POLITICAL RHETORIC OR POLICY RE-INVENTION: CAN PUBLIC COLLEGES AND UNIVERSITIES BECOME MORE COMMITTED TO STUDENT SUCCESS UNDER PERFORMANCE-BASED FUNDING POLICIES?

by

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(Under the Direction of James Hearn)

ABSTRACT

Faced with increasing budget constraints and a greater need for a highly educated labor force, state governments have been making efforts to improve higher education productivity. Performance-based funding strategy is replacing the traditional enrollment-based funding method. This dissertation examined the impact of performance-based funding policy on public higher education institutions, i.e. whether public colleges and universities became more committed to student success under this outcome-driven funding strategy. Through a state by state analysis of three states, the effects of different designs of performance-based funding policies on student-related expenditures were examined. Policy effects were also analyzed in both public 4-year systems and public 2-year systems.

INDEX WORDS: performance-based funding policy, state higher education financing

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DEDICATION

Psalm 117:2 For His merciful kindness is great toward us, and the truth of the LORD endures forever. Praise the LORD!

Romans 8:29-30 (MSG) God knew what He was doing from the very beginning. He decided from the outset to shape the lives of those who love Him along the same lines as the life of His Son. The Son stands first in the line of humanity He restored. We see the original and intended shape of our lives there in Him. After God made that decision of what His children should be like, He followed it up by calling people by name. After He called them by name, He set them on a solid basis with Himself. And then after getting them established, He stayed with them to the end, gloriously completing what He had begun.

I dedicate this dissertation to God the Father, my Lord Jesus Christ and the Holy Spirit. You are the most remarkable Person in my life. Forever I praise You for Your amazing grace, wonderful works, and extravagant love. You are sweet, omnipotent, marvelous, and eternal. You are יְהוָֹה-AWESOME. You are the α and the ω, who is and who was and who is to come! Thank You for covering me with Your presence forever!

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To my parents, even though you could not possibly understand every word I wrote here, every word I wrote could not have possibly been written without your enduring love and support.

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CHAPTER 1

INTRODUCTION

One of the most significant challenges faced by public higher education in the U.S. is the ever increasing demand for cost-effective, quality higher education even with weakening public funding support. Under such a context, there is a heightened call for productivity and efficiency, which has given rise to a new wave of performance-based funding in state higher education financing. The effort begun some decades ago to make public colleges and universities more accessible to underrepresented students had only achieved a partial success before the alarmingly low college completion rates grabbed the attention of policymakers and the public. Admittedly, if increased college access is not accompanied by higher graduation rates, the effort to improve college access could be in vain although scholars (see Toutkoushian, Shafiq & Trivetter, 2013) have found evidence that college non-completers still benefited from attending higher education and were better off than those who did not attend college at all.

The heightened call for accountability undoubtedly presents a conundrum to public higher education institutions: not only do they have to educate a much more diverse body of students, but they must also assume responsibility for students' on-time graduations and degree completion. Essentially, public colleges and universities are faced with a dual task of achieving educational equity as well as achieving educational efficiency. Making the task even more challenging is the less widely acknowledged gap between high school graduation and college readiness. According to a report by Greene and Forster (2003), of all the students who have successfully graduated from high school, less than half of these graduates possess the necessary academic skills and qualities to attend a four-year college. The picture is bleaker if the percentage is broken down by ethnic groups. Nonetheless, as long as state governments can support their public higher education with sufficient financial resources, public colleges and universities can manage to address these issues by offering remedial courses and other academic enhancement initiatives to improve student persistence and graduation.

In reality, as much as it is a state government's constitutional responsibility to support its public higher education, state governments have been unable to meet the growing financial needs of public colleges and universities[1]. One reason for the declining state funding, as Zumeta (1999) observed, is the escalating costs of other state public service demands, such as healthcare, K-12 education, and corrections. Public higher education, which is often treated as a "budget balancer" (McGuiness, 2005), becomes a smaller and smaller share of the state budget. Another reason lies in the shift of viewing public higher education as a pure public good to viewing it as public investment. The concept of funding for performance is grounded in such a perspective. Many state governments believe that as they incorporate performance-based funding into state higher education financing, they can maximize the return of the dollars invested in public higher education.

Apparently, using state funding as an incentive to stimulate institutional performance and achieve statewide higher education goals is appealing to state governments for both economic and political reasons. State governments increasingly view public higher education as an asset through which more assets may be acquired

(McLendon, Heller and Young, 2005). Advocates (e.g., Complete College America, 2013; Aldeman & Carey, 2009; Kelly, Schneider & Carey, 2010; Burke & Minassians, 2003) for this funding strategy claim that not only can the implementation of performance-based funding effectively align public higher education institutions with state higher education goals but also that such a funding strategy incentivizes public higher education institutions to be more productive, particularly in the area of undergraduate education. State governments can therefore acquire their needed human capital while spending fewer tax dollars. Politically, performance-based funding becomes an expedient policy choice for state legislators. It addresses the widespread public concern regarding efficient use of tax dollars. Better still, performance-based funding policy gives public colleges and universities the flexibility to choose their own means to reach predetermined performance goals. In this way, the institutional autonomy of public colleges and universities is arguably maintained.

These alleged advantages of the performance based funding approach in fact mask many operational challenges at the institutional level. At the fundamental level, the nature of production in higher education defies the key assumption that tying funding to specific measures of performance can effectively stimulate productivity. Degree production in higher education, for example, is affected not only by various financial aspects of state higher education policy but is also intrinsically associated with other endogenous and exogenous factors (Titus, 2009). From an organizational perspective, public higher education institutions are complex organizations which simultaneously contain the characteristics of academic bureaucracies (Stroup, 1966), collegial communities (Goodman, 1962), organized anarchies (Cohen & March, 1974), and political organizations (Baldridge, 1971). This entails the tremendous dynamics of management and administration within each campus. Additionally, performance benchmarks that fail to recognize the diversities in the missions and purposes of each individual public higher education institution can easily turn the rewards for performance into nothing but perverse incentives, resulting in public colleges and universities limiting the admission of underrepresented students[2] (Dougherty et al., 2016; Dougherty & Reddy, 2013).

A less articulated, but perhaps more fundamental, issue at the core of all the arguments and debates concerning higher education accountability, hence the performance-based funding policy, is the feasibility of what is promulgated as "doing more with less" in public higher education. The statement made by the U.S. Department of Education (2006) that "[w]e want postsecondary institutions to provide high-quality instruction while improving their efficiency in order to be more affordable to the students, taxpayers and donors who sustain them" (p. viii) reveals most politicians' and the general public's ignorance of the zero-sum relationship among cost, quality and access in public higher education, which constitutes the so-called "iron triangle". It is simply impossible to excel in any two of those critical values without sacrificing the third. This is not to say that public higher education cannot be more productive, no matter how one wishes to define productivity in public higher education, but the demand for efficiency and effectiveness must be established upon a more explicit understanding of at least two of the most basic issues: first, the importance of resources in institutional performance; and second, the amount of resources needed.

Concerning the significance of resources in organizational success, there is no doubt that resources are essential for better institutional performance. Ironically, while state policymakers emphasize institutional effectiveness and improved student outcomes, they are not fully informed of the importance of adequate financial resources in managing higher education institutions. Public administration literature has long asserted the necessity for sufficient resources in successful performance (Kettl and Fesler, 2005; Fernandez and Rainey, 2006). In order for public colleges and universities to successfully execute their missions in teaching, research, and public service, adequate financial provisions are vital. In expressing their concerns regarding the shift toward a greater degree of privatization of public higher education institutions, campus leaders (e.g., Register-Guard, 2010), researchers (e.g., Rice, 2006), and even the news media (e.g., Thrift, 2010) have noted that higher levels of public funding offer stronger incentives for public higher education institutions to serve state higher education goals. Taken together, these theories and perspectives suggest an appreciable point: if public higher education institutions are to offer quality education with broader access at a more affordable price, state government, as well as the federal government, must supply public higher education with stable and sufficient funding.

With regard to the amount of resources needed to achieve desired student outcomes, this issue is particularly relevant as the very purpose of adopting a performance-based funding policy in state higher education financing is to improve student outcomes. For public higher education to meet the needs of a state's economy by supplying a highly educated labor force, adequate educational resources must be at its disposal. Unfortunately, no one is able to accurately calculate the exact costs of production in higher education. As Bowen (1976) explained, production in higher education can be described by what is called the “cost disease”, a phenomenon that is characterized by ever growing costs and no commensurate increase in productivity as Baumol and Bowen (1966) illustrated by using performing arts as an example. The revenue theory of costs advanced by Bowen (1980) shows that colleges and universities almost always need to maximize their revenue and spend as much as they can in their pursuit of institutional prestige and ranking. Further, the non-linear and joint production process in higher education virtually makes any cost identification effort a vain endeavor. Not surprisingly, calculating the costs associated with achieving prescribed performance goals can, therefore, become a highly contested matter between state legislators and campus leaders. State government may always be tempted to believe that public colleges and universities are not spending public dollars in a responsible manner. However, campus leaders, who are driven by the pursuit of institutional prestige, are often more sensitive to their institutions’ financial needs. Despite the lack of an objective standard that can measure the actual costs, the author of this study believes that for performance-based funding policies to positively affect student outcomes, it must at least enable public colleges and universities to allocate more funding toward functional categories that directly contribute to student development. The allocation of more financial resources into student-related areas, such as instruction, student services, and academic support due to performance-based funding policies, can indicate that public colleges and universities are responding to the financial incentives that are offered through such policies and are enabled to translate their strengthened commitment to student success into efforts directly targeting student learning.

Research Questions

A majority of the studies on performance-based funding policy primarily deal with identifying policy effect on student outcomes. Because the ultimate policy goals are intended to improve student outcomes, intuitively one would expect that public colleges and universities that operate under performance-based funding policies would yield better student outcomes than institutions without such policies. This expectation has not yet been met with corresponding findings from a majority of empirical analyses. However, one cannot hastily conclude that performance-based funding policies cannot improve student outcomes simply based on the findings from those empirical studies. One important reason is that, unlike state financial aid policy, performance-based funding policy does not directly affect students.

Literature on student persistence and success (e.g., Gansemer-Topf & Schuh, 2006; Berger, 2000) has made the point that the organizational behavior of higher education institutions can have a significant influence on student outcomes. For performance-based funding policy to positively affect student outcomes, it must first positively impact public colleges and universities. Interestingly though, the question of whether or how public higher education institutions have been affected by the shift from traditional funding approaches to performance-based funding may not have been thoroughly understood (Dougherty et al. 2013; Rabovsky, 2012). In particular, do public colleges and universities become more committed to student success in response to performance-based funding policies? If so, are they enabled to actualize such a commitment by spending more money on students? While inklings of such changes can be perceived from a few qualitative studies (e.g., Dougherty and Reddy, 2013; Rutschow et al., 2011), which show a heightened awareness of performance and more rigorous data-based institutional planning, the need exists for quantitative evidence to show that campus leaders are prioritizing students' academic success due to performance-based funding policy.

Therefore, it behooves us to investigate the quantitative dimension of how performance-based funding policy affects public colleges and universities. Such knowledge fills the gap in research on performance-based funding policy and advances our understanding of the policies' influences on public higher education institutions. This dissertation explores whether performance-based funding policies have caused public colleges and universities to allocate more funding to student-related expenditures. As performance-based funding policy is implemented to improve student outcomes, the author believes that this policy should cause more resources to be set aside for students. To confirm this hypothesis, this dissertation analyzed the impact of performance-based funding on public colleges and universities in three selected states—Indiana, Louisiana and Washington. The state by state analyses allowed the author to make comparisons among different performance-based funding strategies with considerations given to their distinctive state higher education contexts. Toward these ends, this study is guided by the following research questions:

1. How does performance-based funding policy impact institutional resource allocation for instruction, student services, and academic support?
2. How are these spending categories affected by different policy designs of performance-based funding?

3. Does the impact of performance-based funding policy on these spending categories display different patterns between public 2-year colleges and public 4-year institutions?

Significance of the Study

As performance-based funding policy will most likely dominate state higher education financing throughout the U.S., the significance of knowing its organizational and managerial influences on public higher education institutions is apparent. The findings of quantitative evidence that reflects public colleges' and universities' strengthened commitment to student learning due to performance-based funding is a critical step in knowing whether public higher education institutions are able to translate policy goals into appropriate actions. Institutions may differ in their specific practices, but increased spending on instruction, student services, and academic support, whether in real terms or in relative terms, reflects an institution's increased commitment to student academic success.

As such, the findings of this study also raise issues concerning how states should finance public higher education to achieve state higher education goals. These findings give policymakers a more informed perspective regarding the function and the role of performance-based funding policy in improving student outcomes as well as the significance of adequate financial support in achieving a state's higher education goals. This study also holds practical implications for campus leaders. Given that the effectiveness of performance-based funding policy is not only a matter of good policy design but also appropriate management practices to operationalize the policy (Gerrish, 2016), it is important that campus leaders have a clear understanding regarding the operationalization of performance-based funding at their institutions. Finally, given the symbiotic relationship between the state and its public higher education, the findings of this study intend to help state policymakers and campus leaders collaborate with improved understanding toward the significance of state input as well as toward efficient use of state dollars to achieve state higher education goals.

CHAPTER 2

LITERATURE REVIEW

In the past decade, growing application of performance-based funding policy in state higher education financing has spurred a burgeoning interest in examining its design, implementation, and impact. This section begins with a brief overview of performance-based funding policy followed by reviewing empirical studies that examine its impact. The final section of this chapter draws upon educational finance literature that investigates the role of educational input in the achievement of improved student outcomes. These studies made a point that increasing spending on students is associated with better student outcomes.

A Brief Overview of Performance-based Funding Policy

For the record, performance-based funding has been widely practiced in many public organizations (Moynihan, 2008). It was first applied in state higher education financing in Tennessee in 1979 (Banta, Rudolph, VanDyke, & Fisher, 1996). Following the lead of Tennessee, many states ventured to make a similar move by including performance measures in allocating funding for public higher education (Dougherty & Reddy, 2013). Instead of appropriating funding solely based on enrollment, state governments expect institutions to achieve certain outcomes with state grants. Given that this nascent version of performance-based funding was often an added component to the existing enrollment-based formula funding, Hearn (2015) believed that this move toward so-called performance-based funding can simply be viewed as a new type of formula funding, which, in addition to placing weight on student enrollment and campus operation costs, included a new component to capture institutional performance in certain measurable areas.

This initial move toward performance oriented state higher education financing also took two other forms—*performance-budgeting* and *performance-reporting* (Burke, 2002). Different from *performance-funding*, *Performance-budgeting* does not directly bind institutional performance with a specific amount of state dollars. Rather, performance indicators in *performance-budgeting* serve as references for policymakers as they appropriate money to public higher education. *Performance-reporting* requires public colleges and universities to submit reports on institutional achievements but is independent of the amount of state appropriations allocated to public higher education institutions. According to McLendon and Hearn (2013), almost every state had at least one of these performance-oriented policies. Dougherty and Reddy (2013) further noted that the application of *performance-budgeting* had waned due to the fact that it is often treated as *performance reporting* by the state.

The first wave of performance-based funding initiatives did not result in a radical shift in state funding mechanisms for public higher education throughout the nation. From the 1990s to 2010, about 20 states implemented performance-based funding (Tandberg & Hillman, 2014). Of these states, a number of them discontinued performance-based funding after several years of implementation, such as Arizona, Kentucky, and Minnesota, while others switched between performance-based funding and traditional formula funding, such as Oregon and South Carolina (Tandberg &

Hillman, 2014). *Performance-budgeting* and *performance-reporting* are more or less out of the spotlight due to their presumably lower impacts. This initial move of tying state dollars to institutional performance is referred to as Performance Funding 1.0 (PF 1.0) to distinguish from the recent more vigorous resurgence of performance-based funding in the discourse of state higher education financing, which is often referred to as Performance Funding 2.0 (PF 2.0) in some of the literature, while others (e.g., Labi, 2015; Snyder, 2015) use the term *outcome-based funding*, highlighting the fact that achieving better student outcomes is the major policy goal. In this study, performance-based funding is used as a generic term, unless it is necessary to distinguish between PF1.0 and PF 2.0.

As an important component of state higher education financing, performance-based funding policy is heavily intertwined with a state's political economy, and a state's political factors can actively influence the adoption and the implementation of performance-based funding programs. McLendon, Hearn and Deaton (2006) found that the presence of a Republican-dominated legislature and a coordinating public higher education governing board led to a higher chance of the adoption of performance-based funding policies, whereas a Democratic-dominated legislature and a consolidated public higher education board increased the possibility of performance-budgeting policies being adopted. Their event history analysis further indicated that states' economies, sociopolitical dynamics as well as states' higher education environments could influence the states' choices for different forms of performance oriented policies.

Among the states having implemented performance-based funding policies, they vary greatly from one another in terms of specific policy design and implementation.

Two studies (Burke, 2005; Zumeta & Kinne, 2011) claimed that in some states, the adoption of a performance-based funding policy served only as a symbolic gesture to reiterate a state's oversight of public higher education. Others (Dougherty, Natow, Bork, Jones &Vega, 2011; Zumeta & Kinne, 2011) found that the introduction of performance-based funding programs was highly correlated with the economic well-being of the state. During times of economic prosperity, states were more likely to adopt, or initiate, performance-based funding programs, since more money could be appropriated to public higher education; whereas during economic recessions, states often suspended performance-based funding programs. This differs from the (re)adoption of performance-based funding in the most recent years. Under the new wave of the accountability movement, performance-based funding is viewed by many state governments as a better alternative to the traditional enrollment-based funding[3]. Although states differed from one another in their specific performance-based funding policy designs, and displayed diverse experiences in implementing such policies, two trends emerged as shared reasons for the suspension of performance-based funding programs in most states. Generally speaking, states were inclined to place performance-based funding policies in abeyance under austere fiscal conditions (Dougherty et al., 2011; Zumeta & Kinne, 2011), and campus resistance often led to the suspension of performance-based funding programs (Dougherty & Natow, 2009).

Tennessee stood out as an exception. Since its implementation in 1979, Tennessee's performance-based funding policy has endured through the vicissitude of state political economy and remained as a major theme in its state higher education financing. Bogue and Johnson (2010) contributed the longevity of Tennessee's performance-based funding program to its unique policy design process, which was driven by the higher education community with funding support from various foundations. Bogue and Johnson (2010) further pointed out two other distinctive features that contributed to the success of Tennessee's performance-based funding program: first, necessary adjustments were made accordingly to the policy assessment, which was carried out every five years; second, the policy was designed in such a way that the funding gains were not zero-sum among public colleges and universities.

The flexible and adaptive nature of Tennessee's performance-based funding program was certainly reflected by their most recent effort to implement a new formula for performance-based funding, which targets specifically boosting state higher education degree attainment by 55% by the year 2025. Labi (2015) noted that Tennessee's outcome-driven formula contained many desirable features of the reinvented performance-based funding policy: drawing upon its rich heritage of financing public higher education through performance-based funding, Tennessee's new formula emphasized the role of public higher education institutions in improving student academic achievement. The new formula gave different weight according to institutional types and missions, and measured academic achievement by more diversified metrics (Labi, 2015). The revision of the performance-based funding formula in Tennessee also reflects the latest trend in the policy design of such funding strategies. According to a series of articles released by the Lumina Foundation, one of the leading advocates of performance-based funding policies, the new wave of performance-based funding is increasingly oriented toward rewarding public colleges and universities for improved student outcomes by measuring how well public higher education promotes college access and student success.

More specifically, the new wave of performance-based funding distinguishes itself from PF 1.0 in several important ways: first, in terms of performance indicators, greater emphasis and focus are on student academic progress and achievement. Retention rates, on-time completion of gateway courses, and graduation rates are the major concerns of policy design in almost every state that has adopted, or will implement performance-based funding policies. Second, instead of simply making performance-based funding an added bonus to the existing funding formula, PF 2.0 is designed in such a way that a larger portion of state appropriations, which can vary from 5% to 25%, is to be determined by institutions' achievement on student outcome indicators. In addition, as is illustrated in Snyder (2015), PF 2.0 draws valuable lessons from the pitfalls of PF 1.0 in terms of policy design and implementation. PF2.0 embraces a more simplified funding metric while giving adequate consideration to institutional diversity and the nature of production in higher education. Instead of imposing upon public colleges and universities what they must achieve solely from the state government's perspective, policymakers invite the participation of other higher education stakeholders in the policy design process. McLendon and Hearn (2013) showed the active role of private foundations played in advancement of PF 2.0 implementation. They noted that Lumina Foundation supported performance improvement by offering funding to eleven states which are committed to the PF 2.0 program.

The Institutional Impact of Performance-based Funding Policies

One way that performance-based funding policy may stimulate institutional change to improve student outcomes is by increasing the availability of more detailed information on institutional performance and raising awareness of academic performance among faculty and administrators. In a series of studies, Dougherty and his associates claimed that performance-based funding policy could have a profound organizational impact. In Dougherty and Reddy (2013), the authors produced a lengthy report by reviewing 60 empirical studies on performance-based funding policies in 8 states. Heightened awareness of state higher education priorities among campus administrators was identified as the most salient impact of performance-based funding policy by these authors. Driven by such awareness, more rigorous data-based institutional planning was practiced in many colleges and universities under performance-based funding policy, and changes to academic policies, remedial education programs and student services were made accordingly (Dougherty and Reddy, 2013). Reindl and Reyna (2011) further noted that more detailed information on institutional performance helped state policymakers identify how public higher education was serving the state's needs. A number of scholars (e.g., Dougherty & Hong, 2006; Ewell, 1999; Massy, 2011; Burke, 2002) showed that information on institutional performance relative to other institutions also helped public colleges and universities to have a clearer understanding of their achievement and their visions.

As public colleges and universities become more performance conscious, they are found to be proactively engaged in various performance enhancing initiatives and other organizational learning activities. For example, Rutschow et al. (2011) used qualitative research methods to study community colleges under the auspices of Achieving the Dream—a performance-based funding program sponsored by the Lumina Foundation. They found that these community colleges relied heavily on their institutional research offices for data and evaluative reports to identify issues that hindered student success. Analytical studies by the institutional research offices were also used to improve academic offerings and intervention programs. In addition, Rutschow and her colleagues found that improvements were made to enhance college leadership and data analytic capacity due to Achieving the Dream. Another qualitative study by Petrides, McClelland, and Nodine (2004) showed that performance-based funding programs impacted organizational activities. In their observation, they found that institutions under performance-based funding policies engaged in many initiatives to improve institutional performance, such as discussions on improving student learning, collaborative efforts across disciplines and improvement in database construction. In addition, leaders of these institutions were more conscious of aligning institutional goals with state agendas. Dougherty et al. (2014) found that public higher education institutions subject to performance-based funding policy often offered better developmental education, more articulated transfer and more comprehensive academic counseling, albeit there were other factors along with performance-based funding policy which motivated colleges and universities to make such efforts, as their interviews with state officials and higher education professionals in Ohio, Indiana and Tennessee indicated. Additionally, their analysis also showed that the full-fledged effect of performance-based funding could often be hindered by inappropriate performance measures and an overestimation of institutional capacity to carry out changes.

On the other hand, a number of scholars maintained that there was a great variation in terms of institutions’ willingness and ability to collect relevant information and to engage in organizational learning in the operationalization of performance-based funding policies (e.g., Dougherty et al., 2014; Dougherty & Reddy, 2013). A recent study by Dougherty et al. (2016) found that among the selected public 2-year colleges and 4-year institutions in three leading performance-based funding states, none of these institutions had responded to performance-based funding policies by building up institutional research capacity. Instead, they preferred to adopt informal but more flexible practices to monitor the operation of performance-based funding policy.

Two quantitative studies yield some preliminary evidence showing the modest impact of performance-based funding policy on the financial behavior of public colleges and institutions. Kelchen and Stedrak (2016) examined the changes in higher education institutions’ financial outlooks due to performance-based funding policies. In their analyses of policy effects, they used state-level financial and political characteristics as covariates and controlled for institutional fixed effects and year fixed effects in their panel data modeling. They found that the 4-year institutions under a performance-based funding policy received slightly more state appropriations when the policy was first implemented. In terms of institutional expenditures, 4-year institutions shifted to spending more money on instruction and student services and less on auxiliary enterprises. The authors also found that 4-year institutions inclined to recruit students of higher academic caliber because of the performance-based funding policy. For the 2-year sector, after controlling for state-level characteristics, colleges with a performance-based funding policy had smaller tuition revenue and revenue from auxiliary enterprises, and they spent more on student services. Another interesting finding of this study was that the effect of performance-based funding policy on some organizational behaviors changed from year to year.

An earlier study by Rabovsky (2012) examined the impact of performance-based funding policy on research and instruction expenditures. He found that an institution's expenditure on research was positively associated with total enrollment but negatively associated with the percent of undergraduate enrollment. Higher education institutions subject to performance-based funding policy spent 34% less on research and 89% more on instruction than those in states without performance-based funding policy. Rabovsky (2012) also found a differential impact of performance-based funding on different types of institutions. However, Rabovsky (2012) did not consider the influence of performance-based funding policy on other student related spending categories.

Both Rabovsky (2012) and Kelchen and Stedrak (2016) offered a general view of the systematic impacts and trends of performance-based funding policy on some financial behaviors of public colleges and universities, but did not consider the possibly differential impact of different policy designs. Some performance-based funding policies may contain stronger incentives than others and, thus, have a larger impact on higher education institutions. A state by state examination allows us to generate a more concrete understanding. My study complements their findings in two aspects: first, the focus of my study is to determine whether the emphasis on student outcomes of performance-based funding policy is translated into appropriate actions on the part of public colleges and universities; second, examining different performance-based funding policies in different states respectively with regard to their impact on institutions' commitment to student success allowes me to contextualize the impact of performance-based funding policy within a specific state context and therefore, provides a more explicit understanding about the impact of performance-based funding policy on public colleges and universities.

The Performance-based Funding Policies and Student Outcomes

The majority of studies on performance-based funding are concerned with identifying policy impact on student outcomes. As the main goals of performance-based funding policy are to improve student outcomes, it is expected that public colleges and universities under such policies will display increases and improvements in student's academic achievement. Despite some positive experiences reported in Snyder (2015) showing that the performance-based funding policy improved student outcomes, many empirical studies did not find convincing evidence to support the conceptual argument for performance-based funding policies (Hillman et al. 2015; Hillman et al. 2014; Rutherford & Rabovsky, 2014; Dougherty & Reddy, 2011; Sanford & Hunter, 2011; Shin, 2010; Volkwein & Tandberg, 2008; Shin and Milton, 2004). Most studies found no positive effects of performance-based funding on graduation rates; a few of them identified a positive yet very small effect (e.g., Hillman, Tandberg & Fryar, 2015), and others even found a negative effect of performance-based funding (e.g., Rutherford & Rabovsky, 2014; Tandberg & Hillman, 2013; Fryar, 2011). The impact of performance-based funding policy on student retention was not definitively identified either. Except for the meager evidence showing higher retention rates in 2-year colleges with performance-based funding policy than non-performance-based funding college in Larocca and Carr (2012), other studies indicated a non-effect of performance-based funding policy on retention rates (e.g., Rutherford and Rabovsky, 2014; Sanford and Hunter, 2011). Some scholars speculated that the insignificant effect of performance-based funding on student outcomes might largely be due to the fact that many states discontinued their performance-based funding programs before the full effect could be observed (Shin and Milton, 2004; Tandberg & Hillman, 2014; Dougherty and Reddy, 2013), while others suggested that performance-based funding might be an ineffective policy instrument to improve college graduation rates (Rutherford & Rabovsky, 2014).

Of the quantitative analyses of the effect of performance-based funding on students, there are five major national studies. None of them affirms that performance-based funding policy has played a significant role in improving student outcomes. The earliest national study by Shin and Milton (2004) used Hierarchical Linear Modeling to analyze the effect of performance budgeting and performance-based funding. The regression analysis of states with performance-based funding/budgeting and states without performance-based funding showed that neither performance budgeting nor performance funding significantly improved graduation rates. However, the comparative analysis among states with performance budgeting and/or funding indicated that states with both performance-funding and performance budgeting out-performed states with either performance-based funding only or performance budgeting only.

In a later study, Shin (2010) used graduation rates and levels of external research funding as indicators of institutional performance. He found that state-level factors, such as demographics, economy, and state higher education policy, only accounted for about 15% of the total variance in graduation and 6% of the total variance in external research funding. The HLM modeling showed that states with performance budgeting and performance-based funding, or either, had a higher increase in graduation rates, but these accountability policies were not shown to affect the levels of research funding.

Inspired by the findings of Abernathy's (2007) and Radin's (2006) studies on K-12 accountability policies, which suggests that performance-based funding policy may have varied impact depending on organizational health and strength, Fryar (2011) tested whether or not the impact of performance-based funding policy in higher education displayed similar patterns. The panel data analysis of this study showed that performance-based funding policies were associated with a 0.5% drop in graduation rates at the institutional level on average. In terms of the possible negative effect of performance-based funding on institutions enrolling a larger number of Pell grant recipients, Fryar (2011) showed that this was not necessarily the case.

The more recent study by Tandberg and Hillman (2014) examined the impact of performance-based funding on baccalaureate degree completion in public 4-year institutions at the state level. Utilizing the difference-in-differences design, they created three different control groups to compare with the states that implemented performance-based funding policies. The statistical models across different control groups indicated a non-significant effect of performance-based funding on degree completion. However, the authors found some interesting facts: performance-based funding states had higher college enrollment levels with lower state appropriations per full-time equivalent, but they provided higher financial aid to individual students. In conclusion, Tandberg and Hillman (2014) suggested that the identified non-effect of performance-based funding did not necessarily mean that performance-based funding policy was ineffective because it could take a longer period of time for performance-based funding to manifest its effect on degree completion.

The findings of Rutherford and Rabovsky (2014) put the capacity of performance-based funding policies in improving the student outcomes in question. In their study, they used panel data analysis to examine the effect of performance-based funding across the U.S. from 1993 to 2010. Variables reflecting PF 1.0, PF 2.0, as well as the length of their implementation were all included in the statistical models. The authors found that PF 1.0 had a negative impact on graduation rates and degree completion, and no effect on retention. While PF 2.0 was not found to have negatively affected graduation rates, its impact on degree completion was negative.

Recognizing that the specific design and implementation of performance-based funding policy varies from state to state due to diverse higher education contexts, a number of studies examined the impact of performance-based funding policy on student outcomes in one particular state. Using Spline Linear Regression, Sanford and Hunter (2011) examined whether the improved design of Tennessee's performance-based funding policy improved student retention and graduation. They found that the changes in the performance-based funding policy did not result in any statistically significant improvement in student retention and graduation. They also suggested that public higher education institutions in Tennessee seemed to be able to satisfy state performance criteria without making actual improvements in student outcomes and other areas of institutional performance.

The study by Jenkins et al. (2012) used both qualitative and quantitative research methods to assess Washington's Student Achievement Initiative (SAI)—a performance-based funding program designed specifically to improve retention and degree completion in community colleges. They found that while the SAI seemed to be raising awareness about improving student success among administrators and faculty members, the statistical analysis did not reveal any positive impact of the SAI on student outcomes. They believed that this was partly due to the modest amount of funding tied to the performance measures.

Similarly, a study by Hillman et al. (2015) did not reveal any significant effect of the SAI on improving student retention or the number of students who earned long-term certificates, but it did find a lagging effect on associate's degree completion and the increased number of short-term certificates. In this study, Hillman et al. (2015) constructed three control groups to compare with Washington: WICHE member states that do not have performance-based funding, neighboring states without performance-based funding, and propensity score matched states. The quasi-experimental techniques implemented in this study yielded more robust results which showed the modest effect of the SAI on student outcomes.

In Pennsylvania, the performance-based funding policy, which is applied to its 4-year institutions, uses 2.4% of the state's annual higher education funding to award institutional performance. Cavanaugh and Garland (2012) reported that the performance-based funding program boosted higher education achievements in Pennsylvania: four-year graduation rates increased by 8%, the annual baccalaureate attainment increased by 12%, and there was also a significant increase in the second-year persistence of Hispanic students. However, according to the findings of Hillman, Tandberg and Gross (2014), Cavanaugh and Garland's (2012) findings may have exaggerated the effect of

Pennsylvania's performance-based funding program. Hillman et al. (2014) found that the performance-based funding had a significant, but very small, effect on improving degree completion only when institutions in the Northeast Region were used as the control group; a slightly greater than 1.2% increase in degree completion was attributable to the implementation of performance-based funding. Considering the possible lagging effect of the performance-based funding policy, the authors also used the graduation rates with a 4-year lag. In this scenario, performance-based funding was found to have a very small effect when compared with the neighboring states control group and the control group of all of the states. The findings of Hillman et al. (2014) are more robust than Cavanaugh and Garland (2012) because of the rigorous statistical methods used in identifying policy effects and control groups. However, Hillman et al. (2014) might be too hasty in suggesting that performance-based funding is not an effective policy instrument for improving college completion.

The Relationship between Expenditures and Educational Outcomes

All discourses on performance-based funding policy in effect revolve around education productivity. Many of the empirical studies that examine the impact of performance-based funding on student outcomes implicitly conceptualize a production function between educational input and student outcomes. The theory of action concerning such policies also implies a functional relationship between educational input and output. Therefore, it is useful to draw upon literature specifically examining education productivity to gain a better idea of how performance-based funding policy can be operationalized at the campus level to improve student outcomes.

Although some may argue that higher education productivity can be only poorly understood by a production function (Fortune, 1993; Hodas, 1993; Levin, 1993), investigating the relationship between educational input and educational outcomes from an economic perspective can still offer valuable insights, and approaching such a relationship via a production function is both useful and meaningful (Monk, 1992; Monk, 1993). Studies that used production function on education productivity to examine secondary education and higher education generally found a positive relationship between educational input and student outcomes (e.g., Hedges et al., 1994; Greenwald et al., 1996; Card and Kruger, 1996; Zhang, 2009; Astin, 1993). Hanushek (1997) is one of the very few studies that indicated a rather ambivalent relationship between financial resources and educational outcome.

Greenwald et al.'s (1996) exhaustive meta-analysis of studies on educational production showed that increased input in education resources could have a significantly positive impact on student achievement. In fact, these authors asserted that even a small increase in educational expenditure could remarkably improve student outcomes. In Card and Kruger (1996), the authors used educational attainment and earnings, instead of test scores, to measure educational output. Relying on a natural experimental setting created by educational policies during the segregation era in North Carolina and South Carolina, Card and Krueger (1996) found that school resources had an impact on individual students' educational attainment and future earnings. A later study by Pritchett and Fulmer (1999) further suggested that increasing spending on educational resources, such as instructional materials and technology, was more effective in improving learning than paying higher salaries to teachers.

Studies that dealt with the impact of financial input on student outcomes in higher education came to similar conclusions. In the higher education sector, spending as an educational input is either measured by the state funding level or by individual institutions' expenditures. Zhang (2009) showed a positive relationship between the state funding level and graduation rates at public 4-year institutions. Using a panel data approach, the author compared between-institution, within institution fixed-effects, and random-effects models, and found that state appropriations were positively associated with higher graduation rates in all models. The author further conducted a disaggregated analysis that used within institution fixed effects models by grouping public higher education institutions according to the trend of state funding, showing that for institutions receiving decreasing funding from the state, a 10% reduction was associated with a 0.56 percentage point drop in graduation rates, whereas in institutions receiving an increasing level of state funding, a 10% increase was associated with a 0.64 percentage point increase/rise in graduation rates.

Studies that used institutional expenditures as a measure for educational input also indicate that student academic achievement is positively affected by institutional spending. Even studies whose main interests are not in explaining the relationship between institutional expenditure and graduation rates indicated similar results (e.g., Porter, 2000; Smart et al., 2002). A study by Ryan (2004) showed that expenditures on instruction and academic support positively affected degree attainment. In this study, Ryan (2004) used expenditures on instruction, academic support services, extracurricular activities, and administrative functions as spending indicators. Based on the results of multiple regression analysis, Ryan (2004) argued that increasing spending on categories that could directly affect students' learning would have a positive effect on degree attainment, whereas increasing spending on other categories would result in reduced financial resources for instruction and academic support, and therefore could negatively affected students' academic achievement. Similarly, Gansemer-Topf and Schuh (2006) also showed that institutional expenditures on instruction, academic support and institutional support had positive effects on first-year retention rates and graduation rates by using private baccalaureate institutions as their samples.

As part of the effort to understand the impact of college on students, Astin (1993) found that spending on student services was significantly related to many measures of student outcomes, while spending on instruction had only a very limited effect on students. In this study, instead of using the traditional input-output function, Astin (1993) presented an input-environment-output framework, in which expenditures on students were treated as an environment variable. Within this framework, Astin (1993) examined how different college environments affected student growth and how differences in spending across different higher education institutions might have varied impacts on student achievement. Webber and Ehrenberg (2010) echoed Astin (1993), showing that student service expenditures were associated with higher retention and graduation rates in less prestigious institutions, which had lower entrance test scores and a larger portion of students who received the Pell Grant. In addition, Webber and Ehrenberg (2010) found that a higher level of research expenditures per student did not seem to improve graduation rates.

Belfield and Thomas (2000) specified their production function by examining the relationship between college expenditures and institutional performance which was measured by the scores of each college's inspection report. They found that in general, higher institutional expenditure was associated with better performance, but they cautioned that this finding did not necessarily sustain the argument for increasing spending to improve performance. At the same time, they found little relationship between per student expenditures and institutional performance. On the other hand, using data collected by the State University of New York, Blose et al. (2006) indicated that a higher level of spending per student was not only associated with higher graduation rates but also earlier graduation. The variances of the effect of per student expenditures speaks about the complexities in the process of education production, but it is indisputable that better student outcomes are associated with increased spending that contributes to student development.

As is shown by studies investigating the relationship between educational input and student outcomes, increased financial input has positive effects on student outcomes. Especially in higher education, increased expenditures on functional categories that directly contribute to students' academic and social integration improve retention and graduation rates. This implies that for performance-based funding policy to effectively improve student outcomes, it must motivate public colleges and universities to be more committed to student success by increasing spending on instruction, student services and academic support. It is, therefore, necessary to investigate if public colleges and universities subject to performance-based funding policy are able to allocate more financial resources to student-related categories. Such knowledge improves our understanding of the policy implementation at the institutional level and yields insights to state policymakers and campus leaders into how they can work together to make performance-based funding policy an effective instrument in the achievement of state higher education goals.

CHAPTER 3

CONCEPTUAL FRAMEWORK

An important assumption that underlies performance-based funding policy is that financial incentives will motivate public colleges and universities to prioritize state higher education goals and improve student outcomes. As state policymakers seek a more parsimonious funding approach to meet the state's growing need for human capital, performance-based funding policy appears to be a rational choice for state policymakers. Because colleges and universities are the critical intermediaries who bring to pass what the state government desires to accomplish, how performance-based funding policy influences their organizational behaviors and activities can make a difference in the accomplishment of the ultimate policy goals. In other words, the effectiveness of performance-based funding policy in improving student outcomes not only depends on the design of the policy per se but also relies on the ability of public higher education institutions to fully carry out this policy. The process of translating desired policy goals into concrete practices and actions is what McDonnell and Elmore (1987) defined as "a theory of action". This concept captures the theoretical assumptions hold by policymakers that performance-based funding policy will incentivize public colleges and universities be more committed to student learning and produce better student outcomes.

As performance-based funding has come to be viewed as a more operative and practical way to improve student outcomes (Burke, 2002; Burke, 2005; Complete College American, 2013; Dougherty, Natow et al., 2015; Harnisch, 2011; Lumina Foundation, 2009; Zumeta and Kinne, 2011), it is implied that public higher education institutions assume the responsibility of operationalizing performance-based funding policy by choosing appropriate processes and practices. Through such efforts, performance-based funding policy can improve institutional effectiveness, and ultimately student outcomes. The organizational impact of performance-based funding policies can encompass a myriad of dimensions. In fact, as studies in the previous chapter have revealed, public colleges and universities adopt different strategies for operationalizing performance-based funding policy. While each of these practices is expected to influence student outcomes, some are more direct and effective than others; some reflect a genuine commitment to improving student outcomes, while others may be more interested in generating good results with little organizational adjustments. Economic theories and resource dependency theory offer useful theoretical frameworks to understand the impact of performance-based funding policy on public colleges and universities. These theoretical perspectives complement each other in the analysis and the interpretation of the policy effect on institutions' commitment to student success.

The Economic Perspective

The economic perspective assumes that decision makers are rational. In allocating scarce resources, they are guided by the ideology of utility-maximization. The pre-defined set of objectives and goals allows decision makers to estimate the utility of different choices and choose the one that has the highest utility. For business firms, profit maximization, in most cases, is equivalent to utility maximization, making the calculation of utility a straightforward mathematics problem. For public higher education institutions, however, utility often cannot be measured by monetary output, nor can it be easily defined by a set of quantifiable measures. For this reason, Pondy (1970) suggested that the maximization of discretionary resources can serve the purpose of utility maximization for non-profit organizations, such as public higher education institutions: "…the concept of discretionary resources provides us with a means of generalizing the profit-maximizing assumption to a nonbusiness-firm analog, to wit, that organizations seek to allocate resources in such a way as to maximize discretionary resources…." (p. 277). For public colleges and universities, state appropriations constitute one of their major revenue sources. According to Pondy's (1970) claim, since a larger amount of state dollars will be appropriated based on student outcomes (Labi, 2005), public colleges and universities should act upon performance-based funding policy by strengthening their commitment to student success.

Principal-Agent Theory

The relationship between a state and its public higher education institutions can be viewed from a principal-agent perspective (e.g., Tandberg & Hillman, 2014). In the principal-agent model, the principal pays the agent for certain desired outcomes that the principal itself does not possess the necessary resources to achieve. Under the principal-agent model, the state government acts as the principal, and public colleges and universities are its agents for producing the desired outcomes expected by state government. The principal-agent theory further recognizes that the agent and the principal can differ from one another in significant ways. For example, the principal and the agents have their own interests and preferences. They also have different stakeholders and constituencies. Due to these differences, agents may have the tendency to seek their own interests using the resources provided by the principal.

Given that graduation rates are used as performance indicators in performance funding policies, empirical research has frequently examined the impact of performance-based funding policy on graduation rates as the indicator of policy effectiveness (e.g., Tandberg and Hillman, 2014; Hillman et al., 2015). A major flaw in understanding the efficacy of performance-based funding using graduation rates or other student achievement indicators as the outcome variables is that it fails to acknowledge the significant role of student attributes in academic achievement. Studies on student persistence and college completion (e.g., Strage, 1999; Cerna, Pérez & Sáenz, 2009; Willingham, 1985) have indicated that graduation, degree completion and other student outcomes are dependent upon a wide array of factors, and students' individual attributes can be more important determinants than institutional-level factors. The agent—public colleges and universities—may have done all they could to improve student learning, but graduation rates may still remain flat. Given that higher education institutions may only be able to improve graduation rates indirectly, my study uses institutional expenditures on instruction, student services and academic support as the outcome variables and, thus, allows the principal-agent perspective to be more sufficient to account for the (in)effectiveness of performance-based funding policy in incentivizing public higher education institutions.

Although the relationship between state government and its public higher education fit the principal-agent model, it must be noted that public colleges and universities are also held accountable by other stakeholders. Lane's (2007) analysis indicated a "spider-web" of public higher education's external oversight, including state legislatures, state governing boards, federal government, accrediting agencies and other informal stakeholders. This means that public colleges and universities actually have more than one principal. Having multiple principals can limit the agent ability to fully satisfy the requirement of any of its principal (Whitford, 2005; Koppell, 2005).

The Resource Dependency Perspective

Resource dependency theory contends that the so-called rational criteria in decision making within an organization can easily be violated. As Pfeffer (1977) pointed out, it is almost impossible for an organization to follow the so-called rational criteria in making decisions, due to the diverse goals of an organization, different preferences for prioritizing these goals, and competing perspectives regarding the means to an end. The amount of money allocated to each area is thus subject to power and influence. According to resource dependency theory, resource allocation within an organization is a political process. Organizational characteristics can play a dynamic role in this process.

By viewing resource allocation within an organization as a political process, resource dependency theory also acknowledges that an organization conducts itself in the context of social control according to its external environments. An organization's internal activities, resource allocations in particular, are shaped by the influence and power of an organization's resource providers. In fact, this is one of the fundamental arguments of resource dependency theory. Because an organization must obtain resources from its external environment, it invariably develops dependency on its resource providers. According to Pfeffer and Salancik (1978):

> Because organizations are not self-contained or self-sufficient, the environment must be relied upon to provide support. For continuing to provide what the organization needs, the external groups or organizations may demand certain actions from the organization in return. It is the fact of the organization's dependence on the environment that makes the external

> constraint and control of organizational behavior both possible and almost inevitable. (p. 43)

As is pointed out by Pfeffer and Salancik (1978), an organization's need for resources from its environment creates its reliance on the resource providers and dependence upon the environment. As organizations, public universities and colleges draw their resources from various external stakeholders. Each public higher education institution draws its revenues from tuition, government grants, and endowments, in addition to state appropriations. Because of their dependence on the environment, public colleges and universities have to give in to the control and influence of their resource providers, and these external influences are usually reflected in how public colleges and universities allocate their resources to organize teaching, research and public service. Changes in external financial resources can often result in adjustments in resource allocation. Therefore, to investigate whether performance-based funding policy has made public higher education institutions to be more committed to student success, it is necessary to control for other financial variables of an institution.

Undoubtedly, being held accountable by different stakeholders can create conflicts and problems for public higher education institutions. Meeting the demands of one interest group can often entail possible failures to satisfy the expectations of another group, especially when stakeholders impose competing demands. According to Pfeffer and Salancik (1978), an organization's solution to the issue of conflicting demands from various stakeholders is determined by its dependence on each interest group. Three factors are identified by Pfeffer and Salancik (1978) as the critical determinants:

> First, there is the importance of the resource, the extent to which the organization requires it for continued operation and survival. The second is the extent which the interest group has discretion over the resource allocation

> and use. And, third, the extent to which there are few alternatives, or the extent of control over the resource by the interest group, is an important factor determining the dependence of the organization. (pp. 45-46)

For public colleges and universities, the resources needed are primarily financial resources; therefore the criticality of the resource has largely to do with the amount of the resource. If the amount of performance-based funding is rather small, it may not provide strong enough motivation for public colleges and universities to be more committed to student success. Different designs of performance-based funding policy may also have different impacts on how public colleges and universities allocate money for instruction, academic support and student services. In addition, the dependence of an institution on its interest groups is determined by the amount of the interest group's provision. Since public 2-year colleges and public 4-year institutions systematically differ in their external environments, their responses to performance-based funding policy at the institutional level may display different patterns.

Given that performance-based funding policy has placed a much greater emphasis and focus on improving student academic achievement, with an increased amount of state dollars tied to student outcomes (Labi, 2015), I hypothesize that public higher education institutions subject to performance-based funding policy will prioritize expenditures on students in comparison with public higher education institutions in non-performance funding states.

Based on this hypothesis, public colleges and universities under this new wave of performance-based funding policy should allocate more resources to areas that directly contribute to student achievement. Such changes in institutional spending reflect a strengthened commitment to student success. Dougherty et al. (2016) showed that public colleges and universities have adopted new practices and programs in response to performance-based funding policy and other performance-oriented initiatives. However, to have a more informed understanding on how public colleges and universities are impacted by such policies, quantitative evidence are needed, especially since performance-based funding policy is an incentive based funding strategy. Knowing whether public colleges and universities are enabled to increase their expenditures on instruction, student service, or academic support has important implications for policymaking. It is also a significant step toward understanding how performance-based funding policy can improve student outcomes. Without such quantitative evidence, the organizational impact of performance-based funding policy on public higher education institutions is very poorly understood, and examining the impact of performance-based funding on student outcomes with such limited understanding could yield misleading conclusions regarding the efficacy of this policy.

CHAPTER 4

RESEARCH DESIGN AND METHOD

Research Design

This quantitative study used the difference-in-differences (DID) method to examine whether public colleges and universities became more committed to student success due to performance-based funding policy, i.e. whether performance-based funding policy enabled public higher education institutions to translate their commitment to student success into concrete actions. Three states were selected for policy analyses: Indiana, Louisiana and Washington. Because each of these states had a unique performance-based funding policy, policy impact was analyzed state by state using the DID method.

After an investigation of how performance-based funding policy affected institutional spending on instruction, student services, and academic support in each of these states through the DID approach, I then compared whether different policy designs had varied impact on an institution’s commitment to student success. In addition, I also examined whether performance-based funding policy impacted public 2-year institutions and public 4-year institutions differently.

The selection of these states for policy analyses was based on two major reasons: first, the performance-based funding programs in these states must have been implemented in comparatively recent years and had not been interrupted since implementation. Second, their performance-based funding policies should contain certain distinctive or representative features. For example, in Louisiana, the state government did not directly appropriate money to the performance-based funding program; instead, Louisiana allowed public colleges and universities to raise tuition by 5-10% once they met performance benchmarks. Indiana had a more popular performance-based funding formula, which assigned a certain portion of state appropriations to reward performance. Washington's Student Achievement Initiative (SAI) was specifically designed to improve 2-year institutions, and was regarded by some (e.g. Jenkins, Wachen, Moore & Shulock, 2012) as a model of PF 2.0, while others (e.g., Dougherty and Reddy, 2013) argued that the SAI is essentially a PF 1.0 containing PF 2.0 features.

The Difference-in-Differences Method

In order to examine the impact of performance-based funding policy on institution's commitment to student success, it is important to rightly determine whether the observed changes are due to performance-based funding policy. Unlike laboratory experiments, social-science experiments are often faced with the formidable challenges of endogeneity, self-selection bias, and missing counterfactuals. These issues underscore the importance of applying quasi-experimental techniques to analyze policy effect. Such approaches enable one to more accurately approximate policy impact.

One of the most commonly used quasi-experimental designs to identify policy effect is the DID method. It has been used in many studies in the education field to examine the effect of a public policy (e.g., Dynarski, 2004; Long, 2004; Garces, 2013). The basic assumption of the DID method is that, in the absence of the intervention, the unobserved differences between the treatment group and the control group will remain unchanged. Therefore, it is possible to identify policy effect by comparing the difference between the treatment group and the control group after the intervention with the difference between the treatment group and the control group before the intervention. This can be expressed by the following equation:

$$(E(Y_{1t1}) - E(Y_{0t1})) - (E(Y_{1t0}) - E(Y_{0t0})) = \Delta \qquad (1)$$

As equation (1) indicates, four essential elements are needed to implement DID modeling: the treated group (Y_1), the control group (Y_0), and the two time periods (t_0, t_1). The treated group contains units that are subject to the policy intervention. For this study, the treated group consisted of public higher education institutions in Indiana, Louisiana, and Washington respectively. The control group was composed of public higher education institutions from states that were not subject to a performance-based funding policy. Time period t_0 denotes the pre-treatment period, and t_1 denotes the post-treatment period. In equation (1), $E(Y_{it1})$ is the conditional mean for the post-intervention period of the treatment group if i=1 and that of the control group if i=0. $E(Yit_0)$ represents the conditional mean during the pre-intervention period of the treatment group when i=1 and that of the control group when i=0. The difference between these two groups of means, Δ, is the indicator of the policy effect. The fact that Indiana, Louisiana, and Washington recently implemented performance-based funding policies with a number of states never having performance-based funding policies presents an ideal scenario to examine the impact of performance-based funding policy on public higher education institutions with the DID method.

An additional advantage of the DID method is that the statistical model can be represented by a regression framework, which allows other covariates to be included to control for characteristics that differ across higher education institutions. Scholars

(Shadish, Cook & Campell, 2002) have noted that a quasi-experimental method can still be quite limited for detecting whether a causal relationship truly exists between a policy and the observed effects. Adding covariates into the basic model helps to rule out other factors that may be causing the change and, therefore, increases the capacity of the DID method to make causal inferences. The DID model which includes covariates is expressed by the following equation:

$$Y_{it} = \alpha + \beta_1(PF) + \beta_2(post) + \beta_3(PF * post) + \mho X_{it} + \varepsilon_{it} \qquad (2)$$

where the performance-based funding policy (PF) variable takes the value 1 if an institution is in the treatment group, or 0 if an institution is in the control group. The post-treatment variable (post) is also a dummy variable, and it is set to be 1 in the post-treatment years and 0 in the pre-treatment years. X_{it} represents control variables. β_3 is the DID estimator which indicates the effect of performance-based funding policy on public higher education institutions.

Because the datasets for the state studies are all panel data, I used fixed-effects models to control for unobservable factors at the institutional level. The results of the F-test (see APPENDIX B) showed that panel data models are better than pooled models. Therefore, equation (2) is re-specified as follows:

$$Y_{it} = \alpha + \beta(PF * post) + \mho X_{it} + \gamma_i + \delta_t + \varepsilon_{it} \qquad (3)$$

where γ_i is the institutional fixed effect, and δ_t is the time-fixed effects. β is the estimator of interest. Variables of PF and post in equation (2) were excluded to avoid collinearity. Although the Hausman test[4] (Greene, 2012) is usually conducted in panel data analysis to determine if a fixed-effects model is superior to a random-effects model, the fixed-effects model should be used when applying the DID method.

The control states were listed in APPENDIX A. Each treatment group was compared against a national control group and a regional control group. In a nutshell, for the state of Indiana, public 4-year institutions from states which did not have performance-based funding policies from 2004 to 2012 were used as its national control group. For Louisiana, public 4-year institutions which did not have a performance-based funding policy from 2004 to 2014 were used as its national control group for public 4-year institutions. For public 2-year colleges, an identical national control group was used for both Louisiana and Washington. This national control group was composed of public 2-year colleges from states that did not a have performance-based funding policy in its public 2-year system from 2004 to 2014. The regional control group for each treatment group contained control states in the same geographical region as the treated states. The purpose of creating two control groups is to enhance the robustness of the estimation strategy.

Information on a state's higher education financing and its performance-based funding policy is synthesized and cross-checked by referring to a variety of sources, including studies and reports (e.g., Tandberg & Hillman, 2014; Dougherty et al. 2010; Dougherty & Natow, 2009; Miao, 2012; Harnisch, 2011), news media coverage and the National Congress of State Legislators' website, and the websites of state higher education governing boards, which contain relevant information. Note that Illinois and Florida, which I included in the nationwide control group for Indiana, had performance funding programs in the 1990s, but both programs ended well before 2004 (Dougherty & Natow, 2009). Additionally, the structure and the implementation of these so-called performance funding programs were essentially different from the performance-based funding program in question. These two were excluded from Louisiana's nationwide control group for public 4-year institutions because they both started a performance-based funding program after 2011.

When policy effect was found to be statistically significant, I conducted a placebo test. A placebo was constructed by randomly choosing a time point that occurred during the pre-treatment period as a false implementation year, and then, I ran the DID model with the placebo to test if the false policy impacted the outcomes variables. If the estimator of the placebo policy was significant, it implied that the previously estimated policy effect may not be authentic. If the estimator of the placebo policy was not significant, the identified effects of a performance-based funding policy were robust.

Data Collection

The data for this study was collected from the Integrated Postsecondary Education Data System (IPEDS), which is an on-line educational data system and is accessible for public use. The dependent variables (Y_{it}) which were chosen to measure an institution's commitment to student success were institutional expenditures on instruction, student services, and academic support. These variables were also measured in relative terms by dividing instructional expenditures, student services expenditures, and academic support expenditures by an institution's total expenditures, which was the sum of an institution's operating and non-operating expenses and other deductions. Because performance-based funding policy is designed to motivate public colleges and universities to improve on student outcomes, an effective performance-based funding policy must enhance an institution's commitment to student success. My hypothesis was that public higher education institutions subject to a performance-based funding policy would allocate more resources to at least one of those areas that is directly related to student development.

The covariates included in the statistical analyses are presented by X_{it} in the equation. They are: the enrollment of full-time undergraduate students (full-time enrollment); the enrollment of part-time students (part-time enrollment); percentage of black students (% black) used to proxy institutional diversity; percentage of students who received any financial aid (% receiving FA); graduation rates; and first-year retention rates. These covariates represent some of the observable factors that may affect an institution's spending on student-related categories.

Covariates on institutional finances were also controlled in the DID models. In terms of revenues, public colleges and universities have revenue sources besides state appropriations and tuitions. In terms of expenditures, student-related categories represent only one area of their overall spending. A public higher education institution's response to the shift in state funding method can be affected by its revenues from other sources as well as its spending in other areas. The financial variables included in the statistical model were represented by administrative costs, which were measured by spending on the institutional support; other revenues were generated by deducting revenues from tuition and state appropriations from an institution's total revenues, the weight of tuition in an institution's total revenues (tuition/revenues), and the weight of state appropriations in an institution's total revenues (state funding/revenues). Note that an institution's institutional support, total revenues, tuition and state appropriations were directly obtained from IPEDS. According to IPEDS definitions, institutional support measures an institution's expenses for operational support and administrative services; an institution's total revenues include revenues from all tuition and fees, appropriations, auxiliary enterprises, endowments and other contributions. Tuition includes both tuition and required fees that students paid for a full academic year. State appropriations represent the amount of money that an institution received from a state to cover its day-to-day operating expenses. The dollar amount for each financial variable was transformed to constant dollars of 2015, and natural log-transformation was used to normalize all financial variables as well as full-time enrollment and part-time enrollment.

Limitations

This study only examined the average policy effect on student-related expenditures across the public 4-year institutions or public 2-year colleges. One must be aware that specific institutions subject to a performance-based funding policy can vary from one another as they allocate funding to instruction, student services, and academic support. Additional studies using ethnographic case study approach (see e.g., Ness, Deupree & Gándara, 2015), or intensive case studies with more detailed institutional level data, can draw comparisons among institutions and further articulate policy impact on institutional resource allocation.

Another major limitation of this study has to do with accurate identification of states that have/do not have performance-based funding policy. Tandberg and Hillman (2013) discussed the difficulties of studying performance-based funding policy and mentioned that the availability of accurate data regarding when each state implemented, discontinued or re-adopted such funding strategies was limited, and verification of the available data was difficult; thus, an accurate identification of the actual policy effects can be elusive. Of the selected states, Washington actually had a performance-based funding program from 1997-1999. However, since this program was simply a budget *proviso* and ended long before the implementation of the SAI in 2007, I considered the 1997 performance-based funding program to have barely had any effect on public colleges. For Indiana, although the full-fledged performance-based funding program was implemented in 2007, performance measures on research productivity were applied to research institutions in 2003. However, the 2003 precursor to the 2007 performance-based funding program was actually very different in terms of performance measures, the amount of funding tied to research productivity and the institutions to which such a program was applied, therefore I agreed with many studies (e.g., Harnisch, 2011) in using 2007 as the year when Indiana implemented a performance-based funding policy.

The empirical approach used to examine the impact of performance-based funding policy on institutional resource allocation is practical but limited in at least five aspects. First, this approach cannot model the revisions made to the policy as the details of policy design varied from time to time since the states implemented the policy. Both Indiana and Washington made changes to their original policy designs by either changing performance metrics, or the amount of financial incentives. Second, since the IPEDS data did not contain more detailed information on state higher education policy or institutional finances, this study was not able to test if any differentiated policy effects were associated with the amount of money designated as performance dollars. Future studies may be able to refine the statistical models by obtaining data on the actual amount of money assigned to performance-based funding policy. Third, although Indiana implemented performance-based funding policy in its 2-year colleges, these institutions were aggregated and reported to the IPEDS as a single institution. Therefore, the public

2-year system in Indiana was not included in the analyses of this study. Fourth, because I applied two way fixed-effects DID model, variables representing institutional type (Baccalaureate, Master, and Doctoral) of public 4-year institutions are not included in the model to avoid collinearity. It is likely that different types of public 4-year institutions would respond differently to performance-based funding policies. Fifth, even though this study used a regional control group along with a national control group, future studies can improve the rigor of the control group. Because each state can differ greatly from one another in higher education contexts, creating a control group that is most similar to the treatment states may yield more robust results. In order to create such control groups, one must collect variables on state demography, economy, politics, etc. and devise a sound identification strategy.

Because performance-based funding policies may have lagged effects on spending (and ultimately on student outcomes), I ran models examining the effects of using a one-year post-implementation lag. In most instances, these models showed no significant policy effects. When more data become available for the post-implementation periods, finding out how public higher education institutions were responding after two, or three years of the initial policy implementation could yield more insights into policy effects.

CHAPTER 5

STATE ANALYSES

In this chapter, I present the state analyses for Indiana, Louisiana and Washington respectively. Each state study begins with a brief introduction of the state's performance-based funding policy along with other relevant contextual information. Then I present the statistical results of the Different-in-Differences analyses. The findings indicate that performance-based funding policy has not yet made an overwhelming impact on public higher education institutions in terms of their expenditures on student-related categories.

The Indiana Story

As the 16th most populous state in the U.S., Indiana places great emphasis on education. The public 4-year sector in Indiana is composed of 6 universities, with Purdue University and Indiana University-Bloomington as the state's flagship institutions. The multiple campuses of Indiana's universities spread throughout the state. The public 2-year system in Indiana includes Ivy Tech Community College of Indiana, which has 31 campuses, and Vincennes University, with 2 campuses. Over the years, Indiana has implemented a number of notable initiatives to improve student outcomes. For example, the 21st Century Scholars program offers financial assistance to high school students who meet the income level and helps them to succeed in college. Indiana is also being recognized for its efforts to strengthen the connection between K-12 and higher education.

All public higher education institutions are under the supervision of the Indiana Commission for Higher Education, which is a coordinating governing board responsible for developing and implementing public higher education policies. The state legislature of Indiana follows a biennial budget cycle, with budget activities usually taking place in odd years. The state funding for public higher education in Indiana encompasses funding for campus operations, funding for capital projects, student financial aid and other miscellaneous items having to do with higher education. Among these categories, funding for campus operations takes up more than 70% of the state higher education budget. The performance-based funding dollars are parsed out from the funding for campus operations.

The performance-based funding policy in Indiana is part of the state's "Reaching Higher" initiative. The Indiana Commission for Higher Education initiated the performance-based funding program and played the leadership role in developing performance metrics and determining the amount of performance dollars. With the Commission members as the primary decision makers, Indiana's Governor, members of state General Assembly, and other chief public higher education stakeholders supported the policy process by offering guidance and suggestions. Aligning the state's need with institutional goals and ensuring the relevance of performance measures to all institutions are the Commission's guiding principles in framing the performance measures. The Commission for Higher Education is also responsible for the continual management and maintenance of the performance-based funding program.

In the first year of the performance-based funding program, Indiana set aside 5% of the state appropriations to reward performance. This amount also represented 65% of the marginal increase in state appropriations that year (HCM Strategist, 2011). College completion, which was measured by the increase in the number of degrees awarded at each institution, and "on-time" graduations (four years for a bachelor's degree; two years for an associate's degree) as well as student transfers, were the major areas measured by the performance metrics. At the same time, Indiana also revised its enrollment-based funding by counting enrollment at the end of the semester (Miao, 2012). In this way, even the enrollment-based funding in Indiana puts an emphasis on student outcomes.

The financial reward for meeting the performance benchmarks can vary according to the availability of funds and changes in performance funding metrics. For the first two years of performance-based funding policy in Indiana, more than half of the marginal increase in state higher education appropriations was designated as performance dollars. However, since 2009, with no increase in state appropriations, no extra state dollars could be assigned as performance-based funding. The Commission for Higher Education had to incorporate the performance-based funding metrics into the base funding formula, and has since used this strategy to maintain the performance-based funding policy (HCM strategist, 2011). Such a change meant that 5% of each institution's base funding would be held back and be released to each institution based on their performance. Strokes' (2011) coverage on Indiana's performance-based funding indicated that the state of Indiana was making an effort to increase the percentage of performance dollars to 6% in state higher education appropriations. Lahr et al. (2014) further noted that, instead of holding back the entire 6%, 3.8% would be used as "new money," and 2.2% would be released later based on performance.

Indiana's performance funding metrics underwent many revisions since it was first implemented in 2007. For example, when performance-based funding was first launched in 2007, 2-year colleges were awarded for student transfers and workforce development, but these metrics were no longer used after 2010. Increases in enrollment were included in performance funding metrics up to 2012, but were replaced by metrics of student persistence and completion of remediation courses since then. Metrics awarding the degree completion of underrepresented students were added in 2009. Since 2013, the Commission also added the completion of a high impact degree to funding metrics and allowed each institution's self-defined productivity metrics to be included as one component of the performance funding formula (CHE, 2016). Current performance measures that are used to calculate performance dollars for each institution can be grouped by completion measures and progress measures, and only in-state students are counted by these measures[5].

In terms of the amount of money attached to each performance measure, the initial policy design was that a public 4-year institution will be rewarded with $5,000 for each additional bachelor's degree in each of the college completion measures—i.e., an institution gains $5,000 for producing an additional bachelor's degree and another $5,000 if this bachelor's degree is completed in four years. For 2-year institutions, an additional student transferring to a 4-year institution entails a reward of $1,500 (Crellin, Aaron, Mabe, & Wilk, 2011). A more recent report by the Indiana Commission for Higher Education[5] indicated that in 2015, $66.5 million out of nearly $1.3 billion in state higher funding was designated as performance dollars. Indiana Commission for Higher Education further refined the weights and financial reward associated with each performance measure to differentiate higher education institutions with different missions. Performance improvement is gauged by comparing each college with its own achievement in the past six-year period. With the newly adjusted weights for each performance measure, each college will reap the largest amount of performance dollars as they fulfill their own institutional missions.

Up to now, Indiana has implemented its performance-based funding program for nearly ten years. Indiana's Commission for Higher Education seemed to have successfully incorporated performance-based funding into the traditional funding models. The performance-based funding program in Indiana has been applied to both the public 4-year system and public 2-year system. The statistical analyses in this study only examined the impact of the performance-based funding program on Indiana's public 4-year system, due to the fact that public 2-year institutions were aggregated together as Ivy Tech Community College and reported to IPEDS as a single institution.

The data analysis for Indiana's public 4-year system covered the years from 2004 to 2012 for the purpose of being able to construct a more inclusive pool for the control group, as a number of states have performance-based funding policies that took effect in 2013. The strongly balanced panel dataset was created by eliminating observations containing missing values, and any institution that failed to report for all the years investigated in this study. After data cleaning and balancing, there were 126 observations in the treatment group and 2,430 observations in the control group. Dummy variables representing institutional missions were created to differentiate Baccalaureate, Master and Doctoral institutions. Log transformation was applied to financial variables and student enrollment variables to correct the positively skewed distribution.

Table 1. Descriptive Statistics (IN's public 4-year sector in comparison from 2004-12)

	Indiana		National Control		Regional Control	
Variables	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Expenditures ($000)						
instruction	136822.60	181811.70	118854.40	160177.60	128068.30	167206.10
student services	12941.08	14177.73	18696.11	18673.69	20542.78	20150.58
academic support	29274.34	44243.65	32671.03	50628.87	36611.59	54842.83
administrative costs	31005.44	40881.97	28188.24	29413.94	25231.29	28397.19
total expenditures (exp)	371744.70	504120.10	421139.70	692217.20	488124.30	874113.40
Income ($000)						
tuition	119870.40	172386.30	87177.50	104367.90	108281.20	140438.30
state funding	94799.12	104053.70	105079.70	119837.80	94441.20	106837.10
total revenues	405130.50	555637.80	454888.00	753234.10	518162.60	948052.90
Enrollment (in 100s)						
full-time enrollment	107.12	97.29	104.02	81.39	103.99	78.97
part-time enrollment	37.21	24.42	34.02	33.82	31.16	24.31
Other characteristics						
%receiving financial aid	77	8	81	13	83	10
% of black students	8	6	14	22	7	11
retention rates	0.67	0.10	0.74	0.11	0.74	0.09
graduation rates	0.36	0.17	0.46	0.17	0.50	0.15
doctoral	0.36	0.48	0.34	0.47	0.37	0.48
master	0.43	0.50	0.51	0.50	0.47	0.50
baccalaureate	0.21	0.41	0.15	0.36	0.17	0.37
Derived variables						
instruction/exp	0.40	0.07	0.34	0.07	0.34	0.08
student service/exp	0.06	0.02	0.07	0.04	0.08	0.04
academic support/exp	0.08	0.04	0.08	0.03	0.09	0.03
tuition/revenues	0.32	0.07	0.24	0.11	0.28	0.10
state funding/revenues	0.33	0.09	0.31	0.10	0.27	0.09
N	126		2430		522	

Table 2.1 Models for instructional expenditures in IN's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
PBF	-0.05**	-0.02	-0.02	-0.02
	(-2.81)	(-1.48)	(-1.52)	(-1.08)
other revenues			0.33***	0.35***
			(14.21)	(6.29)
administrative costs			0.09***	-0.01
			(8.45)	(-0.52)
% receiving FA			0.05	-0.03
			(1.57)	(-0.41)
% black			0.28*	0.07
			(2.15)	(0.22)
part-time enrollment			0.03*	0.03
			(2.20)	(1.09)
full-time enrollment			0.14***	0.16*
			(5.96)	(2.50)
tuition/revenues			1.36***	1.76***
			(11.88)	(6.30)
state funding/revenues			1.36***	1.49***
			(13.77)	(6.98)
retention rates			-0.04	-0.39**
			(-0.82)	(-3.24)
graduation rates			0.16**	0.06
			(3.06)	(0.55)
constant	17.82***	17.87***	8.09***	9.49***
	(3349.51)	(1944.80)	(16.82)	(8.72)
N	2556	648	2556	648

t statistics in parentheses *p<0.05   **p<0.01   ***p<0.001

Findings

Summary statistics of the Indiana data are presented in Table 1. In comparison with public 4-year institutions in the control groups, instructional costs and administrative costs were higher in Indiana. Public 4-year institutions in Indiana on average spent $17,968,200 more on instruction than the national control group and $8,754,300 more

Table 2.2 Models for student services expenditures in IN's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
PBF	-0.04	0.02	-0.04	-0.00
	(-1.47)	(0.92)	(-1.48)	(-0.08)
other revenues			0.29***	0.29***
			(7.62)	(3.66)
administrative costs			0.00	-0.13***
			(0.16)	(-5.52)
% receiving FA			0.15**	-0.13
			(3.03)	(-1.42)
% black			0.08	-0.10
			(0.39)	(-0.21)
part-time enrollment			0.09***	-0.03
			(4.39)	(-0.66)
full-time enrollment			0.16***	0.33***
			(4.24)	(3.72)
tuition/revenues			1.35***	1.29**
			(7.27)	(3.22)
state funding/revenues			0.94***	1.43***
			(5.90)	(4.68)
retention rates			0.07	-0.09
			(0.78)	(-0.51)
graduation rates			0.15	0.08
			(1.72)	(0.50)
constant	16.07***	16.13***	7.94***	9.59***
	(1989.41)	(1241.97)	(10.22)	(6.14)
N	2556	648	2556	648

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

than the regional control group. 40% of an institution's total expenditures were on instruction in Indiana, whereas for both the national control group and the regional control group, this number was 34%. Institutional expenditures on student services and academic support, on the other hand, were much lower in Indiana. Compared with public 4-year institutions within the same region, the average expenditures on student services were $12,941,080 in Indiana versus $20,542,780 in the regional control states, and the average expenditures on academic support was $29,274,340 in Indiana versus

Table 2.3 Models for academic support expenditures in IN's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
PBF	-0.09**	-0.05	-0.09**	-0.08
	(-2.60)	(-1.03)	(-2.63)	(-1.73)
other revenues			0.39***	-0.12
			(8.16)	(-0.72)
administrative costs			-0.03	-0.22***
			(-1.56)	(-4.49)
% receiving FA			0.01	-0.50**
			(0.13)	(-2.59)
% black			0.17	0.00
			(0.62)	(0.00)
part-time enrollment			0.12***	0.04
			(4.64)	(0.53)
full-time enrollment			0.14**	0.56**
			(2.86)	(2.96)
tuition/revenues			1.52***	-0.40
			(6.34)	(-0.48)
state funding/revenues			1.60***	0.60
			(7.77)	(0.92)
retention rates			-0.11	-0.47
			(-0.96)	(-1.31)
graduation rates			0.22	-0.11
			(1.95)	(-0.32)
constant	16.35***	16.39***	6.72***	17.50***
	(1577.86)	(609.42)	(6.71)	(5.33)
N	2556	648	2556	648

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

$36,611,590 in the regional control states. When these two categories were measured in relative terms, Indiana was similar to the national control group. The average revenues from tuition charges in Indiana were $119,870,400, exceeding the average of the national control group by $32,692,900 and the regional group by $11,589,200. Public 4-year institutions in Indiana had lower state appropriations when compared with the national control group, and their average total revenues ($405,130,505) were lower than both the national control group ($454,888,000) and the regional control group ($518,162,600).

Public 4-year institutions in Indiana had the largest enrollment of students, with an average of 10,722 full-time students compared with 10,402 in the national control group and 10,399 in the regional control group, and 3,721 part-time students compared to 3,402 in the national control group and 3,116 in the regional control group. The percentage of students receiving financial aid in Indiana was 4% lower than in the national control group and 6% lower than in the regional control group. The average percentage of black students in Indiana was only 8% versus 14% in the national control group.

Table 2.1, Table 2.2 and Table 2.3 present the estimates when logarithm-transformed instructional expenditures, student services expenditures, and academic support expenditures were used as the outcome variables. In Table 2.1, I found that the performance-based funding policy in Indiana had a negative effect (about 5% less) on financial resources allocated to instruction in Model 1 when using the national control group. However, this effect disappeared when covariates were added in Model 2. In Table 2.2, there was no statistically significant policy effect on student services expenditures. In Table 2.3, Model 1 indicates that public 4-year institutions in Indiana on average spent about 9% less on academic support due to the implementation of performance-based funding policy when compared with the national control group, and this effect remained unchanged when all covariates were included in Model 2. When compared with the regional control group, Indiana’s performance-based funding policy was not found to have impacted institutional spending on instruction, student services or academic support.

Table 3.1 Models for relative instructional expenditures in IN's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
PBF	0.01*	0.01	0.01	0.01
	(2.19)	(1.13)	(1.92)	(0.85)
other revenues			-0.02**	0.02
			(-2.65)	(0.85)
administrative costs			-0.01**	-0.04***
			(-3.24)	(-7.02)
% receiving FA			0.03**	0.03
			(3.00)	(1.25)
% black			0.05	-0.02
			(1.16)	(-0.14)
part-time enrollment			0.00	0.01
			(0.87)	(1.37)
full-time enrollment			0.01	0.03
			(0.72)	(1.37)
tuition/revenues			-0.01	0.29**
			(-0.13)	(2.78)
state funding/revenues			0.03	0.26**
			(0.91)	(3.28)
retention rates			-0.01	-0.08
			(-0.61)	(-1.70)
graduation rates			0.06***	0.02
			(3.44)	(0.52)
constant	0.33***	0.34***	0.77***	0.20
	(190.61)	(98.63)	(4.62)	(0.49)
N	2556	648	2556	648

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

When expenditures on these areas were measured in relative terms, i.e., its weight in an institution's overall expenditures, I found no evidence showing that the relative spending on instruction and student services were affected in any statistically significant way due to the presence of the performance-based funding policy when compared with both control groups (see Table 3.1 and Table 3.2). In Table 3.3, performance-based

Table 3.2 Models for relative student services expenditures in IN's public 4-year sector

	Model 1		Model 2	
	National	regional	national	regional
PBF	0.00	0.00	-0.00	-0.00
	(0.12)	(1.08)	(-0.79)	(-0.05)
other revenues			-0.01***	-0.00
			(-3.94)	(-0.61)
administrative costs			-0.01***	-0.01***
			(-4.75)	(-6.81)
% receiving FA			0.02***	0.01
			(5.34)	(0.96)
% black			-0.01	-0.02
			(-0.47)	(-0.53)
part-time enrollment			0.00**	0.00
			(3.01)	(0.76)
full-time enrollment			0.00	0.02**
			(0.99)	(2.96)
tuition/revenues			-0.01	0.00
			(-0.67)	(0.01)
state funding/revenues			-0.05***	0.02
			(-4.31)	(0.80)
retention rates			0.00	-0.01
			(0.15)	(-0.73)
graduation rates			0.02*	-0.01
			(2.27)	(-0.45)
constant	0.06***	0.07***	0.31***	0.14
	(102.23)	(67.73)	(5.18)	(1.12)
N	2556	648	2556	648

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

funding policy was found to have increased the relative spending on academic support by 1% compared with both control groups in Model 1. However, this effect remained only when compared with the national control group in Model 2. Interestingly, while Table 2.3 shows that the performance-based funding policy negatively affected the amount of money allocated to academic support, Table 3.3 indicates that the relative spending on academic support in Indiana's public 4-year institutions was increased by 1%.

A placebo policy was then created by using 2005 as the year of policy implementation. According to the results of the placebo tests (see APPENDIX C), the effects of performance-based funding policy on academic support can stand.

Table 3.3 Models for relative academic support expenditures in IN's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
PBF	0.01***	0.01**	0.01**	0.00
	(3.53)	(3.08)	(2.68)	(1.77)
other revenues			0.00	-0.03***
			(0.38)	(-3.46)
administrative costs			-0.01***	-0.02***
			(-6.85)	(-6.99)
% receiving FA			0.00	-0.02*
			(0.63)	(-2.02)
% black			0.03	0.08
			(1.59)	(1.61)
part-time enrollment			0.01***	-0.01
			(4.55)	(-1.96)
full-time enrollment			-0.00	0.03**
			(-0.22)	(3.28)
tuition/revenues			0.01	-0.08
			(0.72)	(-1.89)
state funding/revenues			0.03	-0.06
			(1.91)	(-1.86)
retention rates			-0.00	0.00
			(-0.53)	(0.17)
graduation rates			0.01	-0.02
			(1.86)	(-1.18)
constant	0.08***	0.08***	0.15*	0.74***
	(106.19)	(55.02)	(2.10)	(4.39)
N	2556	648	2556	648

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

The Louisiana Story

Louisiana's public higher education system is composed of 34 public higher education institutions, which are grouped into 4 sub-systems: the University of Louisiana system, the state university system, the southern university system, and the community and technical college system. The Louisiana Board of Regents was created as a coordinating governing board to develop, coordinate and regulate public higher education policies. The Board of Regents also works with four sub-system management boards that were created to supervise and manage individual colleges and universities. One of the major responsibilities of the Board of Regents is to develop and maintain a funding formula for the state's public higher education institutions. This funding formula is also a critical component of the state's Master Plan for public higher education. The management boards assume responsibility for administering state appropriations for each institution that is under their charge.

Compared with other states, public higher education in Louisiana needs improvement in many areas, but particularly in student outcomes. In fact, one Louisiana's state report plainly stated that "the percentage of those who graduate or earn certificates of completion [in Louisiana] is extremely low" (Public Affairs Research Council, 2008). According to statistics from the *Chronicle of Higher Education*, in 2010 for example, the six-year graduation rate in Louisiana's public 4-year institutions did not even exceed 40%, far below the national average of 56%; for public 2-year institutions, the graduation rate was only about 15%, lagging behind the national average by nearly 5%[6].

Another serious issue faced by public higher education in Louisiana is its insufficient state funding. The funding formula developed by the Board of Regents includes core funding, funding for quality improvement and a performance reward. According to Louisiana's state constitution, the state government of Louisiana should appropriate funding to its public higher education based on the funding formula developed by the Board of Regents. In actual operation, however, since the state has never been able to fully supply the amount of money required by the formula, Louisiana's funding for public higher education is determined by historic funding levels. Quality improvement and performance reward have long remained as unfunded mandates[7]. Because Louisiana's funding for public higher education is notoriously lower than the regional average of the southern states, public colleges and universities in Louisiana often point to the lack of sufficient funding as the primary reason for their sluggish performance. State accountability initiatives are often met with strong campus resistance.

The initiation of a performance-based funding policy in Louisiana was recommended by the Governor at the request of the Board of Regents. Prior to the implementation of this policy, the state conducted reviews on the status quo of its public higher education. At the same time, state commissioned studies on performance-based funding programs in other states were conducted. Based on the findings from these studies, recommendations were made to state policymakers, including revising the funding formula to facilitate the phase-in of a performance-based funding program, adding a new component that rewards institutions for meeting state needs, as well as applying weight to the funding formula to recognize institutional diversity in their missions, student body and academic offerings (Public Affairs Research Council, 2008).

The actual performance-based funding program was launched in Louisiana by the enactment of the Granting Resources and Autonomy for Diplomas Act (GRAD Act) in 2010. The major purpose of the GRAD Act is to officially establish performance agreements between the Board of Regents and public higher education institutions in Louisiana. It articulates performance requirements that public colleges and universities must satisfy in order to obtain limited institutional autonomy from the Board of Regents in tuition setting and some other areas. Public colleges and universities that meet the performance requirements can raise tuition by 5%. This number could be raised to 10% if a GRAD institution meets performance goals consecutively for the first two years.

The performance agreements between a GRAD institution and the Board of Regent are designed for a 6-year time frame. During this 6-year period, participating institutions must submit an annual report to the Board of Regents on their achievements in each performance goal listed in the GRAD Act. The Board of Regents then reviews each institution's annual report and determines whether a GRAD institution has met the performance requirements. Different from the more common practices of rewarding institutions for increases in graduation rates, the GRAD Act requires that the graduation rates of each participating institution must be consistent with their peer institutions. In terms of retention rates and degree completion, each participating institution is expected to demonstrate increases in the percentage. For public 2-year system, institutions are expected to show an increase in student retention rates, graduation rates as well as passage rates on licensure and certification exams. They are also expected to make efforts to improve student articulation and transfer. In addition, participating institutions are obliged to improve institutional effectiveness in other areas. For example, institutions are expected to partner with high schools to facilitate college transition. The GRAD Act has also stipulated specific institutional data that must be included in each annual report to the Board of Regents.

In many ways, the performance-based funding program in Louisiana resembles performance reporting. The major differences are that the Board of Regents evaluates the annual reports with more specific criteria, and there are financial benefits associated with meeting the performance requirements. It is entirely up to each public higher education institution's own discretion whether to be a GRAD institution and enter a 6-year contract with the Board of Regents. Of all the public colleges and universities engaged in this contractual relationship with the Board of Regents, Acadiana Technical College and Northeast Louisiana Technical College withdrew from being GRAD institutions only two years later after their participation in 2010. Capital Area Technical College also did not participate in the GRAD program after 2013. It is unclear whether these institutions chose to relinquish being a GRAD institution or if the Board of Regents revoked their GRAD status.

The analyses of the impact of the GRAD Act on Louisiana's public higher education were conducted to examine the 2-year system and the 4-year system separately. All data was obtained from IPEDS. For the 2-year system, seven 2-year colleges in Louisiana were retained, and eight 2-year colleges had to be eliminated from the panel data analysis due to missing values and incomplete information for all the years from 2004 to 2014. The national control group contained 325 public 2-year colleges, and the regional control group had 105 public 2-year colleges. Table 4 presents the descriptive statistics on the data used for analysis. All financial variables were in constant dollars and rescaled by 1000. Full-time enrollment and part-time enrollment were rescaled by 100. Natural logarithm transformation was applied to these variables when running the DID models.

Table 4. Descriptive Statistics (LA's public 2-year sector in comparison from 2004-14)

	Louisiana		National Control		Regional Control	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Expenditures ($000)						
instruction	8818.67	5581.40	25096.29	24281.95	18046.45	21171.86
student services	3086.02	2684.96	6040.82	5942.14	4086.08	5019.47
academic support	1847.57	1402.97	5020.73	5825.41	3938.02	5353.39
administrative costs	4082.19	2660.87	9019.19	8805.55	6557.55	7958.00
total expenditures (exp)	25981.63	15355.93	61243.72	56135.51	41932.28	47886.88
Income ($000)						
tuition	4887.29	3987.60	10466.57	12806.32	9825.87	15296.39
state funding	8205.09	4778.65	18141.11	18317.98	14672.42	13240.97
total revenues	25897.54	14955.86	64937.08	58361.96	45751.77	52134.67
Enrollment (in 100s)						
full-time enrollment	26.73	16.61	51.41	48.41	38.93	46.58
part-time enrollment	17.82	9.82	48.55	50.66	33.41	43.94
Other characteristics						
% receiving FA	76	15	72	18	75	20
% black	37	21	14	17	28	21
retention rates	0.50	0.07	0.58	0.10	0.56	0.10
graduation rates	0.11	0.09	0.25	0.13	0.24	0.14
Derived variables						
instruction/exp	0.36	0.10	0.41	0.09	0.43	0.09
student services/exp	0.11	0.06	0.10	0.04	0.10	0.03
academic support/exp	0.08	0.04	0.08	0.05	0.09	0.04
tuition/revenues	0.19	0.08	0.17	0.09	0.18	0.08
state funding/revenues	0.34	0.10	0.31	0.14	0.39	0.14
N	77		3498		1078	

Findings for the Public 2-year System in Louisiana

The descriptive statistics presented in Table 4 reveal that public 2-year colleges in Louisiana lagged behind their counterparts in both control groups in all the financial measures to a substantial degree. Compared with the national control group, institutional

Table 5.1 Models for instructional expenditures in LA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	0.20***	0.20***	0.08**	0.07*
	(5.78)	(4.43)	(2.68)	(2.08)
other revenues			0.32***	0.37***
			(18.56)	(11.66)
administrative costs			0.09***	0.19***
			(8.89)	(8.58)
% receiving FA			-0.12***	-0.08
			(-3.87)	(-1.41)
% black			-0.36***	-0.46***
			(-3.57)	(-3.36)
part-time enrollment			0.04**	0.05*
			(3.05)	(2.46)
full-time enrollment			0.25***	0.39***
			(14.39)	(13.18)
tuition/revenues			1.11***	1.05***
			(10.58)	(5.59)
state funding/revenues			1.18***	1.63***
			(15.48)	(10.84)
retention rates			0.01	0.06
			(0.22)	(1.05)
graduation rates			0.19***	0.23***
			(5.36)	(3.46)
constant	16.43***	16.08***	6.82***	3.21***
	(1971.73)	(856.52)	(22.14)	(6.06)
N	3575	1155	3575	1155

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

total revenues in Louisiana were $25,897,540 on average, which was much less than half of the national control average ($ 64,937,080), and was $19,854,230 short of the regional control average. Expenditures on instruction, student services, and academic support in Louisiana were, as a result, much lower in Louisiana. Note that the relative spending on student services and academic support were comparable between Louisiana and both control groups, but the relative spending on instruction in Louisiana was 5% lower than the national control average and 7% lower than the regional control average. In terms of

Table 5.2 Models for student services expenditures in LA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.02	-0.09	-0.07	-0.06
	(-0.28)	(-1.19)	(-1.27)	(-0.79)
other revenues			0.27***	0.38***
			(8.11)	(5.86)
administrative costs			0.09***	0.10*
			(4.83)	(2.11)
% receiving FA			-0.06	0.01
			(-1.10)	(0.09)
% black			-0.27	-0.39
			(-1.43)	(-1.37)
part-time enrollment			0.03	-0.09*
			(1.20)	(-2.33)
full-time enrollment			0.07*	0.13*
			(2.04)	(2.06)
tuition/revenues			0.72***	0.36
			(3.60)	(0.94)
state funding/revenues			0.95***	1.90***
			(6.48)	(6.14)
retention rates			0.05	0.27*
			(0.83)	(2.30)
graduation rates			0.19**	0.42**
			(2.74)	(3.09)
constant	14.93***	14.66***	7.48***	5.95***
	(1077.56)	(484.81)	(13.22)	(5.16)
N	3575	1155	3575	1155

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

student enrollment, the average full-time enrollment in public 2-year colleges in the national control group was 5,141, almost twice as many as the full-time enrollment of

Table 5.3 Models for academic support expenditures in LA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.00	0.07	-0.07	0.03
	(-0.03)	(-0.69)	(-0.98)	-0.26
other revenues			0.26***	0.35***
			(6.12)	(3.90)
administrative costs			0.12***	0.24***
			(4.91)	(3.86)
% receiving FA			-0.04	-0.31
			(-0.50)	(-1.94)
% black			1.10***	2.25***
			(4.46)	(5.74)
part-time enrollment			0.18***	0.27***
			(5.86)	(5.01)
full-time enrollment			0.08	-0.11
			(1.78)	(-1.31)
tuition/revenues			0.33	0.34
			(1.26)	(0.63)
state funding/revenues			1.21***	2.01***
			(6.43)	(4.68)
retention rates			0.39***	0.77***
			(4.87)	(4.72)
graduation rates			-0.19*	-0.22
			(-2.18)	(-1.18)
constant	14.70***	14.48***	5.67***	2.40*
	(815.28)	(342.80)	(7.48)	(1.59)
N	3575	1155	3575	1155

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

public 2-year colleges in Louisiana (2,673). When compared with the regional control group, public 2-year colleges in Louisiana still had a much lower enrollment of full-time students. The average part-time enrollments in both the national control group and the regional control group were also much higher than that of Louisiana. At the same time, there were a larger percentage of black students (37%) in public 2-year colleges in Louisiana than in both the national control group (14%) and the regional control group (28%).

Table 6.1 Models for relative instructional expenditures in LA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.00	0.00	0.00	0.01
	(-0.04)	(-0.41)	(-0.36)	(-0.68)
other revenues			-0.02***	-0.00
			(-3.74)	(-0.30)
administrative costs			-0.02***	-0.02**
			(-6.77)	(-3.03)
% receiving FA			-0.03**	0.03
			(-3.02)	(-1.81)
% black			-0.10**	-0.20***
			(-3.14)	(-4.96)
part-time enrollment			0.01*	0.00
			(2.06)	(0.00)
full-time enrollment			0.02**	0.04***
			(-2.95)	(-4.07)
tuition/revenues			0.00	0.03
			(-0.03)	(-0.54)
state funding/revenues			0.01	0.11**
			(-0.39)	(-2.59)
retention rates			-0.00	0.01
			(-0.33)	(-0.36)
graduation rates			0.07***	0.03
			(-6.27)	(-1.69)
constant	0.39***	0.41***	0.91***	0.44**
	(-164.22)	(-96.89)	(-9.02)	(-2.85)
N	3575	1155	3575	1155

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

The regression results of the GRAD Act's impact on instructional expenditures, student services expenditures, and academic support expenditures are presented in Table 5.1, Table 5.2 and Table 5.3 respectively. Table 5.1 shows that Louisiana's public 2-year

Table 6.2 Models for relative student services expenditures in LA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.03***	-0.03***	-0.02***	-0.02***
	(-5.07)	(-7.00)	(-3.73)	(-4.36)
other revenues			-0.01***	0.00
			(-3.30)	(0.57)
administrative costs			-0.01***	-0.02***
			(-3.72)	(-5.20)
% receiving FA			-0.01**	0.00
			(-2.73)	(0.03)
% black			0.00	-0.00
			(0.18)	(-0.11)
part-time enrollment			0.00	-0.01***
			(0.41)	(-3.52)
full-time enrollment			-0.02***	-0.02***
			(-5.17)	(-4.46)
tuition/revenues			-0.04*	-0.04
			(-2.05)	(-1.52)
state funding/revenues			-0.02	0.05**
			(-1.75)	(2.63)
retention rates			-0.01	-0.00
			(-1.02)	(-0.03)
graduation rates			0.02**	0.03**
			(2.59)	(3.29)
constant	0.09***	0.09***	0.51***	0.46***
	(74.08)	(44.25)	(9.37)	(6.47)
N	3575	1155	3575	1155

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

colleges increased the amount of money allocated to instruction due to the implementation of the GRAD Act. In Model 1, the GRAD Act was found to have increased the instructional expenditures by about 20%. When covariates were controlled in Model 2, the size of the policy effect became smaller, but still, there was an 8% increase in instructional expenditures due to the GRAD Act when compared with the national control group. In comparison with the regional control group, the GRAD Act was found to have increased instructional expenditures by 7% in Louisiana. Based on the results presented in Table 5.2 and Table 5.3, I did not find any evidence showing that student services expenditures and academic support expenditures were affected by the GRAD Act in a statistically significant way.

Table 6.1, Table 6.2 and Table 6.3 present the results when an institution's expenditures on instruction, student services, and academic support were measured in

Table 6.3 Models for relative academic support expenditures in LA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.01*	-0.01	-0.01	0.00
	(-2.52)	(-1.04)	(-1.58)	(0.46)
other revenues			-0.00	0.01
			(-0.36)	(1.28)
administrative costs			-0.01***	-0.00
			(-3.73)	(-0.79)
% receiving FA			0.00	-0.01
			(0.59)	(-1.60)
% black			0.02	0.06**
			(1.45)	(2.85)
part-time enrollment			0.01***	0.01*
			(4.21)	(2.32)
full-time enrollment			-0.00	-0.02***
			(-0.48)	(-3.81)
tuition/revenues			-0.03	-0.05
			(-1.92)	(-1.61)
state funding/revenues			0.03**	0.08***
			(3.09)	(3.56)
retention rates			0.01	0.01
			(1.71)	(1.71)
graduation rates			-0.01*	-0.02*
			(-2.33)	(-2.07)
constant	0.08***	0.09***	0.12**	0.08
	(75.17)	(41.80)	(2.62)	(0.99)
N	3575	1155	3575	1155

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

relative terms. Table 6.1 indicates that the relative spending on instruction in Louisiana's public 2-year colleges were not affected by the GRAD Act. In Table 6.2 I found that the relative spending on student services decreased due to the presence of the GRAD Act.

Table 7. Descriptive Statistics (LA's public 4-year sector in comparison from 2004-14)

Variables	Louisiana Mean	Louisiana Std. Dev.	National Control Mean	National Control Std. Dev.	Regional Control Mean	Regional Control Std. Dev.
Expenditures ($000)						
instruction	63048.57	67265.91	117112.10	167423.40	83827.02	95952.87
student services	9440.02	6101.24	21206.63	21736.48	14538.00	13745.39
academic support	17815.44	22183.93	34162.67	58028.22	25547.96	44408.24
administrative	17452.18	13147.36	29491.77	32082.42	26497.06	26180.33
total expenditures (exp)	200769.00	246306.30	420076.60	714424.70	320558.40	484561.60
Income ($000)						
tuition	46269.18	50083.22	87746.64	103602.10	72208.16	89642.42
state funding	62352.06	78574.77	97059.53	113212.00	79383.52	100858.60
total revenues	202732.20	251861.40	450326.50	769659.20	343986.80	516970.10
Enrollment (in 100s)						
full-time enrollment	82.30	54.64	98.54	73.79	81.96	65.73
part-time enrollment	24.82	10.96	28.87	33.60	30.62	45.52
Other characteristics						
% receiving FA	92	6	80	12	86	10
% black	30	26	13	22	29	29
retention rates	0.68	0.09	0.75	0.11	0.71	0.11
graduation rates	0.34	0.13	0.48	0.17	0.42	0.16
doctoral	0.31	0.46	0.28	0.45	0.26	0.44
master	0.62	0.49	0.56	0.50	0.54	0.50
baccalaureate	0.08	0.27	0.16	0.37	0.21	0.41
Derived variables						
instruction/exp	0.35	0.06	0.34	0.08	0.33	0.07
student services/exp	0.06	0.02	0.08	0.04	0.07	0.04
academic support/exp	0.09	0.03	0.09	0.03	0.08	0.03
tuition/revenues	0.25	0.06	0.26	0.11	0.24	0.12
state funding/revenues	0.31	0.07	0.29	0.11	0.28	0.08
N	143		1727		638	

Model 1 shows that the proportion of student services in overall spending dropped by about 3%. When all the covariates were added in Model 2, there was still a 2% drop due to the GRAD Act. This effect of the GRAD Act was the same across both control groups. Table 6.3 shows that the relative spending on academic support dropped by 1% due to the GRAD Act in Model 1 when the national control group was used; however, this effect disappeared when covariates were added to the basic model. When using the regional control group, I did not find the GRAD Act to have any impact on the relative spending on academic support.

Findings for the Public 4-year System in Louisiana

The IPEDS data used to analyze the impact of the GRAD Act on the public 4-year system in Louisiana contained 143 observations in the treatment group, 1727 observations in the national control group, and 638 observations in the regional control group after data cleaning and balancing. Descriptive statistics for this dataset is presented in Table 7. Similar to Louisiana's public 2-year system, the public 4-year system in Louisiana fell behind their counterparts in the control groups in terms of institutional finances. The average total revenues of a public 4-year institution were only $20,273,220 in Louisiana versus the national control average of $45,032,650 and the regional average of $34,398,680. Revenues from both tuition and state appropriations were also much lower in Louisiana than in both control groups, so were the institutional expenditures when measured in dollar amount. Note that the relative spending on instruction in Louisiana was 35%, slightly higher than the national control group by 1% and the regional control group by 2%. For the enrollment of full-time students, Louisiana had an average of 8,230, lower than the national control group by 1,625 but slight higher than

Table 8.1 Models for instructional expenditures in LA's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.18***	-0.18***	-0.03	0.01
	(-11.19)	(-9.75)	(-1.84)	(0.32)
other revenues			0.38***	0.63***
			(15.11)	(14.56)
administrative costs			0.15***	0.14***
			(11.11)	(6.77)
% receiving FA			0.10**	0.06
			(2.92)	(1.20)
% black			0.53***	0.35*
			(4.28)	(2.52)
part-time enrollment			-0.01	0.02
			(-0.77)	(1.33)
full-time enrollment			0.15***	0.02
			(5.70)	(0.68)
tuition/revenues			1.44***	2.30***
			(11.95)	(12.80)
state funding/revenues			1.57***	2.56***
			(14.61)	(13.55)
retention rates			-0.03	0.05
			(-0.44)	(0.72)
graduation rates			0.30***	0.25**
			(5.31)	(3.25)
constant	17.76***	17.53***	6.11***	1.98
	(2475.50)	(1479.16)	(12.15)	(2.54)
N	1870	781	1870	781

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

the regional control group by 34. In terms of part-time enrollment, Louisiana 405 lower than the national control group, and 580 lower than the regional control group. 92% of students in Louisiana's public 4-year institutions received financial aid, exceeding the national control average by 12% and the regional control average by 6%.

Table 8.2 Models for student services expenditures in LA's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.13***	-0.14***	-0.03	-0.00
	(-6.02)	(-5.71)	(-1.16)	(-0.12)
other revenues			0.22***	0.43***
			(6.15)	(6.28)
administrative costs			0.15***	0.13***
			(7.44)	(4.09)
% receiving FA			0.03	-0.08
			(0.52)	(-1.03)
% black			0.43*	0.30
			(2.35)	(1.36)
part-time enrollment			0.04*	0.04
			(2.47)	(1.25)
full-time enrollment			0.18***	0.15**
			(4.67)	(2.65)
tuition/revenues			1.25***	2.17***
			(7.10)	(7.62)
state funding/revenues			0.68***	1.47***
			(4.34)	(4.91)
retention rates			-0.02	0.05
			(-0.28)	(0.42)
graduation rates			0.10	0.05
			(1.23)	(0.41)
constant	16.14***	16.02***	6.54***	2.29
	(1705.97)	(978.09)	(9.79)	(2.74)
N	1870	781	1870	781

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

Table 8.1, Table 8.2 and Table 8.3 indicate the regression estimates when logarithm-transformed expenditures on instruction, student services, and academic support were used as the outcome variables. Model 1 across all these tables indicates that public 4-year institutions in Louisiana reduced the instructional expenditures, student services expenditures, and academic support expenditures by about 18%, 13%, and 16% respectively due to the GRAD Act compared with the national control group. When

Table 8.3 Models for academic support expenditures in LA's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.16***	-0.15***	0.01	0.09*
	(-5.92)	(-4.54)	(0.19)	(2.39)
other revenues			0.51***	1.02***
			(11.54)	(11.21)
administrative costs			0.08**	-0.08
			(3.30)	(-1.86)
% receiving FA			-0.04	0.03
			(-0.63)	(0.24)
% black			-0.30	-0.53
			(-1.36)	(-1.83)
part-time enrollment			0.05*	0.08*
			(2.26)	(2.12)
full-time enrollment			0.17***	0.10
			(3.75)	(1.39)
tuition/revenues			1.79***	3.70***
			(8.42)	(9.88)
state funding/revenues			2.09***	4.35***
			(11.02)	(11.03)
retention rates			-0.04	-0.06
			(-0.41)	(-0.35)
graduation rates			0.11	0.25
			(1.05)	(1.52)
constant	16.35***	16.04***	2.88**	-4.55**
	(1419.39)	(752.01)	(3.25)	(-2.79)
N	1870	781	1870	781

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

compared with the regional control group, there was an 18% decrease in instructional expenditures, a 14% decrease in student services expenditures, and 15% decrease in academic support expenditures due to the GRAD Act. However, when the covariates were controlled for in Model 2, the GRAD Act was found to have increased academic support expenditures by about 9% compared with the regional control group (see Model 2 in Table 8.3), but it was not shown to have impacted instructional expenditures or

Table 9.1 Models for relative instructional expenditures in LA's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.01**	-0.00	-0.01**	0.00
	(-2.78)	(-0.82)	(-2.61)	(-0.05)
other revenues			-0.02	0.02
			(-1.90)	(1.31)
administrative costs			-0.00	0.00
			(-0.93)	(-0.32)
% receiving FA			0.05***	0.04*
			(4.69)	(2.34)
% black			0.14**	0.12**
			(3.29)	(2.88)
part-time enrollment			-0.00	0.01
			(-0.24)	(1.48)
full-time enrollment			-0.00	-0.04***
			(-0.60)	(-4.25)
tuition/revenues			-0.01	0.09*
			(-0.37)	(1.58)
state funding/revenues			0.03	0.21***
			(0.85)	(3.71)
retention rates			-0.01	0.02
			(-0.36)	(0.89)
graduation rates			0.12***	0.08***
			(6.57)	(3.47)
constant	0.32***	0.32***	0.61***	0.10
	(156.58)	(110.20)	(3.69)	(0.40)
N	1870	781	1870	781

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

student services expenditures. However, the significant effect of the pseudo policy in the placebo test for this model indicates that the identified effect most likely was not authentic (see APPENDIX E).

When these spending categories were measured in relative terms, I found that the GRAD Act had negative impacts on instruction and student services compared with the national control group. Table 9.1 indicates that Louisiana public 4-year institutions have decreased their relative spending on instruction by about 1% in both Model 1 and Model

Table 9.2 Models for relative student services expenditures in LA's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.00	-0.00	-0.01***	-0.00
	(-1.52)	(-0.03)	(-3.74)	(-1.19)
other revenues			-0.02***	-0.02**
			(-6.03)	(-3.13)
administrative costs			-0.00	0.00
			(-1.11)	(0.94)
% receiving FA			0.02***	0.00
			(3.53)	(0.19)
% black			0.01	0.02
			(0.48)	(1.19)
part-time enrollment			0.01**	0.01*
			(3.07)	(2.18)
full-time enrollment			0.00	-0.00
			(1.28)	(-0.04)
tuition/revenues			-0.03*	-0.01
			(-2.04)	(-0.65)
state funding/revenues			-0.09***	-0.06**
			(-6.25)	(-2.62)
retention rates			-0.01	-0.00
			(-0.93)	(-0.37)
graduation rates			0.01	-0.02*
			(1.55)	(-2.04)
constant	0.07***	0.06***	0.42***	0.32**
	(84.64)	(52.13)	(6.19)	(3.25)
N	1870	781	1870	781

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

2. Table 9.2 shows that the GRAD Act has also caused the relative spending on student services to drop by 1% with all covariates being controlled for. On the other hand, when the regional control group was used, Table 9.3 indicates that the relative spending on academic support was raised by 1% due to the GRAD Act. The placebo tests I conducted showed that these findings are robust (see APPENDIX E).

Table 9.3 Models for relative academic support expenditures in LA's public 4-year sector

	Model 1		Model 2	
	national	regional	national	regional
GRAD Act	-0.00	0.00	-0.00	0.01*
	(-0.61)	(0.16)	(-0.34)	(2.36)
other revenues			0.00	0.04***
			(1.01)	(4.66)
administrative costs			-0.01***	-0.02***
			(-3.53)	(-5.51)
% receiving FA			-0.00	0.01
			(-0.19)	(1.45)
% black			-0.02	-0.02
			(-1.19)	(-0.82)
part-time enrollment			0.01***	0.01*
			(3.81)	(2.07)
full-time enrollment			0.00	-0.00
			(0.84)	(-0.18)
tuition/revenues			0.00	0.12***
			(0.15)	(3.79)
state funding/revenues			0.04*	0.21***
			(2.57)	(6.30)
retention rates			-0.00	-0.01
			(-0.48)	(-0.51)
graduation rates			-0.00	0.01
			(-0.00)	(0.38)
constant	0.08***	0.08***	0.04	-0.38**
	(84.87)	(44.96)	(0.49)	(-2.80)
N	1870	781	1870	781

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

The Washington Story

Washington is among the top states in terms of baccalaureate degree production in public higher education. However, its 4-year college access rate falls below the national average. Financially, per student public higher education funding is below the national average, and the level of tuition in Washington is above the national average (Washington Higher Education Coordinating Board, 2012). Washington first adopted a performance-based funding program in 1997. However, it switched back to its traditional funding mechanism after only two years. The abandonment of this initial attempt was primarily due to major flaws in both policy design and implementation. Not only was the performance-based funding program simply established as a budget proviso, but the funding metrics also ignored institutional diversities and characteristics. As a result, this initial attempt to reward performance with financial benefits received little support from public colleges and universities in Washington (Dougherty et al., 2011).

In 2007, a second attempt was made to adopt a performance-based funding policy. The Student Achievement Initiative (SAI) launched by the Washington State Board for Community and Technical Colleges was implemented in public 2-year institutions throughout Washington. Washington has a strong public 2-year college system. Established during the 1960s as the state's strategy to absorb the growing population requiring higher education, the community and technical colleges in Washington enroll a significantly large share of high school graduates[8]. The public financial support for public 2-year colleges in Washington is entirely drawn from the state government, and no local property tax is used. Because of the large number of high school graduates who attend public 2-year colleges, Washington's public 2-year sector plays a particularly important role in supplying the state's need for human capital. With no funding appropriated from local property taxes, the state government is highly interested in funding its public 2-year colleges through an effective and parsimonious strategy.

The SAI was developed together by the State Board for Community and Technical Colleges and institutional leaders. The major policy goal is to improve the accountability of public 2-year colleges. To avoid the pitfalls of the previous failure in 1997, the policy design of the SAI was guided by the overarching principles of improving student achievement, while allowing each institution to have the flexibility to carry out its own missions. Policymakers relied heavily on scholarly input in developing performance metrics. They partnered with the Community College Research Center (CCRC), a research group that has been studying community colleges and performance-based funding for years for selecting performance measures and general policy consultation.

The SAI gauges institutional performance by calculating each institution’s achievement points per academic year. A public 2-year college gains achievement points when meeting performance benchmarks on student academic progress and outcomes. These measures cover four areas: 1. college-level skills development: this is measured by students’ achievement on a standardized test or passing college preparation courses in writing and math; 2. first year retention rates and the completion of credit hours; 3. the completion of gateway courses—college-level math courses; and, 4. the completion of a degree/certificate/training program. An institution’s points gained in each of these areas are then added up as its overall achievement points.

The SAI is claimed to be different from the previous generation of performance-based funding programs in two important ways: first, it demonstrated efforts to address the major pitfalls of neglecting student progression in past policy designs. Performance is gauged by throughput measures, such as satisfying college readiness requirements, student retention, credit hours, completion of gateway courses, as well as output measures, such as certificates completion and degree attainment. For community colleges, throughput measures are particularly meaningful to assess an institution’s performance in student outcomes. Most community colleges have “open access” admission policies and recruit a large number of underprepared students. Therefore, detailed throughput measures are needed to pinpoint students' academic progress. These measures also help institutions to more accurately identify roadblocks to student success. Rewarding institutions for their achievement in throughput measures recognizes the mission and characteristics of community colleges and motivates institutions to be more actively engaged in improving student outcomes.

Second, in addition to incentivizing institutions to improve student achievement, the SAI is also designed to help institutions rely on data-based evidence to identify strategies and practices that can improve institutional effectiveness (Shulock & Jenkins, 2011). It emphasizes the use of data in helping each institution measure student progress and make relevant decisions. Each public 2-year college in Washington would receive data on their performance from the state board every quarter. Based on this information, each college pinpoints areas that need improvement and targets their efforts in those areas.

In addition, the SAI boasts other distinctive features. For example, it was jointly developed by state policymakers, campus leaders and faculty representatives. It used more realistic and attainable measures to align state priorities with institutional performance. The structure of accumulating the achievement points made it possible for each institution to mark its own progress, instead of making meaningless comparisons among institutions. To ensure that the SAI remain consistent and can be sustained in the long run, Washington adopted a strategy of gradually transitioning from a traditional funding strategy to fully embracing this new funding mechanism. According to Shulock and Jenkins (2011), in 2007-2008, seed money of $51,000 was given to each college to prepare themselves for the upcoming changes as the SAI began to be phased in. This seed money was an added bonus to the base funding. In 2008-2009, instead of giving each college the seed money as an added bonus, $66,000 was designated from the base funding as the SAI seed money. In addition to the SAI seed money, which is directly

Table 10. Descriptive Statistics (WA's public 4-year sector in comparison from 2004-14)

	Washington		National Control		Regional Control	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Expenditures ($000)						
instruction	23490.60	11688.72	25096.29	24281.95	30982.67	24314.39
student services	6069.29	4982.11	6040.82	5942.14	8234.59	6447.93
academic support	3315.84	1790.50	5020.73	5825.41	6328.18	6778.46
administrative costs	5276.17	1682.37	9019.19	8805.55	10542.60	8557.79
total expenditures (exp)	52160.89	21748.26	61243.72	56135.51	80341.25	59596.91
Income ($000)						
tuition	8798.82	5958.93	10466.57	12806.32	8343.26	9327.08
state funding	19113.24	7186.11	18141.11	18317.98	24592.89	24492.78
total revenues	58825.74	23563.03	64937.08	58361.96	85811.85	62468.69
Enrollment (in 100s)						
full-time enrollment	41.70	17.25	51.41	48.41	67.75	51.43
part-time enrollment	25.69	13.41	48.55	50.66	75.42	59.81
Other characteristics						
% receiving FA	57	17	72	18	65	17
% black	4	3	14	17	7	9
retention rates	0.60	0.06	0.58	0.10	0.60	0.12
graduation rates	0.31	0.10	0.25	0.13	0.25	0.12
Derived variables						
instruction/exp	0.45	0.07	0.41	0.09	0.38	0.08
student services/exp	0.11	0.06	0.10	0.04	0.11	0.04
academic support/exp	0.06	0.02	0.08	0.05	0.08	0.04
tuition/revenues	0.14	0.07	0.17	0.09	0.10	0.07
state funding/revenues	0.34	0.07	0.31	0.14	0.27	0.14
N	176		3498		1232	

from state appropriations, each college is rewarded for their achievement points. The rewards for the achievement points are jointly provided by the state government and private foundations. In 2009-10, for example, the total amount of rewards for the achievement points reached $1.8 million, of which the Ford Foundation offered $800,000. Similarly, in 2010-11, the Gates Foundation gave $800,000 to the financial reward for the achievement gains.

When Washington initially launched the SAI in 2007, the state was planning to fund the SAI with additional funds added to the base funding. However, after only 2 years, the state government could not afford extra money to fund the SAI. To ensure policy consistency, Washington reallocated the base funding to sustain the SAI. While doing so helped public 2-year colleges to secure the base funding from state budget cuts, campus leaders were offended by the state's inability to keep its original plan.

Findings

The panel dataset generated by cleaning the raw IPEDS data covered the years from 2004 to 2014. It contained 176 observations in the treatment group, 3,498 observations in the national control group, and 1232 observations in the regional control group. Table 10 provides the descriptive statistics for the data used in this state study. The 11-year average of the institutional expenditures on student related categories indicates that public 2-year colleges in Washington had lower instructional expenditures and academic support expenditures than both control groups, but they had slightly higher student services expenditures than the national control group. When these categories were measured in relative terms, 45% of Washington's total expenditures were spent on instruction, exceeding the national control average by 4% and the regional control average by 7%. Compared with the control groups, both the full-time enrollment and part-time enrollment were lower in Washington and in particular, the part-time enrollment. The average percentage of students who received any financial aid in public 2-year colleges in Washington were only 57%, 15% lower than the national control average, and 8% lower than the regional control average. Washington also had a much lower percentage of black students (4%), compared with the national control average of 14% black students.

Table 11.1 Models for instructional expenditures in WA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
SAI	-0.10***	-0.09***	-0.04*	-0.04
	(-4.11)	(-3.60)	(-2.02)	(-1.71)
other revenues			0.30***	0.34***
			(17.40)	(11.09)
administrative costs			0.09***	0.04**
			(9.08)	(3.07)
% receiving FA			-0.12***	-0.10*
			(-4.20)	(2.29)
% black			-0.47***	-0.68**
			(-4.48)	(3.17)
part-time enrollment			0.04**	0.01
			(3.19)	(0.59)
full-time enrollment			0.25***	0.16***
			(14.37)	(5.39)
tuition/revenues			0.10***	1.35***
			(9.71)	(7.17)
state funding/revenues			1.10***	0.84***
			(14.55)	(7.81)
retention rates			-0.00	0.04
			(-0.01)	(0.81)
graduation rates			0.16***	0.06
			(4.59)	(1.17)
constant	16.46***	16.73***	7.31***	8.41***
	(2065.83)	(1428.74)	(23.71)	(15.73)
N	3674	1408	3674	1408

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

Table 11.1, Table 11.2 and Table 11.3 present the regression estimates when instructional expenditures, student services expenditures and academic support

Table 11.2 Models for student services expenditures in WA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
SAI	0.02	0.04	0.06	0.09*
	(0.38)	(-0.97)	(1.44)	(-2.07)
other revenues			0.24***	0.32***
			(7.39)	(5.45)
administrative costs			0.09***	-0.02
			(4.99)	(-0.76)
% receiving FA			-0.08	-0.05
			(-1.38)	(-0.59)
% black			-0.16	-0.88*
			(-0.79)	(-2.16)
part-time enrollment			0.02	0.10*
			(1.05)	(2.02)
full-time enrollment			0.07*	0.03
			(2.10)	(0.59)
tuition/revenues			0.71***	1.16**
			(3.66)	(3.23)
state funding/revenues			0.81***	0.69***
			(5.69)	(3.36)
retention rates			0.04	-0.05
			(0.62)	(-0.57)
graduation rates			0.19**	-0.01
			(2.76)	(-0.13)
constant	14.96***	15.33***	8.33***	8.81***
	(1128.21)	(745.52)	(14.28)	(8.64)
N	3674	1408	3674	1408

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

expenditures were measured in dollar amounts. According to the estimated coefficients, the presence of the SAI had a negative effect on the amount of financial resources allocated to instruction. Model 1 in Table 11.1 indicates that, compared with the national control group, instructional expenditures in Washington's public 2-year colleges decreased by about 10% due to the implementation of the SAI. When using the regional control group, I found that there was a 9% decrease in instructional expenditures in

Table 11.3 Models for academic support expenditures in WA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
SAI	-0.01	-0.05	0.05	0.02
	(-0.16)	(-1.08)	(1.01)	(0.44)
other revenues			0.23***	0.51***
			(5.43)	(7.70)
administrative costs			0.14***	0.09**
			(5.76)	(3.26)
% receiving FA			-0.02	0.00
			(-0.32)	(0.05)
% black			1.33***	-1.46**
			(5.15)	(-3.22)
part-time enrollment			0.18***	0.10
			(6.01)	(1.94)
full-time enrollment			0.09*	-0.00
			(2.00)	(-0.00)
tuition/revenues			0.15	1.95***
			(0.60)	(4.87)
state funding/revenues			1.08***	1.23***
			(5.83)	(5.37)
retention rates			0.39***	-0.06
			(4.92)	(-0.58)
graduation rates			-0.16	-0.05
			(-1.83)	(-0.44)
constant	14.72***	14.95***	5.90***	3.44**
	(842.21)	(636.46)	(7.77)	(3.03)
N	3674	1408	3674	1408

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

public 2-year colleges in Washington. Model 2 in Table 11.1 indicates that when the covariates were controlled for, public 2-year colleges in Washington still spent about 4% less on instruction due to the SAI compared with the national control group, but the SAI was not found to have affected instructional expenditures when the regional control group was used. In terms of student services expenditures, Model 2 in Table 11.2 indicates that, compared with the regional control group, public 2-year colleges in Washington raised their spending by about 9% due to the SAI.

Table 12.1 Models for relative instructional expenditures in WA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
SAI	-0.00	0.01	-0.01	0.00
	(-0.48)	(1.00)	(-0.88)	(0.59)
other revenues			-0.03***	-0.05***
			(-4.45)	(-4.88)
administrative costs			-0.02***	-0.02***
			(-7.02)	(-5.04)
% receiving FA			-0.03***	-0.06***
			(-3.39)	(-4.28)
% black			-0.13***	-0.03
			(-3.75)	(-0.39)
part-time enrollment			0.01*	-0.00
			(2.29)	(-0.34)
full-time enrollment			0.02**	0.02*
			(3.13)	(2.07)
tuition/revenues			-0.01	0.07
			(-0.36)	(1.16)
state funding/revenues			-0.01	-0.09**
			(-0.28)	(-2.67)
retention rates			-0.01	0.02
			(-0.60)	(1.18)
graduation rates			0.06***	0.04*
			(5.34)	(2.38)
constant	0.39***	0.38***	0.99***	1.49***
	(168.09)	(103.53)	(9.71)	(8.41)
N	3674	1408	3674	1408

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

When expenditures on instruction, student services and academic support were measured in relative terms, Table 12.2 indicates that policy effect was consistent across

Model 1 and Model 2. When compared with the national control group, there was an about 1% increase on the relative spending on student services attributable to the SAI.

Table 12.2 Models for relative student services expenditures in WA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
SAI	0.01***	0.02***	0.01**	0.02**
	(3.39)	(3.44)	(3.09)	(3.07)
other revenues			-0.01***	-0.01*
			(-4.03)	(-2.12)
administrative costs			-0.01***	-0.02***
			(-3.61)	(-4.95)
% receiving FA			-0.02**	-0.01
			(-3.29)	(-1.44)
% black			0.02	-0.06
			(1.28)	(-1.34)
part-time enrollment			-0.00	0.00
			(-0.13)	(0.06)
full-time enrollment			-0.02***	-0.01*
			(-5.12)	(-2.26)
tuition/revenues			-0.04*	0.00
			(-2.09)	(0.09)
state funding/revenues			-0.03*	-0.03
			(-2.54)	(-1.20)
retention rates			-0.01	-0.00
			(-1.26)	(-0.35)
graduation rates			0.02**	0.00
			(2.71)	(0.07)
constant	0.09***	0.01***	0.54***	0.73***
	(76.50)	(41.73)	(10.11)	(6.10)
N	3674	1408	3674	1408

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

When the regional control group was used, there was an about 2% increases on the relative spending on student services due to the presence of the SAI. On the other hand, I did not find any evidence showing that the SAI affected the relative spending on

Table 12.3 Models for relative academic support expenditures in WA's public 2-year sector

	Model 1		Model 2	
	national	regional	national	regional
SAI	0.00	0.00	0.00	0.00
	(0.53)	(0.53)	(0.30)	(0.88)
other revenues			-0.00	0.00
			(-0.66)	(0.91)
administrative costs			-0.00**	-0.01**
			(-3.10)	(-2.89)
% receiving FA			0.00	-0.00
			(0.67)	(-0.21)
% black			0.03*	-0.03
			(2.04)	(-1.05)
part-time enrollment			0.01***	0.01
			(4.58)	(1.88)
full-time enrollment			-0.00	-0.00
			(-0.11)	(-0.54)
tuition/revenues			-0.04*	0.07*
			(-2.46)	(2.47)
state funding/revenues			0.03**	0.01
			(2.72)	(0.94)
retention rates			0.01	-0.01
			(1.78)	(-1.17)
graduation rates			-0.01	-0.00
			(-1.94)	(-0.66)
constant	0.08***	0.07***	0.11***	0.05
	(76.47)	(46.76)	(2.30)	(0.66)
N	3674	1408	3674	1408

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

instruction or academic support (see Table 12.1 and Table 12.3). A placebo policy was created to test if the significant effects of the SAI on instruction and student services in Table 11.1 and Table 12.2 were robust. The non-significant effect of the placebo policy on these outcome variables testified for the validity of the significant effects identified by Model 2 in Tables 11.1, 11.2 and 12.2 (see APPENDIX F).

This chapter examined the effects of three performance-based funding policies of three states. Each state had their unique and interesting experience in their adoption of this funding mechanism. As the statistical analyses indicated, despite these states' varied incentive structures and higher education contexts, in many instances, the effects of performance-based funding policies on student-related categories were not statistically significant. In the following chapter, I discuss the results of each state as well as their policy implications.

CHAPTER 6

DISCUSSION

In the current environment of heightened accountability, a serious issue in regard to performance-based funding is the danger of making public higher education the scapegoat for policymakers' ideological infighting and state's weakening financial support. At first glance, implementing student outcome measures to improve efficiency and productivity may seem promising to state capitols. However, the complexity of higher education production and the elusive relationship between financial resources and educational outcomes undoubtedly render a proven business practice a controversial matter.

While more financial resources do not necessarily lead to better student outcomes, substantial improvement in graduation rates and retention rates certainly require adequate financial input. The majority of empirical studies have not yet found convincing evidence confirming the positive role of performance-based funding policy in improving student outcomes. At the same time, it is unclear how public higher education institutions were affected by the shift in state funding, particularly in regard to their spending on instruction, student services, and academic support. To understand this dimension of policy impact, this study sought to answer the following questions:

1. How does performance-based funding policy impact institutional resource allocation for instruction, student services, and academic support?

2. How are these spending categories affected by different policy designs of performance-based funding?
3. Does the impact of performance-based funding policy on these spending categories display different patterns between public 2-year colleges and public 4-year institutions?

Spending on instruction, student services, and academic support were measured in two ways: the actual amount of money allocated to each category and their weight in an institution's overall expenditures, which I referred to as relative spending. Using the difference-in-differences design, I analyzed performance-based funding policy in Indiana, Louisiana, and Washington on a state-by-state basis. A national control group and a regional control group were created for each state. Since the performance-based funding policies in these states had varied policy designs, policy impacts on financial resources allocated to instruction, student services, and academic support differed from one state to another. For Indiana, when compared with the national control group, the performance-based funding policy was shown to have reduced institutional spending on academic support by about 9%, yet at the same time, there was about a 1% increase in the relative spending on academic support attributable to the policy. When compared with the regional control group, Indiana did not display any statistically significant variance in resource allocation.

In Louisiana, policy impacts differed from the public 2-year system to the public 4-year system. For public 2-year colleges, a 7% to 8% increase in instructional expenditures can be attributed to the implementation of the GRAD Act, whereas expenditures on student services and academic support were not affected. For the public

4-year system, the GRAD Act was found to have reduced the relative spending on both instruction and student services by 1% when compared with the national control group but slightly increased the relative spending on academic support by 1% when compared with the regional control group.

In Washington, the SAI was found to have increased the relative spending on student services by about 1% to 2%. I also found that the SAI reduced instructional expenditures by 4% when compared with the national control group and increased student services expenditures by 9% when compared with the regional control group.

Although all these findings have passed the placebo test, they must still be interpreted with caution. Due to the lack of a control group that perfectly matches with the treated group, researchers (Meyer, 1995; Shadish, Cook & Campbell, 2002) often regarded results that were significant across all control groups to be more robust and results that were significant with only one control group as open to alternative explanations. This being said, only the impact of Louisiana's GRAD Act on its public 2-year colleges' instructional expenditures (a 7% to 8% increase) and Washington's SAI on the relative spending on student services (a 1% to 2% increase) are probably most suggestive of the authentic policy effect. Such findings generally agree with previous studies, which concluded that performance-based funding policies had a very limited impact on institutional finance and that the financial incentives were not strong enough (Dougherty et al., 2014b; Kelchen & Stedrak, 2016; Rabovsky, 2012).

Admittedly, the findings of this study can at best be considered indicative, but not definitive. According to the principal-agent theory, the non-effect of performance-based funding policy on public 4-year systems in Indiana and Louisiana suggests that the agents (public colleges and universities) may not be motivated by the resources provided by the principal (state governments) to produce desired student outcomes. On the other hand, just as Whitfold (2005) and Koppell (2005) pointed out, public 4-year institutions are held accountable by more than one principal, and are limited in their ability to be fully committed to one principal. Therefore, principal-agent theory has its limitations for explaining the obstacles encountered when implementing performance-based funding policy in public higher education.

While the empirical patterns of policy impact on public colleges and universities are yet to be uncovered, the state-by-state analyses seem to suggest that public 2-year colleges were more responsive than public 4-year institutions to performance-based funding policy. From the resource dependency perspective, it is conceivable that public 2-year colleges and public 4-year institutions should differ systematically in their responses to state policy. As Pfeffer and Salancik (1978) have asserted, an organization relies on its external stakeholders for resources, and an organization's reliance on a particular resource provider is determined by, among others, the availability of alternative resource providers. In terms of revenue streams, public 2-year colleges have fewer resources than public 4-year institutions. Therefore, they rely more heavily on state funding. At the same time, the comparatively less complex missions of public 2-year colleges also make it easier to operationalize performance-based funding policy at the institutional level. The differential impacts of Louisiana's GRAD Act on its public 2-year system and public 4-year system reaffirm the resource dependency argument advanced by Pfeff and Salancik (1978).

Performance-based Funding Policy and Public Higher Education

The resurrection of performance-based funding policy in state higher education financing shows that policymakers are still drawn to applying market-economy principles to enhancing public higher education accountability and institutional improvement. Overall, the experiences of Indiana, Louisiana and Washington demonstrate that they all made deliberate efforts to tailor their own versions of performance-based funding policy to fit their distinct higher education contexts. The analyses in the previous chapter indicate that the policies have not yet made a sweeping impact on resources allocated to instruction, student services and academic support.

In Indiana and Washington, policymakers developed detailed performance metrics to define how public higher education institutions were to be rewarded for their achievements in student outcomes. Noticeably, the specific amount of money attached to performance indicators fluctuated in both Indiana and Washington. The state of Indiana even made several adjustments to performance measures since their performance-based funding policy first took effect in 2007. It is worthwhile to note that the fluctuation of funding levels and the changes in performance measures have both been identified as obstacles to policy effectiveness (see Dougherty et al., 2016). How these factors contributed to the limited policy impact on an institution's spending on students is worthy of further investigation. While both Indiana and Washington initially planned to reward institutional performance with additional funding on top of regular state appropriations, in the actual implementation, both states were unable to maintain their original plans but designated a portion of regular state appropriations as performance-based funding. Louisiana presented a different picture. Not only did performance measures go beyond student outcomes and cover other areas in institutional effectiveness, but these measures were not attached to a specific amount of financial reward. One important reason is that Louisiana's state government was never able to fully fund the funding formula for public higher education. By devising the idea of granting public colleges and universities limited authority in raising tuition and a greater degree of institutional autonomy for improved performance, the Board of Regents created an incentive mechanism that would allow public higher education institutions to generate extra revenue without increasing state's financial burden.

The stories of adopting performance-based funding policies in these states illustrate the challenges of carrying out this policy in public higher education. On one hand, performance measures must be selected with careful consideration. They must be meaningful, simple and fair. On the other hand, financial incentives need to be strong, yet they do not impose extra burden on state government. Up to now, performance-based funding policy has been in Indiana and Washington for nearly 10 years, and Louisiana for about 7 years, yet it is still unclear if these states are truly successful in reforming their state higher education financing and eventually improving student outcomes. Indeed, whether performance-based funding policy can achieve its goals is a highly complex topic. Empirically, policy analyses may only uncover some of the policy effects on institutions or students due to limited data availability and unobservable factors. Practically, many social and political factors are involved in both policy formation and implementation. These dynamics invariably introduce considerable uncertainties and affect policy effectiveness.

Since more state governments are endorsing the idea of funding for student outcomes in public higher education, perhaps a more salient question is how to make performance-based funding policy work rather than should this policy be dismissed from the discourse of state higher education financing due to its limited impact at present. After all, for a performance-based funding policy to have a full-fledged effect on public higher education institutions, and ultimately, student outcomes, many adjustments at various levels must be made.

My argument is that a performance-based funding policy must first enable public colleges and universities to allocate more financial resources to students before one can possibly observe its positive effect on student outcomes. The large corpus of literature on educational finance attests to the positive role of financial input in improving student outcomes (e.g., Greenwald et al., 1996; Card & Kruger, 1996; Zhang, 2009). Given the limited policy impact on institutional expenditures on student-related categories, it is perhaps not surprising that most empirical analyses could not find any positive effects of a performance-based funding policy on student outcomes. The limited policy impact at the institutional-level leads one to believe that performance-based funding policy may have failed to incentivize public colleges and universities to become more committed to student success.

One reason could be that the financial incentives are too small. Burke and Serban (1998) mentioned that performance-based funding policy simply represents a radical shift in the ideology of state higher education funding but does not, in effect, entail any substantial change in the amount of state funding. Although the newer version of this policy has made attempts to increase the weight of performance components in state funding (Labi, 2005), in the cases of both Indiana and Washington, performance-based funding was still a very small portion (about 5%) from state appropriations. Remarkably, a few years after implementing the policy, both Indiana and Washington began to designate a larger portion of state appropriations, instead of providing additional funding, to sustain the policy. Is this what policymakers meant by “phasing-in?”

At the fundamental level, while a great amount of attention was paid to selecting performance measures and fitting the policy to state higher education contexts, and state policymakers often highlighted the financial benefits of meeting the performance criteria, states were not fully committed to their financial obligations. In both Indiana and Washington, performance-based funding policies did not actually offer an authentic bonus, for they were not able to reward public higher education institutions for their achievements in student outcomes on top of state appropriations. Rather, public colleges and universities would suffer the consequence of losing state funding if they failed to meet state expectations. Demanding performance in the absence of adequate resources imposes unfair burdens on public colleges and universities and limits their abilities to improve student outcomes. The dismal possibility of obtaining even less funding from state governments may easily tempt campus leaders to use gaming tactics. Should this happen, performance-based funding policy miserably fails to serve its purpose.

As is shown in the analyses, neither Indiana nor Washington showed any increase in spending on instruction, student services, or academic support in real terms. This suggests that institutional behaviors and their business practices were not affected by the policy to an extensive level. If state governments wish to use performance-based funding policies as managerial tools for enhanced accountability and institutional improvement in public higher education institutions, they must ensure that the design of the policy contains authentic incentives that can successfully motivate public colleges and universities to serve state needs.

The unconventional performance-based funding strategy employed by Louisiana was shown to have increased instructional expenditures by 7% to 8% in public 2-year colleges but did not affect the public 4-year system. In many ways, Louisiana's approach is to compensate the shortfalls in state support by raising tuition conditional on institutions meeting performance criteria. The strength of this incentive system is two-fold. First, the possibility of increasing revenues by raising tuition could give campus leaders more freedom and motivate them to be innovative. Second, public colleges and universities would not lose state dollars if their efforts to improve student outcomes were unsuccessful. Compared with Indiana and Washington, Louisiana's strategy may represent a better way to create a stronger incentive without increasing the financial burdens on the state government.

The state-by-state analyses offer valuable lessons for states relying on performance-based funding policy as an alternative to their existing funding strategy. The issues that these states attempted to address in their policy design and the issues that emerged from policy implementation indicate that creating a genuine incentive mechanism is essential, but is also just the first step toward a successful performance-based funding policy. Other prominent issues include defining meaningful performance indicators, balancing state interests with institutional needs, and ensuring fairness given institutional diversity, to name a few. On the other hand, because the system performance of state public higher education is more closely associated with the overall affluence and education levels of the state rather than performance-based practices or even higher education governance structures (Volkwein & Tandberg, 2008), policymakers must have a sober understanding of the possibilities and the limits of performance-based funding policy.

At its core, state higher education financing always revolves around the contending principles of equal access, high-quality and cost-efficiency. No single policy can effectively and simultaneously address all the issues implied in these three principles. Take Louisiana's GRAD Act for an example, while this strategy may be an efficient way to institutional improvement, it may also create barriers for low-income students to attend college. Therefore, policymakers must be well-informed of state higher education needs and the best way to meet each need. Any attempt that tries to meet all the needs once and for all through one policy is overly ambitious and will fail to meet any of the needs. Performance-based funding is not a panacea or a universal policy lever that offers convenient solutions to all states' accountability concerns over public higher education.

Should Public Higher Education Alone Bear All the Blame?

To safeguard public higher education from being a scapegoat, state policymakers must develop a holistic perspective on the situation as they look to performance-based funding as an alternative way to fund public higher education. In addition to the challenges that are inherently associated with implementing this policy, the ongoing discussions on improving student outcomes in public higher education via state policy must also be understood in the light of a panoramic view of K-16 educational pipelines. After all, it is all too easy to blame public higher education institutions for dissatisfactory student outcomes. Many policymakers have a very simplistic, even naïve, understanding of higher education institutions and the nature of production in higher education, let alone how secondary education may affect postsecondary education outcomes.

Lareau (2003) documented how social class into which one was born can leave an almost indelible mark on one’s educational aspirations and achievements. K-12 education plays a key role in endowing individuals with cognitive capabilities, social skills, and academic capacities to succeed in postsecondary education. A student from a low SES background, however, may be deprived of many opportunities to acquire these assets simply because of his/her upbringing and the K-12 environment that was available to him/her. Higher education is an individual's social and political right, but this fact does not mean that public higher education alone should bear the responsibility for addressing educational inequality and reducing the gaps that exist among different social classes. If inequality in educational quality remains at the K-12 level, one's social and political right to pursue higher education can always be violated, especially for someone from an underprivileged background.

The structural disconnection between the secondary education system and higher education in the U.S. undoubtedly complicates the matter of student success in public higher education. Although many K-16 initiatives have been carried out in recent years, the gap between K-12 and postsecondary education still creates many loopholes in the educational pipeline. As a result, many college-bound students are not fully equipped with the level of academic and social capitals that are needed for success in higher education. Clearly, public colleges and universities are only partially responsible for low retention rates and graduate rates. The highly unbalanced educational quality among different school districts invariably undermines the efforts made by public colleges and universities to improve student outcomes. It is likely that the low retention rates and low graduation rates result from the increased enrollment of underprepared students as public higher education tries to fulfill its mission to achieve educational equality while maintaining academic quality. To what degree should the staggering college completion rates be attributed to factors other than postsecondary institutions, such as to the unbalanced K-12 education system? When state governments try to regulate public higher education institutions through state funding, a knowledge of the bearing of many contextual, latent factors on student outcomes in public higher education helps to improve the design of performance-based funding policy.

Implications

Compared with public higher education systems in other countries, the U.S. has made outstanding achievements in expanding college access. While state policy can effectively direct public higher education to admit a larger number of students from various backgrounds, implementing performance-based funding policy to improve student outcomes requires sufficient resources, capable organizational leadership, and an organizational culture that is sensitive and responsive to students' academic needs. In many ways, except for the state of Tennessee, performance-based funding is still in its nascence and using performance-based funding policy to improve student outcomes calls for substantial financial and political support from state governments. Without robust financial incentives, performance-based funding policies are unlikely to motivate public colleges and universities, let alone make a real positive difference in improving student outcomes. In other words, even though performance-based funding policies may be a more efficient funding strategy, they do not necessarily enable state governments to further cut funding for public higher education. In fact, because of the lags between policy implementation and the ultimate manifestation of policy effects on student outcomes, to successfully implement performance-based funding policies may require state governments increase their financial investment in public higher education.

Undoubtedly, the symbiotic relationship between the states and their public higher education systems requires state governments and public higher education institutions to cooperate and seek solutions that benefit all higher education stakeholders. State governments must shift from a criticizing and fault-finding mentality to a cooperative mindset; they must also shift from imposing political interests upon public higher education to an understanding that states will benefit most from a more *laissez-faire* approach. A concerted effort on the part of state governments and institutional leaders is required to improve college access, affordability, and student success in the era of renewed performance-based funding policy. It is time to put away political rhetoric and petty politics.

For public colleges and universities, the shift in state funding strategy calls for organizational innovation to cope with the most likely irreversible trend of declining state funding in relative terms while serving state needs. They need to seek a more balanced revenue model and diversify their revenues streams to protect themselves from economic and political whims. To effectively improve student outcomes, public colleges and universities not only need to increase their spending on student-related categories, but they also need to constantly engage themselves in organizational learning. The positive role of financial input in improving student outcomes highlights the importance of sufficient resources. The other side of the coin is to spend wisely. Webber and Ehrenberg

(2010) have showed that the effect of student-related spending categories is associated with students' academic and socioeconomic backgrounds. Therefore, public colleges and universities must utilize institutional research to identify how different categories of expenditures are related to the characteristics of students who attend their institutions, and identify which categories require more financial input.

For state policymakers, rather than simply requiring public colleges and universities to meet performance benchmarks without strong financial or political commitment, they need to share the responsibility with public higher education and help public colleges and universities to achieve better student outcomes. Performance-based funding policy targeting student outcomes must contain strong incentives that can bolster public higher education institutions' commitment to student success and enable them to translate their commitment into effective actions. State governments must also implement initiatives that address education quality in low performing K-12 school districts and reduce the gap between K-12 education and higher education.

This comprehensive perspective entails that policymakers must establish a coherent policy framework and coordinate state policies on higher education finance, student financial aid, and others. With a holistic policy approach, state governments can help public higher education meet the persistent challenges of offering quality higher education to as many students as possible at an affordable price. Otherwise, the demand of accountability for improved student outcomes, coupled with the need of expanding college access to low-income students, can simply leave public colleges and universities in a difficult dilemma.

Thomas Jefferson wrote in the Declaration of Independence, “We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.—That to secure these rights, Governments are instituted among Men…” (The Declaration of Independence, 1776). Accordingly, the role of public higher education policy should be to facilitate public colleges and universities to meet the tasks presented by the “iron-triangle.” Ironically though, public higher education is often victimized in the political process. In a nutshell, individual rights, common interests, efficiency, and equality are the core values that underpin a democratic society. The principles of the market economy emphasize individual gain and efficiency. On the other hand, without a vibrant community, an individual’s rights to life, liberty, and the pursuit of happiness can be undermined. Therefore, in order to create a favorable environment for the operation of the market economy, a political economy that promotes the common good and social equality is needed. It is the very dynamics in maximizing these core values while maintaining them within checks and balances that keep a society prosperous. Public policy serves as a means to this end.

Apparently, funding public higher education is perhaps one of the very few areas that benefits both an individual and the community and promotes efficiency while improving equality, especially in today’s knowledge-based economy. The return on investment in public higher education is not only in the economic realm but is also associated with social and cultural benefits (Baum & Payea, 2010; Becker & Lewis, 1992; Leslie & Brinkman, 1988). The argument that public dollars should be reduced from funding public higher education because of the private benefits accrued by the individuals is oblivious to the social benefits that are generated by public higher education. There is little doubt that states benefit most from a vigorous academic community. A government “of the people, by the people, for the people” should prioritize public higher education in the state budget without question rather than using it as a “budget balancer” (McGuiness, 2005).

As state governments find themselves struggling to make ends meet, funding for public higher education has been facing severe trials. State policymakers need to explore other options to address state governments’ financial challenges instead of always resorting to cutting funding for public higher education. Implementing performance-based funding policy in public higher education requires state government devote more financial resources and be fully committed to their financial obligations toward public higher education. If state governments are unable or unwilling to supply public higher education with the necessary financial resources, how can public colleges and universities translate their commitment to student success into concrete and effective actions? Further, what has likely been overlooked in the discourse of state higher education financing is what level of priority should be placed on public higher education. Without a fundamental shift in public higher education’s position in the state budget, performance-based funding policy, or any other higher education funding strategy for that matter, is likely to be political rhetoric rather than policy re-invention.

NOTES

1. Breneman (2002) indicated that during the early 1990s, state appropriations, for the first time, could not keep up with the funding levels of the previous year. On the other hand, Zumeta (1999), measuring state funding support by higher education's share in a state's budget, claimed that the share of state higher education appropriations dropped from nearly 14% in FY86 to slightly more than 12% in FY96.

2. Snyder (2016) protested against such claims by stating that the most recent design of performance-based funding in some states has taken measures to address such concerns.

3. Jones (2013) views traditional enrollment-based funding as a type of performance funding. His argument is that as enrollment-based funding rewards institutions for increased access, it is, in essence, using access as a measure for institutional performance.

4. The Hausman test for all the models used in this study yielded mixed results which are not reported.

5. The report by the Indiana Commission for Higher Education can be found at https://www.in.gov/che/files/Performance_Funding_FAQ_FINAL.pdf

6. These numbers were obtained from *The Chronicle of Higher Education*, "College completion: Who graduates from college, who doesn't, and why it matters," accessed December 15, 2014.

7. According to the Report by the Public Affairs Research Council of Louisiana May 2008, the Board of Regents formula was not used in setting the appropriations; instead, historic funding levels are used as references.

8. Based on Zumeta's (2006) calculation, more than 70 percent of students in Washington attend its community and technical colleges.

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APPENDICES

APPENDIX A Control Groups

Treatment states	Control states for the public 4-year system	Control states for the public 2-year system
Indiana	Alabama, Alaska, California, Colorado Connecticut, Delaware, Florida, Georgia, Hawaii, Idaho, **Illinois**, **Iowa**, Kentucky, Maryland, Montana, **Michigan**, **Nebraska**, New Hampshire, New Jersey, New Mexico, Nevada, North Carolina, **North Dakota**, Oklahoma, Rhode Island, **South Dakota**, Texas, Vermont, Washington, West, Virginia, **Wisconsin**, Wyoming,	
Louisiana	**Alabama**, Alaska, California, Colorado, Connecticut, **Delaware**, **Georgia**, Hawaii, Idaho, Iowa, **Kentucky**, **Maryland**, Montana, Nebraska, New Hampshire, New Jersey, Rhode Island, Vermont, Washington, **West Virginia**, Wisconsin, Wyoming,	**Alabama**, Alaska, Arizona, California, Colorado, Connecticut, **Delaware**, **Florida**, **Georgia**, Idaho, Iowa, Kansas, **Kentucky**, **Maryland**, Montana, Nebraska, New Hampshire, New York, Oregon, Pennsylvania, Rhode Island, Vermont, **Virginia**, **West Virginia**
Washington		Alabama, Alaska, **Arizona**, **California**, **Colorado**, Connecticut, Delaware, Florida, Georgia, **Idaho**, Iowa, Kansas, Kentucky, Maryland, **Montana**, Nebraska, New Hampshire, New York, **Oregon**, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia

Note: states that are in **bold** were also used in the regional control group

APPENDIX B F-test for all Models

Table 2.1

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{283, 2263}$=1412.03	$F_{71,567}$ =2171.28	$F_{283, 2253}$=31.21	$F_{71, 557}$=23.74
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 2.2

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{283, 2263}$=453.17	$F_{71,567}$ =752.61	$F_{283, 2253}$=67.09	$F_{71, 557}$=89.18
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 2.3

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{283, 2263}$=469.25	$F_{71,567}$ =323.57	$F_{283, 2253}$=39.40	$F_{71, 557}$=25.75
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 3.1

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{283, 2263}$=47.69	$F_{71,567}$ =46.81	$F_{283, 2253}$=19.29	$F_{71, 557}$=17.90
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 3.2

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{283, 2263}$=97.16	$F_{71,567}$ =170.31	$F_{283, 2253}$=57.20	$F_{71, 557}$=83.85
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 3.3

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{283, 2263}$=45.76	$F_{71,567}$ =47.02	$F_{283, 2253}$=38.32	$F_{71, 557}$=46.75
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 5.1

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{324, 3239}$=403.84	$F_{104, 1039}$=196.83	$F_{324, 3229}$=25.76	$F_{104, 1029}$=21.93
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 5.2

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{324, 3239}$=163.13	$F_{104, 1039}$=92.14	$F_{324, 3229}$=18.89	$F_{104, 1029}$=11.28
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 5.3

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{324, 3239}$=114.69	$F_{104, 1039}$=52.73	$F_{324, 3229}$=31.29	$F_{104, 1029}$=13.07
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 6.1

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{324, 3239}$=33.00	$F_{104, 1039}$=35.84	$F_{324, 3229}$=22.05	$F_{104, 1029}$=20.58
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 6.2

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{324, 3239}$=19.75	$F_{104, 1039}$=21.38	$F_{324, 3229}$=17.54	$F_{104, 1029}$=19.97
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 6.3

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{324, 3239}$=51.78	$F_{104, 1039}$=29.87	$F_{324, 3229}$=44.57	$F_{104, 1029}$=26.34
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 8.1

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{169, 1689}$=1447.76	$F_{70, 699}$=1058.77	$F_{169, 1679}$=36.92	$F_{70, 689}$=26.77
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 8.2

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{169, 1689}$=646.60	$F_{70, 699}$=439.19	$F_{169, 1679}$=89.86	$F_{70, 689}$=52.72
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 8.3

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{169, 1689}$=697.99	$F_{70, 699}$=469.82	$F_{169, 1679}$=58.96	$F_{70, 689}$=37.16
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 9.1

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{169, 1689}$=73.13	$F_{70, 699}$=82.48	$F_{169, 1679}$=25.32	$F_{70, 689}$=28.23
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 9.2

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{169, 1689}$=127.53	$F_{70, 699}$=107.73	$F_{169, 1679}$=68.13	$F_{70, 689}$=45.86
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 9.3

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{169, 1689}$=51.53	$F_{70, 699}$=42.29	$F_{169, 1679}$=40.81	$F_{70, 689}$=32.44
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 11.1

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{333, 3329}$=414.68	$F_{127, 1269}$=457.18	$F_{333, 3319}$=24.97	$F_{127, 1259}$=19.68
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 11.2

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{333, 3329}$= 167.53	$F_{127, 1269}$= 151.00	$F_{333, 3319}$= 20.03	$F_{127, 1259}$= 17.19
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 11.3

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{333, 3329}$= 115.26	$F_{127, 1269}$= 141.00	$F_{333, 3319}$= 31.86	$F_{127, 1259}$= 33.02
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 12.1

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{333, 3329}$= 32.52	$F_{127, 1269}$= 31.62	$F_{333, 3319}$= 21.32	$F_{127, 1259}$= 19.44
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 12.2

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{333, 3329}$= 21.78	$F_{127, 1269}$= 15.98	$F_{333, 3319}$= 19.71	$F_{127, 1259}$= 14.64
p-value	<.000.1	<.000.1	<.000.1	<.000.1

Table 12.3

	Model 1		Model 2	
	national	regional	national	regional
F-test	$F_{333, 3329}$= 52.06	$F_{127, 1269}$=34.59	$F_{333, 3319}$= 45.07	$F_{127, 1259}$= 31.08
p-value	<.000.1	<.000.1	<.000.1	<.000.1

APPENDIX C Placebo Tests I (public 4-year Indiana)

Placebo Tests I (public 4-year Indiana)

	Placebo Test 1	Placebo Test 2
placebo	-0.09	0.00
	(-1.74)	(0.86)
other revenues	0.40***	0.00
	(8.24)	(0.27)
administrative costs	-0.03	-0.01***
	(-1.26)	(-7.18)
% receiving FA	0.01	0.00
	(0.18)	(0.58)
% black	0.15	0.03
	(0.56)	(1.66)
part-time enrollment	0.12***	0.01***
	(4.52)	(4.69)
full-time enrollment	0.13**	-0.00
	(2.79)	(-0.17)
tuition/revenues	1.54***	0.01
	(6.44)	(0.60)
state funding/revenues	1.61***	0.03
	(7.84)	(1.80)
retention rates	-0.13	-0.00
	(-1.12)	(-0.38)
graduation rates	0.22	0.02
	(1.94)	(1.89)
_cons	6.59***	0.16
	(6.59)	(2.25)
N	2556	2556

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

Note: placebo test 1 tested Model 2 in Table 2.3 with the national control group. Test 2 tested Model 2 in Table 3.3 with the national control group

APPENDIX D Placebo Tests II (public 2-year Louisiana)

Placebo Tests II (public 2-year Louisiana)

	Placebo Test 1	Placebo Test 2	Placebo Test 3	Placebo Test 4
placebo	0.04	-0.02*	0.01	-0.02**
	(0.70)	(-2.53)	(0.22)	(-2.71)
other revenues	0.33***	-0.01***	0.37***	0.00
	(18.61)	(-3.35)	(11.62)	(0.70)
administrative costs	0.09***	-0.01***	0.19***	-0.02***
	(8.93)	(-3.77)	(8.62)	(-5.34)
% receiving FA	-0.12***	-0.01**	-0.08	-0.00
	(-3.87)	(-2.78)	(-1.37)	(-0.20)
% black	-0.34***	0.00	-0.45**	-0.00
	(-3.43)	(0.08)	(-3.23)	(-0.19)
part-time enrollment	0.04**	0.00	0.05**	-0.01***
	(3.14)	(0.37)	(2.61)	(-3.65)
full-time enrollment	0.26***	-0.02***	0.40***	-0.02***
	(14.57)	(-5.39)	(13.54)	(-5.00)
tuition/revenues	1.14***	-0.04*	1.10***	-0.05
	(10.97)	(-2.40)	(5.90)	(-1.87)
state funding/revenues	1.18***	-0.02	1.62***	0.06**
	(15.38)	(-1.62)	(10.74)	(2.86)
retention rates	0.01	-0.01	0.06	-0.00
	(0.19)	(-1.07)	(1.02)	(-0.23)
graduation rates	0.19***	0.02**	0.22***	0.03***
	(5.34)	(2.64)	(3.39)	(3.44)
_cons	6.76***	0.52***	3.10***	0.48***
	(21.97)	(9.58)	(5.84)	(6.71)
N	3575	3575	1155	1155

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

Note: placebo test 1 tested Model 2 in Table 5.1 with the national control group. Test 2 tested Model 2 in Table 6.2 with the national control group. Test 3 tested Model 2 in Table 5.1 with the regional control group. Test 4 tested Model 2 in Table 6.2 with the regional control group.

APPENDIX E Placebo Tests III (public 4-year Louisiana)

Placebo Tests III (public 4-year Louisiana)

	Placebo Test 1	Placebo Test 2	Placebo Test 3	Placebo Test 4
placebo	0.00	-0.00	0.09*	0.00
	(0.03)	(-1.12)	(2.12)	(1.26)
other revenues	-0.01	-0.02***	0.96***	0.03***
	(-1.21)	(-5.26)	(11.31)	(4.17)
administrative costs	-0.00	-0.00	-0.09*	-0.02***
	(-0.76)	(-0.84)	(-2.15)	(-5.80)
% receiving FA	0.06***	0.02***	0.06	0.01
	(4.84)	(3.67)	(0.52)	(1.66)
% black	0.15***	0.01	-0.52*	-0.02
	(3.53)	(0.69)	(-1.82)	(-0.92)
part-time enrollment	-0.00	0.00*	0.09*	0.01*
	(-0.73)	(2.48)	(2.46)	(2.46)
full-time enrollment	0.00	0.00	0.10	-0.00
	(0.03)	(1.89)	(1.40)	(-0.37)
tuition/revenues	0.01	-0.02	3.52***	0.10***
	(0.24)	(-1.32)	(9.81)	(3.33)
state funding/revenues	0.06	-0.07***	4.01***	0.18***
	(1.78)	(-5.39)	(11.36)	(5.97)
retention rates	-0.01	-0.01	-0.03	-0.00
	(-0.63)	(-1.17)	(-0.22)	(-0.27)
graduation rates	0.12***	0.01	0.27	0.01
	(6.31)	(1.23)	(1.63)	(0.55)
_cons	0.45**	0.33***	-3.24**	-0.25**
	(2.85)	(5.25)	(-2.26)	(-2.08)
N	1870	1870	781	781

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

Note: placebo test 1 tested Model 2 in Table 9.1 with the national control group. Test 2 tested Model 2 in Table 9.2 with national control group. Test 3 tested Model 2 in Table 8.3 with the regional control group. Test 4 tested Model 2 in Table 9.3 with the regional control group.

APPENDIX F Placebo Tests IV (public 2-year Washington)

Placebo Tests IV (public 2-year Washington)

	Placebo Test 1	Placebo Test 2	Placebo Test 3	Placebo Test 4
placebo	-0.03	0.01	0.05	0.01
	(-0.90)	(1.62)	(0.70)	(1.42)
other revenues	0.30***	-0.01***	0.32***	-0.02*
	(17.43)	(-4.08)	(5.31)	(-2.20)
administrative costs	0.09***	-0.01***	-0.02	-0.02***
	(9.11)	(-3.66)	(-0.79)	(-4.98)
% receiving FA	-0.13***	-0.02**	-0.03	-0.01
	(-4.38)	(-3.07)	(-0.34)	(-1.13)
% black	-0.47***	0.02	-0.87*	-0.06
	(-4.44)	(1.24)	(-2.13)	(-1.29)
part-time enrollment	0.04**	-0.00	0.09	-0.00
	(3.28)	(-0.26)	(1.89)	(-0.13)
full-time enrollment	0.25***	-0.02***	0.03	-0.01*
	(14.33)	(-5.06)	(0.63)	(-2.20)
tuition/revenues	1.00***	-0.04*	1.13**	0.00
	(9.74)	(-2.14)	(3.13)	(0.03)
state funding/revenues	1.10***	-0.03*	0.68***	-0.03
	(14.54)	(-2.54)	(3.31)	(-1.20)
retention rates	0.00	-0.01	-0.05	-0.00
	(0.01)	(-1.29)	(-0.56)	(-0.34)
graduation rates	0.16***	0.02**	0.01	0.00
	(4.57)	(2.72)	(0.06)	(0.34)
_cons	7.29***	0.55***	8.96***	0.75***
	(23.62)	(10.18)	(8.73)	(6.21)
N	3674	3674	1408	1408

t statistics in parentheses *p<0.05 **p<0.01 ***p<0.001

Note: placebo test 1 tested Model 2 in Table 11.1 with the national control group. Test 2 tested Model 2 in Model in Table 12.2 with the national control group. Test 3 tested Model 2 in Table 11.2 with the regional control group. Test 4 tested Model 2 in Table 12.2 with the regional control group.