table 10

*Average State Variable Values by Year*

| | Year | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| FAMINCOME | 58.2 | 57.3 | 56.9 | 56.8 | 57.3 | 57.7 | 59.0 |
| PAREDU | 44.9 | 46.5 | 47.2 | 48 | 49.1 | 49.8 | 50.5 |
| PAREMP | 72.5 | 72.5 | 73.3 | 73.9 | 74.3 | 75.3 | 76.4 |
| LININT | 87.5 | 89.0 | 88.9 | 89.0 | 89.0 | 88.7 | 88.7 |
| PREENR | 45.2 | 46.7 | 46.4 | 46.2 | 45.8 | 45.6 | 45.2 |
| KINENR | 75.9 | 77.5 | 77.7 | 77.0 | 76.7 | 76.9 | 77.2 |
| ELEMREAD | 31.5 | 33.1 | 33.1 | 34.8 | 34.8 | 35.9 | 35.9 |
| MSMATH | 32.5 | 34.6 | 34.6 | 35.0 | 35.0 | 32.9 | 32.9 |
| HSGRAD | 68.9 | 71.8 | 73.5 | 75.0 | 81.2 | 81.2 | 83.2 |
| YAEDU | 51.7 | 54.3 | 54.8 | 54.8 | 54.2 | 53.9 | 54.2 |
| AEATT | 36.9 | 38.3 | 38.7 | 39.3 | 39.7 | 40.0 | 40.6 |
| ANNINC | 48.1 | 50.5 | 51.2 | 50 | 49.9 | 49.9 | 49.9 |
| STEEMP | 68.5 | 68.7 | 69.4 | 70.5 | 71.0 | 72.0 | 72.9 |

Diagnostic tests were run on all variables to be included in the model to determine if any collinearity existed among variables. For all models of outcome measures, both PAREDU (percent of children with at least one parent with a postsecondary degree) and PAREEMP (percent of children with at least one parent working full time and year-round) were found to have a tolerance of less than 0.1 and a VIF score greater than 10, and were removed from future analyses. In the institution level dataset, the variables for instructional and student services expenditures were closely related to other covariates and were also excluded from analyses. Models run for 2-year institutions only did not

include the variables CARNEGIE (because of the lack of variation in the data) and ACT (because of the large quantity of missing data).

## Research Question 1

Q1 What is the relationship between state college readiness policy and the change in statewide college-going rates when controlling for state-level covariates?

An initial visual examination of the plotted growth trajectories did not show a change in the college-going rate over time. This was explored further through diagnostic models.

The first model fitted was the unconditional means model, or a one-way analysis of variance (ANOVA). Results of this model are displayed in Table 11. The average state college-going rate was statistically different from zero and there was also variation in the state means for college-going. This finding indicates that it is appropriate to move forward with hierarchical linear modeling techniques, since there is a difference in college-going rates that may be explained by additional factors.

Table 11

*Model A: Unconditional Means Model--College Going*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.628354 | 0.009687 | 64.868 | 49 | <0.001 |
| **Final Estimation of Variance Components** | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.06799 | 0.00462 | 49 | 1429.56109 | <0.001 |
| level-1, *e* | 0.02562 | 0.00066 | | | |

I next fitted the unconditional growth model, which adds the variable of YEAR to determine if college-going rates have changed over time. Results of this model, displayed in Table 12, confirm the visual analysis of the plotted values--while there is variation among states, there is not a significant change in the college-going rate over time. Results of the pseudo-$R^2$ statistic show that adding year only explains 1.5% of the variance in college-going rates. Given this finding, it would not be appropriate to move forward with additional modeling on the growth in college-going rates. Instead, I conducted an additional analysis in SPSS to determine if there is any relationship between state college readiness policy and college-going rates in year 6 (2016-17). Only one year could be included in this analysis due to the related nature of the state level records. This analysis used a hierarchical regression model with state variables entered in step 1 (model C1), and policy variables entered in step 2 (model C2). Because the variable of policy count (POLCOUNT) was so closely correlated with the other policy variables, a separate model

(model C3) was fitted to measure the relationship between the number of college readiness policies and college-going rate. Doing so allowed me to identify the specific relationship for number of policies without any interference from the other policy variables. Results of the hierarchical regression models are displayed in Table 13.

Table 12

*Model B: Unconditional Growth Model--College Going*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.631288 | 0.009944 | 63.481 | 49 | <0.001 |
| For YEAR slope, $\pi_1$ | | | | | |
| INTRCPT2, $\beta_{10}$ | -0.000978 | 0.001034 | -0.946 | 149 | 0.346 |
| Final Estimation of Variance Components | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.06800 | 0.00462 | 49 | 1433.96090 | <0.001 |
| level-1, *e* | 0.02558 | 0.00065 | | | |

Table 13

*Model C: Conditional Means Model--College-Going Year 6*

| | Model C1 | | | | Model C2 | | | | Model C3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | *SE* | *t*-ratio | *p*-value | Coefficient | *SE* | *t*-ratio | *p*-value | Coefficient | *SE* | *t*-ratio | *p*-value |
| (Constant) | -.035 | .408 | -.086 | .932 | .053 | .442 | .121 | .904 | .005 | .413 | .011 | .991 |
| FAMINCOME | -.006 | .003 | -1.899 | .065 | -.004 | .004 | -1.197 | .240 | -.005 | .003 | -1.717 | .094 |
| LININT | .002 | .001 | 1.401 | .169 | .002 | .001 | 1.524 | .137 | .002 | .001 | 1.507 | .140 |
| PREENR | .005 | .002 | 3.113 | .004** | .005 | .002 | 2.701 | .011* | .005 | .002 | 3.125 | .003** |
| KINENR | -.004 | .004 | -1.200 | .238 | -.006 | .004 | -1.429 | .162 | -.005 | .004 | -1.282 | .208 |
| ELEMREAD | -.003 | .002 | -1.364 | .181 | -.003 | .003 | -.964 | .342 | -.003 | .002 | -1.292 | .204 |
| MSMATH | -.001 | .002 | -.613 | .544 | -.002 | .002 | -.916 | .366 | -.001 | .002 | -.624 | .537 |
| HSGRAD | -.001 | .002 | -.586 | .561 | -.002 | .002 | -.918 | .365 | -.002 | .002 | -.768 | .448 |
| YAEDU | .005 | .002 | 2.390 | .022* | .005 | .002 | 2.183 | .036* | .005 | .002 | 2.384 | .022* |
| AEATT | .001 | .004 | .310 | .758 | .002 | .004 | .432 | .669 | .002 | .004 | .397 | .693 |
| ANNINC | .005 | .003 | 1.490 | .145 | .004 | .003 | 1.015 | .317 | .004 | .003 | 1.308 | .199 |
| STEEMP | .009 | .003 | 2.723 | .010* | .009 | .004 | 2.553 | .015* | .009 | .003 | 2.594 | .014* |
| CCRDEF | | | | | .027 | .022 | 1.213 | .234 | | | | |
| CPREQ | | | | | .003 | .022 | .125 | .901 | | | | |
| CCALIGN | | | | | .003 | .021 | .136 | .892 | | | | |
| HSASSALIGN | | | | | -.015 | .020 | -.772 | .446 | | | | |
| PSDEC | | | | | .022 | .022 | 1.043 | .305 | | | | |
| POLCOUNT | | | | | | | | | .006 | .007 | .808 | .424 |
| *R* | .804 | | | | .819 | | | | .808 | | | |
| $R^2$ | .647 | | | | .671 | | | | .653 | | | |
| *df* | 11,38 | | | | 16, 33 | | | | 12, 37 | | | |
| *F* | 6.319 | | | | 4.203 | | | | 5.794 | | | |

* $p < .05$, ** $p < .01$

The variables related to state context explain 64.7% of the variance in college-going rates; adding the five college readiness policies explains an additional 2.4%, and the count of policies only adds 0.6%. The models show a positive relationship between several variables and college-going rates: the percent of 3- and 4-year old children enrolled in preschool; the percent of young adults enrolled in postsecondary education; and the percent of adults in the labor force working full time and year round. This may indicate that states with a history of college enrollment and strong employment opportunities may see greater rates of college-going among students graduating from high school. Among the variables related to college readiness policies, none were significantly correlated to the 2016-17 college-going rates after controlling for state-level variables.

In summary, there has been no change in average statewide college-going rates over the period included in this study. No relationship exists between state college readiness policy and college-going rates, though at the state level, preschool enrollment, young adult enrollment in postsecondary education, and steady employment all positively correlate to college-going.

**Research Question 2**

Q2 What is the relationship between state college readiness policy and the change in institutional retention rates when controlling for state-and institutional-level covariates?

An initial visual examination of the plotted retention rates by year show a positive linear relationship over time. Results of the diagnostic models confirm this.

**Two-Year Institutions--Retention**

The first model fitted was the unconditional means model (model D), or a one-way analysis of variance (ANOVA). Results of this model are displayed in Table 14. The average state level retention rate is statistically different from zero and there is also variation in the state means. This finding indicates that it is appropriate to move forward with hierarchical linear modeling techniques, since there is a difference in retention rates that may be explained by additional factors.

Table 14

*Model D: Unconditional Means Model--2-Year Institutions--Retention*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.569887 | 0.005729 | 99.469 | 49 | <0.001 |
| **Final Estimation of Variance Components** | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.03926 | 0.00154 | 49 | 2213.95671 | <0.001 |
| level-1, *e* | 0.08399 | 0.00705 | | | |

I next fitted the unconditional growth model (model E), which adds the variable of YEAR to determine if retention rates have changed over time. Results of this model, displayed in Table 15, confirm the visual analysis of the plotted values--retention rates have increased over time at a rate of 0.4% annually. However, results of the pseudo-$R^2$ statistic show that YEAR only explains 0.1% of the variance in retention rates, which indicates that while year contributes, there must be other variables that explain more of

the between state variation in retention rate. Given this change, it was appropriate to move forward with hierarchical growth modeling in order to determine what factors may explain this growth.

Table 15

*Model E: Unconditional Growth Model--2-Year Institutions--Retention*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.557716 | 0.00616 | 90.538 | 49 | <0.001 |
| For YEAR slope, $\pi_1$ | | | | | |
| INTRCPT2, $\beta_{10}$ | 0.004229 | 0.000592 | 7.149 | 6498 | <0.001 |
| Final Estimation of Variance Components | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.0391 | 0.00153 | 49 | 2224.78768 | <0.001 |
| level-1, *e* | 0.08357 | 0.00698 | | | |

Next, I added in covariates at level 1 and 2 to create a conditional growth model (model F). Again, two versions were created; one with CCRDEF, CPREQ, CCALIGN, HSASSALI, and PSDEC as the level-2 variables, and one with POLCOUNT (representing a count of how many of those policies a state has). Results for both models can be found in Table 16 below.

Table 16

*Model F: Conditional Growth Model--2-Year Institutions--Retention*

Final estimation of fixed effects (with robust standard errors)

| | | Model F1 | | | | | Model F2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fixed Effect | | Coefficient | *SE* | t-ratio | *df* | *p*-value | Coefficient | *SE* | t-ratio | *df* | *p*-value |
| For INTRCPT1, π0 | INTRCPT2, β00 | 0.930 | 0.116 | 7.990 | 44 | <0.001 | | | | | |
| | CCRDEF, β01 | 0.002 | 0.013 | 0.159 | 44 | 0.874 | | | | | |
| | CPREQ, β02 | -0.001 | 0.012 | -0.059 | 44 | 0.953 | | | | | |
| | CCALIGN, β03 | -0.009 | 0.010 | -0.900 | 44 | 0.373 | | | | | |
| | HSASSALI, β04 | -0.013 | 0.011 | -1.190 | 44 | 0.241 | | | | | |
| | PSDEC, β05 | 0.011 | 0.012 | 0.913 | 44 | 0.366 | | | | | |
| For INTRCPT1, π0 | INTRCPT2, β00 | | | | | | 0.935 | 0.116 | 8.040 | 48 | <0.001 |
| | POLCOUNT, β01 | | | | | | -0.003 | 0.004 | -0.705 | 48 | 0.484 |
| For YEAR slope, π1 | INTRCPT2, β10 | 0.004 | 0.001 | 3.388 | 4609 | <0.001** | 0.004 | 0.001 | 3.367 | 4609 | <0.001** |
| For NONWHITE slope, π2 | INTRCPT2, β20 | -0.040 | 0.034 | -1.161 | 4609 | 0.246 | -0.040 | 0.034 | -1.162 | 4609 | 0.245 |
| For PARTTIME slope, π3 | INTRCPT2, β30 | -0.067 | 0.043 | -1.561 | 4609 | 0.119 | -0.067 | 0.043 | -1.577 | 4609 | 0.115 |
| For OOS slope, π4 | INTRCPT2, β40 | -0.108 | 0.031 | -3.534 | 4609 | <0.001** | -0.108 | 0.030 | -3.557 | 4609 | <0.001** |
| For FAMINCOM slope, π4 | INTRCPT2, β50 | 0.004 | 0.001 | 3.473 | 4609 | <0.001** | 0.004 | 0.001 | 3.664 | 4609 | <0.001** |
| For LININT slope, π6 | INTRCPT2, β60 | -0.002 | 0.001 | -3.569 | 4609 | <0.001** | -0.002 | 0.001 | -4.327 | 4609 | <0.001** |
| For PREENR slope, π7 | INTRCPT2, β70 | 0.002 | 0.001 | 2.604 | 4609 | 0.009** | 0.002 | 0.001 | 2.645 | 4609 | 0.008** |
| For KINENR slope, π8 | INTRCPT2, β80 | 0.000 | 0.001 | -0.262 | 4609 | 0.793 | 0.000 | 0.001 | -0.089 | 4609 | 0.929 |
| For ELEMREAD slope, π9 | INTRCPT2, β90 | 0.001 | 0.001 | 0.901 | 4609 | 0.368 | 0.001 | 0.001 | 0.874 | 4609 | 0.382 |
| For MSMATH slope, π10 | INTRCPT2, β100 | 0.000 | 0.001 | 0.100 | 4609 | 0.921 | 0.000 | 0.001 | 0.147 | 4609 | 0.883 |
| For HSGRAD slope, π11 | INTRCPT2, β110 | 0.000 | 0.000 | 0.967 | 4609 | 0.334 | 0.000 | 0.000 | 0.937 | 4609 | 0.349 |
| For YAEDU slope, π12 | INTRCPT2, β120 | -0.001 | 0.001 | -1.705 | 4609 | 0.088 | -0.001 | 0.001 | -1.494 | 4609 | 0.135 |
| For AEATT slope, π13 | INTRCPT2, β130 | 0.000 | 0.001 | -0.251 | 4609 | 0.802 | -0.001 | 0.001 | -0.366 | 4609 | 0.714 |
| For ANNINC slope, π14 | INTRCPT2, β140 | -0.003 | 0.002 | -2.116 | 4609 | 0.034* | -0.003 | 0.002 | -2.093 | 4609 | 0.036* |

* $p < .05$, ** $p < .01$

Both fitted models were found to be significant, with a pseudo-$R^2$ statistic of .196, indicating that the level-1 variables explained an additional 20% of the variance in retention rates. None of the policy variables of interest were found to be significantly related to retention rates, indicating that the presence of state college-readiness policies did not correlate to an individual institution's retention rate.

Several of the level-1 state and institution level covariates did show significant relationships with retention rates. Among the institution level covariates, only the percent of students from out-of-state was found to be statistically significant in the model. For every 1% increase in the percent of out-of-state students, institutional retention rates decreased by 0.1% at 2-year institutions. The majority of states with average out-of-state enrollments in the 2-year sector of 10% or more are rural with smaller higher education sectors, so this variable may actually be representing something else about the 2-year institutions within these states. Note that the institution level variables NONWHITE, PARTTIME, and OOS are all calculated as percentages, with values between 0-1, while all other ratio type covariates are on a 0-100 scale. At the state level, the percent of children in families with incomes at least 200% of the poverty level as well as the percent of 3- and 4-year old children enrolled in preschool were both found to have a positive relationship with retention rates. For every 1% increase in percentage of linguistic integration within a state (that is, the percentage of children whose parents are fluent English-speakers), institutional retention rates decreased by 0.2%, an unexpected result. States with higher linguistic integration rates tend to be less populated and more rural (for example, Montana, North Dakota, and West Virginia), so this variable may potentially be a proxy for something else not accounted for in the Education Week reports. In addition,

the percent of adults with incomes at or above the national median was negatively related to 2-year institution retention rates, which may be due to a lack of financial commitment to the 2-year sector or an emphasis on student transfer in states with higher median wages.

**Four-Year Institutions--Retention**

Switching to 4-year institutions, again the first model fitted was the unconditional means model (model G). Results of model G can be found in Table 17. The average state level retention rate is statistically different from zero and there is also variation in the state means. As with the 2-year institutions, this finding indicates that it is appropriate to move forward with hierarchical linear modeling techniques.

Table 17

*Model G: Unconditional Means Model--4-Year Institutions--Retention*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.730754 | 0.00853 | 85.671 | 49 | <0.001 |
| **Final Estimation of Variance Components** | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.05916 | 0.0035 | 49 | 1603.45407 | <0.001 |
| level-1, *e* | 0.10274 | 0.01056 | | | |

I next fitted the unconditional growth model (model H), which adds the variable of YEAR to determine if retention rates have changed over time. Results of this model, displayed in Table 18, confirm the visual analysis of the plotted values--retention rates

have increased over time at a rate of 0.2% annually. At 4-year institutions, results of the pseudo-$R^2$ statistic show that YEAR explains 0.3% of the variance in retention rates. Given this change, it is appropriate to move forward with hierarchical growth modeling in order to determine what factors may explain this growth.

Table 18

*Model H: Unconditional Growth Model--4-Year Institutions--Retention*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.723281 | 0.00906 | 79.833 | 49 | <0.001 |
| For YEAR slope, $\pi_1$ | | | | | |
| INTRCPT2, $\beta_{10}$ | 0.002479 | 0.000532 | 4.659 | 4201 | <0.001 |
| Final Estimation of Variance Components | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.0591 | 0.00349 | 49 | 1604.62667 | <0.001 |
| level-1, *e* | 0.10264 | 0.01053 | | | |

I next added the institution and state level covariates to create two versions of the conditional growth model (model I). Results of model I can be found in Table 19. Both fitted models were found to be significant, with a pseudo-$R^2$ statistic of .763, indicating that the level-1 variables explained an additional 76% of the variance in retention rates. Again, none of the policy variables of interest were found to be significantly related to retention rates, indicating that the presence of state college-readiness policies did not correlate to an individual institution's retention rate.

Table 19

*Model I: Conditional Growth Model--4-Year Institutions--Retention*

Final estimation of fixed effects (with robust standard errors)

| | | Model I1 | | | | | Model I2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fixed Effect | | Coefficient | *SE* | *t*-ratio | *df* | *p*-value | Coefficient | *SE* | *t*-ratio | *df* | *p*-value |
| For INTRCPT1, π0 | INTRCPT2, β00 | 0.423 | 0.043 | 9.949 | 44 | <0.001 | | | | | |
| | CCRDEF, β01 | 0.015 | 0.012 | 1.251 | 44 | 0.218 | | | | | |
| | CPREQ, β02 | 0.024 | 0.014 | 1.734 | 44 | 0.090 | | | | | |
| | CCALIGN, β03 | -0.021 | 0.013 | -1.623 | 44 | 0.112 | | | | | |
| | HSASSALI, β04 | -0.030 | 0.017 | -1.701 | 44 | 0.096 | | | | | |
| | PSDEC, β05 | 0.011 | 0.016 | 0.702 | 44 | 0.486 | | | | | |
| For INTRCPT1, π0 | INTRCPT2, β00 | | | | | | 0.431 | 0.044 | 9.875 | 48 | <0.001 |
| | POLCOUNT, β01 | | | | | | -0.002 | 0.005 | -0.369 | 48 | 0.714 |
| For YEAR slope, π1 | INTRCPT2, β10 | 0.000 | 0.001 | 0.102 | 2661 | 0.918 | 0.000 | 0.001 | 0.064 | 2661 | 0.949 |
| For NONWHITE slope, π2 | INTRCPT2, β20 | 0.021 | 0.016 | 1.317 | 2661 | 0.188 | 0.021 | 0.016 | 1.305 | 2661 | 0.192 |
| For PARTTIME slope, π3 | INTRCPT2, β30 | -0.098 | 0.017 | -5.656 | 2661 | <0.001** | -0.098 | 0.017 | -5.628 | 2661 | <0.001** |
| For OOS slope, π4 | INTRCPT2, β40 | 0.006 | 0.019 | 0.308 | 2661 | 0.758 | 0.007 | 0.019 | 0.343 | 2661 | 0.732 |
| For CARNEGIE slope, π5 | INTRCPT2, β50 | -0.018 | 0.004 | -4.305 | 2661 | <0.001** | -0.018 | 0.004 | -4.321 | 2661 | <0.001** |
| For ACT slope, π6 | INTRCPT2, β60 | 0.019 | 0.002 | 12.535 | 2661 | <0.001** | 0.019 | 0.002 | 12.573 | 2661 | <0.001** |
| For FAMINCOM slope, π7 | INTRCPT2, β70 | 0.001 | 0.001 | 1.697 | 2661 | 0.090 | 0.001 | 0.001 | 1.455 | 2661 | 0.146 |
| For LININT slope, π8 | INTRCPT2, β80 | -0.002 | 0.001 | -2.891 | 2661 | 0.004** | -0.002 | 0.001 | -3.939 | 2661 | <0.001** |
| For PREENR slope, π9 | INTRCPT2, β90 | 0.001 | 0.001 | 1.741 | 2661 | 0.082 | 0.001 | 0.001 | 2.205 | 2661 | 0.028* |
| For KINENR slope, π10 | INTRCPT2, β100 | -0.001 | 0.001 | -1.038 | 2661 | 0.299 | 0.000 | 0.001 | -0.753 | 2661 | 0.452 |
| For ELEMREAD slope, π11 | INTRCPT2, β110 | 0.001 | 0.001 | 1.490 | 2661 | 0.136 | 0.001 | 0.001 | 1.516 | 2661 | 0.130 |
| For MSMATH slope, π12 | INTRCPT2, β120 | 0.000 | 0.001 | -0.136 | 2661 | 0.892 | 0.000 | 0.001 | -0.081 | 2661 | 0.935 |
| For HSGRAD slope, π13 | INTRCPT2, β130 | 0.000 | 0.000 | -0.213 | 2661 | 0.831 | 0.000 | 0.000 | -0.247 | 2661 | 0.805 |
| For YAEDU slope, π14 | INTRCPT2, β140 | -0.001 | 0.001 | -1.240 | 2661 | 0.215 | -0.001 | 0.001 | -0.952 | 2661 | 0.341 |
| For AEATT slope, π15 | INTRCPT2, β150 | 0.002 | 0.001 | 1.336 | 2661 | 0.182 | 0.002 | 0.001 | 1.167 | 2661 | 0.243 |
| For ANNINC slope, π16 | INTRCPT2, β160 | 0.000 | 0.001 | -0.577 | 2661 | 0.564 | 0.000 | 0.001 | -0.497 | 2661 | 0.619 |
| For STEEMP slope, *π17* | INTRCPT2, β170 | 0.000 | 0.001 | -0.166 | 2661 | 0.868 | 0.000 | 0.001 | 0.127 | 2661 | 0.899 |

* $p < .05$, ** $p < .01$

At 4-year institutions, the percent of students enrolled part-time was found to have a significant negative relationship: for every 1% increase in the percentage of part-time students, retention rates decreased 0.1%. Carnegie classification is also negatively correlated to retention. The variable for Carnegie classification was coded with Doctoral/Research Universities as 1, so this indicates that as you move down the Carnegie classifications to lower research universities; retention rates decrease by 1.8% per category (so 4-year institutions with a greater research intensity had higher retention rates). Median ACT (or SAT) score of incoming students has a positive relationship with retention rates; for every 1-point score increase, retention rates increased by 1.9%.

**Research Question 2a**

Q2a Is there a difference in the relationship between state college readiness policy and the change in institutional retention rates at 2-year institutions compared to 4-year institutions when controlling for state-and institutional-level covariates?

No policies related to college readiness were found to be significantly related to retention rates, so there is no difference in the relationship between sectors to explore further. However, there are several differences worth noting in the models for 2- and 4-year institutions. At 2-year institutions, the fitted model explains 20% of the variance in retention rates (pseudo-$R^2$ =.196), while at 4-year institutions the model explains 76% of the variance (pseudo-$R^2$ =.763). Clearly there are additional variables that better explain the variance in retention at 2-year institutions that were not included in this study; these variables might include median student age, institutional mission (technical training vs. transfer focused), and institution location (rural vs. urban).

Year is significantly related to retention rates at 2-year institutions but not 4-year, further indicating that the covariates in the model are explaining growth at 4-year

institutions, but not fully for 2-year institutions. Only one variable was found to have significant correlations for both 2- and 4-year institutions: as in the overall model, the linguistic integration of a state (that is, the percentage of children whose parents are fluent English-speakers) is negatively related to retention. To determine if there are any significant differences in the strength of these correlations, I calculated a z statistic for the coefficients for this variable in both models. For LININT, the z statistic was 0, indicating there is no significant difference in the relationship at 2- and 4-year institutions.

In addition, several other variables significantly related to 2-year retention rates that were not found to be significant for 4-year institutions. The percent of enrollment that comes from out-of-state as well as the percent of adults with incomes at or above the national median all related negatively to retention rates. The percent of children in families with incomes at least 200% of the poverty level as well as the percent of 3- and 4-year old children enrolled in preschool are both found to have a positive relationship with growth in 2-year institution retention rates. At 4-year institutions, the percent of enrollment by part-time students has a negative relationship with retention rates, but not at 2-year institutions.

In summary, there is no evident relationship between state college readiness policy and retention rates in both the 2- and 4-year sector. Several institution and state level variables correlate to retention rates, though no significant differences are found in the significance of these relationships between the two sectors.

**Research Question 3**

Q3 What is the relationship between state college readiness policy and the change in institutional graduation rates when controlling for state-and institutional-level covariates?

An initial visual examination of the plotted graduation rates by year show a positive linear relationship over time, with greater change among 2-year institutions. Results of the diagnostic models confirm this.

**Two-Year Institutions--Graduation**

The first model fitted was the unconditional means model (model J), or a one-way analysis of variance (ANOVA). Results of this model are displayed in Table 20. The average state level graduation rate was statistically different from zero and there was also variation in the state means. This finding indicates that it is appropriate to move forward with hierarchical linear modeling techniques, since there is a difference in graduation rates that may be explained by additional factors.

Table 20

*Model J: Unconditional Means Model--2-Year Institution--Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.241268 | 0.009756 | 24.731 | 49 | <0.001 |
| **Final Estimation of Variance Components** | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.06793 | 0.00461 | 49 | 1937.49893 | <0.001 |
| level-1, *e* | 0.10632 | 0.0113 | | | |

I next fitted the unconditional growth model (model K), which adds the variable of YEAR to determine if retention rates have changed over time. Results of this model, found in Table 21, confirm the visual analysis of the plotted values--graduation rates at

2-year institutions have increased over time at a rate of 0.8% annually. Results of the pseudo-$R^2$ statistic show that YEAR explains 2.4% of the variance in graduation rates. Given this change, it is appropriate to move forward with hierarchical growth modeling in order to determine what factors may explain this growth.

Table 21

*Model K: Unconditional Growth Model--2-Year Institutions--Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.217395 | 0.01041 | 20.883 | 49 | <0.001 |
| For YEAR slope, $\pi_1$ | | | | | |
| INTRCPT2, $\beta_{10}$ | 0.008321 | 0.000913 | 9.118 | 6428 | <0.001 |
| Final Estimation of Variance Components | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.06776 | 0.00459 | 49 | 1996.10169 | <0.001 |
| level-1, *e* | 0.10502 | 0.01103 | | | |

Next, I added in covariates at level 1 and 2 to create a conditional growth model (model L). Again, two versions were created; one with CCRDEF, CPREQ, CCALIGN, HSASSALI, and PSDEC as the level-2 variables, and one with POLCOUNT (representing a count of how many of those policies a state has). Table 22 includes the results of both versions.

Table 22:

*Model L: Conditional Growth Model--2-Year Institution--Graduation*

Final estimation of fixed effects (with robust standard errors)

| | | Model L1 | | | | | Model L2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fixed Effect | | Coefficient | *SE* | *t*-ratio | *df* | *p*-value | Coefficient | *SE* | *t*-ratio | *df* | *p*-value |
| For INTRCPT1, π0 | INTRCPT2, β00 | 0.379 | 0.037 | 10.347 | 44 | <0.001 | | | | | |
| | CCRDEF, β01 | 0.015 | 0.021 | 0.710 | 44 | 0.481 | | | | | |
| | CPREQ, β02 | -0.040 | 0.015 | -2.583 | 44 | 0.013* | | | | | |
| | CCALIGN, β03 | -0.019 | 0.016 | -1.152 | 44 | 0.256 | | | | | |
| | HSASSALI, β04 | -0.030 | 0.021 | -1.457 | 44 | 0.152 | | | | | |
| | PSDEC, β05 | -0.003 | 0.018 | -0.160 | 44 | 0.874 | | | | | |
| For INTRCPT1, π0 | INTRCPT2, β00 | | | | | | 0.391 | 0.035 | 11.256 | 48 | <0.001 |
| | POLCOUNT, β01 | | | | | | -0.014 | 0.006 | -2.363 | 48 | 0.022* |
| For YEAR slope, π1 | INTRCPT2, β10 | 0.010 | 0.001 | 6.645 | 4579 | <0.001** | 0.010 | 0.002 | 6.438 | 4579 | <0.001** |
| For NONWHITE slope, π2 | INTRCPT2, β20 | -0.172 | 0.024 | -7.174 | 4579 | <0.001** | -0.172 | 0.024 | -7.168 | 4579 | <0.001** |
| For PARTTIME slope, π3 | INTRCPT2, β30 | -0.193 | 0.037 | -5.239 | 4579 | <0.001** | -0.193 | 0.037 | -5.278 | 4579 | <0.001** |
| For OOS slope, π4 | INTRCPT2, β40 | 0.071 | 0.044 | 1.607 | 4579 | 0.108 | 0.071 | 0.044 | 1.606 | 4579 | 0.108 |
| For FAMINCOM slope, π4 | INTRCPT2, β50 | 0.003 | 0.001 | 3.110 | 4579 | 0.002** | 0.003 | 0.001 | 3.077 | 4579 | 0.002** |
| For LININT slope, π6 | INTRCPT2, β60 | -0.002 | 0.001 | -2.542 | 4579 | 0.011* | -0.002 | 0.001 | -3.044 | 4579 | 0.002** |
| For PREENR slope, π7 | INTRCPT2, β70 | 0.000 | 0.001 | 0.282 | 4579 | 0.778 | 0.001 | 0.001 | 0.513 | 4579 | 0.608 |
| For KINENR slope, π8 | INTRCPT2, β80 | 0.001 | 0.001 | 0.995 | 4579 | 0.320 | 0.001 | 0.001 | 1.122 | 4579 | 0.262 |
| For ELEMREAD slope, π9 | INTRCPT2, β90 | -0.002 | 0.001 | -1.770 | 4579 | 0.077 | -0.002 | 0.001 | -1.768 | 4579 | 0.077 |
| For MSMATH slope, π10 | INTRCPT2, β100 | 0.001 | 0.001 | 2.041 | 4579 | 0.041* | 0.001 | 0.001 | 2.095 | 4579 | 0.036* |
| For HSGRAD slope, π11 | INTRCPT2, β110 | 0.000 | 0.000 | -0.718 | 4579 | 0.473 | 0.000 | 0.000 | -0.633 | 4579 | 0.527 |
| For YAEDU slope, π12 | INTRCPT2, β120 | 0.000 | 0.001 | -0.116 | 4579 | 0.908 | 0.000 | 0.001 | -0.151 | 4579 | 0.880 |
| For AEATT slope, π13 | INTRCPT2, β130 | 0.002 | 0.002 | 1.163 | 4579 | 0.245 | 0.002 | 0.002 | 1.082 | 4579 | 0.279 |
| For ANNINC slope, π14 | INTRCPT2, β140 | -0.007 | 0.001 | -5.908 | 4579 | <0.001** | -0.007 | 0.001 | -5.976 | 4579 | <0.001** |
| For STEEMP slope, $\pi_{15}$ | INTRCPT2, β150 | 0.003 | 0.002 | 1.866 | 4579 | 0.062 | 0.003 | 0.001 | 1.959 | 4579 | 0.050 |

* $p < .05$, ** $p < .01$

Both fitted models were found to be significant, with a pseudo-$R^2$ statistic of .318, indicating that the level-1 variables explained an additional 32%% of the variance in graduation rates. Two of the policy variables of interest are found to be significantly related to graduation rates, though with a negative relationship. States that require a college preparatory curriculum in high school have graduation rates 4% lower than those that did not. In addition, for each additional policy a state had in place, graduation rates were 1.4% lower. Both of these are interesting and unexpected findings and may indicate that the college readiness policies included in this study are more focused on 4-year institutions than 2-year and may encourage students who attend 2-year institutions to transfer rather than graduate from their initial institution. In addition, of the 12 states with 3 or 4 policies in place, 9 had average state graduation rates at or below the national average, indicating that these states may have so many policies because they already have low graduation rates in the 2-year sector, and these policies may be an attempt to address the issue.

As with retention, several of the level-1 state and institution level covariates did show significant relationships with graduation rates. Among the institution level covariates, both the percent of non-European American students and part-time students are found to be statistically significant in the model. That is, institutions with a more diverse student body and a greater number of part-time students have lower graduation rates. After controlling for other factors, for every 1% increase in the percent of non-European American and part-time students, institutional graduation rates decreased by 0.2% at 2-year institutions. Note that part-time students are not included in the graduation

rate calculation, so an increase in the part-time population may result in a smaller sample of students included in the graduation rate cohort.

At the state level, the percent of children in families with incomes at least 200% of the poverty level, the percent of 3- and 4-year old children enrolled in preschool, and middle school Math achievement scores are all found to have a positive relationship with graduation rates. As with the retention models, both the percentage of linguistic integration within a state (that is, the percentage of children whose parents are fluent English-speakers) and the percent of adults with incomes at or above the national median are negatively related to 2-year institution graduation rates. Results for the two income-related variables seem to be contradictory, but might be explained for reasons hypothesized above: states with fewer children raised in poverty may likely see greater success in the education sector as a whole, while states with higher median incomes are less likely to commit resources to the 2-year sector.

**Four-Year Institutions--Graduation**

Switching to 4-year institutions, again the first model fitted was the unconditional means model (model M). Results of the model are displayed in Table 23. The average state level graduation rate is statistically different from zero and there is also variation in the state means. As with the 2-year institutions, this finding indicates that it is appropriate to move forward with hierarchical linear modeling techniques.

Table 23

*Model M: Unconditional Means Model--4-Year Institutions--Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.454861 | 0.013465 | 33.781 | 49 | <0.001 |
| **Final Estimation of Variance Components** | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.09352 | 0.00875 | 49 | 1403.23968 | <0.001 |
| level-1, *e* | 0.16166 | 0.02613 | | | |

I next fitted the unconditional growth model (model N), which adds the variable of YEAR to determine if graduation rates have changed over time. Table 24 includes the results of this model which confirm the visual analysis of the plotted values--graduation rates have only increased slightly over the time period included in the study, or 0.2% annually. At 4-year institutions, results of the pseudo-$R^2$ statistic show that YEAR explains 0% of the variance in graduation rates. Given this change, it is appropriate to move forward with hierarchical growth modeling in order to determine what factors do explain the variance in graduation rate over time.

Table 24

*Model N: Unconditional Growth Model--4-Year Institutions--Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.449711 | 0.013063 | 34.427 | 49 | <0.001 |
| For YEAR slope, $\pi_1$ | | | | | |
| INTRCPT2, $\beta_{10}$ | 0.001687 | 0.000956 | 1.765 | 4491 | 0.078 |
| Final Estimation of Variance Components | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.09352 | 0.00875 | 49 | 1403.68153 | <0.001 |
| level-1, *e* | 0.16165 | 0.02613 | | | |

I next added the institution and state level covariates to create two versions of the conditional growth model (model O). Table 25 includes the results for both versions. Both fitted models were found to be significant, with a pseudo-$R^2$ statistic of .763, indicating that the level-1 variables explained an additional 76% of the variance in retention rates. Again, none of the policy variables of interest are found to be significantly related to retention rates, indicating that the presence of state college-readiness policies did not correlate to an individual institution's graduation rate.

Table 25

*Model O: Conditional Growth Model--4-Year Institution--Graduation*

Final estimation of fixed effects (with robust standard errors)

| | | Model O1 | | | | | Model O2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fixed Effect | | Coefficient | *SE* | *t*-ratio | *df* | *p*-value | Coefficient | *SE* | *t*-ratio | *df* | *p*-value |
| For INTRCPT1, π0 | INTRCPT2, β00 | 0.069 | 0.043 | 1.606 | 44 | 0.116 | | | | | |
| | CCRDEF, β01 | -0.007 | 0.019 | -0.387 | 44 | 0.701 | | | | | |
| | CPREQ, β02 | 0.007 | 0.018 | 0.357 | 44 | 0.723 | | | | | |
| | CCALIGN, β03 | -0.022 | 0.018 | -1.200 | 44 | 0.237 | | | | | |
| | HSASSALI, β04 | -0.018 | 0.023 | -0.763 | 44 | 0.449 | | | | | |
| | PSDEC, β05 | 0.008 | 0.023 | 0.349 | 44 | 0.729 | | | | | |
| For INTRCPT1, π0 | INTRCPT2, β00 | | | | | | 0.076 | 0.041 | 1.875 | 48 | 0.067 |
| | POLCOUNT, β01 | | | | | | -0.007 | 0.007 | -0.960 | 48 | 0.342 |
| For YEAR slope, π1 | INTRCPT2, β10 | 0.005 | 0.002 | 2.196 | 2651 | 0.028* | 0.005 | 0.002 | 2.215 | 2651 | 0.027* |
| For NONWHITE slope, π2 | INTRCPT2, β20 | -0.081 | 0.021 | -3.823 | 2651 | <0.001** | -0.081 | 0.021 | -3.834 | 2651 | <0.001** |
| For PARTTIME slope, π3 | INTRCPT2, β30 | -0.380 | 0.037 | -10.195 | 2651 | <0.001** | -0.380 | 0.037 | -10.216 | 2651 | <0.001** |
| For OOS slope, π4 | INTRCPT2, β40 | 0.062 | 0.028 | 2.222 | 2651 | 0.026* | 0.063 | 0.028 | 2.273 | 2651 | 0.023* |
| For CARNEGIE slope, π5 | INTRCPT2, β50 | -0.029 | 0.006 | -4.785 | 2651 | <0.001** | -0.029 | 0.006 | -4.793 | 2651 | <0.001** |
| For ACT slope, π6 | INTRCPT2, β60 | 0.031 | 0.001 | 28.130 | 2651 | <0.001** | 0.031 | 0.001 | 28.219 | 2651 | <0.001** |
| For FAMINCOM slope, π7 | INTRCPT2, β70 | 0.000 | 0.001 | -0.152 | 2651 | 0.879 | 0.000 | 0.001 | -0.105 | 2651 | 0.916 |
| For LININT slope, π8 | INTRCPT2, β80 | -0.004 | 0.001 | -4.370 | 2651 | <0.001** | -0.004 | 0.001 | -5.370 | 2651 | <0.001** |
| For PREENR slope, π9 | INTRCPT2, β90 | 0.002 | 0.001 | 2.418 | 2651 | 0.016* | 0.002 | 0.001 | 2.546 | 2651 | 0.011* |
| For KINENR slope, π10 | INTRCPT2, β100 | 0.000 | 0.001 | 0.498 | 2651 | 0.619 | 0.001 | 0.001 | 0.563 | 2651 | 0.574 |
| For ELEMREAD slope, π11 | INTRCPT2, β110 | 0.000 | 0.001 | 0.086 | 2651 | 0.931 | 0.000 | 0.001 | 0.168 | 2651 | 0.866 |
| For MSMATH slope, π12 | INTRCPT2, β120 | 0.002 | 0.001 | 2.030 | 2651 | 0.042* | 0.002 | 0.001 | 2.134 | 2651 | 0.033* |
| For HSGRAD slope, π13 | INTRCPT2, β130 | 0.000 | 0.000 | -1.032 | 2651 | 0.302 | 0.000 | 0.000 | -1.061 | 2651 | 0.289 |
| For YAEDU slope, π14 | INTRCPT2, β140 | 0.002 | 0.001 | 2.128 | 2651 | 0.033* | 0.002 | 0.001 | 2.245 | 2651 | 0.025* |
| For AEATT slope, π15 | INTRCPT2, β150 | 0.000 | 0.003 | 0.116 | 2651 | 0.908 | 0.000 | 0.002 | 0.123 | 2651 | 0.902 |
| For ANNINC slope, π16 | INTRCPT2, β160 | -0.001 | 0.001 | -0.820 | 2651 | 0.412 | -0.001 | 0.001 | -0.779 | 2651 | 0.436 |
| For STEEMP slope, *π17* | INTRCPT2, β170 | 0.001 | 0.002 | 0.321 | 2651 | 0.748 | 0.000 | 0.002 | 0.308 | 2651 | 0.758 |

* $p < .05$, ** $p < .01$

As with 2-year institutions, at 4-year institutions, the percent of non-European American students and the percent of students enrolled part-time are found to have a significant negative relationship with graduation rates. Carnegie classification is also negatively correlated to graduation. The variable for Carnegie classification was coded with Doctoral/Research Universities as 1, so this indicates that as you move down the Carnegie classifications to lower research universities; graduation rates decrease by 2.9% per category (indicating that 4-year institutions with a greater research intensity had higher graduation rates). The percent of students from out-of-state has a positive relationship with graduation rate, as does median ACT (or SAT) score of incoming students; for every 1-point score increase, graduation rates increase by 3.1%.

At the state level, the percent of 3- and 4-year old children enrolled in preschool, middle school math achievement scores, and the percent of young adults enrolled in postsecondary education or with a degree are all found to have a positive relationship with graduation rates. As with the retention models, the percentage of linguistic integration within a state (that is, the percentage of children whose parents are fluent English-speakers) is negatively related to 4-year institution graduation rates.

**Research Question 3a**

Q3a Is there a difference in the relationship between state college readiness policy and the change in institutional retention rates at 2-year institutions compared to 4-year institutions when controlling for state-and institutional-level covariates?

As discussed in the previous sections, none of the college readiness policies correlate to graduation rates at 4-year institutions, while college preparatory curriculum requirements have a negative relationship with graduation rates at 2-year institutions. In

addition, having a greater number of college readiness policies within a state corresponds with decreased graduation rates in the 2-year institution sector.

There are several other differences worth noting in the models for 2- and 4-year institutions. At 2-year institutions, the fitted model explains 32% of the variance in graduation rates (pseudo-$R^2$ =.318), while at 4-year institutions the model explains 84% of the variance (pseudo-$R^2$ =.837). As with retention, there are clearly additional variables that better explain the variance in graduation at 2-year institutions that were not included in this study. Overall, 2-year institutions saw greater growth than 4-year institutions, with 2-year institution graduation rates increasing 0.8% annually compared to 0.2% at 4-year institutions.

Among the level-1 variables, several were found to have significant correlations for both 2- and 4-year institutions. In both sectors, preschool enrollment and middle school math test scores are positively correlated with graduation rates. As with retention, the linguistic integration of a state (that is, the percentage of children whose parents are fluent English-speakers) is negatively related to graduation. At the institution level, percent of non-European American and part-time students are negatively correlated with graduation rates. Z statistics were calculated for each of these variables to determine if there is a significant difference in the coefficients. For the variables of year, LININT, and MSMATH, no difference was found; however, z statistics greater than 2 were found for both NONWHITE and PARTTIME, indicating significant differences at the $p < .05$ level. At 2-year institutions, the percent of non-European American students has a statistically greater impact on graduation rate than at 4-year institutions (-.17 vs. -.08), while the

percent of part-time students has a statically greater impact on graduation rates at 4-year institutions vs. 2-year (-.38 vs. -.19).

In addition, two other variables significantly related to 2-year graduation rates that were not found to be significant for 4-year institutions. The percent of children in families with incomes at least 200% of the poverty level is positively related to 2-year institution graduation rates, while the percent of adults with incomes at or above the national median related negatively to 2-year graduation rates. This indicates that the income of the state population has a greater influence on outcomes in the 2-year sector than the 4-year. At 4-year institutions, the percent of young adults enrolled in college or with a degree has a positive relationship with graduation rates, but no significant relationship at 2-year institutions.

In summary, the only college readiness policy found to have a relationship with graduation rates is a required college-preparatory curriculum, which has a negative relationship with graduation rates at 2-year institutions. There is no evident relationship between state college readiness policy and growth in graduation rates at 4-year institutions. Several institution and state level variables correlate to graduation rates; of these, the percent of non-European American students has a stronger negative relationship with 2-year institution graduation rates, while the percent of part-time students has a stronger negative relationship with 4-year institution graduation rates.

**Research Question 4**

Q4 What is the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students and non-European American students when controlling for state- and institutional-level covariates?

In this section, I will first discuss the results for models fitted to 2-year institutions with European American and non-European American graduation rate as the outcomes. Then, I will discuss the models for both outcomes based on the 4-year institution dataset. I will discuss differences found within each sector, answering Research Questions 4a and 4b.

### Two-Year Institutions--European American Graduation

An initial visual examination of the plotted graduation rates by year show a positive linear relationship over time. Results of the diagnostic models (shown in Table 26) confirm this. The first model fitted was the unconditional means model (model P), or a one-way analysis of variance (ANOVA). The average state level graduation rate for European American students was statistically different from zero and there was also variation in the state means. This finding indicates that it is appropriate to move forward with hierarchical linear modeling techniques, since there is a difference in graduation rates that may be explained by additional factors.

Table 26

*Model P: Unconditional Means Model--2-Year Institutions--European American Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.26789 | 0.01086 | 24.672 | 49 | <0.001 |
| **Final Estimation of Variance Components** | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.07557 | 0.00571 | 49 | 1876.2529 | <0.001 |
| level-1, *e* | 0.11888 | 0.01413 | | | |

I next fitted the unconditional growth model (model Q), which adds the variable of YEAR to determine if retention rates have changed over time. Results of this model, shown in Table 27, confirm the visual analysis of the plotted values--graduation rates at 2-year institutions have increased over time at a rate of 1.1% annually. Results of the pseudo-$R^2$ statistic show that YEAR explains 3.3% of the variance in graduation rates. Given this change, it is appropriate to move forward with hierarchical growth modeling in order to determine what factors may explain this growth.

Table 27

*Model Q: Unconditional Growth Model--2-Year Institutions--European American Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.23712 | 0.01156 | 20.516 | 49 | <0.001 |
| For YEAR slope, $\pi_1$ | | | | | |
| INTRCPT2, $\beta_{10}$ | 0.01074 | 0.0011 | 9.744 | 6398 | <0.001 |
| Final Estimation of Variance Components | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.07543 | 0.00569 | 49 | 1948.7694 | <0.001 |
| level-1, *e* | 0.11693 | 0.01367 | | | |

Next, I added in covariates at level 1 and 2 to create a conditional growth model (model R). Again, two versions were created; one with CCRDEF, CPREQ, CCALIGN, HSASSALI, and PSDEC as the level-2 variables, and one with POLCOUNT (representing a count of how many of those policies a state has). Results can be found in Table 28.

Table 28

*Model R: Conditional Growth Model--2-Year Institution--European American Graduation*

Final estimation of fixed effects (with robust standard errors)

| | | Model R1 | | | | | Model R2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fixed Effect | | Coefficient | *SE* | *t*-ratio | *df* | *p*-value | Coefficient | *SE* | *t*-ratio | *df* | *p*-value |
| For INTRCPT1, π0 | INTRCPT2, β00 | 0.386 | 0.040 | 9.677 | 44 | <0.001 | | | | | |
| | CCRDEF, β01 | 0.020 | 0.025 | 0.798 | 44 | 0.429 | | | | | |
| | CPREQ, β02 | -0.045 | 0.016 | -2.768 | 44 | 0.008** | | | | | |
| | CCALIGN, β03 | -0.020 | 0.021 | -0.930 | 44 | 0.357 | | | | | |
| | HSASSALI, β04 | -0.033 | 0.023 | -1.398 | 44 | 0.169 | | | | | |
| | PSDEC, β05 | -0.004 | 0.021 | -0.194 | 44 | 0.847 | | | | | |
| For INTRCPT1, π0 | INTRCPT2, β00 | | | | | | 0.401 | 0.038 | 10.548 | 48 | <0.001 |
| | POLCOUNT, β01 | | | | | | -0.016 | 0.007 | -2.280 | 48 | 0.027* |
| For YEAR slope, π1 | INTRCPT2, β10 | 0.012 | 0.002 | 5.145 | 4562 | <0.001** | 0.012 | 0.002 | 5.124 | 4562 | <0.001** |
| For NONWHITE slope, π2 | INTRCPT2, β20 | -0.078 | 0.027 | -2.875 | 4562 | 0.004** | -0.078 | 0.027 | -2.875 | 4562 | 0.004** |
| For PARTTIME slope, π3 | INTRCPT2, β30 | -0.203 | 0.042 | -4.786 | 4562 | <0.001** | -0.204 | 0.042 | -4.828 | 4562 | <0.001** |
| For OOS slope, π4 | INTRCPT2, β40 | 0.071 | 0.047 | 1.530 | 4562 | 0.126 | 0.071 | 0.046 | 1.526 | 4562 | 0.127 |
| For FAMINCOM slope, π4 | INTRCPT2, β50 | 0.003 | 0.001 | 2.011 | 4562 | 0.044* | 0.003 | 0.001 | 1.970 | 4562 | 0.049* |
| For LININT slope, π6 | INTRCPT2, β60 | -0.001 | 0.001 | -0.910 | 4562 | 0.363 | -0.001 | 0.001 | -1.195 | 4562 | 0.232 |
| For PREENR slope, π7 | INTRCPT2, β70 | 0.000 | 0.001 | 0.216 | 4562 | 0.829 | 0.001 | 0.001 | 0.463 | 4562 | 0.643 |
| For KINENR slope, π8 | INTRCPT2, β80 | 0.000 | 0.002 | -0.064 | 4562 | 0.949 | 0.000 | 0.002 | 0.014 | 4562 | 0.989 |
| For ELEMREAD slope, π9 | INTRCPT2, β90 | -0.002 | 0.001 | -1.977 | 4562 | 0.048* | -0.002 | 0.001 | -1.968 | 4562 | 0.049* |
| For MSMATH slope, π10 | INTRCPT2, β100 | 0.002 | 0.001 | 1.851 | 4562 | 0.064 | 0.002 | 0.001 | 1.881 | 4562 | 0.060 |
| For HSGRAD slope, π11 | INTRCPT2, β110 | 0.000 | 0.001 | -0.447 | 4562 | 0.655 | 0.000 | 0.001 | -0.368 | 4562 | 0.713 |
| For YAEDU slope, π12 | INTRCPT2, β120 | 0.000 | 0.001 | -0.374 | 4562 | 0.709 | 0.000 | 0.001 | -0.398 | 4562 | 0.691 |
| For AEATT slope, π13 | INTRCPT2, β130 | 0.003 | 0.003 | 1.207 | 4562 | 0.227 | 0.003 | 0.003 | 1.133 | 4562 | 0.257 |
| For ANNINC slope, π14 | INTRCPT2, β140 | -0.006 | 0.002 | -2.863 | 4562 | 0.004** | -0.006 | 0.002 | -2.862 | 4562 | 0.004** |
| For STEEMP slope, $\pi_{15}$ | INTRCPT2, β150 | 0.002 | 0.002 | 1.085 | 4562 | 0.278 | 0.002 | 0.002 | 1.155 | 4562 | 0.248 |

* $p < .05$, ** $p < .01$

Both fitted models were found to be significant, with a pseudo-$R^2$ statistic of .203, indicating that the level-1 variables explained an additional 20% of the variance in graduation rates. This is less than the overall 2-year graduation model, which has a pseudo-$R^2$ statistic of .318. This indicates that for European American students, there are additional factors that explain the variance in graduation rates. As in the model examining total student graduation rates, two of the policy variables of interest are found to be significantly related to graduation rates, though with a negative relationship. States that require a college preparatory curriculum in high school have graduation rates 4.5% lower than those that did not. In addition, for each additional policy a state had in place, graduation rates were 1.6% lower. Again, this may indicate that these policies prepare students for success at 4-year institutions rather than 2-year, and students in these states may be more likely to transfer than complete at their initial 2-year institution.

As with retention, several of the level-1 state and institution level covariates did show significant relationships with graduation rates. Among the institution level covariates, both the percent of non-European American students and part-time students are found to be statistically significant in the model. That is, institutions with a more diverse student body and a greater number of part-time students have lower graduation rates. After controlling for other factors, for every 1% increase in the percent of non-European American and part-time students, institutional graduation rates decreased by 0.1% and 0.2%, respectively, at 2-year institutions. Note that part-time students are not included in the graduation rate calculation, so an increase in the part-time population may result in a smaller sample of students included in the graduation rate cohort.

At the state level, again the model shows that the percent of children in families with incomes at least 200% of the poverty level has a positive relationship with graduation rates. The percent of adults with incomes at or above the national median are negatively related to 2-year institution graduation rates for European American students as well, as are elementary reading assessment scores. Elementary reading scores were not significant in the model for overall graduation rates, but results of this model show that as elementary reading assessment scores for a state increased, graduation rates for European Americans at 2-year institutions decreased, a surprising finding, as research generally indicates that greater levels of reading achievement leads to greater student outcomes.

**Two-Year Institutions--Non-European American Graduation**

Again, an initial visual examination of the plotted graduation rates for non-European American students by year show a positive linear relationship over time. Results of the diagnostic models confirm this. The first model fitted was the unconditional means model (model S). Results of this model are displayed in Table 29. The average state level graduation rate for non-European American students was statistically different from zero and there was also variation in the state means. This finding indicates that it is appropriate to move forward with hierarchical linear modeling techniques, since there is a difference in graduation rates that may be explained by additional factors.

Table 29

*Model S: Unconditional Means Model--4-Year Institutions--Non-European American Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.18445 | 0.00837 | 22.047 | 49 | <0.001 |
| **Final Estimation of Variance Components** | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.05763 | 0.00332 | 49 | 1415.6188 | <0.001 |
| level-1, *e* | 0.11073 | 0.01226 | | | |

I next fitted the unconditional growth model (model T), which adds the variable of YEAR to determine if retention rates have changed over time. Results of this model, shown in Table 30, confirm the visual analysis of the plotted values--non-European American student graduation rates at 2-year institutions have increased over time at a rate of 0.7% annually. Results of the pseudo-$R^2$ statistic show that YEAR explains 1.4% of the variance in graduation rates. Given this change, it is appropriate to move forward with hierarchical growth modeling in order to determine what factors may explain this growth.

Table 30

*Model T: Unconditional Growth Model--2-Year Institutions--Non-European American Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.16524 | 0.00901 | 18.345 | 49 | <0.001 |
| For YEAR slope, $\pi_1$ | | | | | |
| INTRCPT2, $\beta_{10}$ | 0.00669 | 0.00114 | 5.875 | 6418 | <0.001 |
| Final Estimation of Variance Components | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.05753 | 0.00331 | 49 | 1443.8114 | <0.001 |
| level-1, *e* | 0.10993 | 0.01209 | | | |

Next, I added in covariates at level 1 and 2 to create a conditional growth model (model U). Again, two versions were created; one with CCRDEF, CPREQ, CCALIGN, HSASSALI, and PSDEC as the level-2 variables, and one with POLCOUNT (representing a count of how many of those policies a state has). Table 31 includes the results of both versions.

Table 31

*Model U: Conditional Growth Model--2-Year Institution--Non-European American Graduation*

Final estimation of fixed effects (with robust standard errors)

| | | Model U1 | | | | | Model U2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fixed Effect | | Coefficient | *SE* | t-ratio | *df* | *p*-value | Coefficient | *SE* | *t*-ratio | *df* | *p*-value |
| For INTRCPT1, π0 | INTRCPT2, β00 | 0.256 | 0.035 | 7.333 | 44 | <0.001 | | | | | |
| | CCRDEF, β01 | 0.001 | 0.021 | 0.040 | 44 | 0.968 | | | | | |
| | CPREQ, β02 | -0.029 | 0.016 | -1.814 | 44 | 0.077 | | | | | |
| | CCALIGN, β03 | -0.031 | 0.017 | -1.805 | 44 | 0.078 | | | | | |
| | HSASSALI, β04 | -0.025 | 0.019 | -1.322 | 44 | 0.193 | | | | | |
| | PSDEC, β05 | -0.010 | 0.015 | -0.711 | 44 | 0.481 | | | | | |
| For INTRCPT1, π0 | INTRCPT2, β00 | | | | | | 0.265 | 0.034 | 7.780 | 48 | <0.001 |
| | POLCOUNT, β01 | | | | | | -0.018 | 0.006 | -3.006 | 48 | 0.004** |
| For YEAR slope, π1 | INTRCPT2, β10 | 0.008 | 0.002 | 4.932 | 4578 | <0.001** | 0.008 | 0.002 | 4.825 | 4578 | <0.001** |
| For NONWHITE slope, π2 | INTRCPT2, β20 | -0.070 | 0.017 | -4.130 | 4578 | <0.001** | -0.070 | 0.017 | -4.135 | 4578 | <0.001** |
| For PARTTIME slope, π3 | INTRCPT2, β30 | -0.146 | 0.040 | -3.678 | 4578 | <0.001** | -0.146 | 0.039 | -3.703 | 4578 | <0.001** |
| For OOS slope, π4 | INTRCPT2, β40 | 0.042 | 0.038 | 1.111 | 4578 | 0.267 | 0.042 | 0.038 | 1.111 | 4578 | 0.267 |
| For FAMINCOM slope, π4 | INTRCPT2, β50 | 0.005 | 0.001 | 4.355 | 4578 | <0.001** | 0.005 | 0.001 | 4.331 | 4578 | <0.001** |
| For LININT slope, π6 | INTRCPT2, β60 | -0.003 | 0.001 | -3.643 | 4578 | <0.001** | -0.003 | 0.001 | -4.235 | 4578 | <0.001** |
| For PREENR slope, π7 | INTRCPT2, β70 | 0.001 | 0.001 | 0.847 | 4578 | 0.397 | 0.001 | 0.001 | 1.024 | 4578 | 0.306 |
| For KINENR slope, π8 | INTRCPT2, β80 | 0.003 | 0.001 | 2.381 | 4578 | 0.017* | 0.003 | 0.001 | 2.452 | 4578 | 0.014* |
| For ELEMREAD slope, π9 | INTRCPT2, β90 | -0.001 | 0.001 | -0.769 | 4578 | 0.442 | -0.001 | 0.001 | -0.756 | 4578 | 0.449 |
| For MSMATH slope, π10 | INTRCPT2, β100 | 0.001 | 0.001 | 1.406 | 4578 | 0.160 | 0.001 | 0.001 | 1.452 | 4578 | 0.147 |
| For HSGRAD slope, π11 | INTRCPT2, β110 | 0.000 | 0.001 | -0.616 | 4578 | 0.538 | 0.000 | 0.001 | -0.571 | 4578 | 0.568 |
| For YAEDU slope, π12 | INTRCPT2, β120 | 0.000 | 0.001 | -0.233 | 4578 | 0.816 | 0.000 | 0.001 | -0.241 | 4578 | 0.809 |
| For AEATT slope, π13 | INTRCPT2, β130 | -0.002 | 0.002 | -1.027 | 4578 | 0.305 | -0.002 | 0.002 | -1.063 | 4578 | 0.288 |
| For ANNINC slope, π14 | INTRCPT2, β140 | -0.008 | 0.001 | -6.546 | 4578 | <0.001** | -0.008 | 0.001 | -6.544 | 4578 | <0.001** |
| For STEEMP slope, $\pi_{15}$ | INTRCPT2, β150 | 0.003 | 0.002 | 1.781 | 4578 | 0.075 | 0.003 | 0.002 | 1.892 | 4578 | 0.059 |

* $p < .05$, ** $p < .01$

Both fitted models were found to be significant, with a pseudo-$R^2$ statistic of .207, indicating that the level-1 variables explained an additional 21% of the variance in graduation rates. Only one of the policy variables of interest was found to be significantly related to graduation rates, though with a negative relationship. For each additional policy a state had in place, graduation rates were 1.8% lower. Requiring a college-preparatory curriculum, which is significantly related to European American student graduation rates, is not statistically significant in this model.

As with European American student graduation rates, several of the level-1 state and institution level covariates did show significant relationships with graduation rates. Among the institution level covariates, both the percent of non-European American students and part-time students are found to be statistically significant in the model. After controlling for other factors, for every 1% increase in the percent of non-European American and part-time students, institutional graduation rates decreased by 0.1% at 2-year institutions. These coefficients are less than those found to be significant in the European American student graduation rate model (0.1% and 0.2%).

At the state level, the percent of children in families with incomes at least 200% of the poverty level and the percent of students enrolled in kindergarten are both found to have a positive relationship with graduation rates. As with the models fitted to overall graduation rate, both the percentage of linguistic integration within a state (that is, the percentage of children whose parents are fluent English-speakers) and the percent of adults with incomes at or above the national median are negatively related to 2-year institution graduation rates.

**Research Question 4a**

Q4a Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students compared to non-European American students at 2-year institutions when controlling for state-and institutional-level covariates?

College preparatory curriculum requirements have a negative relationship with graduation rates at 2-year institutions for European American students, while having no significant correlation to graduation rates for non-European American students. For both groups of students, having a greater number of college readiness policies within a state corresponds with decreased graduation rates. Again, this may be due to an emphasis on transfer, or the fact that states with more policies have lower 2-year institution graduation rates overall and may have implemented several policies at once to address the issue. To determine if there is a significant difference in the relationship between policy count and European American vs. non-European American graduation rates, I calculated a z statistic using the coefficients from both models. The value calculated was less than 2, indicating that there is no significant difference.

Among the level-1 variables, several were found to have significant correlations for both European American and non-European American graduation rates. As in the overall 2-year institution graduation rate model, the percent of children in families with incomes at least 200% of the poverty level is positively related to 2-year institution graduation rates, while the percent of adults with incomes at or above the national median related negatively to 2-year graduation rates. For all populations, YEAR, NONWHITE, and PARTTIME continue to be significantly related to graduation rate. No significant Z statistics were found for any of these covariates, indicating that there is no difference in

the relationship between each variable and the graduation rate for European American and non-European American students.

There are differences found in the state-level variables for sub-population graduation rates. Linguistic integration is found to be significantly negatively correlated with non-European American student graduation rates, but not with European American student rates, while the percent of students enrolled in kindergarten has a positive correlation with non-European American student graduation rate only. Elementary reading assessment scores are negatively related to European American student graduation rates but not significantly correlated with non-European American student graduation rates. Interestingly enough, middle school math assessment scores are significantly related to the overall graduation rate at 2-year institutions but was not found to be significantly related to either European American or non-European American graduation rates.

**Four-Year Institutions--European American Graduation**

Switching to 4-year institutions, again the first model fitted was the unconditional means model (model V). Results of this model can be found in Table 32. The average state level graduation rate is statistically different from zero and there is also variation in the state means. As with the 2-year institutions, this finding indicates that it is appropriate to move forward with hierarchical linear modeling techniques.

Table 32

*Model V: Unconditional Means Model--4-Year Institutions--European American Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.475343 | 0.013353 | 35.598 | 49 | <0.001 |
| **Final Estimation of Variance Components** | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.09235 | 0.00853 | 49 | 1244.48632 | <0.001 |
| level-1, *e* | 0.17142 | 0.02939 | | | |

I next fitted the unconditional growth model (model W), which adds the variable of YEAR to determine if 4-year institution graduation rates for European American students have changed over time. Results of this model, shown in Table 33, confirm the visual analysis of the plotted values--graduation rates for European American students have only increased slightly over the time period included in the study, or 0.1% annually. At 4-year institutions, results of the pseudo-$R^2$ statistic show that YEAR explains 0% of the variance in graduation rates. Given that the change is significant, while small, it is appropriate to move forward with hierarchical growth modeling in order to determine what factors do explain the variance in graduation rate over time.

Table 33

*Model W: Unconditional Growth Model--4-Year Institutions--European American Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.467429 | 0.013378 | 34.94 | 49 | <0.001 |
| For YEAR slope, $\pi_1$ | | | | | |
| INTRCPT2, $\beta_{10}$ | 0.002588 | 0.00103 | 2.513 | 4460 | 0.012 |
| Final Estimation of Variance Components | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.09235 | 0.00853 | 49 | 1245.6173 | <0.001 |
| level-1, *e* | 0.17136 | 0.02937 | | | |

I next added the institution and state level covariates to create two versions of the conditional growth model (model X). Both fitted models were found to be significant, with a pseudo-$R^2$ statistic of .755, indicating that the level-1 variables explained an additional 76% of the variance in retention rates. Table 34 includes results for both versions.

Table 34

*Model X: Conditional Growth Model--4-Year Institution--European American Graduation*

Final estimation of fixed effects (with robust standard errors)

| | | Model X1 | | | | | Model X2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fixed Effect | | Coefficient | *SE* | *t*-ratio | *df* | *p*-value | Coefficient | *SE* | *t*-ratio | *df* | *p*-value |
| For INTRCPT1, π0 | INTRCPT2, β00 | 0.139 | 0.043 | 3.208 | 44 | 0.002 | | | | | |
| | CCRDEF, β01 | 0.013 | 0.018 | 0.742 | 44 | 0.462 | | | | | |
| | CPREQ, β02 | 0.006 | 0.017 | 0.359 | 44 | 0.721 | | | | | |
| | CCALIGN, β03 | -0.018 | 0.015 | -1.197 | 44 | 0.238 | | | | | |
| | HSASSALI, β04 | -0.018 | 0.019 | -0.920 | 44 | 0.362 | | | | | |
| | PSDEC, β05 | 0.014 | 0.021 | 0.643 | 44 | 0.524 | | | | | |
| For INTRCPT1, π0 | INTRCPT2, β00 | | | | | | 0.152 | 0.043 | 3.516 | 48 | <0.001 |
| | POLCOUNT, β01 | | | | | | -0.001 | 0.007 | -0.223 | 48 | 0.824 |
| For YEAR slope, π1 | INTRCPT2, β10 | 0.009 | 0.002 | 3.948 | 2642 | <0.001** | 0.009 | 0.002 | 4.144 | 2642 | <0.001** |
| For NONWHITE slope, π2 | INTRCPT2, β20 | -0.138 | 0.022 | -6.372 | 2642 | <0.001** | -0.138 | 0.022 | -6.381 | 2642 | <0.001** |
| For PARTTIME slope, π3 | INTRCPT2, β30 | -0.316 | 0.033 | -9.558 | 2642 | <0.001** | -0.317 | 0.033 | -9.560 | 2642 | <0.001** |
| For OOS slope, π4 | INTRCPT2, β40 | 0.053 | 0.027 | 1.942 | 2642 | 0.052 | 0.053 | 0.027 | 1.990 | 2642 | 0.047* |
| For CARNEGIE slope, π5 | INTRCPT2, β50 | -0.032 | 0.006 | -4.890 | 2642 | <0.001** | -0.032 | 0.006 | -4.909 | 2642 | <0.001** |
| For ACT slope, π6 | INTRCPT2, β60 | 0.029 | 0.001 | 22.287 | 2642 | <0.001** | 0.029 | 0.001 | 22.353 | 2642 | <0.001** |
| For FAMINCOM slope, π7 | INTRCPT2, β70 | 0.001 | 0.001 | 0.601 | 2642 | 0.548 | 0.001 | 0.001 | 0.538 | 2642 | 0.590 |
| For LININT slope, π8 | INTRCPT2, β80 | -0.004 | 0.001 | -4.577 | 2642 | <0.001** | -0.004 | 0.001 | -5.199 | 2642 | <0.001** |
| For PREENR slope, π9 | INTRCPT2, β90 | 0.002 | 0.001 | 1.749 | 2642 | 0.080 | 0.002 | 0.001 | 2.078 | 2642 | 0.038* |
| For KINENR slope, π10 | INTRCPT2, β100 | 0.001 | 0.001 | 1.308 | 2642 | 0.191 | 0.002 | 0.001 | 1.501 | 2642 | 0.133 |
| For ELEMREAD slope, π11 | INTRCPT2, β110 | 0.000 | 0.001 | 0.053 | 2642 | 0.958 | 0.000 | 0.001 | 0.099 | 2642 | 0.921 |
| For MSMATH slope, π12 | INTRCPT2, β120 | 0.002 | 0.001 | 2.361 | 2642 | 0.018* | 0.002 | 0.001 | 2.510 | 2642 | 0.012* |
| For HSGRAD slope, π13 | INTRCPT2, β130 | -0.001 | 0.001 | -0.934 | 2642 | 0.350 | -0.001 | 0.001 | -0.947 | 2642 | 0.344 |
| For YAEDU slope, π14 | INTRCPT2, β140 | 0.003 | 0.001 | 2.331 | 2642 | 0.020* | 0.003 | 0.001 | 2.419 | 2642 | 0.016* |
| For AEATT slope, π15 | INTRCPT2, β150 | -0.001 | 0.003 | -0.339 | 2642 | 0.735 | -0.001 | 0.003 | -0.445 | 2642 | 0.657 |
| For ANNINC slope, π16 | INTRCPT2, β160 | 0.000 | 0.001 | 0.270 | 2642 | 0.787 | 0.000 | 0.001 | 0.337 | 2642 | 0.736 |
| For STEEMP slope, *π17* | INTRCPT2, β170 | -0.002 | 0.002 | -1.368 | 2642 | 0.171 | -0.002 | 0.002 | -1.297 | 2642 | 0.195 |

* $p < .05$, ** $p < .01$

Findings for the model for European American student graduation rates at 4-year institutions closely align to the results of the overall 4-year institution graduation rates. As in the overall model, no policy related variable is found to be significantly related to European American student graduation rates. The variable for year is significant, indicating that European American student graduation rates at 4-year institutions increased 0.9% annually. The percent of non-European American students and the percent of students enrolled part-time are found to have a significant negative relationship with graduation rates. Carnegie classification is also negatively correlated to graduation. The variable for Carnegie classification was coded with Doctoral/Research Universities as 1, so this indicates that as you move down the Carnegie classifications to lower research universities; graduation rates decrease by 3.2% per category. Median ACT (or SAT) score of incoming students also positively correlates to graduation rates for European American students at 4-year institutions; for every 1-point score increase, graduation rates increase by 2.9%.

At the state level, the percent of 3- and 4-year old children enrolled in preschool, middle school math achievement scores, and the percent of young adults enrolled in postsecondary education or with a degree are all found to have a positive relationship with European American student graduation rates. All three of these variables were also significant in the overall graduation rate model for 4-year institutions.

### Four-Year Institutions--Non-European American Graduation

Using non-European American graduation rates at 4-year institutions as the outcome, the first model fitted was the unconditional means model (model Y). Table 35

includes the results of this model. The average state level graduation rate is statistically different from zero and there is also variation in the state means.

Table 35

*Model Y: Unconditional Means Model--4-Year Institutions--Non-European American Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.386095 | 0.014759 | 26.161 | 49 | <0.001 |
| **Final Estimation of Variance Components** | | | | | |
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.10279 | 0.01057 | 49 | 1631.51688 | <0.001 |
| level-1, *e* | 0.16793 | 0.0282 | | | |

I next fitted the unconditional growth model (model Z), which adds the variable of YEAR to determine if 4-year institution graduation rates for non-European American students have changed over time. Results of this model, shown in Table 36, confirm the visual analysis of the plotted values--graduation rates for non-European American students have not significantly increased over the time period included in the study. These results indicate that there are additional factors that explain the variance in non-European American student graduation rates at 4-year institutions, and that time is not a contributing factor.

Table 36

*Model Z: Unconditional Growth Model--4-Year Institutions--Non-European American Graduation*

| Final Estimation of Fixed Effects (with robust standard errors) | | | | | |
|---|---|---|---|---|---|
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *df* | *p*-value |
| For INTRCPT1, $\pi_0$ | | | | | |
| INTRCPT2, $\beta_{00}$ | 0.380057 | 0.014115 | 26.927 | 49 | <0.001 |
| For YEAR slope, $\pi_1$ | | | | | |
| INTRCPT2, $\beta_{10}$ | 0.001977 | 0.001037 | 1.906 | 4489 | 0.057 |

| Final Estimation of Variance Components | | | | | |
|---|---|---|---|---|---|
| Random Effect | Standard Deviation | Variance Component | *df* | $\chi^2$ | *p*-value |
| INTRCPT1, $r_0$ | 0.10277 | 0.01056 | 49 | 1631.56879 | <0.001 |
| level-1, *e* | 0.1679 | 0.02819 | | | |

Given the lack of growth in non-European American graduation rates at 4-year institutions, I would traditionally not run any additional models--however, for comparison purposes with European American graduation rates, I added the institution and state level covariates to create two versions of the conditional growth model (model AA). Results for these models are displayed in Table 37. Both fitted models were found to be significant, with a pseudo-$R^2$ statistic of .752, indicating that the level-1 variables explained 75% of the variance in non-European American student graduation rates.

Table 37

*Model AA: Conditional Growth Model--4-Year Institution--Non-European American Graduation*

Final estimation of fixed effects (with robust standard errors)

| | | Model AA1 | | | | | Model AA2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fixed Effect | | Coefficient | *SE* | *t*-ratio | *df* | *p*-value | Coefficient | *SE* | *t*-ratio | *df* | *p*-value |
| For INTRCPT1, π0 | INTRCPT2, β00 | -0.158 | 0.061 | -2.569 | 44 | 0.014 | | | | | |
| | CCRDEF, β01 | -0.025 | 0.028 | -0.916 | 44 | 0.364 | | | | | |
| | CPREQ, β02 | 0.013 | 0.024 | 0.557 | 44 | 0.581 | | | | | |
| | CCALIGN, β03 | -0.020 | 0.024 | -0.849 | 44 | 0.401 | | | | | |
| | HSASSALI, β04 | -0.009 | 0.029 | -0.291 | 44 | 0.773 | | | | | |
| | PSDEC, β05 | -0.003 | 0.028 | -0.109 | 44 | 0.913 | | | | | |
| For INTRCPT1, π0 | INTRCPT2, β00 | | | | | | -0.156 | 0.060 | -2.619 | 48 | 0.012 |
| | POLCOUNT, β01 | | | | | | -0.009 | 0.009 | -0.998 | 48 | 0.323 |
| For YEAR slope, π1 | INTRCPT2, β10 | 0.001 | 0.003 | 0.415 | 2651 | 0.678 | 0.001 | 0.003 | 0.424 | 2651 | 0.672 |
| For NONWHITE slope, π2 | INTRCPT2, β20 | 0.077 | 0.020 | 3.833 | 2651 | <0.001** | 0.076 | 0.020 | 3.818 | 2651 | <0.001** |
| For PARTTIME slope, π3 | INTRCPT2, β30 | -0.355 | 0.039 | -9.025 | 2651 | <0.001** | -0.355 | 0.039 | -9.034 | 2651 | <0.001** |
| For OOS slope, π4 | INTRCPT2, β40 | 0.068 | 0.027 | 2.517 | 2651 | 0.012* | 0.069 | 0.026 | 2.593 | 2651 | 0.010* |
| For CARNEGIE slope, π5 | INTRCPT2, β50 | -0.027 | 0.007 | -3.830 | 2651 | <0.001** | -0.027 | 0.007 | -3.841 | 2651 | <0.001** |
| For ACT slope, π6 | INTRCPT2, β60 | 0.036 | 0.002 | 21.322 | 2651 | <0.001** | 0.035 | 0.002 | 21.439 | 2651 | <0.001** |
| For FAMINCOM slope, π7 | INTRCPT2, β70 | -0.002 | 0.002 | -0.951 | 2651 | 0.342 | -0.002 | 0.002 | -0.895 | 2651 | 0.371 |
| For LININT slope, π8 | INTRCPT2, β80 | -0.006 | 0.001 | -4.670 | 2651 | <0.001** | -0.006 | 0.001 | -5.585 | 2651 | <0.001** |
| For PREENR slope, π9 | INTRCPT2, β90 | 0.003 | 0.002 | 1.817 | 2651 | 0.069 | 0.003 | 0.001 | 1.797 | 2651 | 0.072 |
| For KINENR slope, π10 | INTRCPT2, β100 | 0.002 | 0.002 | 1.074 | 2651 | 0.283 | 0.002 | 0.002 | 1.063 | 2651 | 0.288 |
| For ELEMREAD slope, π11 | INTRCPT2, β110 | 0.000 | 0.001 | -0.054 | 2651 | 0.957 | 0.000 | 0.001 | 0.034 | 2651 | 0.973 |
| For MSMATH slope, π12 | INTRCPT2, β120 | 0.003 | 0.001 | 2.231 | 2651 | 0.026* | 0.003 | 0.001 | 2.316 | 2651 | 0.021* |
| For HSGRAD slope, π13 | INTRCPT2, β130 | 0.000 | 0.001 | -0.687 | 2651 | 0.492 | 0.000 | 0.001 | -0.748 | 2651 | 0.455 |
| For YAEDU slope, π14 | INTRCPT2, β140 | 0.002 | 0.001 | 1.373 | 2651 | 0.170 | 0.002 | 0.001 | 1.444 | 2651 | 0.149 |
| For AEATT slope, π15 | INTRCPT2, β150 | 0.001 | 0.003 | 0.501 | 2651 | 0.617 | 0.002 | 0.003 | 0.530 | 2651 | 0.596 |
| For ANNINC slope, π16 | INTRCPT2, β160 | -0.002 | 0.002 | -0.963 | 2651 | 0.336 | -0.002 | 0.002 | -0.937 | 2651 | 0.349 |
| For STEEMP slope, *π17* | INTRCPT2, β170 | 0.002 | 0.002 | 0.903 | 2651 | 0.367 | 0.002 | 0.002 | 0.859 | 2651 | 0.390 |

* $p < .05$, ** $p < .01$

Again, findings for the model for non-European American student graduation rates at 4-year institutions closely align to the results of the overall 4-year institution graduation rates. No policy variable is significantly related to graduation rates, indicating that the presence of state college-readiness policies did not correlate to an individual institution's non-European American student graduation rate. As discussed above, the variable for year is not significant due to the lack of growth in non-European American student graduation rates at 4-year institutions. The percent of students enrolled part-time and Carnegie classification continue to have a significant negative relationship with graduation rates. The variable for Carnegie classification was coded with Doctoral/Research Universities as 1, so this indicates that as you move down the Carnegie classifications to lower research universities, graduation rates for non-European American students decrease by 2.7% per category. In contrast to findings of the overall model and the model fitted to European American student graduation rates, the percent of non-European American students at an institution positively correlates to non-European American student graduation rates. That is, while increases in the diversity of an institution negatively relate to graduation rates for European American students, each percentage increase in the non-European American student population actually increases non-European American student graduation rates by 0.8%. Median ACT (or SAT) score of incoming students also positively correlates to graduation rates for non-European American students at 4-year institutions; for every 1 point score increase, graduation rates increase by 3.6%.

At the state level, state linguistic integration and math achievement scores both have a positive relationship with European American student graduation rates. Both of

these variables were also significant in the overall graduation rate model for 4-year institutions; math was also significantly related to non-European American student graduation rates.

**Research Question 4b**

> Q4b Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students compared to non-European American students at 4-year institutions when controlling for state-and institutional-level covariates?

As discussed in the previous sections, none of the college readiness policies correlate to graduation rates at 4-year institutions, so there is no relationship of significance to compare. Growth in graduation rates is significant for European American students and the overall graduation rate at 4-year institutions, while no change is detected for non-European American students over the period of years included in this study.

Among the level-1 variables, several were found to have significant correlations for both European American and non-European American graduation rates. As in the overall 4-year institution graduation rate model, the percent of non-European American students, part-time, and out-of-state students, the Carnegie classification, and the median ACT (or SAT) score of incoming students were all significantly related to both European American and non-European American student graduation rates. There is no significant difference in the coefficients for PARTTIME, OOS, and Carnegie classification; however, z statistics calculated for NONWHITE and ACT were both greater than 2, indicating a significant difference. A 1% increase in the percentage of non-European American students enrolled at institution decreases the European American student graduation rate by 0.14%, while increasing the non-European American student graduation rate by

0.08%. This is a notable finding worth exploring given the increasing emphasis on closing race/ethnicity gaps in graduation rates. Furthermore, for every 1-point increase in median ACT score of incoming students, European American graduation rates increase by 2.9%, while non-European American graduation rates increase by 3.6%. At the state level, only middle school math assessment scores were found to significantly correlate to European American and non-European American graduation rate; however, the z statistic calculated for this variable shows no significant difference in this relationship.

There are differences found in the state-level variables for sub-population graduation rates. Linguistic integration is found to be significantly negatively correlated with non-European American student graduation rates, but not with European American student rates, while the percent of students enrolled in kindergarten has a positive correlation with non-European American student graduation rate only. Elementary reading assessment scores are negatively related to European American student graduation rates but not significantly correlated with non-European American student graduation rates. Interestingly enough, middle school math assessment scores are significantly related to the overall graduation rate at 2-year institutions but was not found to be significantly related to either European American or non-European American graduation rates.

In summary, the only college readiness policy found to have a relationship with graduation rates is a required college-preparatory curriculum, which has a negative relationship with graduation rates for European American students at 2-year institutions. There is no evident relationship between state college readiness policy and growth in graduation rates for either population of students at 4-year institutions, or for non-

European American students at 2-year institutions. Several institution and state level variables correlate to graduation rates; of these, the percent of non-European American students has a negative relationship with European American students graduation rates at 4-year institutions, and a positive relationship with non-European American student graduation rates at 4-year institutions. The relationship between median ACT/SAT score of incoming students and 4-year institution graduation rates also differs between student populations, with the relationship stronger with non-European American graduation rates.

# CHAPTER V

# DISCUSSION AND CONCLUSIONS

There is often not consensus between K-12 and postsecondary education on what it means to be college ready. Because of this, students may forego attending college, or enter the postsecondary system underprepared and requiring additional remedial coursework, which extends their time to degree. Students who are not prepared may struggle to complete, potentially incurring student debt along the way. States have begun to address this issue by introduction initiatives to increase college readiness and better align the K-12 and postsecondary sectors. These initiatives include a variety of policies addressing both the K-12 and postsecondary systems, as well as the links between them, but little is known about which of these policies have a positive relationship with student outcomes. Without an understanding of which policies, or combination of polices, actually result in increased student outcomes, policy makers are largely left to develop policies based on anecdotal evidence or political whims.

This study sought to understand which, if any, components of state-level college readiness initiatives have a positive relationship with student outcomes. Specifically, I examined if the presence of each of five policies related to college readiness has a correlation with state level college-going rates. I also examined whether the presence of multiple policies is related to student outcomes. These policy areas include a state defined definition of college-readiness; a requirement that all high school students take a college-preparatory curriculum; a requirement that course credits required for a high school

diploma are aligned with the postsecondary system; state high school assessments that are aligned with the postsecondary system; and the use of statewide high school assessment results in admission, placement, or scholarship decisions in the state postsecondary system. I analyzed whether the presence of each of the policies has a relationship with institutional level outcome measures including fall to fall retention rates, graduation rates (within 150% time); and graduation rates for European American (White) students compared to those from non-European American groups (defined as African American, Hispanic, Asian, Pacific Islander, American Indian/Alaska Native, and two or more races). Outcomes of retention and graduation at 2- and 4-year institutions were considered separately. In order to identify the relationship between policy and outcomes, hierarchical linear modeling was used, and included several control variables at both the state and institutional level. This attempted to account for other factors that have been shown to influence the student outcomes identified above.

Using this methodology, this study examined the following research questions:

Q1 What is the relationship between state college readiness policy and the change in statewide college-going rates when controlling for state-level covariates?

Q2 What is the relationship between state college readiness policy and the change in institutional retention rates when controlling for state-and institutional-level covariates?

Q2a Is there a difference in the relationship between state college readiness policy and the change in institutional retention rates at 2-year institutions compared to 4-year institutions when controlling for state-and institutional-level covariates?

Q3 What is the relationship between state college readiness policy and the change in institutional graduation rates when controlling for state-and institutional-level covariates?

Q3a Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates 2-year institutions compared to 4-year institutions when controlling for state-and institutional-level covariates?

Q4 What is the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students and non-European American students when controlling for state- and institutional-level covariates?

Q4a Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students compared to non-European American students at 2-year institutions when controlling for state-and institutional-level covariates?

Q4b Is there a difference in the relationship between state college readiness policy and the change in institutional graduation rates for European American (White) students compared to non-European American students at 4-year institutions when controlling for state-and institutional-level covariates?

In this section, I will provide an overview of my findings, a discussion of implications for states and institutions, recommendations for policymakers and administrators, areas for future research, and concluding remarks.

## Summary of Findings

### Trends in Outcomes

Having answered each research question in Chapter IV, I turn my attention to themes I observed in the data that may help explain my findings. No significant change was found in college-going rates; average state rates have actually decreased from 64% in 2010-11 to 63% in 2016-17. State values range from 44-81% across years. Some states have had a decline of up to 6% during the range of years in the study, while only 1/3 (17) have shown any increase over the 7-year period. Delaware had the highest increase, going from 49% to 71%, though this was largely due to a significant decrease in their

2010 rate--rates in 2008 were 66%. Tennessee has also seen significant gains in college-going, from 64% to 73%. Both states have initiatives specifically aimed at addressing college going (Delaware Student Success and Complete College Tennessee), and these programs may have contributed to these state's success.

Average state retention rates have increased, from 64% in 2010-11 to 66% in 2016-17. The majority of this growth can be attributed to the 2-year sector, which increased at a rate of 0.4% each year, compared to 2% at 4-year institutions. The average retention rate within a state varies significantly by sector; 2-year institutions have a state average of 57.0%, while 4-year institutions have a 73.1% average state level retention rate.

Graduation rates have also increased over the study period, growing from 32% in 2010-11 to 36% in 2016-17. Again, growth has been faster in the 2-year sector, with graduation rates increasing at a rate of 0.8% annually, compared to 0.2% annually at 4-year institutions. State level retention rates at 2-year institutions are on average 24.1%, compared to state level rates of 45.5% at 4-year institutions. In both sectors, there are differences in the average graduation rate for European American and non-European American students. Graduation rates increased for all students at 2-year institutions and for European American students at 4-year institutions but have shown no significant growth for non-European American students at 4-year institutions. At 2-year institutions, the average state level graduation rate for European American students is 26.8% compared to 18.4% for non-European American students; growth in graduation rates has been 1.1% for European American students compared to 0.7% annually for non-European American students, though this difference was not statistically significant in the full

model. Significant gaps are also found at 4-year institutions: state level average graduation rates for European American students was 47.5%, compared to 38.6% for non-European American students.

**College Readiness Policy**

None of the college readiness policies included in this study were found to be significantly related to student outcomes, with the exception of a required college-prep curriculum negatively correlating to graduation rates at 2-year institutions. This may indicate that college-prep curriculum does not adequately reflect the needs of programs in the 2-year sector or may suggest that students in these states are better prepared and more likely to transfer, which is not accounted for in the graduation rate calculation. Overall, more than two-thirds of states had a college readiness definition in place, with assessments aligned with postsecondary expectations as the second most common policy. Ten states had none of the identified college readiness policies, and five states (Arkansas, Maryland, Oklahoma, Tennessee, and Texas) had four policies (no state had all five policies).

**Institutional Factors**

As expected, based on previous research, all of the institution level covariates are related to at least one of the student outcomes. The percent of non-European American students in the student body is negatively related to graduation rate, with the exception of the non-European American student graduation rate at 4-year institutions, which has a positive relationship. Overall, the strength of the relationship is more significant at 2-year institutions than 4-year, and as noted, significantly different at 4-year institutions for European American and non-European American students. The percent of students

enrolled part-time is also negatively correlated to all graduation rates, as well as retention rates at 4-year institutions. This variable had a significantly greater impact on the graduation rates at 4-year institutions (-.38) than at 2-year institutions (-.19), particularly on the graduation rates of non-European American students (-.35 compared to -.14). In other words, an increase in the number of students enrolled part-time is likely to have the greatest negative impact on the graduation rates of non-European American students enrolled in 4-year institutions.

The percent of students from out-of-state also has a significant negative relationship with retention at 2-year institutions, and a positive relationship with graduation at 4-year institutions, indicating that this variable may represent a measure of selectivity among 4-year institutions. Among 4-year institutions, Carnegie classification and median ACT/SAT score of incoming students are significantly related to both retention and graduation rates. Institutions with a greater research emphasis and higher scores have higher rates. There was a significant difference in the relationship between ACT/SAT scores and graduation rates for European American and non-European American students, with the graduation rates for non-European American more strongly impacted (.036 vs .029).

**State Factors--Quality Counts Measures**

The state level covariates used in this study were based on the indicators used in the Education Week Quality Counts Chance-for-Success Index. Of these indicators, two variables, the percent of children with a parent holding a postsecondary degree and percent of children with at least one parent steadily employed, were too closely correlated to the other indicators to be included in the models. An additional two, high school

graduation rates and the percent of adults who have earned a postsecondary degree, were not correlated to any of the outcome measures. This is a surprising result considering they are the two measures more closely related to the postsecondary system. The covariate most frequently found significant was linguistic integration, or the percent of dependent children whose parents are fluent speakers of English. As noted previously, this indicator may actually represent a measure of urbanicity or population, with more urban and highly populated states having a smaller percentage of linguistic integration, as well as greater average retention and graduation rates. Within my data set, there was no variable that allowed for me to control for population or population density.

The two measures related to income are both found to significantly correlate to retention and graduation rates at 2-year institutions. The percent of children in families that are above low income has a positive relationship, while the percent of adults whose annual person income is above the national median has a negative relationship. This indicates that 2-year institutions are more sensitive to the income levels of their surrounding communities, which makes sense given the more local control and funding sources associated with the 2-year sector. Two additional covariates worth nothing are the percentage of 3- and 4-year old children enrolled in preschool and the percent of adults 18-24 years old currently enrolled in postsecondary education; both are found to positively relate to college-going rates and graduation rates at 4-year institutions.

Overall, the Quality Counts indicators do account for some of the state level variance in college-going rates and student outcomes in the postsecondary sector. However, Education Week may want to reconsider several of their indicators and continue to explore what additional state factors may better explain a “person's prospect

of positive outcomes over the course of a lifetime" (Education Week, 2019, para. 2). These factors may include public finance issues such as the tax base and appropriations for education; state diversity, or the percent of non-European Americans in the population; and factors related to a state's economy, such as the percentage of available jobs that require a high school diploma or postsecondary education.

## Application of Theoretical Frameworks to Findings

This study was guided by two conceptual frameworks: principal-agent theory, and Berger and Millem's (2000) theory on organizational behavior in higher education. Principal-agent theory was helpful to understand behavior in hierarchical or contractual relationships, such as the relationship between states and institutions in the current study. In this theory, the principal uses rewards and sanctions to ensure that agents behave in a way that aligns with the principal's goals (Tandberg & Hillman, 2014). Both the principal and the agent work to maximize their own interests, and principal-agent theory helps to explain the motivations behind the behaviors of both parties. In this study, I expected policies enacted by the states to influence the behavior of institutions to bring about the state goals of increased college-readiness, college-going, and educational attainment. In effective states, policy and institutional goals would be aligned, and incentives would be strong enough for institutions to behave in ways the state wants. If this theory applies, I would expect to see increases in student outcomes in those states with the most policies in place; as more action is taken by the states, there would be greater behavioral changes by the institutions. However, given that only one aspect of college readiness policy included in the study was found to have a relationship with college-going, retention rates,

and graduation rates, it does not appear that principal-agent theory fully explains this relationship.

One explanation may be that states are not effectively managing their principal-agent relationships. No action taken by the state appears to positively influence college-going rates, which have remained flat, and the increases in retention and graduation rates have no relationship with state college readiness policy. This may be due to a lack of appropriate incentives or sanctions tied to these policies. For example, if public institutions don't face a penalty for not changing their admissions requirements or placement processes to align with high school graduation requirements, there is little incentive for them to do so. Similarly, if high schools and institutions are not rewarded for increasing their college-going rates, there is little hope that states will see increases in this measure.

Another factor worth considering is the role of local communities, school boards, and coordinating or governing boards in state--institution relationships. High schools and public institutions are often overseen by locally elected bodies who may exert a stronger influence than the state. If the goals of these groups are not aligned with the state goals, then institutions are not likely to focus their efforts on the state level initiatives. For example, if a local community board is more focused on meeting workforce needs than increasing statewide educational attainment, the high school and community college in that area may be more likely to respond to that goal than the one established by the state. Given the localized control many K-12 districts and community colleges have, this is an important factor to take into consideration.

The other theoretical framework used in this study is Berger and Millem's (2000) model of organizational behavior, which identified four characteristic groups that impact student outcomes. This study used covariates representing three of these groups: student entry characteristics; organizational characteristics; and peer group characteristics. Student entry characteristics were represented by median SAT/ACT score of incoming students; organizational characteristics included percent of students that are non-European American, percent that are enrolled part-time, and percent enrolled from out-of-state; and peer group characteristics were represented by Carnegie classification, which includes information on research activity and degrees awarded by an institution.

The Berger and Millem (2000) model proposed that these characteristics provide a better understanding of how institutions impact student behavior. In the current study, all five of these characteristics have a significant relationship with either retention or graduation rates; in fact, at 4-year institutions, all five significantly relate to graduation rates. In the model for 2-year institutions, which did not include ACT/SAT scores or Carnegie classification, these characteristics explained less of the variance in student outcomes but were still found to significantly correlate. These findings support the theory that in order to better understand student behavior and associated outcomes, it is important to understand the differences in organizational characteristics that may influence those outcomes.

## Implications for States and Institutions

Results of this study have important implications for states and institutions. Given the lack of growth in college-going rates, institutions and states should be very concerned about the future of the educational pipeline, particularly as it relates to enrollment and a

skilled workforce. According to WICHE's *Knocking at the College Door* report, the U.S. is heading into a period of stagnation in the overall number of high school graduates expected (Bransberger & Michelau, 2016). Many states will see a sharp drop-off beginning with the 2026 graduating class, given the decline in birth states resulting from the 2008 recession. If college-going rates continue to remain flat or decrease, this will result in a significant decrease in enrollment for institutions over the next decade. For institutions reliant on tuition dollars to remain financially solvent, this will present a major challenge.

Declining enrollments will also have a significant impact on the future workforce. Many states are already facing a shortage of skilled workers to fill current demand (Whinnery & Pompelia, 2018), and a reduction in the number of college-goers will only worsen the issue. If institutions and states cannot increase the college-going rate and continue to increase the retention and graduation rates of students who do attend colleges, this shortage will have a measurable impact on the economies of many regions and states. Employers unable to find skilled workers for positions may change locations, further harming struggling economies, and states may be unable to meet the needs of their populations. One clear example is in the field of healthcare; many of these occupations require some type of postsecondary credential, and given the aging population and increasing healthcare needs, a shortage of individuals in the educational pipeline will leave many of these positions unfilled and create significant issues for those needing care.

Another important implication for institutions and states relates to the demographic makeup of future enrollees. *Knocking at the College Door* also reports that there will be a consistent decline in the number of European American high school

graduates, and that Hispanic public high school graduates will increase by 50% or more (Bransberger & Michelau, 2016). College-going rates for non-European American students remain less than that of European American students (U.S. Department of Education, 2019), so these changes may result in future decreases to the college-going rate. It will certainly lead to changed demographics in institutional enrollment, and institutions should expect larger populations of non-European American students. Results of this study show that the percentage of non-European American students enrolled has a negative relationship with graduation rates in both the 2- and 4- year sector, a result institutions should pay particular attention to. As the non-European American population increases, institutions may need to provide additional support services or consider their campus environment in order to prevent decreases in graduation rates.

Results also showed that the percentage of non-European American students in the student body had a positive relationship with graduation rates for those same students at 4-year institutions, which is a promising indicator for these populations as the percentages increase. However, overall, there has been no increase in the graduation rate for non-European American students at 4-year institutions between 2010 and 2017. Given that this population is expected to increase, as discussed above, we can expect that the opportunity gap between European American and non-European American students will continue to expand. It will be particularly important for institutions to continue prioritizing and focusing resources on how they can support these students in order to change this pattern and achieve greater equity in graduation rates.

Several of the findings related to state characteristics also have important implications for states. Two variables related to the education system within a state are of

particular note. Positive relationships are found between the percent of 3- and 4-year old children enrolled in preschool and both college-going rates and 4-year institution graduation rates. The percent of students proficient on the 8th grade math assessment is also found to positively correlate to graduation rates in both the 2- and 4-year sectors. States often face tough decisions when allocating their education resources, and it is important for states to recognize the relationship these areas have with college-going and student success when making decisions about priorities in the K-12 sector.

Another implication for states is the relationship between family income and linguistic integration and student outcomes. States with greater percentages of children in families with incomes at least 200% of poverty level have higher retention and graduation rates at 2-year institutions. Given that we know educational attainment, even at the certificate or Associate degree level, is associated with higher lifetime wages (U.S. Census Bureau, 2017), this was an important finding with significant implications. If states with high poverty levels don't do more to increase their college-going rates and student success in higher education, they can expect increasing levels of poverty due to a lack of skilled workers and decreased earning potential. Students who attend college but don't complete may also be saddled with debt they are unable to repay, exacerbating their economic struggles.

Similarly, states with a high percentage of linguistic integration, or children whose parents are fluent English-speakers, have lower retention and graduation rates across all institutions. States with extremely high linguistic integration include Montana, North Dakota, and West Virginia. As mentioned before, this variable may actually represent population size, homogeneity, or urbanicity. Many of these states already

struggle to meet employer's needs for a skilled workforce, and this problem will only increase if states don't improve student outcomes in their higher education systems.

## Recommendations for Policy

Given the results of this study, I provide three recommendations for policymakers and school administrators: the need for an increased focus on college-going; the need to explore additional types of policies and initiatives related to P-20 alignment; and the need for a continued emphasis on work related to closing opportunity gaps among student populations.

### Increase Efforts to Improve College-Going Rates

As mentioned previously, there has been no growth in college-going rates between 2010 and 2016, and in fact the rates in many states have declined. In order to achieve their ambitious attainment goals, states need to better understand this trend and continue to increase efforts to enroll high school graduates in the postsecondary sector. Given the expected reduction in the number of high school graduates in the next decade (Bransberger & Michelau, 2016), increasing college-going rates will be necessary for states to achieve their goals. States should focus on creating college-going cultures within their states by involving community members, parents, high schools, and colleges in statewide initiatives. Delaware, Louisiana, and Tennessee have all seen growth of more than 5% during the period included in this study, and other states should look to them for potential best practices that may be transferable. Programs such as guided pathways, dual or concurrent enrollment, and FAFSA completion initiatives all show potential to increase college-going, and states should consider introducing or expanding their efforts in these areas.

### Explore Additional P-20 Alignment Policies

Given that this study found no consistent relationships between the identified college readiness policies and student outcomes, states should explore other policies that may more successfully align the K-12 and postsecondary sector and encourage college readiness. State finance policy is one lever that can be used to better encourage P-20 alignment and attainment, and potential policies for states to implement include performance funding that rewards P-20 efforts; funding for dual enrollment programs; merit scholarship programs; and college savings plans (Callan et al., 2006; McLendon & Perna, 2014; Venezia et al., 2005). States should also consider incorporating P-20 alignment and college-going into their accountability systems for both the K-12 and postsecondary sector, and reward collaboration between the two. Finally, states without a statewide longitudinal data system (SLDS) should implement a multi-sector data system that allows tracking of students between the K-12 and higher education systems and use these data to identify best practices for college-going and student achievement within their own state.

### Focus on Closing Equity Gaps in Graduation Rates

In both the 2- and 4-year sector, there are still significant gaps found in graduation rates for European American students and those from other races/ethnicities. Given the changing demographics expected over the next few decades and the increasing diversity of many states, it is imperative that state systems work with their institutions to address these gaps and improve opportunities for non-European American students. Results from this study show that institutions with larger percentages of non-European American

students have lower graduation rates, indicating that these institutions are not effectively serving these students and need to focus on increasing attainment for these groups. One promising result shows that at 4-year institutions, graduation rates for non-European American actually increase in a more racial or ethnically diverse environment. States should encourage their institutions via policy to continue to increase the diversity of their student policies by focusing on equity in admissions and financial aid. Again, some states are leading the way and can be looked to for best practices; in the 4-year sector, Iowa, New Jersey, and Virginia have all seen growth in their non-European American student graduation rates, while in the 2-year sector, California, Georgia, and Wisconsin have made progress in raising non-European American student graduation rates.

## Recommendations for Future Research

There are several ways in which I believe expanding upon this study and the present literature would be useful: incorporating non-traditional student populations; examining college-going and retention rates by race/ethnicity; expanding the 2-year institution graduation rate to include transfer outcomes; examining the impact of college readiness policies while accounting for other state policies, such as state funding and finance policy; examining the 2019 policy landscape to understand which college readiness policies are still in place, have been discontinued, or additional policies that have been introduced; and examining specific state programs more in-depth to determine their relationship with student outcomes.

First, as noted previously, the retention and graduation rate outcome variables are all based on a cohort of first-time in college, full-time students, which at some institutions may represent as few as 8% of all entering students. Students enrolling part-time or

returning to college are not accounted for, and I believe future research could expand our understanding of how college readiness policies impact these students. It may be possible that college readiness programs are disproportionally successful among part-time students. Results of this study showed that the percent of students enrolling part-time is increasing, and states and institutions would benefit from knowing what policies encourage successful student outcomes among these populations.

Another potential area for future research is an understanding of how college-going and retention rates vary between European American and non-European American students at the individual state level, and whether there are differences in how policies relate to outcomes for both of these groups. It would be interesting to know if policies such as aligning assessments with college admissions requirements impacts the college-going behavior of students from different racial and ethnic backgrounds differently, given what we know about equity gaps that currently exist in ACT/SAT assessment results (Jaschik, 2017; Reeves & Halikias, 2017). Another avenue for future research would be to include transfer from a 2- to 4-year institution as a successful student outcome. In this study, graduation rates only accounted for students who completed a degree, and college readiness policies may actually be encouraging students from the 2-year institution to transfer to a 4-year institution. More robust data, likely from state longitudinal data systems or the National Student Clearinghouse, would be required to examine this outcome, but could greatly help states understand how policies impact student transfer behavior.

Future research on college readiness policy would also benefit from incorporating additional variables related to state policy as covariates. Given what we know about the

significance of finance policy, including performance funding and appropriations, it is likely that variables accounting for these differences in states may explain a significant amount of variance in state level college-going, retention, and graduation rates (Abbott, 2016; Li, 2014; Ragland, 2016; Rutherford & Rabovsky, 2014; Tandberg & Hillman, 2014). Financial aid policy at the state level is also likely to explain differences in student outcomes (Ragland, 2016), and it would be interesting to examine whether college readiness policies explained any additional variance in outcomes once these factors were controlled for. Given the results of this study, it is clear that there are more state factors that relate to student outcomes other than those included in the Quality Works chance-for-success index, and finance and financial aid policy may be better indicators.

Finally, the literature regarding college readiness would benefit from narrowly focused studies on the implementation of specific college readiness programs and policies. The higher education community would benefit from understanding what components of college readiness initiatives are related to student success, and if those programs and benefits could be transferred to other states. Case studies or evaluations of programs such as Colorado's Concurrent Enrollment program, Indiana's 21st Century Scholars, and the Tennessee Promise initiative would provide comprehensive data that could inform the work of other states and institutions.

## Conclusion

If states are going to meet their attainment goals and increase the percentage of their populations with a postsecondary credential or degree, they will need to increase the college readiness of their students in order to ensure those students have the best chance of enrolling in and being successful in the postsecondary sector. Policies such as defining

college readiness, requiring college-preparatory coursework, aligning high school graduation requirements with college admissions requirements, aligning high school assessments to college admissions standards, and using those assessment for admissions and placement, do not appear to have a relationship with improved state college-going rates or student success. If the goal of these policies is to ensure all students graduate high school ready for college, transition to college, and succeed in college, the policies are not meeting their goals.

Without evidence that these policies are successful, it's questionable why states continue to introduce or sustain these policies. One explanation is that the intent of college readiness policy may be more focused on the K-12 sector rather than college-going and postsecondary success. The Education Commission of the States identified "communicating competencies graduates need to be college and career ready" (Glancy et al., 2014) as an important way states are attempting to align their K-12 and postsecondary sectors, and it's reasonable to suspect formalizing college readiness into policy may be a communication tool intended for high school students and school districts, rather than an attempt to change student outcomes in higher education.

Another explanation is that college readiness policies may be introduced in order to meet federal expectations and regulations, rather than to support any goals set by an individual state. States are required to meet specific requirements under the Elementary and Secondary Education Act (ESEA); however, under the Obama administration, the U.S. Department of Education was willing to grant exceptions to certain provisions if states promised to introduce reforms addressing college and career readiness (in addition to reforms addressing other identified principles; Mishkind, 2014). In response to this

offer, 45 states submitted requests for ESEA flexibility, many of which included policies on college readiness. Given that these reforms were externally motivated and not necessarily created as part of any statewide effort (as the plans were often developed by the K-12 sector only), it is understandable that these policies may not show any immediate relationship with student outcomes. Hopefully results of this external pressure are yet to be measured: many of these reforms were proposed in 2011 (thought potentially already in place), while the period of this study only covered 2010-2017.

Finally, college readiness policies may be also be intended as a public relations move or evidence of action by state attainment councils. P-20 councils have often been criticized for slow or nonexistent progress, and for introducing initiatives that are symbolic in nature, rather than impactful or effective (Chamberlin & Plucker, 2008). This is often due to a lack of resources as well as a lack of authority, limiting the ability of some P-20 councils to bring about any meaningful reform (Perna & Armijo, 2014; Walsh, 2009). Given the lack of relationship to college-going or student outcomes, the policies included in this study may have been the type of symbolic, ineffective policies critics warned of.

Having said that, college-going rates are up nationwide from the 2000s. Given the reduction in state appropriations to both K-12 and higher education after the 2008 recession, both college-going and educational attainment may have potentially declined or flattened in the 2010s--perhaps the presence of college readiness policies prevented drops in states that may have been hard hit otherwise. Given the upcoming decline in high school graduates and collegegoers, it's imperative that states figure out some way to effectively address college-going and successful student completion of higher education.

The goal of aligning the K-12 and postsecondary sectors is still a worthy one, and the college readiness policies discussed in this study have intrinsic value, even if not directly related to student outcomes. In any case, states should continue to pursue additional policy levers to better align their P-20 systems and achieve the desired outcomes for their populations.

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# APPENDIX A

# COLLEGE-GOING RATES BY STATE AND YEAR

| State | 2010 | 2012 | 2014 | 2016 |
|---|---|---|---|---|
| AK | 47.5% | 49.2% | 44.1% | 45.4% |
| AL | 65.2% | 59.6% | 62.5% | 66.8% |
| AR | 66.7% | 68.9% | 64.6% | 63.6% |
| AZ | 60.8% | 54.6% | 53.4% | 54.8% |
| CA | 63.4% | 59.6% | 61.9% | 63.8% |
| CO | 62.1% | 60.1% | 58.5% | 60.9% |
| CT | 81.2% | 73.0% | 74.7% | 74.9% |
| DE | 49.2% | 67.4% | 64.3% | 71.4% |
| FL | 65.1% | 65.0% | 64.4% | 64.1% |
| GA | 68.9% | 68.2% | 64.2% | 65.5% |
| HI | 64.1% | 64.5% | 61.0% | 61.9% |
| IA | 67.7% | 67.1% | 67.2% | 66.6% |
| ID | 49.2% | 49.5% | 43.9% | 44.7% |
| IL | 60.1% | 60.9% | 62.2% | 64.0% |
| IN | 66.5% | 63.1% | 61.7% | 61.6% |
| KS | 65.8% | 66.3% | 66.3% | 65.5% |
| KY | 63.6% | 64.2% | 61.8% | 60.5% |
| LA | 65.5% | 67.6% | 71.0% | 72.3% |
| MA | 74.6% | 72.7% | 75.2% | 73.6% |
| MD | 64.9% | 61.1% | 64.8% | 65.4% |
| ME | 56.1% | 55.2% | 55.5% | 57.2% |
| MI | 63.2% | 63.8% | 65.0% | 65.3% |
| MN | 71.6% | 70.3% | 70.7% | 70.4% |
| MO | 62.5% | 63.1% | 62.8% | 59.3% |
| MS | 80.2% | 80.1% | 72.8% | 78.3% |

| State | 2010 | 2012 | 2014 | 2016 |
|---|---|---|---|---|
| MT | 61.3% | 59.8% | 61.1% | 56.1% |
| NC | 64.6% | 63.0% | 63.3% | 64.6% |
| ND | 69.2% | 65.5% | 66.0% | 66.1% |
| NE | 70.5% | 65.5% | 62.6% | 65.3% |
| NH | 65.8% | 63.2% | 60.6% | 61.5% |
| NJ | 70.8% | 71.0% | 72.3% | 72.3% |
| NM | 72.8% | 69.6% | 63.8% | 69.7% |
| NV | 53.4% | 55.6% | 53.3% | 57.0% |
| NY | 70.6% | 71.2% | 70.8% | 72.1% |
| OH | 63.3% | 61.1% | 63.3% | 62.9% |
| OK | 65.2% | 61.4% | 65.9% | 63.6% |
| OR | 48.4% | 47.8% | 47.8% | 50.0% |
| PA | 62.5% | 60.4% | 62.8% | 63.6% |
| RI | 66.9% | 66.6% | 62.6% | 64.4% |
| SC | 69.3% | 66.4% | 68.7% | 69.1% |
| SD | 72.3% | 66.6% | 67.3% | 68.8% |
| TN | 64.2% | 62.1% | 65.1% | 72.9% |
| TX | 57.4% | 59.1% | 60.0% | 58.9% |
| UT | 55.5% | 53.5% | 46.6% | 49.3% |
| VA | 64.6% | 65.1% | 68.1% | 68.7% |
| VT | 53.3% | 53.1% | 54.6% | 53.0% |
| WA | 48.8% | 50.1% | 50.3% | 51.8% |
| WI | 60.5% | 61.7% | 61.4% | 59.1% |
| WV | 61.6% | 58.2% | 56.4% | 60.0% |
| WY | 60.5% | 56.8% | 54.0% | 56.8% |

# APPENDIX B

# AVERAGE RETENTION RATES BY STATE, YEAR, AND SECTOR

| State | Sector | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| AK | 4-Year Institutions | 70.0% | 67.7% | 67.0% | 73.3% | 74.0% | 70.0% | 67.0% |
| | 2-Year Institutions | 30.5% | 52.0% | 31.0% | 60.0% | 90.5% | 45.0% | 45.0% |
| AL | 4-Year Institutions | 71.3% | 70.2% | 71.7% | 72.4% | 73.8% | 74.1% | 74.5% |
| | 2-Year Institutions | 52.8% | 54.4% | 49.5% | 52.9% | 54.7% | 54.6% | 56.3% |
| AR | 4-Year Institutions | 65.2% | 63.1% | 63.3% | 64.5% | 66.4% | 67.3% | 68.0% |
| | 2-Year Institutions | 54.7% | 51.6% | 49.7% | 52.2% | 53.9% | 55.1% | 59.6% |
| AZ | 4-Year Institutions | 77.3% | 83.5% | 79.8% | 80.1% | 80.8% | 80.5% | 80.9% |
| | 2-Year Institutions | 54.5% | 52.7% | 52.1% | 53.3% | 54.7% | 58.7% | 58.3% |
| CA | 4-Year Institutions | 84.4% | 85.8% | 85.0% | 85.9% | 85.9% | 85.7% | 85.6% |
| | 2-Year Institutions | 65.9% | 67.2% | 68.2% | 68.7% | 68.2% | 68.1% | 68.6% |
| CO | 4-Year Institutions | 72.1% | 72.7% | 71.2% | 72.8% | 70.4% | 72.1% | 73.1% |
| | 2-Year Institutions | 54.9% | 54.2% | 53.1% | 54.9% | 55.6% | 56.6% | 56.7% |
| CT | 4-Year Institutions | 82.1% | 80.9% | 81.1% | 81.9% | 84.6% | 82.1% | 82.9% |
| | 2-Year Institutions | 59.5% | 57.7% | 58.9% | 60.4% | 60.3% | 59.6% | 58.4% |
| DE | 4-Year Institutions | 79.5% | 81.5% | 76.0% | 78.5% | 80.0% | 82.0% | 82.0% |
| | 2-Year Institutions | 57.0% | 56.3% | 59.0% | 57.7% | 58.0% | 61.0% | . |
| FL | 4-Year Institutions | 82.5% | 82.8% | 82.3% | 81.4% | 81.5% | 83.4% | 82.5% |
| | 2-Year Institutions | 61.6% | 60.4% | 59.7% | 62.2% | 61.3% | 61.5% | 63.3% |
| GA | 4-Year Institutions | 74.3% | 73.2% | 71.0% | 73.8% | 69.7% | 72.9% | 71.7% |
| | 2-Year Institutions | 52.2% | 52.5% | 51.4% | 54.0% | 53.0% | 55.6% | 58.0% |
| HI | 4-Year Institutions | 68.0% | 61.7% | 72.0% | 72.0% | 68.7% | 69.3% | 72.7% |
| | 2-Year Institutions | 59.0% | 59.8% | 61.8% | 60.5% | 58.3% | 59.5% | 61.5% |
| IA | 4-Year Institutions | 85.0% | 85.3% | 84.3% | 85.3% | 85.7% | 84.0% | 87.0% |
| | 2-Year Institutions | 55.4% | 54.3% | 53.8% | 55.7% | 57.4% | 59.6% | 60.8% |
| ID | 4-Year Institutions | 66.0% | 66.5% | 65.0% | 69.5% | 71.5% | 71.3% | 70.5% |
| | 2-Year Institutions | 52.0% | 58.7% | 54.0% | 55.8% | 56.8% | 58.0% | 58.8% |
| IL | 4-Year Institutions | 75.6% | 73.3% | 71.4% | 70.8% | 73.3% | 72.3% | 70.1% |
| | 2-Year Institutions | 58.7% | 56.4% | 58.0% | 59.9% | 60.3% | 60.3% | 63.3% |
| IN | 4-Year Institutions | 69.7% | 68.7% | 69.1% | 68.9% | 69.7% | 69.5% | 68.3% |
| | 2-Year Institutions | 52.9% | 50.6% | 46.0% | 49.0% | 45.0% | 48.0% | 49.0% |
| KS | 4-Year Institutions | 71.3% | 71.7% | 71.9% | 73.1% | 73.6% | 74.1% | 75.3% |
| | 2-Year Institutions | 57.7% | 57.8% | 58.9% | 59.4% | 56.8% | 58.1% | 57.8% |
| KY | 4-Year Institutions | 70.4% | 70.1% | 68.3% | 70.6% | 70.4% | 71.9% | 73.3% |
| | 2-Year Institutions | 60.7% | 59.1% | 58.4% | 56.9% | 57.8% | 56.8% | 59.1% |
| LA | 4-Year Institutions | 68.6% | 68.4% | 67.7% | 67.8% | 69.5% | 69.2% | 66.5% |
| | 2-Year Institutions | 55.4% | 54.1% | 54.1% | 52.3% | 49.9% | 52.5% | 54.5% |

| State | Sector | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| MA | 4-Year Institutions | 78.4% | 79.2% | 79.8% | 80.2% | 81.7% | 81.0% | 80.5% |
| | 2-Year Institutions | 58.3% | 58.4% | 58.4% | 59.1% | 59.8% | 57.4% | 59.3% |
| MD | 4-Year Institutions | 75.4% | 76.8% | 75.8% | 75.9% | 77.5% | 77.2% | 76.3% |
| | 2-Year Institutions | 59.8% | 60.6% | 58.9% | 58.0% | 59.9% | 61.6% | 61.8% |
| ME | 4-Year Institutions | 69.1% | 66.0% | 65.8% | 66.4% | 66.9% | 68.8% | 69.6% |
| | 2-Year Institutions | 62.6% | 56.0% | 56.6% | 59.1% | 57.9% | 61.1% | 60.6% |
| MI | 4-Year Institutions | 77.7% | 77.5% | 77.3% | 79.3% | 77.2% | 79.7% | 75.3% |
| | 2-Year Institutions | 59.2% | 54.4% | 53.3% | 56.1% | 57.6% | 56.0% | 56.4% |
| MN | 4-Year Institutions | 69.5% | 70.9% | 71.1% | 73.3% | 73.2% | 75.2% | 71.2% |
| | 2-Year Institutions | 56.7% | 56.2% | 51.8% | 55.8% | 56.2% | 57.9% | 57.3% |
| MO | 4-Year Institutions | 69.2% | 69.8% | 68.3% | 69.8% | 72.8% | 71.4% | 71.5% |
| | 2-Year Institutions | 57.6% | 56.1% | 57.5% | 60.2% | 59.6% | 57.7% | 61.5% |
| MS | 4-Year Institutions | 71.6% | 71.9% | 72.6% | 72.4% | 74.3% | 74.9% | 71.0% |
| | 2-Year Institutions | 62.1% | 57.5% | 58.1% | 59.4% | 60.6% | 61.2% | 61.9% |
| MT | 4-Year Institutions | 62.7% | 60.9% | 61.7% | 66.0% | 64.1% | 64.4% | 71.6% |
| | 2-Year Institutions | 49.5% | 49.3% | 50.1% | 50.5% | 50.6% | 49.3% | 53.0% |
| NC | 4-Year Institutions | 78.9% | 78.9% | 79.6% | 80.0% | 80.8% | 80.9% | 80.0% |
| | 2-Year Institutions | 59.1% | 59.5% | 56.7% | 55.9% | 58.3% | 57.8% | 61.0% |
| ND | 4-Year Institutions | 66.4% | 65.3% | 54.3% | 70.9% | 72.7% | 68.7% | 69.3% |
| | 2-Year Institutions | 43.0% | 53.3% | 47.9% | 54.4% | 53.0% | 57.1% | 56.6% |
| NE | 4-Year Institutions | 69.3% | 64.9% | 70.6% | 64.1% | 67.3% | 69.1% | 67.7% |
| | 2-Year Institutions | 59.6% | 53.9% | 55.1% | 56.3% | 56.3% | 59.0% | 60.6% |
| NH | 4-Year Institutions | 74.2% | 75.0% | 72.4% | 72.2% | 73.8% | 74.2% | 75.0% |
| | 2-Year Institutions | 61.1% | 56.0% | 56.6% | 61.1% | 61.4% | 60.0% | 64.4% |
| NJ | 4-Year Institutions | 83.0% | 81.9% | 82.1% | 82.0% | 83.3% | 84.3% | 84.2% |
| | 2-Year Institutions | 63.4% | 62.4% | 62.4% | 63.6% | 64.6% | 63.4% | 66.3% |
| NM | 4-Year Institutions | 62.6% | 62.6% | 62.9% | 61.4% | 63.1% | 62.0% | 64.0% |
| | 2-Year Institutions | 52.2% | 52.4% | 52.0% | 53.2% | 51.2% | 56.4% | 55.4% |
| NV | 4-Year Institutions | 69.0% | 68.8% | 65.0% | 76.0% | 73.0% | 69.2% | 72.2% |
| | 2-Year Institutions | 63.0% | 63.0% | 69.0% | 66.0% | 64.0% | 66.0% | 65.0% |
| NY | 4-Year Institutions | 80.2% | 80.7% | 80.2% | 81.2% | 81.6% | 81.1% | 79.9% |
| | 2-Year Institutions | 60.0% | 58.1% | 58.5% | 60.1% | 60.1% | 60.1% | 60.6% |
| OH | 4-Year Institutions | 65.6% | 62.5% | 62.7% | 64.2% | 66.1% | 66.7% | 66.8% |
| | 2-Year Institutions | 52.5% | 49.6% | 50.0% | 50.3% | 53.6% | 52.8% | 55.4% |
| OK | 4-Year Institutions | 64.7% | 65.0% | 61.1% | 64.5% | 64.8% | 65.7% | 65.0% |
| | 2-Year Institutions | 51.4% | 48.3% | 47.8% | 49.2% | 53.0% | 52.9% | 54.8% |

| State | Sector | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| OR | 4-Year Institutions | 74.0% | 74.6% | 73.3% | 74.0% | 74.1% | 74.3% | 74.6% |
| | 2-Year Institutions | 53.9% | 49.2% | 48.8% | 46.8% | 49.6% | 52.5% | 53.1% |
| PA | 4-Year Institutions | 76.0% | 75.2% | 73.2% | 74.4% | 76.3% | 76.9% | 77.0% |
| | 2-Year Institutions | 58.5% | 56.4% | 55.6% | 59.9% | 61.4% | 60.1% | 60.9% |
| RI | 4-Year Institutions | 78.0% | 79.0% | 78.0% | 79.0% | 80.5% | 80.0% | 78.5% |
| | 2-Year Institutions | 60.0% | 62.0% | 62.0% | 64.0% | 65.0% | 63.0% | 69.0% |
| SC | 4-Year Institutions | 71.8% | 72.0% | 70.5% | 71.5% | 73.2% | 73.4% | 73.4% |
| | 2-Year Institutions | 52.1% | 52.9% | 49.6% | 49.7% | 51.1% | 50.2% | 52.4% |
| SD | 4-Year Institutions | 68.6% | 65.3% | 66.1% | 67.6% | 67.7% | 70.1% | 71.4% |
| | 2-Year Institutions | 59.7% | 66.0% | 61.8% | 61.0% | 61.3% | 62.7% | 72.2% |
| TN | 4-Year Institutions | 72.9% | 72.4% | 69.8% | 70.7% | 72.9% | 73.6% | 73.6% |
| | 2-Year Institutions | 53.7% | 52.4% | 51.6% | 52.9% | 55.0% | 54.7% | 51.4% |
| TX | 4-Year Institutions | 68.8% | 66.9% | 69.2% | 69.1% | 70.1% | 70.4% | 70.9% |
| | 2-Year Institutions | 56.7% | 54.1% | 51.0% | 54.0% | 55.2% | 57.6% | 58.8% |
| UT | 4-Year Institutions | 69.7% | 69.2% | 66.9% | 64.6% | 64.1% | 66.6% | 67.7% |
| | 2-Year Institutions | 55.2% | 55.8% | 53.0% | 52.0% | 56.0% | 52.0% | 57.0% |
| VA | 4-Year Institutions | 82.5% | 82.9% | 82.9% | 83.1% | 82.8% | 84.3% | 83.1% |
| | 2-Year Institutions | 59.1% | 59.7% | 58.4% | 60.3% | 62.0% | 61.6% | 63.3% |
| VT | 4-Year Institutions | 70.4% | 69.2% | 71.2% | 71.2% | 71.2% | 75.2% | 73.8% |
| | 2-Year Institutions | 49.0% | 45.0% | 54.0% | 58.0% | 48.0% | 51.0% | 52.0% |
| WA | 4-Year Institutions | 72.9% | 76.2% | 77.0% | 73.4% | 71.3% | 73.4% | 71.0% |
| | 2-Year Institutions | 59.3% | 59.7% | 60.2% | 60.8% | 61.4% | 62.8% | 62.0% |
| WI | 4-Year Institutions | 75.2% | 75.5% | 76.5% | 76.6% | 78.8% | 77.6% | 75.6% |
| | 2-Year Institutions | 61.4% | 63.0% | 61.5% | 61.2% | 61.8% | 61.2% | 56.6% |
| WV | 4-Year Institutions | 62.3% | 63.3% | 61.2% | 62.5% | 61.9% | 63.5% | 64.9% |
| | 2-Year Institutions | 55.8% | 53.6% | 50.9% | 52.3% | 52.9% | 54.4% | 53.9% |
| WY | 4-Year Institutions | 74.0% | 74.0% | 76.0% | 74.0% | 76.0% | 77.0% | 77.0% |
| | 2-Year Institutions | 56.6% | 55.4% | 58.6% | 57.1% | 61.0% | 62.3% | 62.4% |

# APPENDIX C

# AVERAGE GRADUATION RATES BY STATE, YEAR, AND SECTOR

| State | Sector | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| AK | 4-Year Institutions | 24.4% | 22.4% | 23.4% | 24.7% | 25.1% | 22.2% | 26.2% |
| | 2-Year Institutions | 29.0% | 14.4% | 32.3% | 50.1% | 42.9% | 28.6% | . |
| AL | 4-Year Institutions | 39.6% | 41.0% | 40.4% | 41.6% | 41.0% | 42.5% | 43.8% |
| | 2-Year Institutions | 21.1% | 19.5% | 18.2% | 16.7% | 21.0% | 22.4% | 24.0% |
| AR | 4-Year Institutions | 33.5% | 34.8% | 33.9% | 36.6% | 36.7% | 35.8% | 37.2% |
| | 2-Year Institutions | 23.5% | 24.4% | 22.2% | 22.8% | 26.7% | 28.5% | 30.1% |
| AZ | 4-Year Institutions | 45.2% | 43.1% | 43.0% | 52.4% | 53.7% | 53.1% | 49.0% |
| | 2-Year Institutions | 22.1% | 16.2% | 15.2% | 16.2% | 18.2% | 17.7% | 20.7% |
| CA | 4-Year Institutions | 57.3% | 56.9% | 57.0% | 59.8% | 62.5% | 64.3% | 53.6% |
| | 2-Year Institutions | 23.3% | 22.7% | 24.2% | 25.3% | 27.3% | 28.7% | 29.4% |
| CO | 4-Year Institutions | 45.2% | 44.2% | 45.3% | 45.6% | 47.1% | 47.6% | 43.9% |
| | 2-Year Institutions | 27.4% | 26.1% | 25.3% | 24.7% | 27.3% | 28.8% | 30.9% |
| CT | 4-Year Institutions | 55.6% | 56.5% | 59.1% | 58.4% | 60.9% | 57.5% | 60.3% |
| | 2-Year Institutions | 12.4% | 13.6% | 12.8% | 13.7% | 16.3% | 17.0% | 16.9% |
| DE | 4-Year Institutions | 55.1% | 57.6% | 58.6% | 60.8% | 60.4% | 62.0% | 44.1% |
| | 2-Year Institutions | 13.6% | 11.5% | 15.0% | 14.8% | 14.2% | 13.4% | . |
| FL | 4-Year Institutions | 40.8% | 42.8% | 43.7% | 45.3% | 43.7% | 44.7% | 44.1% |
| | 2-Year Institutions | 38.3% | 36.9% | 35.8% | 33.8% | 36.7% | 36.0% | 34.6% |
| GA | 4-Year Institutions | 34.6% | 34.9% | 36.0% | 33.5% | 30.4% | 30.4% | 30.9% |
| | 2-Year Institutions | 27.2% | 25.6% | 24.8% | 23.0% | 28.1% | 31.7% | 35.9% |
| HI | 4-Year Institutions | 33.5% | 34.8% | 32.7% | 36.3% | 34.2% | 30.2% | 39.2% |
| | 2-Year Institutions | 14.3% | 12.8% | 14.6% | 16.9% | 18.9% | 17.6% | 18.0% |
| IA | 4-Year Institutions | 68.4% | 69.0% | 68.1% | 67.6% | 70.4% | 70.4% | 71.5% |
| | 2-Year Institutions | 33.7% | 31.7% | 29.3% | 29.8% | 31.7% | 34.2% | 37.8% |
| ID | 4-Year Institutions | 35.6% | 37.0% | 38.2% | 38.4% | 39.6% | 38.6% | 39.2% |
| | 2-Year Institutions | 34.3% | 30.4% | 27.7% | 24.5% | 29.3% | 29.0% | 28.7% |
| IL | 4-Year Institutions | 52.6% | 51.9% | 50.7% | 51.2% | 50.4% | 50.4% | 48.8% |
| | 2-Year Institutions | 23.4% | 23.4% | 24.1% | 26.9% | 29.7% | 29.9% | 30.9% |
| IN | 4-Year Institutions | 35.0% | 36.5% | 38.0% | 38.6% | 38.6% | 39.2% | 43.1% |
| | 2-Year Institutions | 10.4% | 8.0% | 8.8% | 8.3% | 10.9% | 14.0% | 15.9% |
| KS | 4-Year Institutions | 46.0% | 45.7% | 45.4% | 44.0% | 44.6% | 45.9% | 49.1% |
| | 2-Year Institutions | 38.4% | 36.8% | 36.4% | 36.2% | 36.5% | 36.9% | 39.2% |
| KY | 4-Year Institutions | 42.2% | 41.9% | 43.4% | 43.9% | 43.7% | 44.2% | 44.7% |
| | 2-Year Institutions | 26.7% | 26.6% | 24.3% | 25.2% | 27.6% | 28.8% | 29.5% |
| LA | 4-Year Institutions | 35.5% | 35.1% | 36.4% | 37.4% | 39.0% | 39.3% | 39.2% |
| | 2-Year Institutions | 29.2% | 29.9% | 25.5% | 24.1% | 25.9% | 25.7% | 27.0% |

| State | Sector | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| MA | 4-Year Institutions | 53.0% | 53.6% | 56.0% | 57.0% | 57.5% | 59.0% | 59.3% |
| | 2-Year Institutions | 16.6% | 16.1% | 16.5% | 17.1% | 17.6% | 18.6% | 18.4% |
| MD | 4-Year Institutions | 50.9% | 50.3% | 50.0% | 51.5% | 51.1% | 48.3% | 53.2% |
| | 2-Year Institutions | 14.6% | 16.0% | 15.7% | 17.0% | 17.6% | 20.3% | 22.9% |
| ME | 4-Year Institutions | 43.6% | 43.2% | 42.2% | 43.8% | 41.9% | 40.4% | 40.3% |
| | 2-Year Institutions | 31.1% | 30.2% | 27.1% | 26.4% | 29.2% | 28.5% | 31.9% |
| MI | 4-Year Institutions | 50.7% | 51.8% | 52.7% | 50.4% | 46.3% | 45.3% | 44.1% |
| | 2-Year Institutions | 15.7% | 15.0% | 14.6% | 15.2% | 17.2% | 17.3% | 18.7% |
| MN | 4-Year Institutions | 45.8% | 46.8% | 47.4% | 47.9% | 47.8% | 52.8% | 49.0% |
| | 2-Year Institutions | 28.7% | 29.5% | 27.0% | 28.2% | 29.2% | 30.2% | 31.9% |
| MO | 4-Year Institutions | 45.3% | 46.6% | 47.2% | 47.1% | 45.2% | 46.3% | 46.4% |
| | 2-Year Institutions | 23.1% | 24.5% | 23.2% | 23.9% | 25.7% | 28.0% | 29.0% |
| MS | 4-Year Institutions | 42.1% | 42.4% | 41.9% | 44.4% | 43.5% | 43.1% | 43.1% |
| | 2-Year Institutions | 26.5% | 26.4% | 25.4% | 24.9% | 29.8% | 32.0% | 35.1% |
| MT | 4-Year Institutions | 36.4% | 38.7% | 40.3% | 35.4% | 34.7% | 38.0% | 35.9% |
| | 2-Year Institutions | 30.2% | 31.5% | 28.8% | 32.1% | 25.6% | 27.7% | 27.2% |
| NC | 4-Year Institutions | 53.8% | 53.8% | 54.6% | 56.5% | 56.4% | 56.3% | 57.7% |
| | 2-Year Institutions | 23.8% | 22.2% | 21.2% | 15.7% | 19.6% | 24.2% | 25.8% |
| ND | 4-Year Institutions | 38.3% | 36.2% | 38.9% | 40.4% | 34.5% | 35.2% | 36.0% |
| | 2-Year Institutions | 34.3% | 32.5% | 29.5% | 31.5% | 34.9% | 28.9% | 30.4% |
| NE | 4-Year Institutions | 48.8% | 49.4% | 40.7% | 43.4% | 44.9% | 44.7% | 45.3% |
| | 2-Year Institutions | 32.1% | 29.9% | 29.0% | 28.0% | 30.3% | 30.9% | 32.9% |
| NH | 4-Year Institutions | 49.5% | 54.8% | 49.9% | 51.4% | 52.0% | 52.8% | 49.7% |
| | 2-Year Institutions | 26.3% | 25.0% | 23.6% | 23.7% | 26.1% | 24.4% | 27.6% |
| NJ | 4-Year Institutions | 62.2% | 62.5% | 62.1% | 62.1% | 63.2% | 63.7% | 64.5% |
| | 2-Year Institutions | 19.0% | 17.9% | 17.3% | 17.7% | 20.5% | 23.0% | 24.0% |
| NM | 4-Year Institutions | 30.6% | 34.9% | 31.5% | 29.5% | 29.8% | 31.5% | 31.1% |
| | 2-Year Institutions | 17.9% | 14.3% | 14.0% | 16.1% | 16.6% | 20.4% | 24.2% |
| NV | 4-Year Institutions | 27.5% | 27.0% | 26.6% | 27.4% | 26.3% | 27.3% | 29.0% |
| | 2-Year Institutions | 16.7% | 15.8% | 21.0% | 27.9% | 30.4% | 30.6% | 28.4% |
| NY | 4-Year Institutions | 50.7% | 51.2% | 52.0% | 52.8% | 53.9% | 54.9% | 55.8% |
| | 2-Year Institutions | 22.2% | 21.4% | 21.6% | 22.5% | 25.8% | 26.7% | 27.8% |
| OH | 4-Year Institutions | 36.5% | 36.0% | 36.5% | 36.0% | 35.6% | 35.6% | 37.9% |
| | 2-Year Institutions | 15.2% | 15.3% | 15.1% | 14.8% | 16.2% | 19.5% | 22.2% |
| OK | 4-Year Institutions | 31.2% | 30.9% | 31.6% | 31.4% | 31.1% | 30.2% | 29.4% |
| | 2-Year Institutions | 19.8% | 18.8% | 17.8% | 18.3% | 21.9% | 24.5% | 24.7% |

| State | Sector | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| OR | 4-Year Institutions | 44.6% | 46.6% | 45.5% | 48.8% | 47.3% | 48.5% | 49.0% |
| | 2-Year Institutions | 17.1% | 16.3% | 18.9% | 17.1% | 19.9% | 19.5% | 22.4% |
| PA | 4-Year Institutions | 53.0% | 51.7% | 53.4% | 52.6% | 53.2% | 52.0% | 51.5% |
| | 2-Year Institutions | 16.9% | 16.6% | 16.4% | 21.5% | 22.5% | 23.4% | 24.7% |
| RI | 4-Year Institutions | 53.7% | 53.0% | 53.2% | 50.7% | 53.6% | 55.1% | 55.9% |
| | 2-Year Institutions | 10.6% | 11.8% | 12.6% | 11.8% | 13.8% | 16.5% | 17.9% |
| SC | 4-Year Institutions | 50.2% | 50.8% | 52.3% | 51.2% | 51.4% | 51.9% | 52.2% |
| | 2-Year Institutions | 13.6% | 13.6% | 13.8% | 13.2% | 14.0% | 15.4% | 16.1% |
| SD | 4-Year Institutions | 38.2% | 42.1% | 42.7% | 42.5% | 41.2% | 41.7% | 40.6% |
| | 2-Year Institutions | 37.0% | 36.8% | 39.9% | 41.2% | 43.4% | 39.8% | 38.0% |
| TN | 4-Year Institutions | 44.2% | 44.6% | 44.2% | 46.4% | 46.6% | 45.6% | 45.5% |
| | 2-Year Institutions | 12.3% | 12.1% | 13.5% | 14.9% | 15.5% | 19.7% | 22.3% |
| TX | 4-Year Institutions | 38.3% | 40.4% | 39.8% | 41.4% | 40.2% | 38.8% | 40.1% |
| | 2-Year Institutions | 15.6% | 16.4% | 16.4% | 16.8% | 16.8% | 19.8% | 22.0% |
| UT | 4-Year Institutions | 40.2% | 41.1% | 44.0% | 43.2% | 42.6% | 43.2% | 44.2% |
| | 2-Year Institutions | 31.3% | 31.2% | 23.2% | 15.9% | 11.2% | 20.6% | 22.1% |
| VA | 4-Year Institutions | 63.1% | 64.8% | 65.1% | 65.6% | 66.4% | 66.9% | 67.8% |
| | 2-Year Institutions | 21.4% | 21.3% | 25.0% | 24.6% | 26.7% | 29.9% | 30.7% |
| VT | 4-Year Institutions | 47.0% | 46.4% | 49.5% | 50.4% | 49.2% | 48.7% | 52.3% |
| | 2-Year Institutions | 12.3% | 14.1% | 11.1% | 17.4% | 15.0% | 14.2% | 21.4% |
| WA | 4-Year Institutions | 42.3% | 40.5% | 41.8% | 42.6% | 40.8% | 40.4% | 38.4% |
| | 2-Year Institutions | 30.5% | 30.2% | 31.4% | 31.3% | 31.5% | 34.0% | 33.0% |
| WI | 4-Year Institutions | 49.9% | 51.7% | 51.7% | 53.0% | 53.0% | 52.3% | 51.8% |
| | 2-Year Institutions | 33.3% | 34.9% | 33.8% | 33.4% | 36.3% | 35.2% | 39.0% |
| WV | 4-Year Institutions | 37.0% | 35.3% | 33.4% | 34.1% | 35.5% | 34.3% | 35.8% |
| | 2-Year Institutions | 17.4% | 18.9% | 20.5% | 23.0% | 25.0% | 27.6% | 31.6% |
| WY | 4-Year Institutions | 53.2% | 54.4% | 54.1% | 54.0% | 55.5% | 55.4% | 58.2% |
| | 2-Year Institutions | 32.9% | 30.9% | 30.4% | 31.6% | 30.2% | 34.9% | 38.5% |

# APPENDIX D

## AVERAGE 4-YEAR INSTITUTION GRADUATION RATES BY STATE, YEAR, AND STUDENT RACE/ETHNICITY

| State | Population | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| AK | European American | 28.5% | 25.6% | 27.7% | 30.5% | 30.5% | 27.4% | 33.3% |
| | Non-European American | 12.2% | 14.4% | 15.4% | 14.1% | 16.9% | 14.9% | 17.3% |
| AL | European American | 41.7% | 44.9% | 40.9% | 44.2% | 42.6% | 45.9% | 46.6% |
| | Non-European American | 33.0% | 35.2% | 35.8% | 37.3% | 33.7% | 36.8% | 36.6% |
| AR | European American | 36.5% | 39.4% | 38.2% | 41.1% | 39.1% | 41.0% | 39.9% |
| | Non-European American | 26.1% | 26.7% | 26.2% | 28.1% | 26.4% | 28.6% | 29.8% |
| AZ | European American | 59.5% | 68.9% | 44.5% | 61.2% | 55.7% | 48.8% | 50.2% |
| | Non-European American | 39.3% | 36.9% | 37.6% | 47.6% | 48.6% | 50.2% | 43.9% |
| CA | European American | 60.2% | 59.9% | 59.8% | 63.7% | 65.3% | 66.6% | 57.4% |
| | Non-European American | 55.4% | 53.8% | 55.0% | 57.0% | 60.7% | 62.7% | 51.4% |
| CO | European American | 46.8% | 46.8% | 47.4% | 47.7% | 48.9% | 49.7% | 46.2% |
| | Non-European American | 39.4% | 38.3% | 39.7% | 41.2% | 41.7% | 42.3% | 38.9% |
| CT | European American | 56.5% | 56.1% | 61.6% | 58.0% | 61.3% | 60.6% | 62.6% |
| | Non-European American | 50.9% | 54.8% | 52.6% | 56.5% | 56.1% | 51.3% | 54.5% |
| DE | European American | 50.9% | 60.5% | 69.4% | 67.6% | 66.4% | 62.3% | 46.6% |
| | Non-European American | 51.5% | 54.3% | 54.7% | 57.4% | 58.3% | 59.3% | 40.7% |
| FL | European American | 41.6% | 44.0% | 44.7% | 46.6% | 45.2% | 47.0% | 46.2% |
| | Non-European American | 37.0% | 38.8% | 39.3% | 42.1% | 40.3% | 40.1% | 39.8% |
| GA | European American | 33.0% | 32.6% | 40.1% | 33.3% | 31.0% | 31.8% | 31.3% |
| | Non-European American | 32.8% | 32.5% | 35.0% | 30.9% | 28.3% | 27.4% | 28.3% |
| HI | European American | 27.4% | 28.4% | 30.0% | 49.3% | 28.0% | 20.0% | 49.1% |
| | Non-European American | 35.5% | 36.5% | 33.7% | 36.2% | 35.6% | 32.0% | 39.6% |
| IA | European American | 69.5% | 70.1% | 69.4% | 68.7% | 72.0% | 71.4% | 72.7% |
| | Non-European American | 55.4% | 57.4% | 55.4% | 56.3% | 55.4% | 62.0% | 65.4% |
| ID | European American | 36.2% | 38.1% | 39.4% | 39.7% | 40.3% | 39.5% | 40.0% |
| | Non-European American | 29.0% | 31.1% | 29.7% | 32.8% | 35.8% | 30.8% | 32.0% |
| IL | European American | 55.4% | 55.6% | 56.6% | 61.5% | 55.1% | 56.9% | 55.3% |
| | Non-European American | 42.8% | 41.6% | 41.1% | 42.7% | 42.0% | 42.1% | 40.9% |
| IN | European American | 37.0% | 38.0% | 39.6% | 40.6% | 40.6% | 41.7% | 45.4% |
| | Non-European American | 24.8% | 28.1% | 29.7% | 30.7% | 31.2% | 29.8% | 32.6% |
| KS | European American | 51.2% | 51.3% | 51.7% | 49.8% | 50.0% | 51.4% | 53.7% |
| | Non-European American | 36.9% | 38.2% | 37.8% | 33.3% | 35.5% | 35.2% | 37.7% |
| KY | European American | 42.6% | 43.9% | 44.2% | 44.4% | 45.5% | 45.6% | 49.4% |
| | Non-European American | 34.3% | 33.5% | 33.1% | 33.7% | 33.8% | 35.3% | 33.2% |
| LA | European American | 35.0% | 34.2% | 38.2% | 39.6% | 47.6% | 38.5% | 45.1% |
| | Non-European American | 28.3% | 28.5% | 30.8% | 32.5% | 32.3% | 32.9% | 33.4% |
| MA | European American | 54.4% | 54.5% | 57.2% | 58.0% | 58.2% | 60.0% | 61.9% |
| | Non-European American | 44.5% | 48.4% | 49.3% | 50.8% | 51.3% | 53.6% | 51.9% |
| State | Population | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |

| State | Population | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| MD | European American | 59.7% | 45.0% | 55.4% | 55.0% | 51.0% | 50.8% | 54.9% |
| | Non-European American | 48.0% | 46.6% | 45.7% | 48.9% | 49.8% | 45.7% | 50.4% |
| ME | European American | 44.7% | 43.3% | 42.1% | 44.4% | 42.4% | 41.8% | 41.1% |
| | Non-European American | 33.5% | 28.1% | 38.2% | 25.6% | 35.0% | 27.6% | 29.1% |
| MI | European American | 53.5% | 55.0% | 56.0% | 53.6% | 49.3% | 48.5% | 47.2% |
| | Non-European American | 40.2% | 39.2% | 40.5% | 38.1% | 35.3% | 34.5% | 32.9% |
| MN | European American | 46.8% | 48.9% | 49.7% | 50.8% | 49.7% | 51.1% | 51.3% |
| | Non-European American | 31.2% | 36.8% | 34.6% | 34.0% | 34.5% | 45.1% | 35.9% |
| MO | European American | 51.2% | 55.1% | 55.1% | 56.6% | 47.8% | 48.6% | 50.1% |
| | Non-European American | 39.5% | 39.5% | 40.3% | 38.3% | 36.5% | 37.2% | 38.4% |
| MS | European American | 42.8% | 38.5% | 36.7% | 48.1% | 45.8% | 45.2% | 41.4% |
| | Non-European American | 35.1% | 35.9% | 35.8% | 39.4% | 37.1% | 34.8% | 35.4% |
| MT | European American | 37.0% | 42.1% | 47.5% | 35.7% | 36.9% | 38.5% | 36.8% |
| | Non-European American | 25.2% | 28.2% | 27.2% | 25.2% | 24.2% | 28.4% | 25.8% |
| NC | European American | 52.7% | 51.9% | 53.7% | 53.3% | 53.3% | 52.2% | 53.5% |
| | Non-European American | 51.9% | 53.2% | 52.4% | 54.2% | 54.9% | 55.3% | 55.9% |
| ND | European American | 41.5% | 38.9% | 42.5% | 53.3% | 39.6% | 45.9% | 38.8% |
| | Non-European American | 24.5% | 22.6% | 23.6% | 27.3% | 21.8% | 20.9% | 22.5% |
| NE | European American | 50.1% | 51.4% | 50.0% | 50.4% | 45.1% | 51.9% | 45.8% |
| | Non-European American | 37.5% | 36.5% | 24.4% | 31.8% | 32.4% | 33.3% | 33.7% |
| NH | European American | 50.4% | 64.3% | 51.3% | 51.6% | 52.4% | 53.0% | 51.8% |
| | Non-European American | 31.2% | 61.2% | 54.6% | 59.8% | 48.7% | 39.4% | 34.5% |
| NJ | European American | 64.7% | 64.8% | 65.1% | 65.2% | 66.3% | 65.7% | 68.0% |
| | Non-European American | 56.7% | 58.2% | 56.4% | 57.7% | 58.9% | 59.7% | 60.7% |
| NM | European American | 30.7% | 33.0% | 31.8% | 32.7% | 35.5% | 37.2% | 35.1% |
| | Non-European American | 29.0% | 32.7% | 29.6% | 27.2% | 29.6% | 29.9% | 29.7% |
| NV | European American | 28.9% | 27.3% | 26.9% | 28.3% | 26.8% | 28.5% | 30.1% |
| | Non-European American | 24.3% | 24.8% | 25.0% | 25.3% | 23.1% | 26.5% | 26.4% |
| NY | European American | 51.7% | 52.8% | 53.8% | 55.0% | 55.3% | 56.2% | 57.3% |
| | Non-European American | 45.6% | 46.0% | 47.2% | 46.7% | 49.4% | 50.3% | 51.6% |
| OH | European American | 39.5% | 37.0% | 40.4% | 37.2% | 37.9% | 38.0% | 41.4% |
| | Non-European American | 24.4% | 28.1% | 25.9% | 26.0% | 26.1% | 23.5% | 27.9% |
| OK | European American | 34.2% | 33.3% | 35.4% | 34.8% | 32.4% | 32.0% | 31.9% |
| | Non-European American | 25.8% | 26.0% | 26.9% | 26.3% | 25.9% | 26.0% | 24.5% |
| OR | European American | 45.3% | 46.6% | 46.0% | 48.8% | 47.7% | 48.7% | 49.0% |
| | Non-European American | 39.0% | 46.8% | 42.4% | 46.3% | 46.3% | 46.6% | 46.9% |
| PA | European American | 54.3% | 54.8% | 56.4% | 53.3% | 55.0% | 53.7% | 56.1% |
| | Non-European American | 43.5% | 39.9% | 41.4% | 42.3% | 43.8% | 41.3% | 41.0% |

| State | Population | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| RI | European American | 55.6% | 54.9% | 53.8% | 52.5% | 55.5% | 58.7% | 58.3% |
| | Non-European American | 41.1% | 44.2% | 42.0% | 44.2% | 46.0% | 45.3% | 48.0% |
| SC | European American | 50.1% | 54.7% | 53.2% | 51.3% | 55.8% | 53.2% | 53.7% |
| | Non-European American | 47.8% | 49.0% | 49.3% | 48.7% | 49.6% | 48.1% | 49.5% |
| SD | European American | 41.4% | 44.2% | 42.4% | 45.7% | 41.5% | 41.9% | 41.6% |
| | Non-European American | 30.5% | 30.8% | 30.2% | 26.6% | 26.2% | 26.1% | 24.3% |
| TN | European American | 46.9% | 45.9% | 46.1% | 49.1% | 49.8% | 48.6% | 47.6% |
| | Non-European American | 38.2% | 38.8% | 39.0% | 41.4% | 40.3% | 39.8% | 40.2% |
| TX | European American | 39.7% | 40.9% | 39.8% | 42.0% | 39.7% | 40.5% | 43.5% |
| | Non-European American | 35.5% | 37.4% | 37.4% | 39.4% | 37.9% | 36.1% | 37.4% |
| UT | European American | 41.7% | 42.2% | 45.4% | 44.8% | 44.8% | 45.1% | 47.0% |
| | Non-European American | 28.9% | 33.5% | 33.6% | 32.9% | 28.4% | 32.4% | 34.4% |
| VA | European American | 59.0% | 64.2% | 63.8% | 65.2% | 65.6% | 68.9% | 67.5% |
| | Non-European American | 56.0% | 63.6% | 63.6% | 62.9% | 64.1% | 62.9% | 64.4% |
| VT | European American | 47.0% | 46.4% | 50.1% | 51.1% | 49.1% | 49.0% | 53.3% |
| | Non-European American | 41.7% | 44.9% | 38.5% | 40.8% | 48.3% | 42.7% | 42.3% |
| WA | European American | 44.4% | 41.6% | 41.3% | 43.2% | 40.5% | 41.3% | 39.3% |
| | Non-European American | 38.3% | 33.7% | 38.7% | 39.4% | 38.9% | 36.6% | 35.1% |
| WI | European American | 50.8% | 53.5% | 53.4% | 54.7% | 55.0% | 54.0% | 53.6% |
| | Non-European American | 35.1% | 36.0% | 38.0% | 39.6% | 38.2% | 39.7% | 40.5% |
| WV | European American | 38.1% | 37.0% | 35.1% | 36.0% | 37.5% | 36.0% | 37.7% |
| | Non-European American | 25.3% | 20.9% | 20.8% | 21.7% | 23.4% | 22.5% | 23.0% |
| WY | European American | 53.2% | 55.4% | 54.6% | 55.8% | 56.8% | 57.9% | 58.8% |
| | Non-European American | 48.8% | 42.0% | 42.4% | 41.8% | 47.1% | 41.1% | 56.5% |

# APPENDIX E

# AVERAGE 2-YEAR INSTITUTION GRADUATION RATES BY STATE, YEAR, AND STUDENT RACE/ETHNICITY

| State | Population | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| AK | European American | 59.1% | 0.0% | 63.3% | 90.2% | 0.0% | 0.0% | . |
| | Non-European American | 21.4% | 13.6% | 20.0% | 45.1% | 54.5% | 33.3% | . |
| AL | European American | 22.0% | 21.7% | 20.9% | 20.1% | 24.1% | 25.0% | 27.2% |
| | Non-European American | 20.5% | 17.3% | 16.3% | 13.6% | 17.2% | 20.4% | 20.1% |
| AR | European American | 25.6% | 27.4% | 24.2% | 25.8% | 29.9% | 31.9% | 33.5% |
| | Non-European American | 19.9% | 20.5% | 16.1% | 19.3% | 20.8% | 22.4% | 22.9% |
| AZ | European American | 20.7% | 18.5% | 18.0% | 18.9% | 18.2% | 20.5% | 25.9% |
| | Non-European American | 20.2% | 14.9% | 12.6% | 14.3% | 16.6% | 15.7% | 17.4% |
| CA | European American | 25.5% | 24.6% | 26.8% | 28.1% | 31.8% | 31.8% | 32.4% |
| | Non-European American | 20.8% | 20.5% | 22.2% | 23.5% | 25.2% | 26.7% | 27.8% |
| CO | European American | 31.0% | 29.3% | 29.0% | 28.8% | 30.3% | 31.9% | 35.7% |
| | Non-European American | 22.6% | 21.9% | 19.5% | 18.2% | 23.1% | 23.8% | 23.8% |
| CT | European American | 13.5% | 15.2% | 14.7% | 16.4% | 19.6% | 19.8% | 20.8% |
| | Non-European American | 7.7% | 11.0% | 10.2% | 8.9% | 11.2% | 13.5% | 12.2% |
| DE | European American | 15.3% | 12.9% | 16.4% | 16.5% | 16.7% | 16.0% | . |
| | Non-European American | 9.5% | 8.0% | 10.5% | 10.7% | 10.0% | 7.6% | . |
| FL | European American | 41.6% | 41.0% | 39.4% | 39.5% | 41.1% | 42.8% | 38.3% |
| | Non-European American | 33.4% | 29.5% | 30.0% | 25.9% | 30.2% | 28.9% | 27.5% |
| GA | European American | 30.2% | 28.9% | 28.9% | 26.8% | 32.5% | 35.1% | 42.4% |
| | Non-European American | 23.4% | 21.9% | 21.6% | 19.1% | 24.0% | 28.7% | 31.5% |
| HI | European American | 11.8% | 12.4% | 13.6% | 17.6% | 24.9% | 17.4% | 14.8% |
| | Non-European American | 13.4% | 11.9% | 13.9% | 16.5% | 17.5% | 16.7% | 17.4% |
| IA | European American | 35.5% | 34.0% | 32.3% | 32.5% | 34.4% | 37.3% | 41.8% |
| | Non-European American | 20.3% | 18.7% | 14.7% | 16.3% | 19.0% | 21.1% | 23.9% |
| ID | European American | 37.5% | 33.4% | 27.2% | 22.5% | 30.7% | 27.0% | 27.6% |
| | Non-European American | 19.5% | 28.3% | 27.8% | 32.7% | 23.0% | 29.7% | 32.7% |
| IL | European American | 27.3% | 27.4% | 28.7% | 31.3% | 35.3% | 34.5% | 38.1% |
| | Non-European American | 18.4% | 15.5% | 16.1% | 17.2% | 20.6% | 19.5% | 20.4% |
| IN | European American | 11.6% | 9.1% | 10.5% | 9.7% | 12.7% | 15.7% | 18.1% |
| | Non-European American | 6.7% | 3.2% | 4.6% | 3.9% | 5.3% | 9.1% | 10.8% |
| KS | European American | 40.7% | 39.5% | 39.2% | 39.3% | 39.9% | 41.0% | 42.0% |
| | Non-European American | 36.2% | 29.6% | 27.5% | 28.6% | 28.1% | 29.4% | 34.3% |
| KY | European American | 27.3% | 27.7% | 25.1% | 26.3% | 28.8% | 30.2% | 30.7% |
| | Non-European American | 20.6% | 20.6% | 16.7% | 20.3% | 18.7% | 21.6% | 24.6% |
| LA | European American | 30.9% | 32.5% | 29.8% | 28.8% | 30.8% | 31.1% | 30.4% |
| | Non-European American | 26.8% | 27.6% | 21.5% | 19.3% | 21.1% | 20.1% | 22.5% |
| MA | European American | 17.8% | 17.3% | 17.7% | 19.2% | 19.4% | 21.0% | 20.4% |
| | Non-European American | 11.6% | 11.4% | 13.0% | 12.6% | 12.4% | 13.4% | 13.7% |

| State | Population | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| MD | European American | 17.6% | 20.4% | 18.6% | 20.4% | 22.3% | 25.9% | 28.3% |
| | Non-European American | 8.2% | 9.2% | 9.4% | 11.2% | 11.1% | 13.8% | 14.7% |
| ME | European American | 32.6% | 31.0% | 27.9% | 28.5% | 30.4% | 29.9% | 32.1% |
| | Non-European American | 19.3% | 18.1% | 23.6% | 15.3% | 16.6% | 17.9% | 25.7% |
| MI | European American | 17.0% | 16.6% | 15.7% | 16.3% | 19.2% | 19.2% | 19.9% |
| | Non-European American | 12.1% | 8.7% | 7.6% | 9.7% | 10.3% | 9.9% | 11.8% |
| MN | European American | 31.2% | 32.9% | 31.4% | 34.3% | 35.1% | 34.1% | 36.7% |
| | Non-European American | 18.7% | 17.6% | 14.0% | 17.1% | 16.3% | 18.4% | 17.4% |
| MO | European American | 24.0% | 25.7% | 24.5% | 25.4% | 27.0% | 29.5% | 30.4% |
| | Non-European American | 16.6% | 13.0% | 14.8% | 16.0% | 18.1% | 17.9% | 19.5% |
| MS | European American | 28.2% | 30.9% | 29.6% | 29.8% | 33.5% | 37.7% | 38.4% |
| | Non-European American | 23.6% | 22.4% | 20.7% | 19.6% | 24.6% | 25.6% | 30.0% |
| MT | European American | 40.7% | 36.3% | 45.2% | 36.5% | 37.1% | 26.0% | 38.3% |
| | Non-European American | 22.7% | 26.0% | 23.7% | 26.8% | 20.8% | 19.0% | 25.0% |
| NC | European American | 25.9% | 24.6% | 23.5% | 18.6% | 23.0% | 27.2% | 28.6% |
| | Non-European American | 20.2% | 17.3% | 16.4% | 11.2% | 14.7% | 18.3% | 20.8% |
| ND | European American | 29.6% | 24.3% | 30.7% | 30.2% | 46.4% | 42.2% | 52.7% |
| | Non-European American | 19.3% | 24.3% | 15.7% | 20.9% | 28.0% | 17.8% | 15.0% |
| NE | European American | 32.3% | 28.9% | 33.1% | 33.6% | 35.4% | 32.0% | 39.6% |
| | Non-European American | 28.3% | 21.6% | 23.4% | 28.1% | 17.1% | 18.1% | 25.4% |
| NH | European American | 33.1% | 25.5% | 23.3% | 25.8% | 25.9% | 26.2% | 28.5% |
| | Non-European American | 34.2% | 11.7% | 28.7% | 17.0% | 16.9% | 12.3% | 27.1% |
| NJ | European American | 23.8% | 21.3% | 20.9% | 22.0% | 25.1% | 28.8% | 29.6% |
| | Non-European American | 13.0% | 12.2% | 12.2% | 11.9% | 15.5% | 16.6% | 19.5% |
| NM | European American | 13.2% | 13.6% | 17.5% | 20.0% | 20.7% | 25.4% | 28.9% |
| | Non-European American | 17.4% | 13.4% | 12.4% | 15.0% | 14.2% | 19.2% | 23.6% |
| NV | European American | 14.9% | 15.9% | 21.1% | 24.8% | 27.3% | 30.4% | 28.8% |
| | Non-European American | 19.5% | 13.8% | 21.1% | 32.8% | 31.8% | 31.1% | 26.6% |
| NY | European American | 25.0% | 23.3% | 24.6% | 25.7% | 28.6% | 30.4% | 32.1% |
| | Non-European American | 14.5% | 13.3% | 14.2% | 15.9% | 16.9% | 18.9% | 20.1% |
| OH | European American | 16.3% | 16.5% | 16.6% | 16.2% | 17.8% | 21.4% | 24.3% |
| | Non-European American | 9.8% | 7.2% | 9.3% | 9.8% | 8.7% | 10.7% | 13.7% |
| OK | European American | 21.8% | 21.5% | 19.3% | 19.5% | 25.8% | 28.5% | 27.6% |
| | Non-European American | 15.9% | 16.0% | 14.1% | 14.6% | 18.9% | 20.7% | 21.4% |
| OR | European American | 18.0% | 17.2% | 19.9% | 18.2% | 20.7% | 19.7% | 22.1% |
| | Non-European American | 12.3% | 12.9% | 14.8% | 13.7% | 17.7% | 19.7% | 22.1% |
| PA | European American | 18.6% | 18.9% | 18.5% | 24.3% | 25.5% | 26.7% | 28.0% |
| | Non-European American | 12.1% | 10.1% | 9.7% | 14.4% | 15.8% | 16.7% | 15.7% |

| State | Population | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 |
|---|---|---|---|---|---|---|---|---|
| RI | European American | 12.0% | 12.9% | 15.0% | 14.0% | 16.6% | 19.9% | 21.8% |
| | Non-European American | 7.0% | 7.5% | 7.0% | 7.7% | 7.6% | 9.0% | 9.4% |
| SC | European American | 16.9% | 16.6% | 17.1% | 17.1% | 17.5% | 19.2% | 21.0% |
| | Non-European American | 10.8% | 10.3% | 10.6% | 8.4% | 10.4% | 11.9% | 11.1% |
| SD | European American | 41.5% | 38.9% | 49.3% | 45.1% | 52.0% | 58.0% | 38.0% |
| | Non-European American | 25.6% | 26.4% | 24.1% | 30.3% | 32.3% | 24.8% | 29.9% |
| TN | European American | 13.7% | 13.6% | 15.1% | 17.2% | 17.3% | 21.9% | 24.1% |
| | Non-European American | 6.6% | 7.3% | 8.2% | 7.6% | 9.3% | 12.0% | 15.7% |
| TX | European American | 17.0% | 17.9% | 18.5% | 18.4% | 18.4% | 21.4% | 23.5% |
| | Non-European American | 14.1% | 15.1% | 14.7% | 15.2% | 15.0% | 18.1% | 21.1% |
| UT | European American | 33.3% | 32.8% | 26.0% | 18.5% | 11.9% | 24.9% | 24.0% |
| | Non-European American | 20.7% | 19.6% | 15.6% | 9.8% | 9.5% | 13.5% | 19.1% |
| VA | European American | 24.5% | 23.7% | 28.6% | 28.0% | 29.7% | 33.8% | 34.2% |
| | Non-European American | 14.9% | 15.7% | 15.6% | 15.4% | 19.7% | 19.9% | 23.9% |
| VT | European American | 14.2% | 15.4% | 11.6% | 17.5% | 14.9% | 14.7% | 24.2% |
| | Non-European American | 4.5% | 5.0% | 5.1% | 22.2% | 19.4% | 11.1% | 9.4% |
| WA | European American | 32.5% | 32.1% | 32.7% | 33.7% | 32.4% | 35.4% | 34.3% |
| | Non-European American | 24.6% | 24.6% | 25.8% | 26.0% | 28.0% | 28.5% | 28.3% |
| WI | European American | 37.8% | 36.9% | 36.2% | 34.8% | 35.7% | 36.1% | 40.0% |
| | Non-European American | 28.3% | 24.9% | 25.1% | 23.5% | 29.4% | 27.7% | 32.6% |
| WV | European American | 18.0% | 19.6% | 21.4% | 23.7% | 25.5% | 29.0% | 32.7% |
| | Non-European American | 14.5% | 11.5% | 14.9% | 16.0% | 18.9% | 17.0% | 22.5% |
| WY | European American | 33.6% | 32.9% | 33.1% | 34.3% | 31.3% | 37.0% | 40.6% |
| | Non-European American | 27.8% | 16.8% | 20.1% | 20.3% | 23.4% | 26.1% | 29.4% |