THE IMPACT OF TEXAS EMERGING RESEARCH UNIVERSITIES ON STUDENT OUTCOMES

by

Miranda Simone Wilson

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Chair of Committee: Dr. Catherine Horn

Committee Member: Dr. Sunny Wong

Committee Member: Dr. Vincent Carales

Committee Member: Dr. Jacqueline Hawkins

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Dedication

I would like to thank God for providing me with strength, patience, and resilience during this entire process. My journey to this point is the culmination of generations of endurance and hard work. I dedicate this work to my African ancestors who endured inhumanity not knowing that their lineage would lead to my existence. I also dedicate this work to the women and men who fought vehemently for my right to education. I would not be the woman that I am today if it was not for my mother and father who afforded me every opportunity to succeed and thrive in this world. They made sure that I have every advantage to thrive in school and in life. I would like to thank my grandmother, Ruby Jewel, for being my second mother. Not only did she nurture me, but she instilled in me courageousness, toughness, and righteousness. Through she may not have realized it, she taught me know be exist in my Blackness and my womanness. I would like to thank my partner for life, Tyrone, for being my shoulder to cry on, my rock, and my optimism. None of this would be possible without my family and God keeping me and giving me strength to persevere.

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Abstract

Title: The Impact of Texas Emerging Research Universities on Student Outcomes. Background: Research and development (R&D) in postsecondary education has impacted policy creation regarding research expenditures. In Texas, the legislature implemented research-based funding programs tied to strategic planning to increase postsecondary research prominence. Research-based funding formulas assign state funds to public institutions based on research expenditures. Emerging research universities, which are budding research institutions, are eligible for these allocations. A primary aim of research-based funding is to increase research productivity and competitiveness and impose accountability through financial incentivization. Texas exemplifies how research incentives intersect efforts to encourage research prestige with those focused on student success and accountability. This study pulls theoretical insights from action theory and institutional isomorphism to understand the outcomes of research-based funding. Purpose: This study investigates whether the emerging research university designation impacts student outcomes as a consequence of research focused behavior and if these impacts align with strategic plans. More specifically, this study examines the extent to which the creation of the emerging research university designation has impacted student admissions and completion patterns at Texas public universities. Methods: This study utilizes individual-level longitudinal student data from the University of Houston Education Research Center and the Integrated Postsecondary Education Data System and difference in difference methodology to examine how students are impacted by research-based indicators. The sample includes 14 Texas public institutions, seven of which were emerging research universities as of 2009. The outcome variables are

application action and six-year graduation. The model investigates how research expenditures and other covariates pertaining to student and university demographics impact application actions and six year graduation among institutions participating in the emerging research university policies. Results: Application action indicates whether students are admitted to an institution based on legislative and/or institutional criteria or whether students are admitted through other unspecified criteria. The findings suggest the mean change in the admissions outcome is not different in emerging research and doctoral universities immediately before and after the emerging research policy enactment. There was a difference in the mean change in the admissions outcome five years after the enactment. The graduation outcome examines whether students graduated within six years or more than six years. There was a difference in the mean change in six year graduation immediately after the enactment of the policy, but that difference did not exist five years after its enactment. Conclusion: Emerging research policies impact student outcomes at emerging research universities; while the policy had no immediate impact on application actions, it did have a five year lag impact. There was also an impact on graduation immediately after policy enactment, but not five years later. The findings also demonstrate that the policy impact varies depending on student and institutional characteristics. With institutional collaboration, legislators can create research-based policies that enhance institutional research productivity and impact student outcomes. This study reveals how state government and universities can create and implement policies that coalesce with statewide strategic plans to achieve common goals for student and institutional success.

Keywords: research and development, emerging research universities, research funding, strategic planning, admissions, completion

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The Impact of Texas Emerging Research Universities on Student Outcomes

Chapter I: Introduction

Government funding for research and development (R&D) at universities is a phenomenon that largely began in the 20th century (Kaiser, 2011). Previously, university R&D funding primarily arrived through local industry, charitable philanthropy, and the university's own funding allocations (Kaiser, 2011; Usselman, 2013). American universities experienced a steep increase in R&D expenditures due to government appropriations incited by war and global competition (Usselman, 2013). The United States has created one of the leading R&D enterprises in the world with the largest expenditures and number of persons employed (National Academy of Sciences Committee on Criteria for Federal Support of Research and Development [NAS], 1995; Usselman, 2013). The government and public universities share a common ideal of the critical significance of R&D expenditures for innovation. The government provides these appropriations to universities which, in turn, provide faculty the opportunity to develop solutions to societal problems through empirical research and to allow students the prospect of involvement in research as a fundamental part of their education (NAS, 1995). This new support created the perception that postsecondary institutions should be accountable to the American public due to governmental funding which included taxpayer dollars. This perceived accountability due to governmental funding of postsecondary institutions would later impact the relationship between the American public and these institutions in an unforeseen manner (Cole, 1994).

Over time, the utopian relationship between governmental funding, research universities, and the public began to shift. Research universities became more reliant on

government funding for research and student financial aid (Cole, 1994) while acquisition of such funding became more competitive due to governmental budget cuts (Mitchell, Leachman, Masterson, & Waxman, 2018). Alongside budgetary restrictions, consumer demands led research universities to expand their missions to include other roles. Research universities extended their role with American society to embrace "social systems of government, industry, and the general culture" (Cole, 1994, p. 2) and accommodate national demands for diversity in student access, economic growth, and scientific ingenuity (Hackett,1996; Pasque, 2010). While these changes were happening, the rise of marketization infiltrated higher education leading to an emphasis on performance measures and other market-based indicators (rankings, workforce alignment, etc.) as metrics for institutional success and recognition (Ziskin, Rabourn, & Hossler, 2018). Combined, these occurrences began to erode the public's trust in the fidelity of postsecondary institutions. The American public began to demand that postsecondary institutions be held accountable to society at large and that institutional accountability be linked to student access and success outcomes (Ewell, 2008). These demands were increasingly stressed as the cost of tuition reached astronomical heights (Taylor, 2010), disparity gaps in access and success outcomes for underrepresented groups of students continued to increase (Graves, 2008), and student loan debt surpassed the trillion-dollar threshold (Best & Best, 2014).

As a solution, state and federal governmental bodies began to link funding to student outcomes to hold colleges and universities accountable to students and their own funding behaviors (Letizia, 2015). To remedy the accountability concerns, performance-based funding models have become a widely utilized method. Many states adopted

performance-based funding formulas in an attempt to incentivize colleges and universities to improve institutional performance with respect to student outcomes like six-year graduation rates or employment statistics (Dougherty & Reddy, 2011). As the popularity of performance-based models to solve accountability issues continued to grow, legislatures also created similar models to encourage institutional behaviors in other areas as well. The state of Texas is a prominent example of how policymakers utilized performance-based funding models to inform funding models specifically created to increase research productivity. Similar to those accountability formulas to increase student success through mechanisms like enrollment with specific targets for underrepresented groups of students (Texas Higher Education Coordinating Board [THECB], n.d.a.; THECB, 2017), Texas has created research-based funding models designed to boost institutional behaviors specifically regarding research. Comparable to the concept of performance-based funding, research-based funding is constructed as a formula to allocate state funds to public colleges and universities based on research expenditures. A primary goal of research-based funding is to align the state's research goals with institutions' goals to increase postsecondary research productivity and state research competitiveness (THECB, 2018a). More specifically, research-based funding imposes accountability by financially incentivizing institutions to apportion R&D expenditures to increase research productivity and institutional prestige through research recognition. Importantly though, Texas is also an example of the ways in which the research enterprise and incentives intersect efforts to bolster research with those focused on student success and accountability.

The aims of performance-based policies were clearly articulated by policymakers at their creation; however, the intended and unintended outcomes of performance-based strategies in relation to student success and research success require more empirical research to be better understood. Performance-based funding strategies are intended to hold institutions accountable to student success parameters (Dougherty & Reddy, 2011). They are also intended to supply stakeholders with quantifiable data about student success results and financially motivate postsecondary institutions to focus on those results including, but not limited to, completion rates, employability, and credit accumulation (Dougherty & Reddy, 2011; Letizia, 2015). Even though performance-based funding formulas were intended for specific functions, these formulas also had unintentional effects including questionable efficacy to enhance positive student outcomes (Gàndara & Rutherford, 2018; Hillman, Fryar, & Crespín-Trujillo, 2018; Kelchen, 2018; Umbricht, Fernandez, & Ortegus, 2015), impeding access for and/or purging of underrepresented groups of students (Jones et al., 2017), and postsecondary institutions augmenting policies to the advantage of students who are already more likely to meet certain success parameters (Dougherty et al., 2014a; Jones et al., 2017). In light of these unintentional consequences, researchers have investigated ways to combat these types of consequences and have found performance-based policies yield favorable results when they incorporate equity parameters to increase the quantity of underrepresented students (Gàndara & Rutherford, 2018; Kelchen, 2018).

The intentions of research-based policies do not have as clearly cut connections with student outcomes as do performance-based policies, but they do exist. In Texas, research-based performance strategies were initially intended to increase the national

research prominence of Texas universities through mechanisms like increasing research expenditures (THECB, 2018a). However, seeking national research prominence (also known as prestige seeking behavior), can also yield unintended consequences. Some prestige seeking behaviors have included, but are not limited to, the institution becoming more selective to meet certain criteria which inadvertently alienates the needs of underrepresented students (Johnson, 2013). While the unintended consequences of research-based policies are not as well known, this study can be used to better understand the connection between research expenditures, student outcomes, and any potential counteracting factors to student success.

Even though the intention of such funding is envisioned to benefit universities, hold them accountable to student outcomes, and increase research productivity, financially incentivized policies can sometimes have unintended consequences for students (Umbricht et al., 2017). The linkage of funding to student outcomes can inadvertently impact postsecondary selectively as universities attempt to meet requirements to access said funding, often negatively affecting underrepresented students (Dougherty et al., 2014b; Pascarella & Terenzini, 2005; Umbricht et al., 2017). The ways that governments and universities implement accountability measures could potentially and inadvertently penalize institutions that enroll students who experience barriers to success and reward institutions for selectivity because it can be difficult for outcome measures to capture the differences between the student populations served by various institutions (Johnson, 2013).These unintentional impacts, driven by the connection of funding to outcomes, have led to this research that examines how funding and stipulations tied to the emerging research designation have impacted students since the

designation's creation. This study answers the following research question: To what extent has the creation of the emerging research university designation impacted student admissions and completion patterns at Texas public universities?

The subsequent chapter includes the Literature Review with a detailed description of the policy and funding context within Texas higher education as it pertains to the creation and maintenance of emerging research universities. The policy and funding context portion of the Literature Review is followed by a section that explores previous research regarding the ways that financially incentivized policies impact postsecondary education and students. Next, there is a discussion of theoretical and conceptual models guiding this research. Chapter III includes the methodology using data provided from the University of Houston Education Resource Center (UH ERC) and the Integrated Postsecondary Education Data System (IPEDS) to conduct two models of a difference in difference (DID) design. Chapter IV includes the study findings and Chapter V concludes the work with a discussion of the results and implications of the study. The researcher hopes to use findings from this study to provide a more comprehensive assessment of how funding tied to research impacts student admissions and graduation in Texas as well as provide policymakers with a more nuanced understanding of the implications of such impacts for students.

Chapter II: Literature Review

The U.S. Research Enterprise

The discussion of research-based funding policies begins with a broader understanding of the research enterprise in the United States. R&D is a major industry in the United States which was initially funded and regulated mostly by the federal government (Nichols, 1994). Concerned with global competition, the United States began to increase research productivity and funding through collaborations with universities after World War II (Nichols, 1994). R&D expenditures saw another steep increase after the Soviet Union's launch of the Sputnik I satellite in 1957 (Geiger, 1997), and continued over time with large funding appropriations through the National Institutes of Health (NIH) and the National Science Foundation (NSF) (Nichols, 1994; United States Congress, 1991). With the tightening of funding budgets and the increase in public needs (Mumper, Gladieux, King, & Corrigan, 2011), the billion-dollar budgets of the NIH and NSF have triggered a call for spending and outcome accountability for research in higher education institutions and the United States in general (Nichols, 1994).

The Carnegie Classification. Shrinking budgets also led to increased competition for funding and the need for a categorization and ranking system that could be consulted when making decisions regarding institutional funding (Shulman, 2000). As the U.S. research enterprise evolved and matured over time, the Carnegie Classification of Institutions of Higher Education was created and used to rank institutional research productivity on a national scale and gauge national recognition of research prominence (Shulman, 2000). This classification has been used since 1970 as a framework for recognizing and describing institutional variety in the United States and has developed a

classification of colleges and universities to empirically support its platform of research and policy analysis (The Carnegie Classification of Institutions of Higher Education, 2017). The Carnegie Classification of Institutions of Higher Education reserves "Carnegie Tier One" for universities with the highest ranking for research activity. "Carnegie Tier One" status is instrumental to the national recognition of institutions as prestigious, viable high-level research producers.

Even though the Carnegie Classification of Institutions of Higher Education is used on a national scale, the state of Texas also has its own classification of universities[1] through its accountability system. The categorization includes research universities, emerging research universities, doctoral universities, comprehensive universities, and master's universities. Texas creates these categories based on institutional characteristics and comparisons through its accountability system. Chapter III discusses the Texas categorization of institutions in more detail with specific implications for this study.

Research Funding in Texas

To increase the research prestige of its institutions, the state of Texas has created research programs to strengthen research specific productivity and gain institutional research recognition through mechanisms like the Carnegie Classification of Institutions of Higher Education. Before 2016, only the University of Texas at Austin (UT), Texas A&M University (TAMU), Rice University, and the University of Houston held the "Carnegie Tier One" classification in the state of Texas (Watkins, 2016). In 2016, Texas Tech University, the University of North Texas, the University of Texas at Arlington, and

[1] Texas also includes categories for community colleges which include very large college, large college, medium college, and small college. For the purpose of this study, there is only a focus on university categories.

the University of Texas at Dallas were added to the list of schools to receive that classification. The following section discusses the ways that research funding programs have strengthened funds available to research-focused universities and opened opportunities and incentives to increase research activity and prestige.

Through the creation of the research-based performance programs and the restructuring of those programs over time, the state of Texas has been attempting to enable its institutions to achieve national prominence as major research universities (THECB, n.d.b.; THECB, 2018a). Texas developed specific research-based programs to enhance accountability and is an example of a state that has developed research programs with specific funding allocations and requirement measures. Table 1 provides an overview of the research programs in Texas.

Table 1

Texas Research Programs

Research Funding	Recipients	2018-2019 Biennium State Appropriations
Permanent University Fund	UT, TAMU, PVAMU	$889,729,453
Texas Research University Fund	Research Institutions	$125,168,214
Core Research Support Fund	Emerging Research	$105,400,268
Texas Comprehensive Research Fund	Non-Research & Non-Emerging Research	$12,845,136
National Research University Fund	Eligible Emerging Research	$46,326,661
Texas Research Incentive Program	Emerging Research	$35,000,000
Research Enhancement Fund	Health-Related	$80,628,378
Autism Research Centers	Eligible Public & Private	$7,800,000

Cancer Prevention & Research Institute of Texas	Public & Private entities	$600,110,000
Governor's University Research Initiative	Support for Distinguished Faculty Recruitment	$5,585,875*

Notes. Appropriation allocations provided by University of Texas System Legislative Appropriations Request: Fiscal Year 2018 and 2019 and State of Texas General Appropriations Act for the 2018-19 Biennium. * An unexpended balance from the first year of the biennium (2018) may be carried forward and expended during the second year of the biennium (2019).

As noted in Table 1, the Permanent University Fund (PUF) receives the largest research appropriations yet serves a small portion of universities. Established in the Texas Constitution of 1876, the PUF uses an appropriation of land grants previously given to the University of Texas at Austin plus 1 million acres (THECB, 2009). UT, TAMU, Prairie View A&M University (PVAMU)[2], and their affiliated systems benefit from the PUF as a unique and lasting competitive benefit in that they receive this pool of money which was valued at $41.3 billion in assets in 2017 (The University of Texas/Texas A&M Investment Management Company, 2017). These funds, which make up PUF, have allowed the flagship universities to thrive becoming the premier research universities in the state of Texas. Due to the high value of the assets, the 21 PUF recipient institutions receive a disproportionately high allocation of funds when compared to other institutions.

[2] PVAMU, a member of TAMU, was created by the Texas constitution to serve African American students and has the Historically Black Colleges and Universities (HBCU) designation. In 1983, the Texas constitution was amended to allow PVAMU to receive funding from the PUF (Prairie View A&M University, 2015). UT and TAMU have benefitted from a longer access period to funds from the PUF than PVAMU.

To increase appropriations at other universities, increase the prestige of the public university system in Texas and broaden student access to research institutions in general, the Texas legislature has created programs to fund research at non-PUF recipient institutions. The creation of these programs included the establishment of the emerging research university designation which incentivizes public research universities to increase their R&D expenditures by improving research activities (Perna & Finney, 2014). The creation of this designation aims to support qualifying institutions in Texas that produce high levels of research and have R&D expenditures over a fixed threshold.

After the creation of the emerging research designation in 2009, the legislature established the National Research University Fund (NRUF) as a dedicated research-based funding source for eligible institutions. In 2015, the Texas legislature created the Texas Research University Fund (TRUF) specifically to deliver funds to Texas research universities with overall research expenditures greater than $450 million and is established over a three-year average of total research expenditures (Texas Education Code, Section 62, Subchapter C). These funds encourage faculty members to produce high quality research and instruction. Historically, the TRUF was created in place of the Texas Competitive Knowledge Fund (TCKF) which was in place from 2008 to 2015 and then phased out. Appendix A and Appendix B provide a list of funding recipients per research program and the specific requirements of NRUF.

Within Texas's 106 public and independent institutions (which includes universities, community colleges, health-related institutions, state colleges, and technical colleges), 37 universities are potentially eligible to receive funds from the research specific funding programs; however, seven universities were originally designated as

emerging research universities in 2009 (Perna & Finney, 2014; Rosales, 2010). The original seven emerging research universities are Texas Tech University, the University of Houston, the University of North Texas, the University of Texas at Arlington, University of Texas at Dallas, University of Texas at El Paso, and University of Texas at San Antonio (THECB, 2019a). In 2012, Texas State University was designated as the eighth emerging research university. According to the most recent National Research University Fund Eligibility report from March of 2019, of the eight designated emerging research universities, the University of Houston and Texas Tech University met eligibility in fiscal year 2012 and began receiving distributions from NRUF and the University of Texas at Dallas reached eligibility for NRUF distribution in fiscal year 2018 and began receiving disbursements (THECB, 2019a). None of the five remaining emerging research universities have met criteria for NRUF distribution (THECB, 2019a).

NRUF dollars act as a bonus in a similar manner that performance funding (PF) 1.0 dollars (described later in the paper) are additive to the regular state funding base because funds are supplementary to the state funding base for recipient schools in Texas. That is, when relating NRUF mechanisms to performance funding, NRUF most similarly operates like PF 1.0 because access to research funds are additive and not a part of the regular state base formula for funding. NRUF allocations are distributed *in addition* to eligible institutions' base level funding and gives them additional funding to spend exclusively on research activities. In this regard, NRUF enhances the ways that recipient universities expend research allocations without negatively impacting those institutions that do not meet NRUF eligibility requirements in terms of their base level allocations from the state.

Research Objectives Within Broader State Goals

Another established precedent in the state of Texas is ensuring that higher education funds and the well-being of higher education in general is appropriately governed. To ensure the effective governance of higher education in the state of Texas, the Texas Higher Education Coordinating Board (THECB) was created in 1965 by the Texas Legislature as the highest authority in state matters of public higher education and acts as a unified guardian for the interests of the public regarding public higher education (THECB, n.d.c.). Since its induction, the THECB has implemented several strategic plans to meet specific goals for public higher education in Texas. The following segment describes pertinent portions of the Closing the Gaps strategic plan regarding research funding and the 60x30TX strategic plan. Later, pertinent portions of both strategic plans are connected to implications for the emerging research university designation and student outcomes.

Closing the Gaps Strategic Plan and Goals. In October of 2000, the THECB created a strategic plan to solve critical issues regarding Texas higher education called Closing the Gaps Higher Education Plan (THECB, n.d.a.). This strategic plan had four goals: to close the gaps in student participation, student success, excellence, and research funding over the course of 15 years (THECB, n.d.a.). With specific focus on the research funding goal, the Closing the Gaps Higher Education Plan initially focused on increasing federally funded science and engineering research at Texas institutions as well as increasing research expenditures at Texas public universities and health related institutions (THECB, n.d.a.). In October of 2005, the THECB revised the research funding goal to reflect Texas institutional improvements as compared to other states and

stated that this was a necessary revision to account for the fluctuations in the amount of federal research funding nationwide and to ensure that Texas institutions were improving funding gains relative to other states. The THECB not only wanted to improve available research funds for Texas institutions of higher education in general but also wanted to promote recognition of Texas institutions as viable high-level research producers. Regarding the participation goal, the plan sought to close the gaps in enrollment rates by adding 630,000 more students by 2015 with specific percentage increases in the number of African American, Hispanic, and White students (THECB, n.d.e., p. 1). The excellence goal intended to significantly increase the number of nationally recognized programs or services at colleges and universities by 2015 with a specific increases in "the number of research institutions ranked in the top 10 among all research institutions from zero to one, and two additional research universities ranked in the top 30 by 2010; increase the number of public research universities ranked in the top 10 among all public universities from zero to two, and four ranked among the top 30 by 2015" (THECB, n.d.d., p. 2). The research funding goals included increasing the "level of federal science and engineering research and development obligations to Texas institutions to 6.5 percent of obligations to higher education institutions across the nation" (THECB, n.d.d., p. 2) More specially, this plan intended to "increase federal science and engineering obligations to Texas universities and health related institutions from 5.6 percent of the obligations in 2000 (or $1.1 billion in 1998 constant dollars) to 6.2 percent in 2010, and 6.5 percent of obligations to higher education by 2015 and increase research expenditures by Texas public universities and health-related institutions from $1.45 billion to $3 billion by 2015" (THECB, n.d.d., p. 2).

60x30TX Strategic Plan. In 2015, the THECB initiated the 60x30TX strategic plan with the vision that Texas be one of the highest-achieving states in America (THECB, n.d.a.). The overarching goal of this strategic plan is that 60 percent of Texans between the ages of 25 to 34 have a certificate or higher by the year 2030. There are four specific goals within the 60x30TX strategic plan that individually focus on the percentage of the educated population, postsecondary completion, marketable skills via postsecondary education, and postsecondary student debt. Of particular significance to this study is goal two—the completion goal. This goal focuses on all students in higher education and the number of credentials produced at institutions each year. Goal two also includes metrics for underrepresented students which includes African American, Hispanic, economically disadvantaged, and male students. The completion goal is attempting to increase African American completions to 76,000 by 2030, increase Hispanic completions to 285,000 by 2030, increase male completions to 275,000 by 2030, and increase the completion of economically disadvantaged students to 246,000 by 2030. A subsection of the completion goal also focuses on the percentage of high school students that enroll in colleges the fall semester directly following their 12th grade year. It hopes to increase the percentage of Texas high school graduates enrolled in Texas higher education to 65%. The completion goal states that by 2030, at least 550,000 will complete a certificate, associate, bachelor's, or master's from a Texas institution (THECB, 2019c). According to the most recent 60x30TX progress report produced in July of 2019, Texas needs an annual increase of 3.9% of overall student completion to meet its 2030 goal of 550,000 completions but has had an average annual improvement rate of 3.1% from 2015-2018. For Hispanic students, Texas needs at annual increase of

7.5% of student completion to meet the 2020 goal of 285,000 but has had an average annual improvement rate of 6.2% from 2015-2018. For African American students, there needs to be an annual increase of 4.5% of student completion to meet the 2020 goal of 76,000, but there has only been an average annual improvement rate of 2.2% from 2015-2018. For male students, there should be annual increase of 5.2% of student completion to meet the 2020 goal of 275,000, but there has only been an average annual improvement rate of 3.2% from 2015-2018. When considering economically disadvantaged students, there needs to be an annual increase of 5.3% of student completion to meet the 2020 goal of 246,000, but there has actually been an average annual improvement rate of 2.9% from 2015-2018. Finally, the state needs an annual increase of 0.7 percentage points of Texas high school graduates to matriculate to higher education institutions in Texas, but the state has actually had an average annual decrease of -0.4 percentage points from 2015-2018 (THECB, 2019c). This study seeks to examine the completion attainment goal at emerging research universities in an effort to explore the interaction of research-based policies with the state's strategic plan. Also, the study seeks to uncover if the intended purpose of emerging research universities and research-based funding programs have an impact on the goals of Texas strategic plans which include a focus on postsecondary completion. 60x30TX was created with the hopes of increasing Texan postsecondary enrollment, completion, and increasing the state's economic competitiveness through postsecondary education. This study can be utilized to bring awareness to how this initiative interrelates with existing policies in a manner that allows for the achievement of these goals.

When examining the differences between Closing the Gaps and 60x30TX, one significant alteration is the research objective from Closing the Gaps was not carried over to the 60x30TX initiative. The latter is primarily focused on degree and certificate completion, workforce skills, and managing student debt (THECB, 2015), but fails to specify any research-based goals. The Closing the Gaps research expenditure objectives aligned with research expenditure goals that were later established through emerging research university funding programs. This alignment created multiple layers of policy that united to achieve a common goal. With the end of Closing the Gaps and removal of the research goals from 60x30TX, the research-based funding policies and the new strategic plan are no longer aligned. If left unchecked, this misalignment could potentially lead to competing goals that allow for the success of one goal over another. More specifically, the predominantly research-based goals of emerging research university policies and the student outcomes focused goals of 60x30TX may create a contradictory policy landscape (Labaree, 1997) due to the inherent differences of these types of goals.

Performance-Based Funding as a Mechanism for Growth

As previously mentioned in the introduction, consumer dissatisfaction with student success outcomes along with increasing financial inputs greatly amplified the call for higher education accountability (Ewell, 2008). Performance-based funding was initially created as an accountability formula that would provide quantifiable data regarding student outcomes while financially incentivizing institutions of higher education to prioritize those outcomes (Dougherty & Reddy, 2011). The ultimate aim of performance-based funding was to improve student success outcomes such as graduation rates, credit accumulation, job placement, and alignment of postsecondary outcomes with

labor market demands (Dougherty & Reddy, 2011; Letizia, 2015). States are able to use performance-based funding models to upsurge institutional changes in a manner that enhances specified outcomes.

This incentive-based, outcomes-driven approach to higher education is not exclusive to student success outcomes. In a similar manner, the creation of research-based funding in Texas mimics the framework of performance-based funding formulas. Public institutions of higher education in Texas are incentivized to increase their institutional prestige through research funding and its link to outcomes (Texas Education Code 62.141-62.149, 2009). The research funding programs available to emerging research universities in Texas incentivize those institutions to meet criteria in order to gain access to a bonus allocation of funding. Due to the nascence of these funding programs, no studies have observed the spending patterns and criteria requirements of emerging research universities on R&D in relation to their impact on student outcomes. The examination of research-based funding policies in relation to student outcomes can be informed by literature on performance-based models and expenditure implications in other arenas (e.g., administration). State level programs used to incentivize behaviors at the university level most closely represent performance-based funding models and university expenditure patterns used to increase institutional prestige.

Similarly, emerging research universities are allocated an amount of money depending on their performance on indicators regarding research. For example, the NRUF statue codifies that funding eligibility depends on meeting mandatory criteria (emerging research university status and restricted research expenditures) as well as meeting four of six optional criteria (endowment funds, Ph.D. degrees awarded, freshman

class of high academic achievement, institutional recognition of research capabilities and scholarly attainment, high quality faculty, and high-quality graduate education) (THECB, 2019a). Even though the aim of performance-based funding is to improve institutional performance with specific respect to student outcomes, the structural similarities between the mechanisms of NRUF in relation to emerging research universities likens this type of policy to performance-based funding in general. The following section examines the general mechanisms of performance-based funding and the related literature.

Broadly described, states have attempted to hold their institutions of higher education accountable through performance-based funding. According to Dougherty and Reddy (2011), in their most basic form, performance-based funding programs "aim to improve institutional performance, particularly with respect to student outcomes" (p. 2). Since the beginning of performance-based funding policies and programs in 1979 in Tennessee, there has been an effort to hold higher education institutions responsible by linking institutional funds to student outcomes (Dougherty & Reddy, 2013). Many states, including Texas, have called for accountability through quantifiable data regarding institutional performance and accurate means of measuring and tracking student success in hopes of adding to their institutional prestige through public recognition for their efficacious practices (Burke, 2002; Perna & Finney, 2014; Rutherford & Rabovsky, 2014). Dougherty and Reddy (2013) stress that "performance funding connects state funding directly and tightly to institutional performance on individual indicators" (p. 5). Depending on the circumstance, a method is produced linking specific institutional outcomes to discrete amounts of funding (Dougherty & Reddy, 2013) Ultimately, these outcomes appear as performance markers like six-year graduation rates and funds are

then apportioned by the performance funding program depending on the indicator (Dougherty & Reddy, 2011). It should be noted that the current discussion of performance-based funding in Texas has been based on four-year, public institutions. Please see Appendix C for a continued discussion of performance-based funding models as they pertain to community colleges in Texas.

At its core, performance-based funding is complex and the literature on its efficacy in improving student outcomes is mixed (Letizia, 2015); however, the performance-based model has inspired the creation of other outcomes-based models in an attempt to establish accountability through financial incentives. Like performance-based funding models, research-based funding models in Texas were created to uphold accountability regarding spending and specific outcomes (THECB, 2019a). The following section examines the components and empirical findings of performance-based funding followed by a discussion regarding research-based funding in Texas.

Before research literature on performance funding can be discussed, several differences and descriptors must be understood. The following section discusses: 1) the difference between performance funding, budgeting, and reporting, 2) the iterations of performance funding, 3) and the types of projected outcomes of performance funding. Performance funding is distinguishable from performance budgeting and performance reporting. Performance budgeting entails state government actors (i.e., legislatures and coordinating boards) considering institutional accomplishments on certain indicators as a partial determinant in the budget allocation but does not connect performance to funding via an explicit formula (Burke, 2002; Dougherty & Reddy, 2013). Performance reporting typically does not tie performance and funding. Even though the same indicators may be

used, the leading driver of institutional improvement is not the status of the reports themselves, but rather the connections to institutional self-awareness, public reputation, and prestige. Burke (2002) amplifies this point by stating, “The acquisition and dissemination of performance data may compel institutional change by making institutions more aware of their performance or of state priorities, or by fostering status competition among institutions desirous of being seen publicly as effective organizations” (p. 8).

Performance funding can be described in two different forms called performance funding 1.0 (PF 1.0) and performance funding 2.0 (PF 2.0) (Dougherty & Reddy, 2011; Dougherty & Reddy, 2013). Funding regarding PF 1.0 occurs in addition to regular state funding for higher education; that is, it acts as a bonus to the institution for meeting outcomes. This funding surplus is typically allocated based a variety of student-based parameters like graduation rates, retention rates, enrollments, etc. With PF 2.0, funding is actually a part of the regular state base funding formula for higher education in that the amount of funding allocated depends on outcomes (Dougherty & Reddy, 2013). With PF 2.0, the base funding formula directly links allotted funds to student outcomes while PF 1.0 allocates funds in addition to base funding depending on student outcomes. Another significant component of performance funding is the way the outcomes are categorized. Performance funding indicators are categorized as ultimate student outcomes and intermediate student outcomes. Ultimate student outcomes are typically described as effects pertaining to the completion and post completion milestones related to postsecondary education like graduation and job placement while intermediate student outcomes pertain to benchmarks that occur during the process of postsecondary education

like course completions or reaching specific credit thresholds (Offenstein & Shulock, 2010).

An example of how research-based funding policies are a form of performance-based funding policies can be explored through NRUF policies. In comparison with research-based funding mechanisms in Texas, expenditure outcomes would likely be considered an ultimate outcome because the expenditure threshold is a mandatory criterion of disbursement eligibility. Enrollment (i.e., freshman class of academic high achievement) could be likened to an intermediate outcome since it is one of the optional criteria. Research-based funding outcomes in Texas are unique in that the expenditure threshold requirement and emerging research status are mandatory while the enrollment outcome is optional. Universities are given a choice to select four of the requirements ($400 million endowment annually; 200 Ph.D. degrees awarded annually; freshmen class with high academic achievement; membership in Association of Research Libraries, Phi Beta Kappa or equivalent national recognition; high quality faculty; commitment to high quality graduate education) (THECB, n.d.b.). When analyzing the NRUF policy stipulations, the broad optional requirements along with the ability to select which four requirements to uphold potentially allows diverse university interpretations as well as varying outcomes among the various institutions. The creation of the policy in this manner potentially allows universities to implement the policy in a more autonomous manner.

Performance Funding: An Empirical Lens. The implications of performance funding have driven researchers to examine it with a critical lens because failure to meet outcomes could signify the loss of access to bonus funding (in the case of PF 1.0) or the

loss of a portion of base level allocated state funding which could be devastating to an institution (in the case of PF 2.0). If institutions are not able to meet student outcomes specified by the performance-based funding formula, the institution does not receive the allotted funding. Supporters of performance funding assert that funding incentives will stimulate growth regarding institutional performance by directly tying funding to student outcomes so that institutions focus on the improvement of those outcomes (Aldeman & Carey, 2009; Kelly & Lautzenheiser, 2013). In contrast, opponents of performance funding criticize how connecting performance outcomes to funding might actually hinder academic quality and rigor, diversity and access initiatives, and may potentially be ineffective overall (Huisman & Currie, 2004; Rhoades, 2012). Furthermore, these hinderances highlight the ways institutions are potentially rewarded for becoming more selective without accounting for the needs of diverse student populations (Johnson, 2013).

Researchers have examined performance funding in the singularity of one state and with multiple states like Tennessee and Ohio (known for their robust performance funding models) and found that policy impacts are typically limited or completely muffled (Hillman et al., 2018). Other performance funding researchers focus on longitudinal models of the national landscape (Volkwein & Tandberg, 2008). Rutherford and Rabovsky (2014) used a national dataset spanning over a decade to evaluate the influence of performance funding (PF 2.0 policies specifically) by utilizing six-year graduation rate, freshman to sophomore year retention rates, and bachelor's degree production. They used these indicators to develop an inclusive observation of the impact of performance funding on institutional performance and determine if there are variations

in performance policy effects across types of performance indicators. The findings from their study indicated that student outcomes are connected to student profiles, institutional characteristics, and state environments, but are not actually enhanced by performance funding policies (Rutherford & Rabovsky, 2014). Further analysis demonstrated that the implementation of performance funding policies may actually negatively impact student outcomes; however, PF 2.0 policies and their connection to institutional base funding may yield long-term improvements as the polices continue over a span of time (Rutherford & Rabovsky, 2014). One of the major highlights from this study is the flaw of attempting to apply a one-size-fits-all policy for postsecondary education (Rutherford & Rabovsky, 2014). More specifically, no one policy can perfectly accommodate the diverse needs of all institutions and therefore may need to allow flexibility for institutional autonomy. Performance-based policies that focus on the generation of specific outcomes must consider student demographics, institutional profiles, and the complexity of state environments to ensure that institutions are not unintentionally incentivized to change their function in a way that hinders certain student groups or impedes diverse institutional objectives. Narrowly defined success criteria implemented through these policies could negatively impact institutions that serve students at risk of success challenges (Harris & Bensimon, 2007). Their research emphasized the importance of policymakers' ability to assist or hamper institutional success depending on their understanding of the implementation of policy with regard to institutional diversity.

Another lens through which performance-based funding literature can be examined is through the linkage of expenditures and outcomes. In this instance, high

expenditures tallied by institutions of higher education have led to the call for accountability measures regarding funding (Ewell, 2008). McClure and Titus (2018) specifically examined the research university status using the Carnegie Classification system to interpret how that classification impacted administrative expenditures. Their results indicated that changing to a research university classification initially increased the amount of spending on administration at public research universities, but then the influence of the reclassification on administrative expenditures weakened over time. In the context of research university classification, increased administrative spending was viewed as a prestige seeking behavior on the part of the institution (McClure & Titus, 2018). Public research universities may be more sensitive to spending priorities regarding performance and prestige than other public colleges due to high levels of public visibility and perception (Rabovsky, 2012). This literature informs this study by examining the ways in which prestige seeking behaviors can take the form of various expenditure patterns (e.g., research expenditures) and how those spending patterns could inadvertently impact outcomes.

Unintended Consequences. Relatedly, it is not uncommon that the decisions made by policymakers regarding performance-based funding divert from their intentions (Dougherty & Reddy, 2011; Dougherty & Reddy, 2013) Unintended consequences of performance-based funding include extra compliance costs for personnel, a decrease in institutional mission diversity, inflation of grades and weakening academic standards, and increased student admission selectively that negatively impacts underrepresented groups of students (Dougherty & Reddy, 2013; Gàndara & Rutherford, 2018; Umbricht et al., 2015). Even though studies have found that performance funding policies for higher

education may be ineffective or trigger inadvertent outcomes, more research is needed to understand the underlying contributing mechanisms that illuminate policy failure before irrefutable reports are largely made regarding performance funding. Rutherford and Rabovsky (2014) note how performance funding policies make assumptions regarding the awareness and capability of institutions to manage themselves in an effective manner. These assumptions do not account for institutional characteristics like ambiguous goals, under skilled leadership, and resource limitations which would impede institutions from improving themselves. The possible inaccuracy of these assumptions must be taken into consideration before performance funding can be deemed ineffective. Furthermore, the distinction between PF 1.0 and PF 2.0 policies may give insight regarding effective accountability strategies. Potentially, financial incentives combined with long term stability may be important (if not the most important) components of accountability policies (Dougherty & Reddy, 2011; Umbricht et al., 2015).

To remedy the issues regarding performance funding and lack of efficiency and/or unintended outcomes, researchers have attempted to conduct rigorous analyses that could potentially yield more telling results. Several studies conducted difference-in-difference models using national data over a period of time to investigate long term effects of performance funding policies (Gàndara & Rutherford, 2018; Hillman et al., 2018; Kelchen, 2018; Umbricht et al., 2015). These studies demonstrated that performance-based funding had little to no impact on producing the intended outcomes whether it was student enrollment, baccalaureate degree production or a variety of outcomes. The only instances that produced promising results included performance-based policies that included certain equity provisions to increase the number of underrepresented students

attending the university (Gàndara & Rutherford, 2018; Kelchen, 2018). Without equity provisions, performance-based policies tended to unintentionally hinder access and/or push out underrepresented groups of students (i.e., racial/ethnic minorities and students from low socioeconomic backgrounds) (Jones et al., 2017). This finding also holds true for diverse institutional types like 2-year minority serving institutions (MSIs) revealing that underrepresented students are buffered when institutions incentivize milestones (intermediate outcomes) as an equity provision (Li, Gándara, & Assalone, 2018). These finding are in alignment with critics of performance funding who assert that the adoption of performance funding policies across the nation in postsecondary education could cause institutions to augment their admissions policies in a manner that favors students who are more likely to succeed and hinders students who have lower scores on admissions tests, grade point averages, and odds of success (Dougherty et al., 2014b; Jones et al., 2017). These trends demonstrate that as Texas seeks to enhance the productivity and recognition of its research industry, it runs the risk of counteracting any equity-based goals regarding student success.

While literature on the impacts of the emerging research designation is scant, performance-based funding literature has provided a foundation for the exploration of this nascent topic. An initial review of performance-based funding policies revealed that these types of policies typically do not efficiently impact student outcomes unless certain equity parameters are specified. Research universities may be more sensitive to policy implicated spending due to the influence of prestige, but overall, more research is needed to investigate the ways in which spending and outcomes are linked for emerging research universities specifically.

Theoretical and Conceptual Models

This study pulls theoretical and conceptual insights from action theory (Argyris & Schön, 1996) and institutional isomorphism (DiMaggio & Powell, 1983). When attempting to comprehend both the intended and unintended outcomes of research-based funding programs in Texas, there also needs to be an understanding of how policies influence the production of certain outcomes. The theory of action used in organizational learning can be adapted to public universities in Texas that change how they expend R&D funds to qualify for emerging research funding programs (Core Research Support Fund, National Research University Fund, and Texas Research Incentive Fund) and maintain those expenditure changes once research funding eligibility is achieved. Argyris and Schön (1996) define a theory of action using a formula regarding a specific situation, consequence, and an action strategy. "The general form of a theory of action is: If you intend to produce consequence C in situation S, then do A" (Argyris & Schön, 1996, p. 13). The equation informed by the theory of action can be used to explain how the Texas legislature and the higher education governing body intended to produce certain consequences in specific situations regarding student outcomes and research outcomes.

With regard to this study, the theory of action is used as an explanatory model pertaining to outcomes of admissions, completions, and expenditure-based research productivity. When examining student outcomes, Texas planned to increase admissions and completions (consequence C) for Texas students (situation S), through strategic planning and policies (A). Through Closing the Gaps, 60x30TX, and certain parameters of policies pertaining the research (e.g., NRUF), the state of Texas expected to increase admissions and completions within postsecondary institutions for citizens of Texas. This

model can also be applied to research expenditure behaviors. Texas intended to increase research expenditures (consequence C) within Texas institutions (situation S), through strategic planning and policies (A). The desired outcomes (admissions, completions, and research expenditures) are included as variables in the design of this study to investigate if there were increases in these areas based on emerging research university policies.

When further examining consequences and action strategies, Argyris and Schön (1996) added that two other components are vital to the full representation of a theory of action: "the values attributed to C make it seem desirable as an end-in-view and the underlying assumptions, or model of the world, that make it plausible that action A will produce consequence C in situation S" (p. 13). The underlying values ascribed to high research productivity (consequence C) at emerging research universities (situation S) include accountability efforts that highlight institutional efficiency and national recognition for prestige. Due to the prominence of the R&D enterprise in the United States, these fundamental values that are connected to high research productivity and empirical validity elevate the stature of universities which, in turn, make them more competitive and nationally desirable. This influence can also be seen at a national level through the Carnegie Classification of Institutions of Higher Education which assigns doctoral universities to one of three categories depending on their level of research activity and is linked to universities' R&D expenditures (The Carnegie Classification of Institutions of Higher Education, 2017). Again, in this instance, the classification is connected to actionable behaviors with regard to universities that are seeking the benefits of said classification. The second component, the underlying assumptions that render the formula plausible, is linked to the financial component and beliefs about efficiency. With

specific regard to student outcomes and research-based funding, plausibility of research programs is contingent on the following assumptions: 1) institutional leaders are able to readily influence research performance while ignoring circumstantial factors that potentially impede outcome manipulation, and 2) institutions and their leaders are knowledgeable about how to increase outcomes and/or meet criteria once incentivized to do so (Rutherford & Rabovsky, 2014). These assumptions have ramifications for the ways that various policies interact and how other covariates could potentially influence outcomes in the models of this study. To meet specific goals, leaders must understand what other factors (covariates) influence the success of those goals. For example, when attempting to increase student admissions, proximity can be a factor in whether or not a student decides to apply to an institution (Tinto, 1973). Like the various factors that each institution must consider for the attainment of student and research success goals, this study also contains covariates that could influence the results of goal attainment for both student and research success parameters. A list of the covariates included in this study is presented in the Methodology chapter.

Potentially, research funding programs can align with various forms of theories of action. Espoused theories of action clarify or rationalize a specified sequence of activity while theories-in-use are implicit in the performance of the sequence of activity (Argyris & Schön, 1996). More specifically, theories-in-use must be derived from behavioral observations, may be implied instead of explicit, and may not align with espoused theories (Argyris & Schön, 1996). Argyris and Schön (1996) clarify this distinction by stating, “An organization’s formal documents, such as organization charts, policy statements, or job descriptions, not infrequently contain espoused theories of action

incongruent with the organization's actual patterns of activity" (p. 14). Regardless of the implicit or explicit nature of the theory of action regarding research funding programs, the desired outcomes can be rendered via a variety of mechanisms including increasing an institution's understanding of their state's higher education objectives, enhancing an institution's awareness of their own standing in relation to their state's higher education objectives, and increasing an institution's comprehension of their ranking among other institutions (Dougherty & Hong, 2006).

To answer the question of how institutions are incentivized to behave in specific ways, this study utilizes insights from literature regarding inducements. According to Howlett (2005), inducements are a policy method used by policymakers to encourage their desired goals through incentives. Policymakers can use these tools as levers to motivate institutions to perform in a manner that will render the policymakers' initiatives. Research performance funding policies, and performance funding policies in general, are inducements in that they entail financial incentives that are used by policymakers to achieve specific outcomes (Dougherty et al., 2014b). For example, in an attempt to increase the research productivity of public Texas institutions, the Texas legislature, in partnership with the THECB, financially incentivized institutions through the creation of NRUF and other funds to produce the desired outcome of high levels of research productivity measured through specified criteria. Public universities that have been designated as emerging research universities in the THECB's accountability system, in turn, comply with the requirements to qualify for such funds, which includes increasing their R&D expenditures to at least $45 million in restricted research (THECB, n.d.e.). According to Stone (2002), there are three conceptual components to inducements

including 1) the possibility of discontinuity between policy design and implementation, 2) the judicious and political nature of receivers of inducements and, 3) the type of relationship between several inducements. For this study, the third component, the relationship between several inducements, is of great significance. The relationship between a multitude of inducements can be complementary, strained, and/or competing depending on the inducements. When examining 60x30TX goals for underserved students in relation to research-based performance funding program requirements (e.g., high achieving freshman class), there is potentially a disconnect between inducements. Institutional leaders may be unintentionally positioned to mitigate the competing goals of admitting and serving underrepresented students and being more selective to ensure a highly competitive freshman class as incentivized by research performance funding stipulations. Due to the overlapping goals of strategic plans and policies around student outcomes and research success, this study examines the relationship between the various types of inducements. In the case of research funding, the inducement (financial rewards) are directly connected to the variable research expenditures. In the case of student outcomes, admissions and graduation are tied to certain aspects of research funding polices but are mostly linked to strategic plans and more intangible inducements like positive recognition for achieving strategic goals. Also, some of the inducements related to certain goals may potentially conflict in a manner that favors certain goals. This study utilizes admissions, completion, and research expenditures as variables to examine how various inducements may interact over time to potentially favor and/or diminish the success of student outcomes and research productivity outcomes.

In this regard, theories of action and inducements regarding research outcome funding at universities can be situated within institutional isomorphism which states that organizations become structurally similar over time due to policymakers' desires of organizational conformity regarding standards (Karlsson, 2008). Not only do institutions, due to the field and profession of research, become more alike due to a perceived efficiency, but also state decision makers act on said institutions to incentivize them to change in a particular way. The underlying mechanism of institutional isomorphism is structuralism of organizational fields which leads to homogenization within the field (Giddens, 1979). DiMaggio and Powell (1983) assert that organizations become more similar due to perceived efficiency and not only competitiveness, and they discuss a variety of fields that have become more homogenous over time including the American textbook field, the hospital field, public schools, and the radio industry. A similar phenomenon is occurring in Texas regarding researching institutions. The Texas flagship universities were the highest research producing institutions in Texas in terms of R&D expenditures spent. When the emerging research university designation was created along with funding programs, other institutions began to mimic the flagships due to the THECB incentives. This model is also applicable to emerging research universities in Texas. Research outcome models attempt to mimic the ways that funding patterns have allowed the flagships to be research productive. Emerging research universities, which are diverse institutions, are now held to similar performance standards regarding the attainment of research productivity.

The structural processes that lead to analogous organizations include increased interactions within the organizational field, the development of interorganizational

standards, increased information for organizations to assess themselves in relation to their field, and awareness of their counterparts in relation to the common enterprise (DiMaggio & Powell, 1983). These mechanisms can be coercive (compliance based), normative (morally and accountability based), and/or mimetic (similarity based and/or admiration based) (DiMaggio & Powell, 1983; Karlsson, 2008). These structural processes coincide with the ways that theory of action allows for organizations to change based on actions used to produce outcomes in specific situations. In Texas, the THECB acts on public universities through accountability policies which cause them to become similar due to the homogeneity of standards. This typically provides legitimacy rather than improves performance as Freeman (1982) indicates how older organizations that have set the standards typically set the tone in their environments. The University of Texas at Austin and Texas A&M University represent these larger, older organizations that dominate the Texas university landscape, and due to their prowess, the THECB and the Texas legislature have created research-based strategies to groom other universities in the image of the flagships regarding R&D expenditures and actions. Since Texas aims to increase is viability regarding research productive institutions on a national scale, its policymakers have implemented research funding programs that prompt institutions to take one another into account causing competition for resources, political power, legitimacy, and overall fitness (Aldrich, 1979). In this regard, the notions of institutional isomorphism along with theory of action and inducements are practical models for understanding how policy persuades institutional behaviors with specific regard to how emerging research universities are essentially being socialized to meet certain R&D benchmarks as well as student success benchmarks. For this reason, the variables student race, student gender,

and student economic status are also considered in the model. Along with admission and graduation, the state of Texas also includes parameters in its strategic plans and policies regarding the increase of certain demographics of students (e.g., male students, Hispanic students, Black students) which can be captured by these included variables. The models in this study address these parameters by using student demographics and institutional demographics as covariates to determine if there are differences between certain groups of admitted and graduated students over time.

The multiple aspects of student outcomes and research success policies in the landscape of Texas higher education and how these various aspects intertwine are layered, complex and dynamic. This study provides missing research in a line of inquiry that is still evolving and not properly understood. Policy creation and implementation does not occur in a vacuum (Anderson, 2011) and policies can intermingle unpredictably creating consequences that were not anticipated by policymakers (Kingdon, 2003). The Texas higher education policy landscape is the premier space to examine how such policies potentially impact one another. Understanding how overlapping policy goals interact within the same landscape over a period of time may help shed light on why performance-based funding policy research (and policies modeled after them) has yielded mostly inconclusive or mixed results.

Chapter III: Methodology

Data Sources and Variables

The study utilizes college admissions and graduation data from the University of Houston Educational Resource Center (UH ERC) as well as institutional variables from the Integrated Postsecondary Education Data System (IPEDS). The UH ERC is a repository and research center for P-20 and workforce data in Texas. The data housed at the UH-ERC that pertains to this study includes longitudinal, student-level data at the college level. The second database, IPEDS, uses an annual institutional survey to compile information from all postsecondary institutions that offer federal financial aid to students. The sample used for this study is comprised of 14 Texas public institutions that could potentially become eligible to receive funds from research-based funding policies, eight of which currently hold the designation of emerging research university. The outcome variables are the application actions of trackable (via student IDs from the UH ERC) students who applied to doctoral and emerging research universities in Texas and completion within six years of admittance from 2004 to 2018.[3] The outcome variables are dummy variables indicating the types of acceptance or graduation standards that were met. For the application action, the number zero indicates unspecified application criteria was met and one indicates legislative and/or institutional criteria was met. For the graduation outcome, one indicates a student graduated within six years of admittance and zero indicates that a student graduated in more than six years of admittance. 2004 was selected as the start year because the tuition deregulation bill (House Bill [HB] 3015)

[3] Students can only be tracked if they are admitted and enrolled in a Texas institution. Trackable students for completion only include students that were admitted, enrolled, and completed at a Texas institution.

became effective September 1, 2003, and institutions started increasing designated tuition in the spring semester of 2004.[4]

This study includes student level demographic variables including race, age at the time of admittance, gender, and family income status. The variable application action includes information about whether or not the student was accepted based on meeting legislative criteria (e.g., top ten percent of his or her graduating high school class) and/or institutional criteria or whether the student was accepted but met some other unspecified criteria. The study includes an institutional demographic variable for emerging research designation or doctoral university and research expenditures per year. The research expenditure variables are included as a measure of research productivity because the state of Texas included increasing research expenditures as a goal of increasing research productivity during Closing the Gaps and the mandatory requirement of NRUF pertains to a threshold of restricted research expenditures. Current year total research expenditures and research salaries and wages were collected using the Governmental Accounting Standards Board (GASB) criteria through IPEDS and are included as two categories of research expenditure types. Table 2 shows the variables listed below:

Table 2

Description of Variables

Variable Name	Variable Description

[4] Prior to HB 3015, the Texas Legislature regulated tuition rates and typically required the same tuition rate be charged across Texas. After this bill was passed, governing boards of public universities were allowed to set designated tuition rates (THECB, 2010).

Application Action	The application action of accepted based on legislative and/or institutional requirements or accepted based on unspecified criteria.
Completed	Whether students graduated within a six year period or more than six years.
Research Expenditures	Research expenditures in dollars less research salaries and wages (log transformed) for each year of the study period from the GASB criteria through IPEDS
Research Salaries and Wages	Salaries and wages dedicated to faculty, staff, and students hired specifically for research purposes (log transformed)
Race	Race of student—White, African American, Hispanic, Asian, Native American, International, or chose not to specify
Age	The student's age at the time of admittance
Gender	Gender of the student—male or female
Family Income Status	The student's socioeconomic status at the time of admittance
Emerging Research University	Whether or not the university was designated as an emerging research university in 2009
Exit Year	A control variable included to account for the year a student graduated.
Entry Year	A control variable included to account for the year a student was admitted.

The following section provides the analytic strategy including a more detailed discussion of how the variables are fit into the model.

Analytic Strategy

The study explores the differences in college admissions actions and graduation at emerging research universities in relation to Texas doctoral universities from 2004 to 2018 using two models of a difference in difference (DID) design. The first model will be a generalized DID design utilizing two groups and multiple time periods to explain the possible outcomes. This type of quasi-experimental design, also known as comparative interrupted time series analysis, can be used to compare the outcomes of multiple groups exposed to policies and environmental factors at different points in time (Delaney &

Kearney, 2016; Wing, Simon, & Bello-Gomez, 2018). For the purpose of this study, DID is used to combat selection bias through the assumption that unobserved heterogeneity of factors is time invariant. This notion is explained in more detail throughout this chapter. It is noted that "DID designs assume that confounders varying across the groups are time invariant, and time-varying confounders are group invariant" (Wing, Simon, Bello-Gomez, 2018, p. 455).

The generalized DID equation is:

$$Y_{gt} = a_g + b_t + \delta D_{gt} + \varepsilon_{gt}$$

In this equation, a_g is a group effect and b_t is a time effect, g represents the cross sectional group units and t represents periods of time. According to Wing, Simon, and Bello-Gomez (2018), when the unit of time and group is larger than two, $D_{gt} = 1$ if the policy (treatment) is operational in group (*g)* and time (*t*). If the policy is not active in group (*g*) and time (*t*), then $D_{gt} = 0$.

The second model of the DID design will include lagged treatment variables. Since it is possible that the effect of policy implementation may vary with time since exposure (Marcus & Siedler, 2015), including lagged treatment variables can be used to examine anticipation effects and phase-in effects in a single regression. According to macroeconomists, the influence of an enacted policy is not always immediate, and the time between the enactment of a policy and the policy's impact is known as the impact lag (McConnell, Brue, & Flynn, 2009). It is important to include lagged variables in the model to account for the impact lag of the policy. This helps to ensure that impact of the policy is captured even if the enacted policy impact is not immediate. In this model,

$$Y_{gt} = a_g + b_t + D_{gt}\delta + \sum_{s=1}^{S} Dg, t + s\gamma s + \sum_{m}^{M} Dg, t - m\lambda s + \varepsilon gt$$

δ represents the initial policy effect while λ_m measures any extra policy effects occurring after the policy is adopted (i.e., *m* intervals after adoption). According to the model, negative values of λ_m indicate that the immediate policy impact dissolve over time conditional on the initial policy impact being positive. If the initial effect of the policy is positive, then positive values of λ_m indicate that the immediate policy impact has greater effects over time conditional on the initial policy impact being positive (Wing, Simon, & Bello-Gomez, 2018).

This model is appropriate given the research objectives and research question because these designs control for unmeasured cofounders even though the underlying variables are not explicitly measured (Wing, Simon, & Bello-Gomez, 2018). By regressing the observed outcome on the treatment variable and the time effects (i.e., group and time), the treatment effect parameter (δ) can be estimated (Bitler & Carpenter, 2016). In this case, groups refer to either the group of emerging research universities or doctoral universities. Also, DID models are appropriate to address considerable variation (Wing, Simon, & Bello-Gomez, 2018). Finally, DID methodologies are also appropriate due to their underlying assumptions. DID is often compared to propensity score matching (PSM) as a method that can be used for analyzing policy impact, but, unlike PSM, DID methods "assume that unobserved heterogeneity in participation is present—but that such factors are time invariant" (Khandker, Koolwal, & Samad, 2010, p. 71). By utilizing observations pre and post the policy enactment, the time invariant factors can be removed through differencing. Moreover, this method is

ideal for analyzing the impact of the emerging research university designation by comparing emerging research and doctoral universities. At the legislative decision making level, assignment to the emerging research university group is not random leading to selection bias. DID methods neutralize this selection bias by canceling it out through differencing since the unobserved heterogeneity is assumed to not change over time (Khandker, Koolwal, & Samad, 2010).

As previously mentioned, DID requires parameters for the time of the policy implementation and the group impacted by the policy. The models in this study include an indicator variable for time which indicates before and after the start of the emerging research university designation in 2009. This indicator variable is a dummy variable with zero indicating pre 2009 and one indicating post 2009. The ERU (Emerging Research University) indicator variable indicates whether or not the institution was designated as an emerging research university in 2009 or not. This is also a dummy variable with zero indicating an institution was not an ERU in 2009 and one indicating that an institution was an ERU in 2009. If an ERU was designated as an emerging research university in 2009, then it is in the treatment group and if it was not designated as an emerging research university in 2009, then it is in the control group. The research expenditures variable includes the total research expenditures for each institution each year. This includes the sum of all expenditures specifically associated with the production of research outcomes at each institution. It can include the production of research outcomes commissioned by an external or internal agency of the institution (e.g. institutes, research centers, individual and project research, etc.) (IPEDS, 2019a). The research expenditures variable does not include research salaries and wages. This variable is log transformed

and on a continuous scale. The research salaries and wages variable indicates research salaries and wages to account for compensation for services to all employees for activities specifically for the production of research outcomes. These employees can include both full time and part time faculty, staff, and students (IPEDS, 2019b). The research salaries and wages variable is also log transformed and on a continuous scale.

Entry year and exit year are included as control variables to account for the years that students were admitted and graduated from a particular institution. Entry year and exit year are categorical variables with each category representing a different year. The age variable is included as a control for student age at the time of admission and is on a continuous scale. Family income status is included to account for the student's socioeconomic status at the time of admittance. Family income status is also a categorical variable with each category representing an income range. Race accounts for the racial identity of the students including White, African American, Hispanic, Asian, Native American, International or chose not to specify. The race variable is categorical with each category representing a different student race. Gender accounts for the student's gender and is binary for either male or female. Gender is a dichotomous variable with zero indicating a student is female and one indicating a student is male. The first outcome variable is application action which is a binary variable of accepted due to meeting either legislative (e.g., top 10%, top 25%) and/or institutional requirements or accepted based on unspecified criteria. This variable is dichotomous with one indicating the specified criteria were met and zero indicating unspecified criteria were met. The second outcome variable is graduation and is also a binary variable for the student completing within six years of their admittance or more than six years. The graduation outcome variable is also

dichotomous with one indicating a student graduated within six years and zero indicating a student graduated in more than six years.

Four models are used in this study to examine the policy impacts of the emerging research university designation on student outcomes. The first model investigates the relationship between ERU status and time with application action as the outcome. The second model investigates the relationship between ERU status and time with application action as the outcome; however, it also includes a variable for a five year lag to investigate if there is a delay in the impact of the policy. The third model investigates the relationship between ERU status and time with graduation as the outcome. Finally, the fourth model investigates the relationship between ERU status and time with the graduation outcome, but it also includes a variable for a five year lag to examine if there is a delay in the impact of the policy. The application and graduation models can be estimated with the following equations:

$$Y_{application\ action} = \alpha_0 + \alpha_1 ERU + \alpha_2 Time + \alpha_3 ERUxTime + \beta x + \varepsilon$$

$$Y_{graduation} = \alpha_0 + \alpha_1 ERU + \alpha_2 Time + \alpha_3 ERUxTime + \beta x + \varepsilon$$

where x = the vector of previously discussed covariates included in the model.

By using DID, the objective is to compare the outcomes in application actions and graduation actions between institutions that where designated as emerging research universities in 2009 due to the emerging research university policy and those that were not designated as emerging research universities in 2009. A challenge to determining the impact of policy using DID is finding a group of institutions that can be compared to emerging research universities. The university landscape in Texas included research institutions (UT and TAMU), emerging research universities, doctoral universities,

comprehensive universities, and master's universities[5]. While the state has created these categorizations due to the nature of the institutional characteristics (mission, size, scope, etc.), these categories are not completely static. Over time, universities can move from one category to another. This process is not extremely typical and usually requires the acquisition of great resources and new agendas around the institution's mission (Dubrow, Moseley, & Dustin, 2006). Examples of this include Texas A&M University-Corpus Christi which changed from a comprehensive to doctoral university from fiscal year 2008 to 2009 or Texas State University which changed from a doctoral university to an emerging research university from fiscal year 2011 to 2012. For the purpose of this study, emerging research universities are the treatment group and doctoral universities are the control group. Even though the state has defined these two groups as categorically different, there is a rational for comparing these groups. Emerging research universities and doctoral universities are similar in that they have the shared mission of research, teaching, and service (THECB, 2007). Typically, emerging research universities are designated as such because they expend more research dollars than doctoral universities, but there is no absolute research expenditure cut off that distinguishes these two groups. In fact, doctoral universities are the most eligible group of institutions to transition to emerging research universities. This in fact occurred in 2012 when Texas State University transitioned from a doctoral university to an emerging research university. For these reasons, emerging research universities will be compared to doctoral universities. Below, Table 3 lists of the treatment and control groups.

[5] Texas also includes categories for community colleges which include very large college, large college, medium college, and small college. For the purpose of this study, there is only a focus on university categories.

Table 3

University Groupings

Treatment Group	Control Group
University of Houston	Texas State University[6]
Texas Tech University	Sam Houston State University
University of Texas at Arlington	Texas A&M University Corpus Christi
University of Texas at El Paso	Texas A&M University Kingsville
University of Texas at San Antonio	Texas A&M University Commerce
University of Texas at Dallas	Texas Woman's University
University of North Texas	University of Texas at Rio Grande Valley

Even though the control group did not participate in the policy in 2009, the control group institutions are the closest in-state representation of a group that can be compared to emerging research universities.

Parallel Trends Assumption

The parallel trends assumption (also known as the common trends assumption) states that the trends observed in the outcome variables would not differ between groups if treatment was not present (Angrist & Pischke, 2009). More specifically, this means that there would be a parallel trend in movement between the treatment and control groups if the treatment was not present. Khandker, Koowal, and Samad (2010) described the parallel trends assumption by stating that unobserved characteristics impacting

[6] Texas State University was designated as an emerging research university in 2012, however this study examines the policy creation and subgrouping that occurred in 2009. For that reason, it is included in the control group.

participation in a treatment are time invariant with treatment status. Unfortunately, the parallel trends assumption cannot be tested directly. In an attempt to demonstrate that the parallel trends parameter is met, information from before and during the policy enactment can be used to demonstrate that the mean differences in the outcomes are not statistically significant. When the mean differences in the outcome variables are not statistically significant between the treatment and control group, it indicates that the parallel trends assumption likely is met (Mason, Wineman, Kirimi, & Mather, 2010). As previously discussed, the parallel trend assumption cannot be directly tested, however, graphical analyses can be used to indirectly determine if the assumption is likely met.

The main objective of this work is to determine how the emerging research designation policy impacts application actions and graduation. In the case of application action, Y_{1i} is the value of the outcome variable application action for student *i* attending a university participating in the emerging research university policy (treatment group) and Y_{0i} is the student's application action outcome for student *i* attending a university not participating in the emerging research university policy (control group). At a specific time point, a university is an emerging research university (Wi = 1) or not (Wi = 0). Therefore, the observed outcome is as follows:

$$Y_i = W_i Y_{1i} + (1 - W_i) Y_{0i}$$

The treatment effect of the emerging research university policy for institutions is:

$$\tau_i = Y_{1i} - Y_{0i}$$

Unfortunately, this effect cannot be seen directly because each institution can only be in one state at a time (either emerging research university or doctoral university). Even though the ideal circumstance would be to estimate the average treatment affect (ATE) of

the emerging research policy on institutions, this estimation is not possible. In order to estimate the ATE, emerging research university participation would need to be assigned at random and outcomes would likely be independent of treatment. Since the emerging research designation is not, in fact, assigned at random, there is selection bias. This likely occurs due to emerging research universities previously being doctoral institutions with the capacity to produce higher levels of research expenditures and other research productive activities. DID can be utilized to address selection bias and provide unbiased estimates.

Chapter IV: Results

This section presents the results of the DID models used to investigate the impact of research policies in the state of Texas. Due to the nature of the data, the Results section begins with a discussion of the parallel trends assumption and dataset modifications. Next, this section presents the results for application outcome models and graduation outcome models in their own respective sections. The application outcome and graduation outcome each contain two models: one model for the immediate impact of the policy and one model for the impact of the policy five years post the enactment. As previously discussed in the Methods section, the models are comprised of the outcome variables application action and six year completion. The remainder of the variables in the models address student level and institutional level characteristics. Also, the sections for application and graduation outcomes will included tables for descriptive statistics. These models address the research question: To what extent has the creation of the emerging research university designation impacted student admissions and completion patterns at Texas public universities? The following portions of the results section provides the findings for each model.[7]

Parallel Trends Assumption

Before the presentation of findings, this subsection presents information regarding the DID design and the parallel trends assumption. Previously, the Methods sections explained the significance of the parallel trends assumption in DID methodologies. Again, the parallel trends assumption states that there should be a parallel trend in the outcomes of the treatment and control group if the treatment was not present. If the

[7] Please note that the University of Houston was omitted from all four models due to collinearity.

parallel trends assumption is not met, the results of DID methods are likely biased. While the parallel trends assumption cannot be directly tested, it can be indirectly tested by graphically utilizing data on the outcome variables from before and during the policy enactment (Ryan, Kontopantelis, Linden, & Burgess, 2019). If the trends in the averages of the outcome variables graphically appear to be parallel over time, then the parallel trends assumption is likely met and the findings of the DID methodology are likely unbiased. Based on this criteria, the averages of the outcome variables (application action and graduation) were graphed separately by treatment and control groups from 2002 to 2018. In terms of the graduation outcome, the graphic depiction over time revealed that the trends between the treatment (ERU) and control (doctoral) were generally parallel over the 2002 to 2018 time period. This indicates that the parallel trends assumption is met and the finding of the DID models will likely be unbiased. The graphic results for the parallel trends assumption for graduation are depicted in Figure 1. For the application action, the same graphical depiction was created for the treatment and control groups during the same time period. The graph generally indicated parallel trends between treatment and control groups from 2006 to 2015. However, the trends pre 2006 and post 2015 were not parallel. This indicates that the findings determined with data prior to 2006 and after 2015 are likely biased. Due to the violation of the assumption before 2006 and after 2015, the dataset was modified for the application outcome to only include data from 2006 to 2015 instead of 2004 to 2018. Figure 2 indicates that the parallel trends assumption is generally met for to reduced observation period using dashed lines. For these reasons, the DID analyses for the graduation outcome contain data from 2004 to 2018 while the DID analyses for the application outcome contain data from 2006 to

2015.The following segment of the Results section presents the findings for the application outcome and the graduation outcome separately.

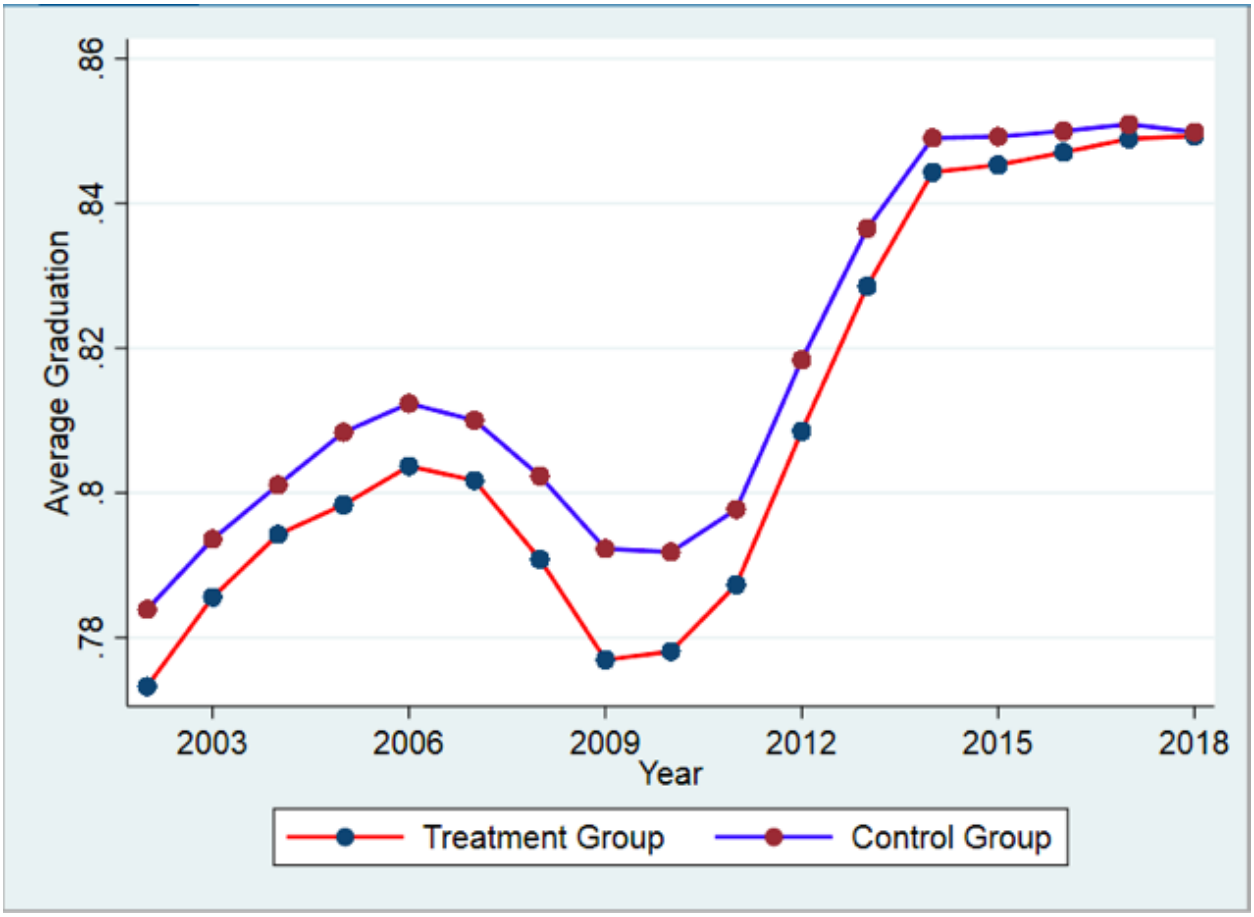

Figure 1. Graduation Parallel Trends Assumption Graph. This is a graphic representation of the parallel trends assumption for the graduation outcome.

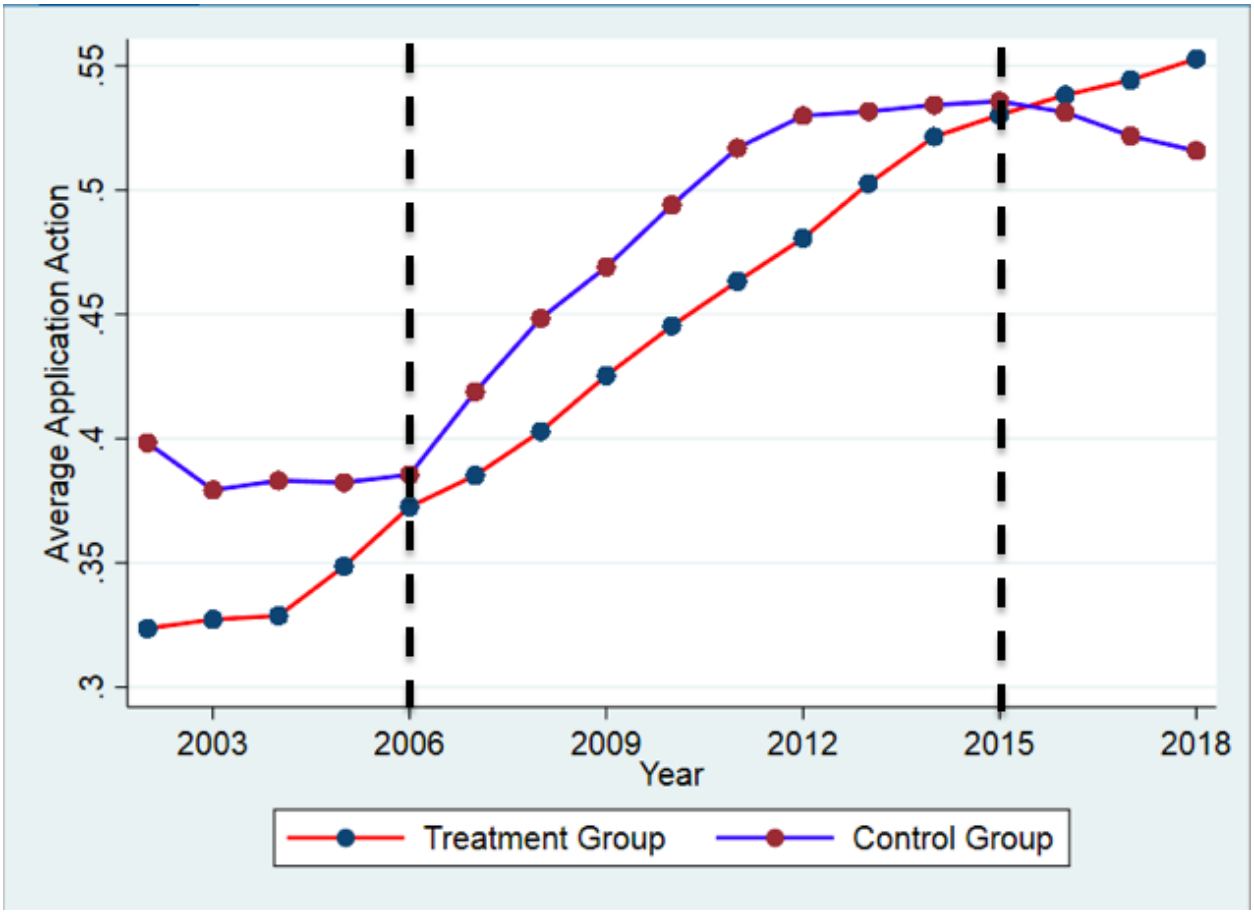

Figure 2. Application Parallel Trends Assumption Graph. This is a graphic representation of the parallel trends assumption for the application outcome.

Results for the Application Outcome

This subsection of the Results presents the findings for application action outcomes. All findings are restricted to the 2006 to 2015 time period. The descriptive statistics for variables used in the model are presented in Table 4 and Table 5. Table 4 includes descriptive statistics for continuous variables used in the immediate and lagged models. Table 5 includes descriptive statistics for the outcome (application action) and discrete variables used in both models.

Table 4

Descriptive Statistics For Continuous Variables

Variable Name	N	Mean	Std. dev.	Min	Max
Research Expenditures	793,312	16.85	1.14	13.53	18.33
Salaries and Wages	793,312	16.65	1.15	12.81	18.21
Age	793,261	18.07	0.96	13	83

Table 5

Descriptive Statistics For Outcome and Discrete Variables

Variable Name	Frequency	Percentage
Application Action		
Meets Specified Criteria	405,129	51.07
Meets Other Criteria	388,183	48.93
Gender		
Male	346,692	43.70
Female	446,620	56.30
Race		
White	207,327	26.13
African Amer.	45,177	5.69
Hispanic	146,229	18.43
Asian	41,063	5.18
Native Amer.	1,986	0.25
International	4,181	0.53
Unspecified	347,349	43.78
Income Status		
Unspecified	334,918	42.22
< $20,000	52,172	6.58
$20,000-$39,999	85,301	10.75
$40,000-$59,999	74,049	9.33

$60,000-$79,999	61,870	7.80
≥ $80,000	185,002	23.32
Entry Year		
2006	113,391	14.29
2007	113,559	14.31
2008	113,708	14.33
2009	106,806	13.46
2010	107,640	13.57
2011	93,096	11.74
2012	72,627	9.15
2013	49,236	6.21
2014	22,335	2.82
Institution		
Sam Houston State Uni.	61,286	7.73
TAMU-Commerce	15,661	1.97
TAMU- Corpus Christi	33,745	4.25
TAMU-Kingsville	18,966	2.39
Texas State Uni.	111,854	14.10
Texas Tech Uni.	132,135	16.66
Texas Women's Uni.	21,104	2.66
UT-Rio Grande Valley	50,395	6.35
UT-Arlington	57,993	7.31
UT-Dallas	39,580	4.99
UT-El Paso	49,191	6.20
UT-San Antonio	100,405	12.66
Uni. of Houston	100,997	12.73

Model 1: DID estimates for emerging research universities and application action.

The first model included a DID analysis with application action as the outcome. The purpose of Model 1 is to examine the immediate impact of the emerging research

policy designation and research expenditures on the application actions of emerging research universities. Recall that application action is a binary variable with one indicating that a student was accepted based on meeting legislative (e.g., top 10%, top 25%) and/or institutional requirements and zero indicating that a student was accepted but did not meet those requirements but rather met other unspecified parameters. The THECB data does not specify the details of the additional unspecified parameters or institutional requirements. This lack of specification is likely due to variety in institutional acceptance standards. Model 1 included a time dummy variable for before and after 2009, the ERU variable (emerging research university or not), an interaction variable for time and emerging research university status, research expenditures, and research salaries and wages. The model also included control variables for entry year, student age upon admission, family income status, student race, institution, and student gender. The adjusted R_2 for the model is 0.065 indicating the 6.5% of the variance is explained by the variables in the model. Due to the low explanatory power of the model, the practical policy impact is modest. Table 6 depicts the statistical results for Model 1.

The estimated coefficient for the variable time is the expected mean change in application action from before to after the policy enactment among the control group. This parameter is a representation of the absence of the policy enactment over time. The estimated coefficient for the variable ERU is the expected mean change in application action between the treatment (emerging research) and control (doctoral) groups before the enactment of the policy. It reflects the existence of initial differences that existed before the policy enactment. The coefficient for the time variable is -0.03 ($p < 0.000$) and the coefficient for the ERU variable is 0.02 ($p < 0.078$). For the time variable, this

indicates that there is a difference in the mean change in application actions before and after the policy enactment for doctoral universities. For the ERU variable, the result indicates that there were initial differences between the institution types. However, these coefficients to do not explain how time and ERU status interact. The coefficient of interest for DID is the interaction term for time and ERU status. This interaction term reveals if the emerging research university policy impacts the application outcome. The null is: The mean change in outcome is not different in emerging research universities and doctoral universities. The alternative hypothesis is: The mean change in outcome is different in emerging research universities and doctoral universities. The equations for the null and alternative hypothesis are listed below:

$$H_0\colon\ \Delta\mu_{doctoral} = \Delta\mu_{ERU}$$

$$H_1\colon\ \Delta\mu_{doctoral} \neq \Delta\mu_{ERU}$$

The coefficient of the interaction term is 0.003 ($p < 0.291$) meaning that we fail to reject the null hypothesis. This indicates that the mean change in outcome was not different in emerging research universities and doctoral universities before and after the policy enactment. Even though the DID interaction term is not statistically significant, other variables in the model are statistically significant. This indicates that there were factors other than the research policy enactment that impacted application action. For example, there are statistically significant indicators for student race. Compared to White students who met some other type of application criteria, African American and International students who met legislative and/or institutional criteria decreased by 0.07 ($p < 0.000$) and 0.14 ($p < 0.000$), respectively, holding all other variables constant. In comparison to White students who met some other type of application criteria, Hispanic, Asian, and

Native American, students who met legislative and/or institutional criteria increased by 0.05 ($p < 0.000$), 0.005 ($p < 0.066$), and 0.03 ($p < 0.007$) respectively, holding all other variables constant. Also, students who did not specify their race who met legislative and/or institutional criteria increased by 0.03 ($p < 0.000$) in comparison to White students who met some other type of application criteria, holding all other factors constant. Since the DID interaction indicator was not statistically significant, the statistically significant results for race cannot be attributed to the research policies but are likely due to other factors that occurred at the same time.

There are also statistically significant results for gender. Compared to female students who met some other type of application criteria, male students who met legislative and/or institutional criteria decreased by 0.10 ($p < 0.000$), holding all other variables constant. When examining the findings in institutions, there are statistically significant results as well. In comparison to students who met some other type of application criteria at Sam Houston State University and the University of North Texas, students who met legislative and/or institutional criteria at all other institutions except Texas State University increased, holding all factors constant. Students who met legislative and/or institutional criteria at Texas State University experienced a decrease, controlling for other factors. Again, these results cannot be attributed to the research policy immediate enactment due to the nonsignificant DID indicator result.

The model also indicated that there are statistically significant findings for research expenditures (0.04, $p < 0.000$) , salaries and wages (-0.04, $p < 0.000$), age (-0.03, $p < 0.000$), and entry year (0.014, $p < 0.000$) that are not attributable to the research policy enactment. Both research expenditures and research salaries and wages (in dollars)

were log transformed for ease of interpretation. In order to interpret, the coefficients we divided by 100. For every 1% increase in research expenditures, there was a 0.04 increase in application action changes from zero to one, holding all other variables constant. In terms of research salaries and wages, for every 1% increase, there was a 0.04 decrease in application action changes from zero to one, holding all other variables constant. For age, for every one year increase in student age, there was a 0.03 decrease in application action changes from zero to one, holding all other factors constant. Finally, entry year is included as a covariate to control for the differences in years that students were admitted to the institution. For every year increase in entry year, there is a 0.014 increase in application action changes from zero to one, holding all other variables constant. More specifically, there is a general increase in students who are admitted within the "meeting legislative and/or institutional criteria" category than not over time.

Finally, income status yielded statistically significant results for all income ranges. Compared to students who did not specify their income and met some other type of application criteria, students with family income less than $20,000 who met legislative and/or institutional criteria increased by 0.11 ($p < 0.000$). In comparison to students who did not specify their income and met some other type of application criteria, students with family income between $20,000-$39,999 who met legislative and/or institutional criteria increased by 0.11 ($p < 0.000$). Students with family income between $40,000-$59,999 who met legislative and/or institutional criteria increased by 0.09 ($p < 0.000$) in comparison to students who did not specify their income and met some other type of application criteria. Students with family income between $60,000-$79,999 who met legislative and/or institutional criteria increased by 0.09 ($p < 0.000$) in comparison to

students who did not specify their income and meet some other type of application criteria. Finally, when compared to students who did not specify their income and met some other application criteria, students whose family income status was greater than or equal to $80,000 increased by 0.005 ($p < 0.002$). All of these statements are true holding all other variables constant. Also, while these findings are statistically significant for all income ranges, they cannot be attributed to the research policy enactment in 2009.

Table 6

Model 1: DID Estimates for Emerging Research Universities and Application Action

Variable Name	Estimate
Time	-0.03***
	(0.000)
ERU	0.02*
	(0.078)
DID	0.003
	(0.291)
Research Expenditures	0.04***
	(0.000)
Salaries and Wages	-0.04***
	(0.000)
Age	-0.03***
	(0.000)
Family Income < $20,000	0.11***
	(0.000)
Family Income $20,000-$39,999	0.11***
	(0.000)
Family Income $40,000-$59,999	0.09***
	(0.000)

Family Income $60,000-$79,999	0.09***
	(0.000)
Family Income ≥ $80,000	0.005***
	(0.002)
Entry Year	0.014 ***
	(0.000)
African American	-0.07***
	(0.000)
Hispanic	0.05***
	(0.000)
Asian	0.005*
	(0.066)
Native American	0.03***
	(0.007)
International	-0.14***
	(0.000)
Unspecified	0.03***
	(0.000)
TAMU-Commerce	-0.03***
	(0.000)
TAMU-Corpus Christi	0.30***
	(0.000)
TAMU-Kingsville	0.36***
	(0.000)
Texas State University	-0.01
	(0.142)
Texas Tech University	0.08***
	(0.000)
Texas Woman's University	-0.05***
	(0.000)
UT-Rio Grande Valley	0.06***
	(0.000)

UT-Arlington	0.10***
	(0.000)
UT-Dallas	-0.05***
	(0.000)
UT-El Paso	0.10***
	(0.000)
UT-San Antonio	-0.06***
	(0.000)
Male	-0.10***
	(0.000)
Constant	0.86***
	(0.000)

Notes ***p<0.01. **p<0.05. *p<0.10. p-values in parentheses. Adjusted R_2 = 0.065. Total observations included in the model = 793,261.

Model 2: DID estimates for emerging research universities and application action with five year lag. The purpose of Model 2 is to examine the impact of the emerging research policy designation and research expenditures on the application actions of emerging research universities five years after the policy was enacted. Similar to Model 1, Model 2 also included a DID analysis with application action as the outcome but also included a five year lag variable for policy implication. While the first model provides pertinent information about the immediate impact of the policy, there can be a delay between policy creation and implementation that led to a delay in outcomes (Marcus & Siedler, 2015). Including a five year lag variable allows the model to account for a five year delay in the impact of the policy. Model 2 contains the same predictor and control variables as the first model with the addition of the five year lag variable. Table 7 depicts the statistical results for Model 2. In Model 2, the included variables explain 6.5%

of variance (Adjusted $R^2 = 0.065$). Again, the explanatory power of the variables included in the model is low indicating that the practical significant is miniscule.

Similar to Model 1, hypothesis testing is used to assess the mean change in the outcome between doctoral and emerging research universities. The null is the mean change in outcome is not different in emerging research universities and doctoral universities, and the alternative hypothesis is the mean change in outcome is different in emerging research universities and doctoral universities. The following equations depict the null and alternative hypothesis:

$$H_0\colon\ \Delta\mu_{doctoral} = \Delta\mu_{ERU}$$

$$H_1\colon\ \Delta\mu_{doctoral} \neq \Delta\mu_{ERU}$$

When examining the coefficient of interest for DID (the interaction term for time and ERU status), the coefficient is statistically significant (0.02, $p < 0.000$) indicating that we reject the null hypothesis. Unlike the immediate impact model, Model 2 indicates that the mean change in outcome is different in emerging research universities and doctoral universities before and after the policy enactment. Compared to students who met some other type of application criteria at doctoral universities, students who met legislative and/or institutional criteria at emerging research universities increased by 0.02 ($p < 0.000$), holding all other variables constant. The coefficient for the time variable is -0.03 ($p < 0.000$) and the coefficient for the ERU variable is 0.02 ($p < 0.113$). For the time variable, this indicates that there is a difference in the mean change in application actions before and after the policy enactment for doctoral universities. For the ERU variable, the result indicates that there were not initial differences between the institution types. Also similar to the first model, there are also statistically significant indicators for other

covariates. However, in the case of the lagged model, these statistically significant findings can be attributed to the policy enactment. Compared to White students who met some other type of application criteria, African American students who met legislative and/or institutional criteria decreased by 0.07 ($p < 0.000$) and International students who met legislative and/or institutional criteria decreased by 0.14 ($p < 0.000$), holding all other variables constant. Compared to White students who met some other type of application criteria, Hispanic students who met legislative and/or institutional criteria increased by 0.05 ($p < 0.000$), holding all other variables constant. Also, Native American students and students who did not choose to specify their race who met legislative and/or institutional criteria increased by 0.03 ($p < 0.0008$) and 0.03 ($p < 0.000$), respectively, compared to White students who met some other type of application criteria, holding all other variables constant. There was not a statistically significant result in this model for Asian students, which may be connected to diversity (or a lack thereof) within the Asian student population in Texas as it relates to challenges experienced by Asian students due to "model minority" stereotypes (Lee, 2007; Ngo & Stacey, 2007).

There are also statistically significant results for gender. Compared to female students who met some other type of application criteria, male students who met legislative and/or institutional criteria to decreased by 0.10 ($p < 0.000$), holding all other variables constant. In comparison to students who met some other type of application criteria at Sam Houston State University and the University of North Texas, students who met legislative and/or institutional criteria at all other institutions except TAMU-Commerce, Texas State University, Texas Women's University, UT San Antonio, and UT-Dallas increased, holding all factors constant. Students who met legislative and/or

institutional criteria at TAMU-Commerce, Texas Women's University, UT San Antonio, and UT-Dallas experienced a decrease, controlling for other factors. There were no statistically significant results for Texas State University.

The model also indicated that there are statistically significant findings for research salaries and wages (-0.02, $p < 0.005$), age (-0.03, $p < 0.000$), and entry year (0.02, $p < 0.000$). For every 1% increase in research salaries and wages, there was a 0.02 decrease in application action changes from zero to one, holding all other variables constant. For age, for every one year increase in student age, there was a 0.03 decrease in application action changes from zero to one, holding all other factors constant. Finally, for every year increase in entry year, there was a 0.02 increase in application actions changes from zero to one, holding all other variables constant.

Family income status yielded statistically significant results for all income ranges in Model 2. Compared to students who did not specify their income and met some other type of application criteria, students with family income less than $20,000 who meet legislative and/or institutional criteria increased by 0.11 ($p < 0.000$), between $20,000-$39,999 who met legislative and/or institutional criteria increased by 0.11 ($p < 0.000$), between $40,000-$59,999 who met legislative and/or institutional criteria increased by 0.10 ($p < 0.000$), between $60,000-$79,999 who met legislative and/or institutional criteria increased by 0.09 ($p < 0.000$), and greater than or equal to $80,000 who met legislative and/or institutional criteria increased by 0.005 ($p < 0.013$). In the case of Model 2 as well, all of these statements are true holding all other variables constant.

Model 2 includes the five year lag variable to assess if the policy implementation has a five year lag in student outcome impact from time of enactment. The five year lag

variable is statistically significant (-0.02, $p < 0.000$). This variable measures the effect of the policy on changes in application actions five years following the policy's enactment. This indicated that there was a lag in changes in application action impact five years following the time of enactment. This indicates that changes in application actions from zero to one decreased by 0.02 five years after the enactment of the policy.

Table 7

Model 2: DID Estimates for Emerging Research Universities and Application Action with 5 Year Lag

Variable Name	Estimate
Time	-0.03***
	(0.000)
ERU	0.02
	(0.133)
DID	0.02***
	(0.000)
Research Expenditures	0.007
	(0.139)
Salaries and Wages	-0.02***
	(0.005)
Age	-0.03***
	(0.000)
Family Income < $20,000	0.11***
	(0.000)
Family Income $20,000-$39,999	0.11***
	(0.000)
Family Income $40,000-$59,999	0.10***
	(0.000)

Family Income $60,000-$79,999	0.09***
	(0.000)
Family Income ≥ $80,000	0.005***
	(0.002)
Entry Year	0.02***
	(0.000)
African American	-0.07***
	(0.000)
Hispanic	0.05***
	(0.000)
Asian	0.003
	(0.238)
Native American	0.03***
	(0.008)
International	-0.14***
	(0.000)
Unspecified	0.03***
	(0.000)
TAMU-Commerce	-0.03***
	(0.000)
TAMU-Corpus Christi	0.30***
	(0.000)
TAMU-Kingsville	0.36***
	(0.000)
Texas State University	0.005
	(0.455)
Texas Tech University	0.08***
	(0.000)
Texas Woman's University	-0.06***
	(0.000)
UT-Rio Grande Valley	0.05***
	(0.000)

UT-Arlington	0.09***
	(0.000)
UT-Dallas	-0.05***
	(0.000)
UT-El Paso	0.10***
	(0.000)
UT-San Antonio	-0.07***
	(0.000)
Male	-0.10***
	(0.000)
5 Year Lag	-0.02***
	(0.000)
Constant	0.95***
	(0.000)

Notes ***p<0.01. **p<0.05. *p<0.10. p-values in parentheses. Adjusted R^2 = 0.065. Total observations included in the model = 775,153.

Results for the Graduation Outcome

This section presents the findings for the graduation outcomes regarding the research-based policy enactment immediate impact and impact after five years. As previously discussed, the graduation outcome variable met the parallel trends assumption criteria. The data for these results span that entire observation period of 2004-2018. Table 8 and Table 9 provide descriptive statistics for the variables within the graduation outcome models. Table 10 presents the results for the graduation model with immediate impact and Table 11 provides the findings for the graduation model with the five year lag.

Table 8

Descriptive Statistics For Continuous Variables

Variable Name	N	Mean	Std. dev.	Min	Max
Research Expenditures	1,369,811	16.69	1.19	12.23	18.62
Salaries and Wages	1,369,811	16.55	1.15	11.65	18.35
Age	1,372,529	18.09	1.07	13	83

Table 9

Descriptive Statistics For Outcome and Discrete Variables

Variable Name	Frequency	Percentage
Graduation		
Graduated	1,114,225	81.17
Not Graduated	258,426	18.83
Gender		
Male	624,333	44.03
Female	768,318	55.97
Race		
White	436,544	31.80
African Amer.	85,302	6.21
Hispanic	284,873	20.75
Asian	76,869	5.60
Native Amer.	3,997	0.29
International	7,628	0.56
Unspecified	477,438	34.78
Income Status		
Unspecified	596,095	43.43
< $20,000	83,073	6.05
$20,000-$39,999	141,336	10.30
$40,000-$59,999	128,609	9.37

$60,000-$79,999	110,220	8.03
≥ $80,000	313,318	22.83
Entry Year		
2003	110,914	8.08
2004	113,057	8.24
2005	110,248	8.03
2006	114,647	8.35
2007	115,348	8.40
2008	116,216	8.47
2009	110,659	8.06
2010	115,092	8.38
2011	109,241	7.96
2012	102,397	7.46
2013	88,251	6.43
2014	54,923	4.00
Exit Year		
2006	22,977	1.67
2007	57,830	4.21
2008	79,191	5.77
2009	91,507	6.67
2010	99,429	7.24
2011	105,564	7.69
2012	114,332	8.33
2013	118,309	8.62
2014	124,506	9.07
2015	129,048	9.40
2016	133,974	9.76
2017	142,614	10.39
2018	152,000	11.07
Institution		
Sam Houston State Uni.	104,795	7.63
TAMU-Commerce	27,752	2.02

TAMU- Corpus Christi	58,231	4.24
TAMU-Kingsville	34,662	2.53
Texas State Uni.	188,264	13.72
Texas Tech Uni.	235,004	17.12
Texas Women's Uni.	35,019	2.55
UT-Rio Grande Valley	79,045	5.76
UT-Arlington	101,827	7.42
UT-Dallas	68,749	5.01
UT-El Paso	90,375	6.58
UT-San Antonio	169,578	12.35
Uni. of Houston	179,350	13.07

Model 3: DID estimates for emerging research universities and graduation.

The third model included a DID analysis with completion as the outcome. The purpose of Model 3 is to examine the impact of the emerging research policy designation and research expenditures on graduation outcomes at emerging research universities. Like application outcomes, graduation outcomes can be used as a performance metric to hold institutions accountable through funding allocations (Letizia, 2015). Recall that graduation is a binary variable with one indicating that a student graduated within six years of entering the institution and zero indicating that a student graduated in more than six years of entering an institution. Consistent with Models 1 and 2, Model 3 included a time dummy variable for before and after 2009, the ERU variable (emerging research university or not), an interaction variable for time and emerging research university status, research expenditures, and research salaries and wages. The model also included control variables for entry year, exit year, student age upon admittance, family income status, student race, institution, and student gender. The variables explain 65.97% of the

variance of the model (Adjusted R_2 = 0.6597). Table 10 depicts the statistical results for Model 3.

The statistical significance of the DID interaction term reveals whether or not the null hypothesis is rejected. The null is the mean change in outcome in emerging research universities and doctoral universities is the same. The alternative hypothesis is the mean change in outcome in emerging research universities and doctoral universities is not the same. The null and alternative hypothesis equations are:

$$H_0\colon\ \Delta\mu_{doctoral} = \Delta\mu_{ERU}$$

$$H_1\colon\ \Delta\mu_{doctoral} \neq \Delta\mu_{ERU}$$

When examining the DID term, the interaction coefficient is 0.002 ($p < 0.02$) which demonstrates that the null hypothesis is rejected. This indicates that the mean change in outcome is different in emerging research universities and doctoral universities before and after the policy enactment. Compared to students who graduated in more than six years at doctoral universities, students who graduated within six years at emerging research universities increased by 0.002, holding all other variables constant. The coefficient for the time variable is -0.005 ($p < 0.000$) and the coefficient for the ERU variable is -0.01 ($p < 0.001$). For the time variable, this indicates that there is a difference in the mean change in application actions before and after the policy enactment for doctoral universities. For the ERU variable, the result indicates that there were also initial differences between the institution types. There are also statistically significant indicators for student race. Compared to White students who graduated in more than six years, African American students, International students, and students who did choose to specify their race who did graduate within six years increased by 0.005 ($p < 0.000$), 0.012

($p < 0.000$), and 0.05 (0.000) respectively, holding all other variables constant. In comparison to White students who graduated in more than six years, Hispanic and Native American students who did graduate within six years decreased by 0.006 ($p < 0.000$) and 0.01 ($p < 0.009$), respectively, all else held constant. There was not a statistically significant result in this model for Asian students.

There are also statistically significant results for gender. Compared to female students who graduated in more than six years, male students who did graduate within six years increased by 0.004 ($p < 0.000$), holding all other variables constant. In comparison to students who graduated in more than six years at Sam Houston State University and the University of North Texas, students who did graduate within six years at all other institutions decreased except UT-Arlington, Texas Tech University, and UT-San Antonio, holding all factors constant. Students who graduated within six years at UT-Arlington experienced an increase (0.003, $p < 0.01$), ceteris paribus. UT-San Antonio and Texas Tech University did not have a statistically significant result.

The model also indicated that there are statistically significant findings for research expenditures (0.003, $p < 0.011$), exit year (-0.16, $p < 0.000$), and entry year (0.16, $p < 0.000$). For every 1% increase in research expenditures, there was a 0.003 ($p < 0.011$) increase in graduation changes from zero to one, holding all other variables constant. The entry year and exit year variables are control variables that account for differences in graduation based on the year students are admitted into and graduate from the institution. For every year increase in graduation year (exit year), there was a 0.16 ($p < 0.000$) decrease in graduation changes from zero to one, holding all other variables

constant. For every year increase in entry year, there was a 0.16 ($p < 0.000$) increase in graduation changes from zero to one, holding all other variables constant.

Family income status yielded statistically significant results for all income ranges in Model 3. Compared to students who did not specify their income and graduated in more than six years, students with family income less than $20,000 who graduated in six years increased by 0.01 ($p < 0.000$), between $20,000-$39,999 who graduated in six years increased by 0.006 ($p < 0.000$), between $40,000-$59,999 who graduated in six years increased by 0.002 ($p < 0.007$), between $60,000-$79,999 who graduated in six years increased by 0.002 ($p < 0.011$), and greater than or equal to $80,000 who graduated in six years increased by 0.005 ($p < 0.000$). All estimates account for holding all other variables constant.

Table 10

Model 3: DID Estimates for Emerging Research Universities and Graduation

Variable Name	Estimate
Time	-0.005***
	(0.000)
ERU	-0.01***
	(0.000)
DID	0.002**
	(0.02)
Research Expenditures	0.003**
	(0.011)
Salaries and Wages	-0.002
	(0.237)
Age	-0.0003

	(0.145)
Family Income < $20,000	0.01***
	(0.000)
Family Income $20,000-$39,999	0.006***
	(0.000)
Family Income $40,000-$59,999	0.002***
	(0.007)
Family Income $60,000-$79,999	0.002**
	(0.011)
Family Income ≥ $80,000	0.005***
	(0.000)
Exit Year	-0.16***
	(0.000)
Entry Year	0.16***
	(0.000)
African American	0.005***
	(0.000)
Hispanic	-0.006***
	(0.000)
Asian	0.001
	(0.229)
Native American	-0.01***
	(0.009)
International	0.012***
	(0.000)
Unspecified	0.05***
	(0.000)
TAMU-Commerce	-0.007***
	(0.000)
TAMU-Corpus Christi	-0.01***
	(0.000)
TAMU-Kingsville	-0.009***

	(0.000)
Texas State University	-0.008***
	(0.000)
Texas Tech University	-0.0005
	(0.522)
Texas Woman's University	-0.01***
	(0.000)
UT-Rio Grande Valley	-0.009***
	(0.000)
UT-Arlington	0.003***
	(0.01)
UT-Dallas	-0.02***
	(0.000)
UT-El Paso	-0.004***
	(0.000)
UT-San Antonio	0.002
	(0.104)
Male	0.004***
	(0.000)
Constant	1.73***
	(0.000)

Notes ***p<0.01. **p<0.05. *p<0.10. p-values in parentheses. Adjusted R_2 = 0.6597. Total observations included in the model = 1,368,889.

Model 4: DID estimates for emerging research universities and graduation with 5 year lag. The fourth model also included a DID analysis with completion as the outcome. The purpose of Model 4 is to examine the impact of the emerging research policy designation and research expenditures on graduation outcomes at emerging research universities five years after the policy was enacted. While Model 3 provided information about the immediate impact of the policy on graduation outcomes, Model 4

accounts for the delayed policy implications through the inclusion of a variable to consider a five year lag. Similar to all other models, Model 4 included a time dummy variable for before and after 2009, the ERU variable (emerging research university or not), an interaction variable for time and emerging research university status, research expenditures, and research salaries and wages. The model also included control variables for entry year, exit year, student age upon admittance, family income status, student race, institution, and student gender. The adjusted $R_2 = 0.6601$ and indicates that 66.01% of the variance in the model is explained by the included variables. Table 11 includes the statistical results for Model 4.

Consistent with the three previous models, hypothesis testing is used to assess any differences in the mean change in the outcome between doctoral and emerging research universities. The null is: There is no difference in the mean change in outcome between emerging research universities and doctoral universities. The alternative hypothesis is: There is a difference in the mean change in outcome between emerging research universities and doctoral universities. The null and alternative hypothesis are depicted below:

$$H_0\colon\ \Delta\mu_{doctoral} = \Delta\mu_{ERU}$$

$$H_1\colon\ \Delta\mu_{doctoral} \neq \Delta\mu_{ERU}$$

The DID term interaction coefficient is -0.0001 ($p < 0.920$) which is not a statistically significant result. This indicates we fail to reject the null hypothesis and that the mean change in graduation outcome is not different in emerging research universities and doctoral universities before and after the policy enactment. There is no difference in students who graduated within six years or more than six years at doctoral and emerging

research universities before and after the enactment of the policy when a 5 year lag is included. The coefficient for the time variable is -0.004 ($p < 0.000$) and the coefficient for the ERU variable is -0.016 ($p < 0.000$). For the time variable, this indicates that there is a difference in the mean change in application actions before and after the policy enactment for doctoral universities. For the ERU variable, the result indicates that there were also initial differences between the institution types. There are statistically significant results in other aspects of the model, but those results cannot be attributed to the policy enactment. The student race variable does provide some statistically significant results for certain racial groups. Compared to White students who graduated in more than six years, African American students, International students, and students who did not choose to specify their race who did graduate within six years increased by 0.005 ($p < 0.000$), 0.01 ($p < 0.000$) and 0.005 ($p < 0.000$), respectively, holding all other variables constant. In comparison to White students who graduated in more than six years, Hispanic and Native American students who did graduate within six years decreased by 0.008 ($p < 0.000$) and 0.01 ($p < 0.010$), respectively, holding all other variables constant. Again, there was not a statistically significant result for Asian students. While these results are statistically significant, they are not due to the research-based funding policies.

There are also statistically significant results for gender that cannot be attributed to the policy enactment. Compared to female students who graduated in more than six years, male students who did graduate within six years increased by 0.005 ($p < 0.000$), holding all other variables constant. In comparison to students who graduated in more than six years at Sam Houston State University and the University of North Texas, students who did graduate within six years decreased at all other institutions except UT-

Arlington, UT-San Antonio, UT-El Paso and Texas Tech University holding all factors constant. Students who graduated within six years at UT-San Antonio and UT-Arlington experienced an increase, holding all other variables constant. UT-El Paso and Texas Tech University did not have a statistically significant result.

The model also indicated that there are statistically significant results for research expenditures (0.007, $p < 0.000$), exit year (-0.17, $p < 0.000$), and entry year (0.16, $p < 0.000$). For every 1% increase in research expenditures, there was a 0.007 increase in graduation changes from zero to one, ceteris paribus. For every year increase in graduation year (exit year), there was a 0.17 decrease in graduation changes from zero to one, holding all other variables constant. For every year increase in entry year, there was a 0.16 increase in graduation changes from zero to one, holding all other variables constant. Again, while these results are statistically significant, they are not due to the policy enactment.

Model 4 also yielded statistically significant findings on graduation based on all ranges of family income status that cannot be attributed to the enactment. Compared to students who did not specify their income and graduated in more than six years, students with family income less than $20,000 who graduated in six years increased by 0.01 ($p < 0.000$), between $20,000-$39,999 who graduated in six years increased by 0.007 ($p < 0.000$), between $40,000-$59,999 who graduated in six years increased by 0.003 ($p < 0.000$), between $60,000-$79,999 who graduated in six years increased by 0.002 ($p < 0.037$), and greater than or equal to $80,000 who graduated in six years increased by 0.005 ($p < 0.000$). All estimates are true holding all other variables constant, but they cannot be attributed to the research-based policy enactment.

Model 4 also includes the five year lag variable to determine if the policy implementation has a five year lag in student outcome impact from time of enactment. The five year lag variable is statistically significant (-0.002, $p < 0.000$). This indicated that there was a lag in changes in graduation five years after the time of enactment; however, since the DID coefficient was not statistically significant, this finding is due to another factor and not the policy enactment itself. This indicates that changes in graduation from zero to one decreased by 0.002 ($p < 0.001$) five years after the enactment of the policy due to another factor that occurred simultaneously.

Table 11

Model 4: DID Estimates for Emerging Research Universities and Graduation with 5 Year Lag

Variable Name	Estimate
Time	-0.004***
	(0.000)
ERU	-0.016***
	(0.000)
DID	-0.0001
	(0.920)
Research Expenditures	0.007***
	(0.000)
Salaries and Wages	-0.003
	(0.125)
Age	-0.0002
	(0.463)
Family Income < $20,000	0.01***
	(0.000)

Family Income $20,000-$39,999	0.007***
	(0.000)
Family Income $40,000-$59,999	0.003***
	(0.000)
Family Income $60,000-$79,999	0.002**
	(0.037)
Family Income ≥ $80,000	0.005***
	(0.000)
Exit Year	-0.17***
	(0.000)
Entry Year	0.16***
	(0.000)
African American	0.005***
	(0.000)
Hispanic	-0.008***
	(0.000)
Asian	0.00004
	(0.969)
Native American	-0.01***
	(0.010)
International	0.01***
	(0.000)
Unspecified	0.05***
	(0.000)
TAMU-Commerce	-0.004**
	(0.036)
TAMU-Corpus Christi	-0.01***
	(0.000)
TAMU-Kingsville	-0.01***
	(0.000)
Texas State University	-0.01***
	(0.000)

Texas Tech University	-0.0008
	(0.396)
Texas Woman's University	-0.006***
	(0.000)
UT-Rio Grande Valley	-0.008***
	(0.000)
UT-Arlington	0.005***
	(0.000)
UT-Dallas	-0.02***
	(0.000)
UT-El Paso	-0.001
	(0.371)
UT-San Antonio	0.003**
	(0.023)
Male	0.005***
	(0.000)
5 Year Lag	-0.002***
	(0.001)
Constant	1.71***
	(0.000)

Notes ***p<0.01. **p<0.05. *p<0.10. p-values in parentheses. Adjusted R_2 = 0.6601.

Total observations included in the model = 1,121,786.

Chapter V: Conclusion

The usage of DID methodology for this research study has yielded insightful results regarding the impact of research-based policies on student outcomes at Texas emerging research universities. The state of Texas has invested considerable time and resources in the development of laws and strategic plans to increase research at its public institutions. In an effort to increase research productivity at its public institutions, legislatures (in conjunction with the THECB) utilized research specific performance funding policy to incentivize institutions to change in a favorable manner regarding research productivity. Over time, these research-based funding policies overlapped with the state's other goals through the strategic plans (i.e., Closing the Gaps, 60x30TX). The empirical literature has indicted that performance-based funding policies can have unintended consequences especially in circumstances where multiple goals are competing in one policy landscape. The findings of the performance-based funding literature, the nuance of research-based funding policies in Texas, and the multitude of overlapping goals in the state's strategic plans incited this study to understand the research question: To what extent has the creation of the emerging research university designation impacted student admissions and completion patterns at Texas public universities? The following portions of this concluding chapter will include a summary of findings and conclusions, a discussion that synthesizes the findings with the literature and conceptual frameworks, limitations of the study, and the significance of the study.

Summary of Findings and Conclusions

Application actions at emerging research universities. The first two models are used to investigate the impact of the emerging research designation policies on

application actions at emerging research universities. In both models, roughly 6.5% of the variance in the models is explained by the included variables. The ensuing discussion is situated within the context of the low explanatory power of the application action models. Even though the lagged application model yielded statistically significant results, the variable in the model are not able to adequately explain the variance in the model. From a practical standpoint, this means that the application action models have very little impact on student outcomes. This is likely due to the wide variety of factors that institutions can use to admit students. The application action variable includes students who are admitted based on legislative criteria (e.g., top 10% students) and/or students who meet institutional criteria (e.g., high school G.P.A. minimum requirements). The institutional criteria likely varies depending on who applies to the institution and the institution's mission regarding the academic make-up of its student body. In the case of the immediate impact of the emerging research university policy, there was no difference between emerging research universities and doctoral universities. Considering the limited variance in the immediate model explained by the variables, there were statistically significant findings for certain variables, however, those findings cannot be attributed to the emerging research university policy enactment in 2009. It is likely that some other factors led to those findings. The significant findings could be due to some other institutional, local, state, and/or federal factors not included in the model. In the case of the five year lag model, there was a difference in changes in application actions between institutional types due to the emerging research university policy enactment. Students who did meet legislative and/or institutional criteria for admittance increased five years after the enactment of the policy at emerging research institutions. This could mean that emerging

research institutions were accepting more top 10% or top 25% students and/or that more students were being accepted that met the institution's criteria for admittance. Even though the emerging research university policy did have an impact on application action outcomes five years after the enactment, these findings are limited due to the low explanatory power of the variables in the model.

Even though there was limited explanatory power of the variables in the five year lagged model, there were statistically significant findings pertaining to student and institutional factors. When observing changes regarding student demographics, there were changes based on race, family income status, and gender. Overall, African American and International students who met legislative and/or institutional criteria experienced a decrease at emerging research universities five years after the policy enactment. This could indicate that fewer African American and International students who met legislative and/or institutional criteria were applying to these institutions or that fewer were being accepted. It could also indicate that more African American and International students who met other criteria for acceptance were being admitted. Hispanic students, Native American students and students who chose not to specify their race who met legislative and/or institutional criteria experienced an increase at emerging research universities five years after the policy enactment. This likely indicates that emerging research institutions were accepting more Hispanic students, Native American students and students who chose not to specify their race under the legislative criteria and/or met the institution's criteria for admittance. In the five year lagged model, emerging research universities saw an increase in students who met legislative and/or institutional requirements five years after the policy enactment for all family income

statuses. In terms of gender, five years after the enactment, there was a decrease in admittance of males who met legislative and/or institutional requirements. Similar to some racial groups, this could also mean that fewer males who met legislative and/or institutional requirements applied or more males who met other unspecified criteria were accepted. When observing changes at each institution, the findings are mixed. Five years after the enactment of the policy, TAMU-Corpus Christi, TAMU-Kingsville, Texas Tech University, UT-Rio Grande Valley, UT-Arlington, and UT-El Paso saw an increase in students admitted who met legislative and/or institutional requirements. For TAMU-Commerce, Texas Woman's University, UT-Dallas, and UT-San Antonio, there was a decrease in students admitted who met legislative and/or institutional requirements.

Finally, there were findings regarding the impact of research salaries and wages and student age on application actions at emerging research institutions. Five years after the policy was enacted, there was a decrease in students admitted who met legislative and/or institutional requirements as research salaries and wages increased at emerging research universities. Also, five years after the policy enactment, there was a decrease in students admitted who met legislative and/or institutional requirements as student age increased at emerging research universities.

Graduation at emerging research universities. The third and fourth models are used to investigate the impact of the emerging research designation policies on six year graduation at emerging research universities. In Model 3 and Model 4, about 66% of the variance in the models is explained by the variables. In the case of both models, changes in graduation at emerging research universities are mostly explained by the variables in the model; however, in the case of Model 4 (the lagged model), the DID indicator is not

statistically significant. These mixed results indicate that there was an impact on graduation immediately after the enactment of the emerging research university policy, but that impact on graduation was no longer present five years later. More specifically, there was an increase in students who graduated within six years from emerging research universities at the enactment of the research-based funding policies, but that increase was no longer present five years after.

There were student level demographic changes based on race, family income status, and gender in both models; however, since the lagged model (Model 4) did not have a statistically significant DID coefficient, it cannot be said that those changes in graduation in the lagged model are due to the policy impact. More specifically, there are statistically significant changes in graduation based on certain indicators for race, gender, and family income status, but it cannot be ascertained that those changes are due to the policy enactment five years later. Due to this finding, the following portion of the summary will focus on the interpretation of Model 3 only.

In Model 3, there was an increase in six year graduation at emerging research universities after the policy enactment for African American students, International students, and students who chose not to specify their race. For Hispanic and Native American students, there was a decrease in six year graduation at emerging research universities after the policy enactment. This likely indicates that Hispanic and Native American students took longer than six years to graduate at emerging research universities. Emerging research universities saw an increase in students who graduated in six years across all family income statuses after the research-based funding policy was enacted. In terms of gender, immediately after the enactment of that policy, there was an

increase in male six year graduation.

When observing changes at each institution, the findings vary. Immediately after the enactment of the policy, TAMU-Commerce, TAMU-Corpus Christi, TAMU-Kingsville, Texas State University, Texas Tech University, Texas Women's University, UT-Rio Grande Valley, UT-Dallas, and UT-El Paso experienced a decrease in student six year graduation. UT-Arlington was the only institution that experienced an increase in student six year graduation immediately after the enactment. Finally, there were findings regarding the impact of research expenditures on graduation at emerging research institutions. Immediately after the policy began, as there was an increase in research expenditures, there were also an increase in student six year graduation.

Discussion

After summarizing the results, the answer to the research question: "To what extent has the creation of the emerging research university designation impacted student admissions and completion patterns at Texas public universities?" is nuanced. The policy that created the emerging research designation along with its research-based funding programs does impact how students meet admissions criteria at emerging research universities. This finding is also true for certain demographics of students and certain institutions. Research expenditures, a central tenant of the research-based funding policies, also impacts the type of criteria that students meet for admission to research universities. The models for application action indicate that the effects of the research-based policies do not impact admission status immediately but there is an impact five years after the enactment of the policy. The impact of the delayed policy influence is small as indicated by the diminutive explanatory power of the variables included in the

model (i.e., 6.5%). However, there are still implications for understanding the criteria under which students are admitted. For instance, an important distinction in the application action findings is that a decrease in students meeting legislative and/or institution-based criteria do not necessarily indicate that fewer students are being admitted in general. Rather, it potentially indicates that there may be a shift from students meeting legislative and/or institution-based criteria to meeting other unspecified criteria. Institutions have the autonomy to admit students based on a variety of criteria, but all that can be gleamed from these findings is certain groups of students are being admitted on criteria *other than* legislative and/or institution-based. The THECB documents legislative criteria as students meeting top 10% or top 25% requirements as indicated by the Texas Administrative Code § 5.5 (2019) and institution-based criteria as students meeting G.P.A. and SAT/ACT requirements as specified by the minimum requirements set by the institution; however, the other unspecified criteria can be any combination of 18 parameters identified in the Texas Education Code, §51.805 (2013). These parameters include any combination of indicators selected by admissions officers in the student's profile and can include characteristics like socioeconomic status, parental occupation and level of education, legacy connections, extracurricular activities, etc. This means that the number of other unspecified reasons that a student could be admitted exceeds 260,000 combinations. For this reason, the THECB allows institutions to record the reason for admittance as "other unspecified." For the full list of other unspecified reasons, see Appendix D.

By drawing on the literature, research-based funding policies, and strategic plans, the changes in application action are consistent. For example, when specifically

examining NRUF (one of the research-based funding programs), one of the optional criteria is rooted in closing gaps in underrepresented student groups. Since emerging research universities can opt to focus on that criterion, they may have certain application criteria based on whether or not a student is underrepresented. In line with 60x30TX, this could be male students, students from lower socioeconomic statuses, Hispanic students, and African American students. It is possible that the interpretation for application action involved some groups of students being admitted that do not meet legislative and/or institutional criteria due to the specification of the NRUF parameter around "High Academic Achievement of Entering Freshman". According to the THECB NRUF report (2019), this parameter is a metric intended to fulfill the institutional commitment to improving the academic performance of underrepresented students based on the Texas Administrative Code. As of March 2019, even though only three institutions (University of Houston, Texas Tech University, and the University of Texas at Dallas) met thresholds to receive NRUF funding, seven institutions (all but UT-El Paso) met that optional parameter for underrepresented students. This indicates that even though research-based funding policies impact how students are admitted, universities still have flexibility within the parameters of the policies to positively impact students. This is supported by the literature that discusses how performance-based policies can purposefully incorporate equity parameters to increase access and success for underrepresented student groups (Gàndara & Rutherford, 2018; Kelchen, 2018).

NRUF is an example of a research-based funding policy with the capability to impact equity, and institutions are opting to meet the equity-based parameter of this policy. From the lens of action theory, the THECB and the state of Texas wanted to

produce more research competitive institutions through research-based funding policies but also wanted to decrease equity gaps for underrepresented groups of students through strategic planning and parameters of those same research-based funding policies. By incorporating inducements in these policies through financial means and public recognition, the THECB and legislature have been able to incorporate these goals in one policy landscape in a manner that is not entirely competing. While the literature provided multiple examples of how policies based on performance could have unintended consequences (Dougherty et al., 2014b; Johnson, 2013; Pascarella & Terenzini, 2005; Umbricht et al., 2015), the findings regarding application actions indicate that Texas may have found a way to get two seemingly competing goals to coalesce. The emerging research designation and its associated policies impact student admissions in a manner that does not hinder access by shifting how students may be admitted. Also, in the case of admissions, the five year lag impact indicates that these changes take time, which is not uncommon in the time between policy creation and implementation (Kingdon, 2003; Solmon, 2003).

Even though the findings for the application action outcome illuminate policy alignment for equity parameters, there are also implications regarding university admissions selectivity. In the lagged application action model, there was an increase in students who met legislative and/or institutional criteria at emerging research universities in comparison to students who met other unspecified criteria at doctoral universities. Again, the explanatory power of the variables in this model were miniscule, but this finding primes a discussion for the relationship of selectivity and performance-based funding measures. The literature on performance-based funding models is littered with

examples of how performance-based metrics can lead to institutions unintentionally increasing their selectively standards to gain access to funding (Dougherty et al., 2014b; Pascarella & Terenzini, 2005; Umbricht et al., 2017). When this occurs, accountability measures (set in place by to safeguard students) inadvertently reward institutional behaviors that support selectively through financial incentives. Admissions selectivity is often linked to perceptions of institutional prestige (Braxton, 1993) and emerging research universities are attempting to increase their research prominence through policy and funding incentives. In the state of Texas, an assumption can be made that institutions that accept students based on legislative admissions criteria (i.e., top 10%, top 25%) and/or institutional-based criteria (i.e., high G.P.A. and SAT/ACT minimum requirements) are considered more selective than those that accept a larger proportion of students who meet other unspecified criteria. Since research-based funding policies are based on performance-based mechanisms, it is possible to speculate that emerging research universities are unintentionally becoming more selective due to attempts to meet research-based accountability metrics. Conversely, performance-based outcome measures do not easily grasp the differences between the student populations served by dissimilar institutions (Johnson, 2013) and selectively metrics can actually signify differences in students' access to resources which has implications for their likelihood of admission (Rooney & Schaeffer, 1998). Furthermore, admitting students based on a wider variety of admissions criteria can lead to more diverse student populations (Carnevale & Rose, 2003) and combat application deterrence for underrepresented students (Rooney & Schaeffer, 1998). Considering the implications of selectivity on prestige and admissions

equity, emerging research universities must intentionally consider the balance of gaining research prominence while providing access for diverse student groups.

In comparison to application action, there are differences in how the emerging research designation policy impacted six year graduation. One of the most drastic differences is the policy impact was seen at the enactment of the policy and unseen after five years. Six year graduation increased for some student groups (e.g., males, African American students, students from different socioeconomic backgrounds, etc.) and decreased for other groups (e.g., Hispanic students, Native American students, etc.) immediately after the enactment of policy in 2009. However, five years after the policy enactment, any meaningful outcomes that occurred were not related to the emerging research policy, but rather were affected by other time-varying factors that occurred at the same time. Even though this study was investigating the impact of the emerging research designation policy on six year graduation, these findings are still in line with the literature. The higher education policy landscape in Texas is diverse and policies can be created and implemented in ways that are difficult to predict (Anderson, 2011; Kingdon, 2003). Even though this study is only testing for research-based policy impact, it is reasonable to speculate that there are other policies at varying levels (i.e., local, institutional, state, federal) that impact six year graduation. Also, at a state and institutional level, this finding is consistent with goals around increasing student completion that permeated through both the Closing the Gaps and 60x30TX strategic plans. Furthermore, when this finding is examined through the lens of institutional isomorphism, it can be demonstrated that institutions not only become more similar in behavior (as indicated by the conceptual framework), but they can also become similar in

their focus on the attainment of certain goals. This finding may make it appropriate to speculate that the external pressures of the policy landscape regarding completion have led to multiple layers of policy that attempt to achieve this goal. Therefore, institutions' goals become similar in a manner that graduation was increased for certain groups through other policy pressures even though the emerging research designation did not have a lasting (five year) impact on that goal.

At the immediate time of the policy, the findings did support that the emerging research policy designation had an impact on graduation. This finding was also nuanced in that graduation increased for certain groups of students while decreasing for others. Interestingly, six year graduation increased as research expenditures increased yet decreased when research salaries and wages increased. Even though both sets of expenditures are explicitly for research, research activities are open to broad institutional interpretations. Research activities and the types of individuals employed by research dollars are vast (Volkwein & Sweitzer, 2006). While many universities link research productivity to tenured faculty (Volkwein & Sweitzer, 2006), other employee that work at research centers or institutes also account for individuals employed by research dollars. Furthermore, institutions have autonomy regarding the choice of research activities and employees that are perused (Kennedy, 1994). For example, research activities greatly vary between institutions that have medical schools and those that do not due to external grant funding (e.g., from the NIH) and community health partnerships (Murphy & Topel, 2003). While emerging research institutions typically expend more on research (Volkwein & Grunig, 2005), the reasons why graduation increased or decreased due to research expenditure type varies.

The findings demonstrate that the emerging research designation can positivity impact admittance and graduation for certain groups when there are equity parameters in place and multiple factors are working to safeguard vulnerable students. While these results were promising, all student groups did not benefit from those protective factors. With particular focus on graduation, Hispanic and Native American students experienced a decrease in six year graduation. While this indicates that these students are graduating in more than six years, students are typically less likely to graduate after six years for a variety of reasons (DesJardins, Ahlburg, & McCall, 2012; University of Buffalo, 2018). In the case of graduation, there are myriad factors that impact this outcome from student background to financial aid (Ishitani, 2006) and research-based policies alone are not likely to increase completion for all groups of vulnerable students.

Limitations

No study is completely infallible and, like all others, this study is subject to limitations. One of the limitations of this study is the development of a comparable control group for emerging research universities in Texas. The state of Texas utilizes an accountability system that develops out-of-state peer groups for each emerging research institution. While it would have been ideal to compare the emerging research universities to their out-of-state peer group, out-of-state institutions are not subject to the same historical higher education policy landscape in Texas and are not directly impacted by research-based funding policies in Texas. For this reason, the control group was derived from doctoral institutions as of 2009 to provide a more accurate comparison due to trends in policy and strategic planning.

This study is also limited by the inclusion of students who were admitted and graduated from the same institution. This study only includes students who attended the same institution from admission to graduation. Due to the nature of the dataset, students were not included if they entered an institution through transfer from another institution or transferred to another institution after their initial admittance. Even though these conditions limit the inclusion of students, this study still provides valuable information about admissions actions and graduation for students that are retained at emerging research universities. Another limitation of the study is the constraint of factors that determine student admission actions and graduation. While the study attempts to control for those factors by including a specific methodology to address variability and also including certain covariates (e.g., socioeconomic status), there are still other factors that potentially influence students' choices like affordability, heritage, personal circumstances, etcetera (Iloh, 2018; Perna, 2006). Also, while the study includes large scale institutional factors like emerging research university designation which provides information about the institutions' research expending behaviors, the study does not include specific institutional factors which are influential determinants of admissions decisions (e.g., SAT/ACT requirements). These limitations likely led to the small explanatory ability of the variables in the application action models. While the application model did yield statistically significant results for the five year lagged model, determinants related to research expenditures do not provide a powerful explanation for these results. Including other determinants of admissions in the model like student G.P.A., student rank, or SAT/ACT scores would likely increase the explanatory impact of the model (Mattson, 2007; Sawyer, 2013).

Finally, the study is limited in date range as it pertains to the impact of policies. While strategic planning pertaining to research productivity can be traced back to the creation of Closing the Gaps circa 1998, the study period began in 2004 to account for changes in tuition deregulation. Beginning the analysis in 2004 may have impacted the study by influencing the immediate and lagged effects of the policy implementation. Even though this may be the case, the impact is likely to be minimal because Closing the Gaps officially began in 2000 and spanned to 2015. Also, it is possible that the nascence of 60x30TX, which began in 2015, could influence results regarding the strategic plan's impact. While this study does contain certain limitations, it can be used to glean insights regarding the impact and interactions of policies and strategic plans on student admissions and graduation in Texas.

Significance of the Study

Through strategic planning, policies, and funding, the state of Texas has tremendously invested resources and time in the research prominence of its public postsecondary institutions. Of utmost importance, this study allows for the analysis of the state's return on investment regarding the linkage of research expending behaviors to student outcomes. Not only was the state of Texas attempting to enhance the national competitiveness of the state through research, but it was also endeavoring to provide students more access to highly productive research institutions other than UT and TAMU. Importantly, this study has demonstrated that research-based funding policies and equity focused strategic plans can exist in the same policy arena. Furthermore, in the case of application actions utilized by institutions, emerging research universities have the autonomy to reach their goals regarding research while utilizing other criteria (other

than legislative and/or institutional criteria) to ensure that underrepresented students have access to research productive institutions. In this way, when emerging research universities change their research expenditure behaviors to meet criteria for research-based funding, they do not completely sacrifice access for vulnerable student populations.

As discussed throughout the paper, research expenditures are utilized by research funding programs as the primary metric for assessing research productivity by the state of Texas. Even though research expenditures are primary, the state of Texas has crafted and implemented research-based policies in a way that also encompass equity measures among other aspects. These findings have shown that this type of intentional policy creation is pivotal to student access and success. In line with the literature on performance-based funding, unintended consequences typically ensue when such equity metrics are not included. The deliberate construction of policy in combination with a policy landscape that promotes equity through its strategic plans has allowed emerging research universities to mitigate risk for certain groups of students. This is in alignment with performance-based funding literature that demonstrates how equity metrics must be included in policies to ensure that underrepresented student groups are not hindered (Gàndara & Rutherford, 2018; Kelchen, 2018).

While this study has demonstrated that the state is predominantly meeting its objectives for some groups of students, there is still ample work to be done for others (i.e., six year graduation for Hispanic and Native American students.) With this information, the state, the THECB, and emerging research universities can continue to create, and enact polices to directly target students who are still experiencing equity gaps. To the state's credit, it is doing just that through the creation of its newest strategic plan,

60x30TX. However, since the new strategic plan has only been in effect for five years with projections for 2030, it may be too soon to see results for all student groups. The most recent progress report on 60x30TX indicated that the state will need to increase percentages of students who meet certain metrics if it is to achieve its goals by 2030 (THECB, 2019c). Legislatures and institutional leaders at emerging research institutions can utilize this work to craft policies that will strengthen multiple layers of policy implementation and ultimately enhance experiences for students in higher education.

The significance of these findings provide multiple implications for future research. First, future research should include organizational level studies that focus on larger institutional factors. This would encompass the use of institutional level data instead of student level data. This would help to illuminate other institutional factors that impact student outcomes like courses, programs, etc. (Wimshurst, Wortley, Bates, & Allard, 2006). Second, when considering application actions, this work could be advanced by acquiring admissions decision data directly from the institutions instead of from the THECB. This would allow researchers to disaggregate the various admission actions and determine the myriad criteria used by emerging research institutions in their admissions processes. Even though the Family Educational Rights and Privacy Act (FERPA) does not include admissions records, colleges are typically encouraged to spread those protections to admissions documents (Bryant, Montgomery, & Smith, 2015). While many universities consider these records to be confidential, it would be worthwhile to investigate trends in “other unspecified” admissions criteria. Admissions officers typically document what factors they use to make decisions and confer with one another to make those decisions (Thresher, 2017). That type of detailed data would be helpful to

determine what types of admissions criteria provide the most access for the most underrepresented students. Another future addition to this work would be to investigate the differences in emerging research universities that have met criteria for access to NRUF funding and those that have not. It is likely that there are differences in institutions within the emerging research university category. It would be worthwhile to examine which institutions have developed better practices that enhance both the research aspects and equity aspects of emerging research policy implementation. Another implication for future research involves the determinants of research productivity at emerging research institutions. As previously discussed, research expenditures are a primary criteria for the emerging research designation and, as such, they were a fitting variable to include in the model. However, research expenditures are not the only marker of research productivity. Volkwein and Grunig (2005) also cited other widely used metrics of research productivity including faculty publications, total citations per faculty, and patents. Future investigators could examine other markers of research productivity included in the literature as well as those defined by the THECB through research-based funding policies (e.g., high quality faculty, institutional recognition of research capabilities and scholarly attainment, endowment funds, number of Ph.D. degrees awarded, etc.[THECB, 2019a]) to determine if there is an impact on student outcomes. Finally, future research could include other forms of dependent variables to assess student outcomes. This could encompass the use of more commonly included ultimate (e.g., graduation rate, job placement) and intermediate (e.g., course completions) student outcomes as specified through performance-based funding metrics (Offenstein & Shulock, 2010).

This study provides a foundation for the exploration of the impact of emerging research universities on admissions actions and graduation. This study demonstrates that research-based funding policies can exist without practically hindering access and success for students. Policymakers must be deliberate in their construction of research-based policies that include equity parameters. For example, of the three research-based funding programs (National Research University Fund, Core Research Support Fund, and Texas Research Incentive Program), only the National Research University Fund includes a parameter for underrepresented students and that parameter is optional. As the state of Texas reconsiders how it funds its emerging research universities, it should consistently add mandatory equity parameters throughout all research-based funding programs to help align them with strategic initiatives that have been in place for over two decades. This study also has major implications for institutions in that they must consider how they implement research-based policies in conjunction with strategic initiatives that focus on student outcomes. In the case of application actions, emerging research universities have the opportunity to use their autonomy to reach their goals regarding research while utilizing other criteria to ensure that underrepresented students have access to research productive institutions. Emerging research universities can broaden their admissions criteria so that vulnerable students are not left out due to selectivity or access to resources. There is still amble research to be conducted to understand how research-based policies and equity parameters coalesce, but this study illuminates a pathway for the continued consideration of research policy implications for students.

References

Aldeman, C., & Carey, K. (2009). *Ready to assemble: Grading state higher education accountability systems*. Education Sector: Washington, DC.

Aldrich, H. (1979) Organizations and Environments. Englewood Cliffs, NJ: Prentice-Hall.

Anderson, J.E. (2011). Public Policymaking: An introduction (7th ed.). Boston, MA: Wadsworth Cengage Learning.

Angrist, J. D., & Pischke, J. S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press.

Argyris, C., & Schön, D. A. (1996). *Organizational learning II: Theory, method and practice*. Reading, Mass: Addison-Wesley.

Best, J., & Best, E. (2014). *The Student Loan Mess: How Good Intentions Created a Trillion-Dollar Problem*. University of California Press. Retrieved from http://www.jstor.org/stable/10.1525/j.ctt5vjzkh.

Bitler, M.P., & Carpenter, C.S. (2016). Health insurance mandates, mammography, and breast cancer diagnoses. American Economic Journal: Economic Policy. 8(3), 39-68.

Braxton, J. (1993). Selectivity and Rigor in Research Universities. The Journal of Higher Education, 64(6), 657–675. https://doi.org/10.1080/00221546.1993.11778462

Bryant, M., Montgomery, C., & Smith, H. (2015). A legal guide for university admissions offices: How to stay out of court. Parameters of Law in Student Affairs and Higher Education (CNS 670). Paper 15. http://digitalcommons.wku.edu/cns_law/15.

Burke, J.C. (Ed.). (2002). Funding public colleges and universities for performance: Popularity, problems, and prospects. Albany, NY: Rockefeller Institute Press.

The Carnegie Classification of Institutions of Higher Education. (2017). Basic Classification Methodology. Indiana University Center for Postsecondary Research. Retrieved from http://carnegieclassifications.iu.edu/methodology/basic.php.

Carnevale, A., & Rose, S. (2003). Socioeconomic Status, Race/Ethnicity, and Selective College Admissions. A Century Foundation Paper. The Century Foundation, New York, NY.

Cole, J.R. (1994). Balancing acts: Dilemmas of choice facing research universities. In Cole, J.R., Barber, E.G., & Graubard, S.R. (Eds.), The research university in a time of discontent (pp. 1-36). Baltimore, MD: The John's Hopkins University Press.

Delaney, J. A. & Kearney, T. D. (2016). Alternative Student-Based Revenue Streams for Higher Education Institutions: A Difference-in-Difference Analysis Using Guaranteed Tuition Policies. The Journal of Higher Education 87(5), 731-769.

DesJardins, S.L, Ahlburg, D.A., McCall, B. (2012). *The Effects of Interrupted Enrollment on Graduation from College: Racial, Income, and Ability Differences* (Vol. 123993). Human Resources and Labor Studies, University of Minnesota: Twin Cities Campus.

DiMaggio, P., & Powell, W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review, 48*(2), 147-160. Retrieved from http://www.jstor.org.ezproxy.lib.uh.edu/stable/2095101.

Dougherty, K. J., & Hong, E. (2006). Performance accountability as imperfect panacea: The community college experience. In T. Bailey & V. S. Morest (Eds.), *Defending the community college equity agenda* (pp. 51–86). Baltimore, MD: Johns Hopkins University Press.

Dougherty, K. J. & Reddy, V. (2011). *The impacts of state performance funding on systems of higher education: Research literature review and policy recommendations.* (CCRC Working Paper No. 37). Retrieved from https://www.tc.columbia.edu/faculty/kd109/faculty-profile/files/gherty&Reddy-TheImpactsofStatePFSystems12-2011.pdf.

Dougherty, K. J., & Reddy, V. (2013). *Performance Funding for Higher Education What Are the Mechanisms? What Are the Impacts?* K. Ward & Wolf-Wendel, L.E. (Eds.) ASHE Higher Education Report, *39*(2), 5-133. Hoboken, NJ: John Wiley.

Dougherty, K. J., Jones, S. M., Lahr, H., Natow, R. S., Pheatt, L., & Reddy, V. (2014a). Performance funding for higher education: Forms, origins, impacts, and futures. Annals of the American Academy of Political and Social Science, 655, 163–184.

Dougherty, K. J., Jones, S. M., Lahr, H., Natow, R. S., Pheatt, L., & Reddy, V. (2014b). Performance funding for higher education: Forms, origins, impacts, and futures. Annals of the American Academy of Political and Social Science, 655, 163–184.

Dubrow, G., Moseley, B., & Dustin, D. (2006). Life at Mission Creep U. *Academe, 92*(3), 24-28. doi:10.2307/40252922.

Ewell, P. T. (2008). Assessment and accountability in America today: Background and context. In V. M. H. Borden & G. R. Pike (Eds.), Assessing and accounting for student learning: Beyond the Spelling 's Commission (New Directions in Institutional Research Series No. SI, pp. 7-17). San Francisco: Jossey- Bass.

Freeman, J. H. (1982). *Organizational life cycles and natural selection processes*. In Staw, B. and Cummings, L. (Eds.), Research in Organizational Behavior. (Vol. 4.), p. 1-32. Greenwich, CT: JAI Press.

Gándara, D., & Rutherford, A. (2018). Mitigating Unintended Impacts? The Effects of Premiums for Underserved Populations in Performance-Funding Policies for Higher Education. *Research in Higher Education, 59*(6), 681-703.

Graves, L. (2008). The Gap in Graduation Rates. *U.S. News & World Report*, *144*(13), 62–63. Retrieved from http://ezproxy.lib.uh.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=mth&AN=31900482&site=ehost-live.

Geiger, R. L. (1997). What Happened after Sputnik? Shaping University Research in the United States. *Minerva: A Review of Science, Learning & Policy*, *35*(4), 349–367. https://doi-org.ezproxy.lib.uh.edu/10.1023/A:1004324331995.

Giddens, A. (1979). Central Problems in Social Theory: Action, Structure, and Contradiction in Social Analysis. Berkeley: University of California Press.

Hackett, E. (1996). The Research University in a Time of Discontent. *The Journal of Higher Education, 67*(6), 718-720.

Harris, F. and Bensimon, E. M. (2007), The equity scorecard: A collaborative approach to assess and respond to racial/ethnic disparities in student outcomes. New Directions for Student Services, 2007: 77-84. doi:10.1002/ss.259.

Hillman, N. W., Fryar, A. H., & Crespín-Trujillo, V. (2018). Evaluating the Impact of Performance Funding in Ohio and Tennessee. American Educational Research Journal, 55(1), 144–170. https://doi.org/10.3102/0002831217732951.

Howlett, M. (2005). What is a policy instruments? Tools, mixes and implementations styles. In F. P. Eliadis, M. M. Hill, & M. Howlett (Eds.), Designing government: From instruments to governance (pp. 31–50). Montre´al: McGill-Queen's University Press.

Huisman, J., & Currie. J. (2004). Accountability in higher education: bridge over troubled water? *Higher Education, 48*(4),529–551.

Iloh, C. (2018). Toward a new model of college "choice" for a twenty-first-century context. Harvard Educational Review, *88*(2). https://doi.org/10.17763/1943-5045-89.2.i.

Integrated Postsecondary Education Data System (IPEDS). (2019a). Variable description—research current year total. Institute of Education Sciences—National Center for Education Statistics. Retrieved from https://nces.ed.gov/ipeds/datacenter/SelectVariables.aspx?stepId=1.

Integrated Postsecondary Education Data System (IPEDS). (2019b). Variable description—research salaries and wages. Institute of Education Sciences—National Center for Education Statistics. Retrieved from https://nces.ed.gov/ipeds/datacenter/SelectVariables.aspx?stepId=1.

Ishitani, T.T. (2006). Studying attrition and degree completion behavior among first-generation college students in the United States. *The Journal of Higher Education*, (*77*)5, 861-885. DOI: 10.1080/00221546.2006.11778947.

Johnson, N. (2013). Can Higher Education Accountability Be Both Fair and Transparent? Lessons from Context for Success. *Change: The Magazine of Higher Learning*, *45*(1), 40-47.

Jones, T, Jones, S. Elliot, K. C., Owens, L. R., Assalone, A. E., & Gàndara, D. (2017). *Outcomes based funding and race in higher education: Can equity be bought?* Palgrave Pivot.

Kaiser, D. (2011). The search for clean cash. *Nature, 472*(7341), 30–31. https://doi-org.ezproxy.lib.uh.edu/10.1038/472030a.

Karlsson, T. (2008). Institutional isomorphism. In S. R. Clegg & J. R. Bailey (Eds.), *International encyclopedia of organization studies* (Vol. 1, pp. 679-681). Thousand Oaks, CA: SAGE Publications, Inc. doi: 10.4135/9781412956246.n233.

Kelchen, R. (2018). Do Performance-Based Funding Policies Affect Underrepresented Student Enrollment? *The Journal of Higher Education, 89*(5), 702-727.

Kelly, A.P., & Lautzenheiser, D.K. (2013). *Taking charge: A state-level agenda for higher education reform*. American Enterprise Institute: Washington, DC.

Kennedy, D. (1994). Making Choices in the Research University. In The Research University in a Time of Discontent. Eds. Cole, Jonathan R., Barber, Elinor G., Graubard, Stephen R. The Johns Hopkins University Press, Baltimore and London.

Khandker, S.R., Koolwal, G.B. and Samad, H.A., 2010. *Handbook on impact evaluation: quantitative methods and practices*. Washington, DC: World Bank Publications.

Kingdon, J. (2003). *Agendas, alternatives, and public policies* (2nd ed.). Boston, MA: Addison-Wesley Educational Publishers Inc.

Labaree, D. F. (1997). Public Goods, Private Goods: The American Struggle Over Educational Goals. *American Educational Research Journal*, *34*(1), 39–81. https://doi.org/10.3102/00028312034001039.

Lee, S. J. (2009). Unraveling the "Model Minority" Stereotype: Listening to Asian American Youth (2nd ed.) New York: Teachers College, Columbia University.

Letizia, A. (2015). *Performance-based funding in higher education: The State of truth in the information age*. Lexington Books.

Li, A. Y., Gándara, D., & Assalone, A. (2018). Equity or Disparity: Do Performance Funding Policies Disadvantage 2-Year Minority-Serving Institutions? *Community College Review*, *46*(3), 288–315. https://doi.org/10.1177/0091552118778776.

Marcus, J., Siedler, T. (2015). Reducing binge drinking? The effect of a ban on late-night off-premise alcohol sales on alcohol-related hospital stay in Germany. Journal of Public Economy. 123, 55-77.

Mason, N.M., Wineman, A., Kirimi, L. and Mather, D. (2017). The effects of Kenya's 'Smarter' input subsidy programme on smallholder behaviour and incomes: Do different quasi-experimental approaches lead to the same conclusions?. *Journal of Agricultural Economic*, (*68*) 45-69. doi:10.1111/1477-9552.12159.

Mattson, C. (2007). Beyond admission: Understanding pre-college variables and the success of at-risk students. *Journal of College Admission*, (196), 8–13. Retrieved from http://search.proquest.com/docview/219131856/

McClure, K. M., & Titus, M. A. (2018) Spending Up the Ranks? The Relationship Between Striving for Prestige and Administrative Expenditures at U.S. Public Research Universities, The Journal of Higher Education, 89:6, 961-987, DOI: 10.1080/00221546.2018.1449079.

Mitchell, M., Leachman, M., Masterson, K., & Waxman, S. (2018). Unkept promises: State cuts to higher education threaten access and equity. *Center on Budget and Policy Priorities*. Retrieved from https://www.cbpp.org/research/state-budget-and-tax/unkept-promises-state-cuts-to-higher-education-threaten-access-and.

McConnell, C. R., Brue, S. L., & Flynn, S. M. (2009). Macroeconomics: Principles, problems, and policies. Boston: McGraw-Hill Irwin.

Mumper, M., Gladieux, L.E., King, J.E. and Corrigan, M.E. (2011). The Federal Government and Higher Education. Altbach, P. G., Gumport, P. J., & Berdahl, R. O. (Eds.). (2011). *American higher education in the twenty-first century : Social, political, and economic challenges*. Retrieved from https://ebookcentral.proquest.com.

Murphy, K., & Topel, R. (2003). Measuring the gains from medical research : an economic approach . Chicago: University of Chicago Press.

National Academy of Sciences (NAS) Committee on Criteria for Federal Support of Research and Development. (1995). Allocating federal funds for science and technology. Supplement 1: The Evolution and Impact of Federal Government Support for R&D in Broad Outline. Washington, D.C.: National Academies Press (US). Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK45556/.

Ngo, B. & Stacey J. (2007). Complicating the image of model minority success: A review of southeast Asian American education. Review of Educational Research, 77(4), 415-453.

Nichols, R.W. (1994). Federal Science Policy and Universities: Consequences of Success in Cole, J. R., Barber, E. G., Graubard, S. R., & American Academy of Arts and Sciences. (1994). *The research university in a time of discontent*. Baltimore: Johns Hopkins University Press.

Offenstein, J., & Shulock, N. (2010). *Taking the next step: The promise of intermediate measures for meeting postsecondary completion goals*. Boston, MA: Jobs for the Future.

Pascarella, E. T., & Terenzini, P. T. (2005). How college affects students: A third decade of research (Vol. 2). San Francisco, CA: Jossey-Bass.

Pasque, P. (2010). *American higher education, leadership, and policy: Critical issues and the public good* (First ed.).

Perna L.W. (2006) Studying college access and choice: A proposed conceptual model. In: Smart J.C. (eds) HIGHER EDUCATION:. Higher Education: Handbook of Theory and Research, vol 21. Springer, Dordrecht.

Perna, L. W., & Finney, J. E. (2014). *The attainment agenda: state policy leadership in higher education*. Retrieved from https://ebookcentral.proquest.com.

Prairie View A&M University. (2015). General Information. Retrieved from https://www.pvamu.edu/ir/wp-content/uploads/sites/98/General-Information1.pdf.

Rabovsky, T. (2012). Accountability in Higher Education: Exploring Impacts on State Budgets and Institutional Spending Patterns. *Journal of Public Administration Research and Theory*, *22*(4), 675-700.

Rhoades, G. (2012). The incomplete completion agenda: Implications for academe and the academy. *Liberal Education*, *98*(1), 18–25.

Rooney, C., & Schaeffer, B. (1998). Test Scores Do Not Equal Merit: Enhancing Equity & Excellence in College Admissions by Deemphasizing SAT and ACT Results. National Center for Fair and Open Testing (FairTest), Cambridge, MA.

Rosales, L.L. (2010). *The Texas research development fund: building institutional research capacity at Texas public universities*. Journal of Research Administration, *41*(1).

Rutherford, A., & Rabovsky, T. (2014). Evaluating Impacts of Performance Funding Policies on Student Outcomes in Higher Education. The ANNALS of the American Academy of Political and Social Science, 655(1), 185–208. https://doi.org/10.1177/0002716214541048.

Ryan, A. M., Kontopantelis, E., Linden, A., & Burgess, J. F. (2019). Now trending: Coping with non-parallel trends in difference-in-differences analysis. *Statistical Methods in Medical Research*, *28*(12), 3697–3711. https://doi.org/10.1177/0962280218814570.

Sawyer, R. (2013) Beyond correlations: Usefulness of high school GPA and test scores in making college admissions decisions. *Applied Measurement in Education*, *26*(2), pp. 89-112. DOI: 10.1080/08957347.2013.765433.

Shulman, L.S. (2000). The Carnegie Classifications of Institutions of Higher Education: A technical report. Menlo Park, CA: The Carnegie Foundation for the Advancement of Teaching. Retrieved from http://carnegieclassifications.iu.edu/downloads/2000_edition_data_printable.pdf.

Solmon, L.C. (2003, December 10). Education policy 'Lag time': How much time should we give a reform before we demand to see results?. *Education Week*. https://www.edweek.org/ew/articles/2003/12/10/15solmon.h23.html.

Stone, D. A. (2002). Policy paradox: The art of political decision making (p. 448). New York: Norton.

Taylor, M. (2010). *Crisis on campus: A bold plan for reforming our colleges and universities* (First ed.).

19 Texas Administrative Code § 5.5 (2019).

Texas Association of Community Colleges. (n.d.). Performance Based Funding for Texas Community Colleges. Retrieved May 19, 2019 from https://tacc.org/sites/default/files/documents/2018-08/performance_based_funding_for_community_colleges.pdf .

Texas Education Code, Section 62, Subchapter C.

Texas Education Code, §62.141-62.149 (2009).

Texas Education Code, §51.805 (2013).

Texas Higher Education Coordinating Board. (2007). Doctoral Universities Peer Group Report. Retrieved from http://www.txhighereddata.org/Interactive/Accountability/DoctoralUniversities.pdf.

Texas Higher Education Coordinating Board. (2009). Overview: Permanent University Fund (PUF) Higher Educations Fund (HEF). Retrieved from http://www.thecb.state.tx.us/reports/PDF/1627.PDF.

Texas Higher Education Coordinating Board. (2010). Overview: Tuition deregulation. Retrieved from http://www.thecb.state.tx.us/reports/PDF/1527.pdf.

Texas Higher Education Coordinating Board. (2015). 60x30TX: Texas Higher Education Strategic Plan: 2015–2030. Retrieved from http://www.thecb.state.tx.us/reports/PDF/9306.PDF?CFID=57485581&CFTOKEN=60423954.

Texas Higher Education Coordinating Board. (2017). *60X30TX Progress Report 2017.* Retrieved from http://www.thecb.state.tx.us/reports/PDF/9742.PDF?CFID=86826084&CFTOKEN=11846865.

Texas Higher Education Coordinating Board. (2018a). Research Funding in Texas Overview. Retrieved September 16, 2018, from http://www.thecb.state.tx.us/reports/PDF/1525.PDF.

Texas Higher Education Coordinating Board. (2018b). Success Points Calculation Details. Retrieved April 16, 2019, from http://www.thecb.state.tx.us/reports/PDF/9595.PDF?CFID=99990379&CFTOKEN=53977534.

Texas Higher Education Coordinating Board. (2019a). National Research University Fund Eligibility. Retrieved April 30, 2019, from http://www.thecb.state.tx.us/reports/PDF/12329.PDF?CFID=99141668&CFTOKEN=84066210.

Texas Higher Education Coordinating Board. (2019b). Accountability System Peer Group Meeting. Retrieved April 18, 2019, from http://www.thecb.state.tx.us/reports/PDF/12301.PDF?CFID=100000891&CFTOKEN=15184934.

Texas Higher Education Coordinating Board. (2019c). 60x30TX Progress Report—July 2019. Retrieved February 3, 2020 from http://www.60x30tx.com/media/1518/2019-60x30tx-progress-report.pdf.

Texas Higher Education Coordinating Board. (n.d.a.). Closing the gaps: The Texas higher education plan. Retrieved July 20, 2018, from http://www.thecb.state.tx.us/reports/PDF/0379.PDF?CFID=81972164&CFTOKEN=67362826.

Texas Higher Education Coordinating Board. (n.d.b.). National Research University Fund (NRUF) Retrieved July 16, 2018 from http://www.thecb.state.tx.us/index.cfm?objectid=973D3270-3113-11E8-BC500050560100A9.

Texas Higher Education Coordinating Board. (n.d.c.). Board/Commissioner. Retrieved July 15, 2018, from http://www.thecb.state.tx.us/index.cfm?objectid=EDCAFB09-D542-11E7-A03300505694284C.

Texas Higher Education Coordinating Board. (n.d.d.). Closing the Gaps Goals and Targets Summary. Retrieved December 21, 2018 from http://www.thecb.state.tx.us/reports/PDF/1724.PDF?CFID=90627207&CFTOKEN=68216653.

Texas Higher Education Coordinating Board. (n.d.e.). Goal two-completion at a glance. Retrieved July 24, 2018, from http://www.60x30tx.com/goals/goal-two-completion/.

Texas Higher Education Coordinating Board. (n.d.f.). Research Funding Awards. Retrieved April 24, 2019, from http://www.thecb.state.tx.us/index.cfm?objectid=260E3DC0-2EA1-11E8-BC500050560100A9.

Thresher, B.A. (2017). *College admissions and the public interest, with a new introduction and reflections from the field.* College Board, New York, NY.

Tinto, V. (1973). College Proximity and Rates of College Attendance. *American Educational Research Journal, 10*(4), 277-293. Retrieved from http://www.jstor.org.ezproxy.lib.uh.edu/stable/1161659.

Umbricht, M. R., Fernandez, F., & Ortagus, J. C. (2017). An Examination of the (Un)Intended Consequences of Performance Funding in Higher Education. Educational Policy, 31(5), 643–673. https://doi.org/10.1177/0895904815614398.

Volkwein, J. F., & Grunig, S. D. (2005). Reputation ratings in higher education: double, double, toil and trouble. In: Joseph, Burke (ed.) Achieving Accountability In High Education: Balancing Public, Academic, and Market Demands, Chapter 11, Jossey-Bass, Francisco, CA, pp. 246-274.

Volkwein, J., & Sweitzer, K. (2006). Institutional Prestige and Reputation among Research Universities and Liberal Arts Colleges. Research in Higher Education, 47(2), 129-148. Retrieved from www.jstor.org/stable/40197404.

Volkwein, J., & Tandberg, F. (2008). Measuring Up: Examining the Connections among State Structural Characteristics, Regulatory Practices, and Performance. *Research in Higher Education, 49*(2), 180-197.

University at Buffalo. (2018, May 17). 'Undermatched' students less likely to graduate on time compared to peers: New study suggests widest graduation gap among Hispanic students. *ScienceDaily*. Retrieved February 28, 2020 from www.sciencedaily.com/releases/2018/05/180517163334.htm.

The University of Texas/Texas A&M Investment Management Company (UTIMCO). (2017). UTIMCO 2017 Annual Report. Retrieved from https://www.utimco.org/funds/allfunds/2017annual/pdf/2017_UTIMCO_Annual_Report%20-%20Printable%20-%20High%20Res.pdf.

United States Congress. (1991). Office of Technology Assessment, Federally Funded Research: Decisions for Decade. OTA-SET-490. Washington, DC: U.S. Government Printing Office.

Usselman, S.W. (2013). Research and development in the united states since 1990: An interpretive history. Retrieved from https://economics.yale.edu/sites/default/files/usselman_paper.pdf.

Watkins, M. (2016, February 2). Four Texas Colleges Reach Carnegie "Tier One" Status. The Texas Tribune. Retrieved from https://www.texastribune.org/2016/02/02/unt-ut-arlington-and-texas-tech-reach-carnegie-tie/.

Wimshurst, K., Wortley, R., Bates, M., & Allard, T. (2006). The impact of institutional factors on student academic results: implications for 'quality' in universities. *Higher Education Research & Development*, *25*(2), 131-145, DOI: 10.1080/07294360600610370.

Wing, C., Simon, K., & Bello-Gomez, R.A. (2018). Designing difference in difference studies: Best practices for public health policy research. Annual Review of Public Health. 39, 453-469.

Ziskin, Mary B., Rabourn, Karyn E., & Hossler, Donald. (2018). Performance-Based Funding of Higher Education: Analyses of Policy Discourse across Four Case Studies. *Journal for Critical Education Policy Studies*, *16*(2), 164-210.

Appendix A

Research Funding Recipients from the 2016-2017 Biennium

Permanent University Fund Recipients

The University of Texas System

The University of Texas at Austin

The Texas A&M System

Texas A&M University

Prairie View A&M University

Texas Research University Fund

Texas A&M University

University of Texas at Austin

Core Research Support Fund

Texas Tech University

University of Houston

University of North Texas

University of Texas at Arlington

University of Texas at Dallas

University of Texas at El Paso

University of Texas at San Antonio

Texas State University

Texas Comprehensive Research Fund

University of Texas Rio Grande Valley

Prairie View A&M University

Tarleton State University

Texas A&M University Kingsville

Texas A&M University at Galveston

Texas A&M International University

Lamar University

University of Texas Tyler

Sam Houston State University

University of Houston Downtown

Sul Ross State University

University of Houston Clear Lake

Texas A&M University Corpus Christi

West Texas A&M University

Texas A&M University Commerce

Texas Southern University

Midwestern State University

Stephen F. Austin State University

Texas Women's University

University of Texas Permian Basin

Angelo State University

Texas A&M University Texarkana

University of Houston Victoria

Texas A&M University San Antonio

University of North Texas Dallas

National Research University Fund

University of Houston

Texas Tech University

Texas Research Incentive Program

Texas Tech University

University of Houston

University of North Texas

University of Texas at Arlington

University of Texas at Dallas

University of Texas at El Paso

University of Texas at San Antonio

Texas State University

Appendix B

NRUF Requirements

Mandatory Requirements

1. The institution must be designated as an emerging research university in the THECB's accountability system.
2. The institution must have expenditures of at least $45 million in restricted research.

Optional Criteria

1. The institution must comply with *four* of the following:
    a. $400 million endowment annually
    b. 200 PhD degrees awarded annually
    c. freshmen class with high academic achievement
    d. membership in Association of Research Libraries, Phi Beta Kappa or equivalent national recognition
    e. high quality faculty

commitment to high quality graduate education (THECB, n.d.b.).

Appendix C

Performance-based Funding at Community Colleges in Texas

The context for the discussion of performance-based funding in Texas has been based on four-year, public institutions. Unlike four-year, public institutions, community colleges participate in performance-based funding and operate independently. The performance-based funding policy in Texas for community colleges is known as Student Success Points and was implemented in 2013 (THECB, 2018b). This funding formula was created on the premise that there are multiple ways to measure student success. This model allocates funding points not only for completed credentials and transfer to four-year institutions but also for college readiness (developmental education), first college-level course, and progress toward a credential via credit hours (THECB, 2018b). For the 2018-2019 biennium, $180 million was appropriated for Student Success Points (Texas Association of Community Colleges, n.d.). While performance-based models are utilized to fund community colleges in Texas, the scope of this study focuses on the research-based funding policies discussed in this paper which do not pertain to community college.

Appendix D

Other Unspecified Criteria

According to Texas Education Code, §51.805 (2013), institutions may admit students based on a combination of any of the following 18 criteria:

1. the applicant's academic record;
2. the socioeconomic background of the applicant, including the percentage by which the applicant's family is above or below any recognized measure of poverty, the applicant's household income, and the applicant's parents' level of education;
3. whether the applicant would be the first generation of the applicant's family to attend or graduate from an institution of higher education;
4. whether the applicant has bilingual proficiency;
5. the financial status of the applicant's school district;
6. the performance level of the applicant's school as determined by the school accountability criteria used by the Texas Education Agency;
7. the applicant's responsibilities while attending school, including whether the applicant has been employed, whether the applicant has helped to raise children, or other similar factors;
8. the applicant's region of residence;
9. whether the applicant is a resident of a rural or urban area or a resident of a central city or suburban area in the state;
10. the applicant's performance on standardized tests;

11. the applicant's performance on standardized tests in comparison with that of other students from similar socioeconomic backgrounds;
12. whether the applicant attended any school while the school was under a court-ordered desegregation plan;
13. the applicant's involvement in community activities;
14. the applicant's extracurricular activities;
15. the applicant's commitment to a particular field of study;
16. the applicant's personal interview;
17. the applicant's admission to a comparable accredited out-of-state institution; and
18. any other consideration the institution considers necessary to accomplish the institution's stated mission (Texas Education Code, 2013, §51.805).