State Higher Education Performance Funding: Data, Outcomes, and Policy Implications*

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ABSTRACT

As states explore strategies for increasing educational attainment levels, attention is being paid to performance funding. This study asks, "Does the introduction of performance funding programs affect degree completion among participating states?" Utilizing a quasi-experimental research design we find limited evidence that performance funding significantly increases baccalaureate degree completions.

INTRODUCTION

Many concerned with public higher education in the United States argue that it has become inefficient and unresponsive to students, the public, and the needs of the states (Complete College America 2012; Liefner 2003). They point to long-term trends and recent data to support their claims, which are not hard to come by: in 2010 four-year colleges and universities graduated less than 30% of their students on time (four years or less) and less that 60% of their students within six years. Two-year colleges were roughly half as successful in graduating their students (ACT 2011). Additionally, the United States has lost significant ground relative to its counterparts in regard to educational attainment rates (OECD 2010). Further, the cost of higher education has increased at a dramatic rate, far exceeding increases in healthcare, inflation, and personal income (The College Board 2010). These factors have resulted in calls for state-level reforms aimed at encouraging innovation and at making public institutions of higher learning

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more accountable for student outcomes. One reform which is not new, but is receiving renewed attention in many state legislatures, is performance funding.

State performance funding programs are incentive systems that link institution funding levels to performance outcomes. States measure "performance" in various ways, including student retention, graduation rates, student scores on licensure exams, job placement rates, faculty productivity, and campus diversity. Ultimately, many of these performance measures are designed to increase the number of students completing postsecondary credentials. Given this context, and the fact that several states currently operate or are in the process of adopting performance funding programs, this study asks "to what extent does the introduction of performance funding programs affect four-year degree completion among participating states?"

Despite the recent attention paid to performance funding, researchers have had difficulty finding a significant relationship between performance funding and improved institutional performance (Dougherty and Reddy 2013; Fryar 2011; Liefner 2003; Sanford and Hunter 2011; Shin 2010; Shin and Milton 2004; Volkwein and Tandberg 2008). However, past studies have been limited by the data and methods utilized to explore the relationship between performance funding and such outcomes. As several states have recently introduced new performance funding initiatives (Table 1) and several more are in the process of doing so (Dougherty and Reddy 2013), it is imperative that we gain a better understanding of performance funding and its impact on students and institutional performance.

PERFORMANCE FUNDING IN HIGHER EDUCATION

In many states, the state oversight and accountability environment for public colleges and universities underwent a significant shift during the 1990s, from one that concentrated on regulatory compliance, rudimentary reporting of inputs, and accounting for expenditures to one that focused on measuring performance and accounting for outcomes or results (Burke and Associates 2005; McGuinness 1995; McLendon 2003; Volkwein 2007; Volkwein and Tandberg 2008). The shift in public policy has been referred to as the "new accountability" movement in public higher education (Gorbunov 2004; McLendon, Hearn, and Deaton 2006; Toutkoushian and Danielson 2002; Zumeta 1998). This new accountability movement corresponds with already prevailing trends within the larger sphere of governmental oversight and public policy, often referred to as the "new public management" or "re-inventing government" movements (Fryar 2011; Gore 1993; Osborne and Gaebler 1992; Rabovsky 2012).

One of the most obvious manifestations of this new approach to state higher

Table 1. State Performance Funding for Four-Year Institutions

State	Performance Funding Years in Operation
Arkansas	1995–1997
Colorado	1994–1996, 2000–2004
Idaho	2000–2005
Indiana	2007–current
Kansas	2002, 2005–current
Kentucky	1995–1997
Louisiana	2009–current
Minnesota	1995–1998
Missouri	1993–2002
New Jersey	1999–2002
New Mexico	2007–current
New York	2000–2007
Ohio	1998–2007, 2009–current
Oklahoma	1998–2000, 2002–current
Oregon	2000–2001, 2007–current
Pennsylvania	2000–current
South Carolina	1996–2004
South Dakota	1998–2002, 2005–current
Tennessee[1]	1979–current
Texas[2]	2009–current
Virginia	2007–current

1. Tennessee began their performance funding policy in 1979. Since our study begins in 1990, we have no observation for this state prior to the adoption of this policy. While Tennessee has significantly reformed their program in recent years (thus, gaining Performance Funding 2.0 status) we believe it is best to exclude the state from the analysis. We yield similar results when including Tennessee in our models, though conceptually we cannot justify the state's inclusion.
2. Texas refers to their program as formula funding; however, as their formula is in part driven by completions and other outcome metrics, they are included in this analysis.

education oversight was the development of performance funding programs. These programs are meant to encourage changes to institutional behavior in order to meet state priorities by linking state funding (or a portion of state funding) for higher education "directly and tightly to the performance of public campuses on individual indicators" (Burke and Minassians 2003, p. 3). There is significant diversity in the types of programs adopted by states. Some states reserve up to 10% of an institution's funding as performance funding; others reserve as little as 2%. In most cases performance funding serves as a bonus. However, a few states take performance funding further and embed it into their base funding formula (Burke and Minassians 2002; Dougherty and Reddy 2013; Ed Sector 2011). In either case, specific levels of funding are determined via weights for various performance factor values, and the basic theory remains the

same—that if an institution meets a specified performance target, it receives a designated amount of state funding.

Proponents argue that because performance funding programs focus on outcomes instead of specific institutional actions or inputs, they allow institutions the autonomy to decide whether and, if so, how they will respond to program incentives. Therefore, these programs allow states to focus institutional attention on state priorities while simultaneously protecting institutional autonomy, at least to a certain degree (Burke and Minassians 2002). Proponents further argue that such programs make it easier for policy makers and the public to ensure that higher education institutions are serving the public interest, evaluate the institutions' overall performance, encourage innovation, and impose sanctions when institutions fail to produce desired results (Aldeman and Carey 2009; Burke and Minassians 2003; Dougherty and Reddy 2013; Kelly, Schneider, and Carey 2010; McLendon, Hearn, and Deaton 2006). Nevertheless, performance funding is not without its critics, who claim such policies are often implemented for political reasons, are blind to the practical realities and complexities of managing colleges and universities, and are often implemented in ways that negate any potential benefits and which distort institutional missions and result in perverse incentives and unintended consequences that negatively affect students and institutions (Dougherty and Reddy 2013; Hunt 2008; McLendon, Hearn, and Deaton 2006; Wellman 2001; Zumeta 2001).

In this new accountability movement, many states have looked to early performance funding adopters for guidance. While Tennessee had a performance funding program in place since the late 1970s, other states did not begin adopting this new funding model until the 1990s. According to McLendon et al. (2006), in 1985 only two states had such a policy, but by 2001 23 states had performance funding systems. However, in the early 2000s these programs began to lose popularity with a significant number of states giving up their programs (Dougherty, Natow, and Vega 2012). Recently a number of large-scale initiatives, backed by some of the largest foundations and higher education policy nonprofits and institutes in the country, have advocated for the development of new state higher education performance funding programs and a significant number of states have launched new programs (Rabovsky 2012). This renaissance has been dubbed "Performance Funding 2.0" (Dougherty and Reddy 2013).

One of the most active advocacy organizations backing the implementation of new performance funding programs is Complete College America (with support from The Bill and Melinda Gates Foundation and The Lumina Foundation for Education, among others). In 2009, Complete College America began advocating for the adoption of a series of higher education reforms, including improved remediation practices and the implementation of performance

funding programs. As of April 2012, 30 states have joined the "Complete College America Alliance of States," which is designed to encourage states to establish college completion goals and adopt policy reforms (such as performance funding) to achieve these goals (Complete College America 2012). The recent attention to performance funding has led to resurgence in these programs, with Indiana, Louisiana, Ohio, Tennessee, and Texas implementing new or significantly revised performance programs since 2009. Likewise, somewhat earlier and heralding the beginnings of Performance Funding 2.0, New Mexico, Oregon, and Virginia began new performance funding programs since 2007. Colorado, Illinois, and Massachusetts are currently actively working towards the development of their own programs (Dougherty and Reddy 2013; Rabovsky 2012). Advocates argue that these innovations have the potential to significantly improve the outcomes associated with performance funding (Complete College America 2012; Dougherty and Reddy 2013; Jones 2012). The goal of this study is to test whether the presence of a performance funding program had an effect on state baccalaureate completions between 1990 and 2010 using panel data and a quasi-experimental research design.

CONCEPTUAL FRAMEWORK

When attempting to understand the theory of action behind state higher education performance funding programs, it is helpful to employ principal-agent theory. Principal-agent theory argues that the principals (in this case the states) utilize rewards and sanctions to ensure that the agents (public four-year colleges) meet the principals' goals. From the principal-agent theoretical perspective, both parties seek to maximize their own, often divergent, preferences. The strategies and practices principals and agents employ in these relationships often become a primary concern of principal-agent theorists and researchers (Moe 1987). Principal-agent relationships can be complicated when principals and agents disagree on the policy goals, when agents face multiple principals, or when the incentives impose significant transaction costs to the agent. We frame our study using principal-agent theory because the underlining theory of higher education performance funding programs is the idea that states can induce institutions to alter their business practices to produce outcomes better aligned to state priorities.

Principal-agent theory can also help us anticipate some of the challenges and transaction costs state policy makers may face when implementing performance funding models and the challenges faced by institutions attempting to respond to the states' incentives. By employing the principal-agent lens to this analysis, we can see that the relationship between states and public institutions might

be complicated in circumstances where institutions do not have the will or the resources to increase college completions, even when financial incentives are in place. Similarly, if institutions are unclear of the state's priorities or if the incentives are not large enough to induce institutions to change their behavior, then we may expect performance funding to be a relatively weak instrument for increasing degree completions.

RELEVANT LITERATURE

While various studies have focused on the origins of performance funding (e.g., McLendon, Hearn, and Deaton 2006), other studies have examined the implications and impacts these programs have on public higher education institutions. In their review of existing research and state documents and reports, Dougherty and Reddy (2013) found that state performance funding programs had varying degrees of impact on such factors as state funding levels, public awareness of state priorities and own institutional performance, and competition among institutions. Likewise, performance funding was found to affect various institutional policies and practices, including the use of data in planning and institutional policy making, and academic and student services improvements. These findings were further buttressed by a later national study by Rabovsky (2012). Utilizing institution-level data, Rabovsky found that performance funding was significantly associated with institutions spending less on research related activities and more on instruction. However, the effect sizes were relatively small.

Nevertheless, no study has produced consistent statistically significant results tying performance funding to improvements in such educational outcomes as completions and retention and graduation rates. This includes studies that utilized state-level data (Sanford and Hunter 2011; Volkwein and Tandberg 2008) and studies utilizing institutional-level data (Doyle and Noland 2006; Fryar 2011; Shin 2010; Shin and Milton 2004). These non-findings are further supported by other state-specific studies (see Dougherty and Reddy 2013).

Interpreting these non-findings can be difficult. It could be that performance funding, as it has been designed and implemented in the past, simply does not affect the final outcomes it was primarily designed to affect. This could be the result of poor design and/or poor implementation. Dougherty and Reddy (2013) identified a number of obstacles to effective performance funding, including inappropriate measures, instability in funding indicators and measures, the brief duration of some programs, inadequate funding, institutional resistance, and gaming of the system. These factors certainly may help explain the non-findings; however, there may be other factors at work too. Tracking the development

of performance funding is a challenging task for any researcher because these policy developments change over time and are not always codified into state statute. As a result, much of the research on the subject relies on self-reported survey results, case studies, or reviews of internal governmental documents. For example, McLendon et al. (2006) summarize several national surveys on performance funding and conclude that 25 states had operated these funding models by 2002. However, a recent study by Rabovsky (2012) indicates far fewer states had (or currently have) performance funding models. These discrepancies in the data could be one reason why the current research on performance funding is so inconclusive.

An additional reason is related to research design, where no studies have implemented quasi-experimental designs aimed at improving the internal validity of the models. Such a technique would help us identify more accurately the impact of performance funding on state educational outcomes. In our study, we address these discrepancies in several ways. First, in order to accurately classify the implementation dates of performance funding states, we have conducted a systematic review of the literature, reviewed state documents and websites, and consulted with recognized experts in the area. Second, we attempt to address two of the weaknesses identified by Dougherty and Reddy (2013) by not only examining performance funding's impact overall (all years and states) but by also examining the possible impact over time. Third, we have implemented a quasi-experimental research design that should help us move closer to identifying the causal link between these new policies and educational outcomes.

IDENTIFYING PERFORMANCE FUNDING STATES

We utilize a variety of sources for identifying performance funding states/years. Joseph Burke and associates conducted annual surveys with state chief financial officers between the years 1998 and 2003 to determine if (and when) states operated performance funding policies (Burke and Minassians 2001, 2002a, 2003; Burke, Minassians, and Lessard 2000; Burke and Modarresi 1999; Burke and Serban 1998a, 1998b). During these years, several states self-reported that they had performance funding policies in place. For example, in Burke's first survey (1998), South Carolina reported that they had a performance funding program in place during 1998. In the subsequent surveys, South Carolina continued to report that they operated a performance funding policy in each year that Burke and associates conducted their studies.

While this information was helpful in terms of classifying states that had self-reported performance funding programs during these years, it does not tell us precisely when the state began and ended their performance funding programs.

Returning to the South Carolina example, they adopted a performance funding policy in 1996, but they decommissioned it in 2004. These dates are not captured in the Burke and associates surveys. Additionally, some of the Burke data conflicted with data from other sources. In order to better capture program birth and death dates and to increase the accuracy of the data, we relied on additional sources. These included secondary sources such as Dougherty's many publications on the topic (e.g., Dougherty, Natow, Hare, Jones, and Vega 2013; Dougherty, Natow, and Vega 2012; Dougherty, Nienhusser, and Reid 2006; Dougherty and Reddy 2013), Rabovsky's recent work (Rabovsky 2012), the Ed Trust's examination of the state of performance funding programs (Aldeman and Carey 2009), the American Federation of Teachers "What Should Count" on-line database (AFT 2012), AASCU's policy brief on performance funding (Harnisch 2011), and the data collection effort of Alexander Gorbunov at Vanderbilt University. Primary sources included state websites, laws, and administrative rules and policies. Finally, we consulted with a number of informed expects on performance funding in order finalize our data. The end result is a comprehensive list of the start and end dates of state performance funding policies affecting public four-year colleges and universities. We triangulated these sources to arrive at our final classification of performance funding states over time.

DATA SOURCES AND VARIABLE SELECTION

After identifying which states had performance funding policies and when, we collected various state-level data for the years 1990 through 2010. We were able to create a state-level panel dataset that includes 1,050 total observations incorporating records from such sources as the U.S. Department of Education's Digest of Education Statistics and Integrated Postsecondary Education Data System (IPEDS), State Higher Education Executive Officers (SHEEO) and Grapevine reports, the National Association of State Scholarship and Grant Aid Programs (NASSGAP), U.S. Census Bureau, and the Bureau of Labor Statistics. All financial data are adjusted for inflation using the Consumer Price Index (2010 dollars).

The outcome variable of interest is *total public baccalaureate degree completions* within each state during each year. Increasing total baccalaureate degree completions is the most frequently cited goal of state performance funding programs, making it the most relevant outcome measure to the performance funding states included here (McKeown-Moak et al. 2013). Total completions are generated from IPEDS degree completion files, and we frame the production of baccalaureate degrees within states as a function of higher education finance trends, current public four-year enrollment levels, state economic and

demographic characteristics, and the presence of performance funding policies that encourage baccalaureate degree completion. Accordingly, our analysis includes the following variables: total state population, percentage of public college students enrolled in public four-year institutions, public four-year tuition levels, public two-year tuition levels, state need-based grant aid expenditures per student, state merit-aid per student, state appropriations to higher education, state unemployment rates, the percentage of the state's population below the federal poverty level, the share of adults with a bachelor's degree or higher, per-capita state gross domestic product (GDP), and the presence of state performance funding policies affecting four-year colleges and universities. All continuous variables are converted to their natural logs to conform to regression assumptions and to aid in interpreting the results.

ANALYTICAL TECHNIQUE

While the aforementioned observable characteristics can help explain degree production within each state, it is plausible that unobserved factors also contribute to a state's degree production. For example, a state's cultural or political preferences towards public higher education or the basic design of its public higher education system might not change during the period under investigation. To the extent that this is the case, we may overlook these within-state characteristics that are conceptually relevant to our analysis. In order to address this issue, we implement fixed effect estimates that are designed to account for unobserved heterogeneity within the states. Similarly, we suspect that some national trends have affected each state in similar ways (e.g., the expansion of the federal Pell Grant program), but they go unobserved in our model. Accordingly, we include year fixed effects to account for changes that are common across all states during various years. If we do not account for these two sources of unobserved heterogeneity, our estimates would potentially be biased, and they may inaccurately predict the magnitude or direction of our parameter estimates (Wooldridge 2002). Tables 3 and 4 provide the regression results, where we estimate the model without fixed effects (columns I, III, and V) and with fixed effects (columns II, IV, and VI). The fixed effects models reduce bias and explain greater variance than the other models, so we interpret the fixed effects results in our "Key Findings" discussion.

In addition to accounting for state and year fixed effects, we implement a difference-in-differences estimation strategy that treats the introduction of performance funding policies as a plausible source of exogenous variation. This technique is often used in policy analysis and program evaluation and is becoming more widely used in higher education policy scholarship (Cellini 2008). The

difference-in-differences strategy identifies changes in degree completion before and after policy adoption, and then it compares these differences against states that never adopted the policy. States that adopted performance funding policies serve as the "treatment" group, while states that never adopted performance funding policies are viewed as the "comparison" group since they never experienced the policy treatment. The value of implementing this technique is based on the ongoing pursuit of improving our identification strategies in social science research. Rarely are we able to identify causal relationships through randomized control groups, so we must turn to quasi-experimental techniques like difference-in-differences to improve our estimation strategies. Accordingly, we implement the following difference-in-differences design:

$$y_{it} = \alpha + \beta(treat * post) + X'_{it} + \gamma_i + \eta_t + \varepsilon_{it}$$

where y is the total number of bachelor's degrees awarded by public institutions in each state, α is the intercept, and β (*treat * post*) is set to unity for all states that have performance funding models. The "*treat * post*" variable interacts a dummy variable for all performance funding states ("*treat*") with the years that the program is in operation[1] ("*post*").

The variable X′ includes a series of covariates to control for time-varying observable characteristics of each state. Included here are demographic characteristics to control for the state's total population, the share adults with a bachelor's degree or higher, and percentage of college students enrolled in public four-year (rather than public two-year) colleges in each state for each year. Additionally, this controls for the state average tuition levels of public four-year and two-year colleges as well as state higher education appropriations and grant aid expenditures per FTE. It also controls for variations in state economic conditions, including: unemployment rates (share of total labor force unemployed), poverty rates, educational attainment rates, and per-capita gross domestic product by state. Titus (2009) utilizes a similar set of control variables to estimate bachelor's degree production in states, finding the market structure and financial conditions of the state are systematically related to degree production.

The variable γ_i represents the state-level *(i)* fixed effects and η_t represents year *(t)* fixed effects, and ε_{it} is the error term. Error terms run the risk of being serially correlated in panel models, and this is particularly important to consider when implementing difference-in-differences models (Bertrand, Duflo, and Mullainathan 2004). To test for the presence of serial correlation, we implemented a Wooldridge test (as summarized by Drukker 2003) and found correlated errors in our original models. In response, we cluster the standard errors at the state level, making these values robust to within-panel heteroskedasticity and autocorrelation (Wooldridge 2002).

1. We use the first year funded as the first year for all performance funding states. In some cases, states authorized performance funding in one year but did not appropriate funds until a later year.

Choosing Comparison Groups

Following the strategy outlined in Meyer (1995) and Shadish and Cook (1999), we offer multiple comparison groups to check the robustness of our findings. We first compare all performance funding states against all "other" states that never adopted performance funding policies. This is the most inclusive model and is a standard strategy for applying the difference-in-differences design in state-level analysis. However, we might expect that states in similar geographic regions will share similar policy preferences (Berry and Berry 1990; Long 2004; Zhang and Ness 2010). To the extent that this is the case, then we suspect that "bordering" states might be a compelling alternative comparison group to serve as our counterfactual. Drawing from the state policy diffusion and higher education finance literature, which has shown that a state's approach to higher education governance affects the cost of higher education in a state, the amount of money states appropriate to public higher education, and the adoption of other higher education finance and accountability policies, among other things (e.g., Doyle 2006; Hearn and Griswold 1994; Hearn, Griswold, and Marine 1996; Lowry 2001; McLendon, Deaton, and Hearn 2007; Ness and Tandberg 2013; Nicholson-Crotty and Meier 2003; Tandberg 2010a, 2010b, 2013; Tandberg and Ness 2011). Therefore, it is also likely that states with similar public higher education governance structures might offer an even more compelling comparison group. Accordingly, our third alternative comparison group includes all states that are classified as "coordinating/planning" boards.

The motivation for offering three alternative comparison groups is to serve as falsification tests where we hope to find performance funding states demonstrating similar results across each comparison group. If a similar pattern is found across multiple comparison groups, then we will have more confidence in our conclusions regarding the impacts of performance funding on degree completion. To summarize, we first have a *national group* that compares all performance funding states against all non–performance funding states (n=29). This is the most inclusive comparison, so the second set of states is slightly more restrictive. Here, *bordering states* that never adopted performance funding policies (n=20) serve as the comparison group. The third comparison group includes states that never adopted performance funding and that are governed by a coordinating/planning board (n=7).

In addition to running our basic model with three comparison groups, we offer a second analysis that disaggregates our results by the duration of performance funding. Since it is likely that states will require time to fully implement performance funding and that institutions within the states will take time to respond to the new policy, we interacted our main treatment effect with

performance funding operating years. For example, we may find that performance states experience little to no systematic change in completions during the first few years of implementation but later begin to experience positive (or negative) outcomes. Our basic model would not be able to disentangle this level of detail since it only examines the average treatment effect. By adding this "duration" interaction to our model, we are able to examine how performance funding affects degree completion depending on how many years the policy has been in operation. Modeling the state-specific time trends offers additional evidence of the temporal nature of the treatment effects (Angrist and Pischke 2009).

To implement this, we interact the treatment with the number of years a state operated performance funding. As displayed in Table 1, for example, Arkansas operated its performance funding model from 1995 to 1997, so we coded 1995 as Year 1; 1996 as Year 2; and 1997 as Year 3. Notice that five states adopted, discontinued, and then readopted their funding models; in these cases, we reset their duration years to zero once a program was discontinued. Colorado illustrates this, where their initial performance funding duration (1994–1996) was three years and their readopted performance funding program had a five-year duration (2000–2004). We ran our analysis with and without these five states, finding no systematic differences in the model results, so we decided to keep these states in our final model.

PRECAUTIONS

This study is limited in the following ways. First, some performance funding policies may offer stronger incentives for institutions to generate more degree completions. For example, Pennsylvania allocates 8% of its appropriations to performance funding initiatives, while Oklahoma allocates 2%. It is possible that the degree to which states encourage degree production via performance funding could have differential impacts according to the size or share of the incentive funds. Our goal is to examine whether the treatment (regardless of its "dosage") has a systematic impact on degree productivity, so further research could examine whether states with stronger incentives generate different educational outcomes. When interpreting these results, it will be helpful to consider the caveat that not all performance funding states are equal with regard to their incentive structures. The second limitation is that Tennessee began its performance funding program prior to 1990, so we are unable to measure the "pre-treatment" period, and the state is excluded from this study. For further information on the impacts of Tennessee's program, see Sanford and Hunter (2011). The third limitation relates to the unit of analysis, as some scholars may argue that colleges and universities are a preferable unit of analysis

(rather than states) to investigate since they ultimately are affected by these state policies. While we do not disagree with such an assessment, we argue that a macro analysis using state-level data can be equally insightful in terms of its contribution to informing ongoing public policy debates, particularly as they relate to the national completion agenda and state policy innovation (see McLendon 2003; McLendon, Hearn, and Deaton 2006; McLendon, Heller, and Young 2005). Fourth, it is possible that states experienced other changes at the same time that they implemented their performance funding programs (such as the implementation of other state policies) which may have affected four-year degree completions. We investigated this possibility in each of the performance funding states and could find no other significant changes that occurred at the same time as the implementation of performance funding in the various states.

KEY FINDINGS

Table 2 provides descriptive statistics of the variables included in the analysis. Here, we see that between the years 1990 and 2010, the average state produced approximately 17,000 public baccalaureate degrees per year, and performance funding states produced more degrees than the national average. This is likely due to the fact that performance funding states tend to be larger than other states, as measured by the total public four-year enrollment levels and total public high school graduates. Additionally, performance funding states also tend to have more generous student financial aid packages than other states; for example, performance funding states provide nearly $130 more grant aid per student than the national average. Given the "high aid" model used in performance funding states, it is not surprising that performance funding states provide lower levels of state appropriations per FTE.

Figure 1 displays each state's bachelor's degree completions from 1990 to 2010. The shaded bars indicate performance funding years. It is clear that even non–performance funding states experienced increased completions, as the lines generally trend upward across all states. Notably, some states experience larger gains than other states, making it difficult to attribute gains in the performance funding states to the implementation of the performance funding programs. The question remains: would the performance funding states experienced larger or smaller gains had they not implemented their performance funding programs? Our difference-in-differences models should help us answer this question.

Table 3 provides regression estimates of the average treatment effects (*Performance funding* × *Post treatment*) to help us answer our research question. As discussed earlier, we compare performance funding states against multiple comparison groups as a robustness check (as seen in results columns 2 and 3 in

Table 2. Mean Values of State Higher Education Characteristics, 1990–2010

	All States		Non–Performance Funding States		Performance Funding States	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
BA degree completions	16,982.7	(17,193.1)	15,145.0	(18,607.5)	19,647.5	(14,519.3)
Total years operating PBF	2.7	(3.8)	0.0	(0.0)	6.5	(3.3)
Percentage enrolled in public four-year sector	61.1	(15.0)	60.0	(16.8)	62.7	(11.9)
State population (in 1000s)	4,248.1	(4,679.8)	3,829.6	(5,006.6)	4,855.1	(4,090.7)
Public in-state tuition (four-year)	$4,915.5	($2,019.3)	$4,861.2	($2,052.9)	$4,994.2	($1,969.4)
Public in-state tuition (two-year)	$2,297.5	($963.5)	$2,292.1	($1,009.1)	$2,305.3	($894.5)
State aid per public FTE	$505.5	($469.7)	$417.2	($400.2)	$633.5	($530.2)
State appropriations per FTE	$7,198.4	($2,029.7)	$7,477.9	($2,333.3)	$6,793.2	($1,388.9)
State unemployment rate	5.4	(1.8)	5.4	(1.9)	5.5	(1.6)
State poverty rate	12.5	(3.6)	11.9	(3.4)	13.4	(3.6)
Share of adult population with BA or higher	24.9	(5.4)	25.2	(5.3)	24.5	(5.4)
Per capita state GDP	$43,908.4	($8,866.8)	$44,921.2	($9,934.5)	$42,439.9	($6,784.2)
Number of states	49		29		20	

this table). In Table 4, we provide the results of our duration model, where we test whether treatment effects vary according to the number of years a policy is in operation. In each model, we tested the robustness of our results by including lagged independent variables, but these lags did not produce systematically different results than those displayed in Tables 3 and 4. Therefore, we do not display the lagged models, but these are available upon request. Also, due to space constraints, we did not list the control variables in Table 4 so these are also available upon request. The control variables not displayed in Table 4 took similar patterns as what was found in Table 3. We use these tables and Figure 1 to frame our discussion of key findings.

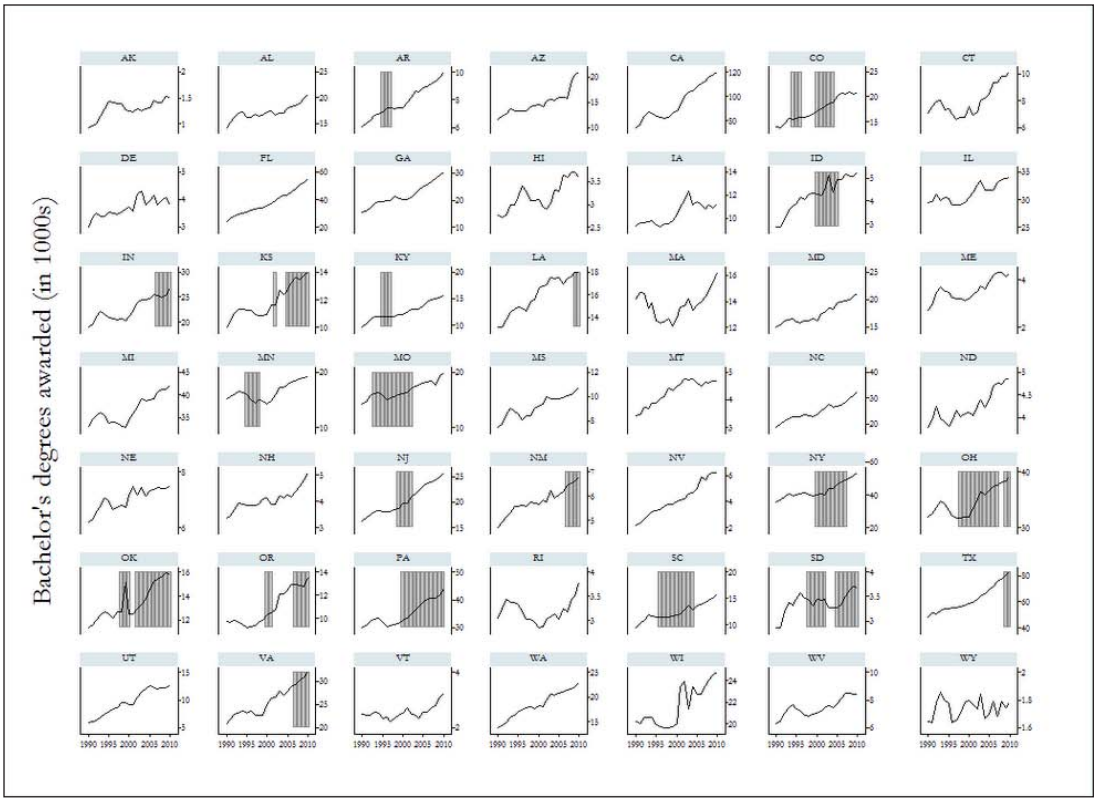

Figure 1. State Bachelor's Degree Completions, 1990–2010
Note: gray bars represent performance funding years

Average Effects of Performance Funding on Bachelor's Degree Completion

Between 1990 and 2010, 20 states implemented performance funding policies designed to affect public four-year colleges and universities. After controlling for education finances, socio-demographics, and state and year fixed effects, on average the introduction of performance funding does not have a statistically significant impact on the total number of baccalaureate degrees produced within the performance funding states, as displayed in Column II of Table 3. When implementing this model with the alternative comparison groups (neighboring states and other coordinating/planning states), the coefficient estimates for performance funding ranges between 0.004 and 0.006, slightly lower than the 0.008 displayed in Column II. While the coefficients for the performance funding treatment are positive across these models, none of them approach conventional standards for statistical significance. Also, the parameter estimates are small, which indicates that even in the event of statistical significance the average effects of performance funding on bachelor's degree completions would

Table 3. Effect of Performance Funding on Public Baccalaureate Degree Completions, 1990–2010

	All States		Neighboring States		Coord./Planning States	
	(I)	(II)	(III)	(IV)	(V)	(VI)
Performance funding × Post treatment	0.007	0.008	0.006	0.006	0.007	0.004
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Percentage enrolled in public four-year sector	0.104**	0.108**	0.077*	0.085**	0.026	-0.027
	(0.044)	(0.046)	(0.041)	(0.040)	(0.065)	(0.073)
State population	0.911***	0.829***	0.869***	0.784***	0.848***	0.680***
	(0.040)	(0.130)	(0.048)	(0.136)	(0.039)	(0.147)
Public in-state tuition (four-year)	0.083***	0.006	0.085**	-0.003	0.113***	-0.022
	(0.029)	(0.051)	(0.034)	(0.059)	(0.031)	(0.058)
Public in-state tuition (two-year)	0.008	0.004	0.017	0.008	0.005	0.021
	(0.030)	(0.034)	(0.036)	(0.042)	(0.041)	(0.049)
State aid per public FTE	0.011	0.010	0.011	0.011	0.002	0.000
	(0.007)	(0.007)	(0.007)	(0.007)	(0.010)	(0.009)
State appropriates per FTE (lagged 1 year)	-0.096**	-0.076*	-0.125***	-0.111**	-0.104**	-0.080
	(0.038)	(0.040)	(0.043)	(0.041)	(0.047)	(0.048)
State unemployment rate	0.039***	0.060**	0.013	0.023	0.017	0.015
	(0.015)	(0.026)	(0.014)	(0.028)	(0.019)	(0.048)
State poverty rate	-0.025	-0.026	-0.001	0.000	0.009	-0.004
	(0.021)	(0.023)	(0.020)	(0.020)	(0.028)	(0.032)
Share of adult population with BA+	0.108***	0.059	0.114***	0.060	0.111*	-0.036
	(0.040)	(0.036)	(0.041)	(0.040)	(0.057)	(0.033)
Per capita state GDP	-0.142***	-0.123	-0.132***	-0.189	-0.166***	-0.133
	(0.045)	(0.103)	(0.050)	(0.115)	(0.051)	(0.151)
Intercept	-3.350***	-1.821	-2.568***	0.020	-2.004**	1.627
	(0.825)	(2.299)	(0.913)	(2.383)	(0.869)	(2.493)
Observations	980	980	800	800	540	540
Number of states	49	49	40	40	27	27
State fixed effects	No	Yes	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes	No	Yes
R^2	0.801	0.815	0.821	0.834	0.804	0.838

Note: Robust standard errors in parentheses, p-value < 0.10 *, 0.05 **, 0.01***

Table 4. Effect of Performance Funding on Public Baccalaureate Degree Completions with Time Interaction 1990–2010

Performance funding × Number of treatment years	All States		Neighboring States		Coord/Planning States	
	(I)	(II)	(III)	(IV)	(V)	(VI)
1	0.007	0.003	0.006	0.003	0.008	-0.001
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
2	0.004	0.006	0.003	0.005	0.004	0.005
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)
3	-0.010	-0.007	-0.011	-0.009	-0.009	-0.008
	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)	(0.010)
4	0.004	0.004	0.003	0.002	0.004	0.002
	(0.012)	(0.010)	(0.012)	(0.011)	(0.012)	(0.012)
5	0.002	0.007	0.000	0.003	0.003	0.004
	(0.014)	(0.013)	(0.014)	(0.013)	(0.013)	(0.014)
6	0.017	0.020	0.014	0.018	0.018	0.016
	(0.019)	(0.017)	(0.018)	(0.017)	(0.017)	(0.015)
7	0.041*	0.042**	0.034	0.035**	0.037*	0.036**
	(0.023)	(0.016)	(0.022)	(0.017)	(0.022)	(0.016)
8	0.053**	0.048***	0.052***	0.048***	0.054***	0.039**
	(0.021)	(0.016)	(0.020)	(0.015)	(0.019)	(0.015)
9	0.012	0.012	0.011	0.012	0.011	0.009
	(0.025)	(0.019)	(0.024)	(0.019)	(0.022)	(0.015)
10	0.037	0.031	0.035	0.025	0.035	0.020
	(0.026)	(0.028)	(0.027)	(0.027)	(0.024)	(0.025)
11	0.113***	0.113***	0.112***	0.110***	0.102***	0.085***
	(0.011)	(0.016)	(0.011)	(0.019)	(0.015)	(0.022)
Intercept	-3.440	-1.965	-2.689	-0.152	-2.001	1.259
	(0.851)	(2.303)	(0.947)	(2.385)	(0.857)	(2.492)
Observations	980	980	800	800	540	540
Number of states	49	49	40	40	27	27
State fixed effects	No	Yes	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes	No	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.804	0.823	0.824	0.843	0.809	0.851

be modest. The average treatment effects of performance funding appear to be small and insignificant in Table 3, but it is plausible that the relative impacts of performance funding may change over time. To test whether performance funding's impacts become stronger (or weaker) over time, we next turn to our "duration" analysis.

Average Effects of Performance Funding over Time

From Table 4, we find that in the early years, performance funding programs do not have a statistically significant effect on total number of baccalaureate degrees

produced. However, in the seventh year, performance funding has a positive and significant impact on the number of degrees produced. The same effect is observed in the eighth and eleventh years and in each case across the comparison groups. The magnitude of these impacts is relatively small, as the coefficients for years 7 and 8 range between 0.035 (Column IV) and 0.042 (Column II). The magnitude rises slightly by year 11, suggesting that the longer a state operates its performance funding program the more likely it may be to increase completions.

This conforms with our earlier argument that it is likely states need time to fully implement the programs and institutions need time to respond. Likewise, with students taking on average four to six years to graduate with a bachelor's degree, and the programs fully affecting only those students who began college after the performance funding programs were implemented, these delayed effects make sense. What is striking, however, is the number of states that have halted their performance funding programs well before the average treatment effects become apparent (Table 1). This supports Dougherty and Reddy's (2013) argument that one reason why performance funding programs have not been observed to produce positive outcomes is the fact that so many states end their programs so soon after implementation.

DISCUSSION AND CONCLUSION

Our analysis of state performance funding programs revealed that on average these programs do not produce significant increases in baccalaureate degree completions. Our duration model showed that after seven years, positive and significant effects begin to emerge. These findings lead us to a number of discussion point and conclusions, discussed below.

We are currently in the midst of what many are calling "Performance Funding 2.0." As part of this wave, 21 states have newly implemented, or are currently implementing, new performance funding programs (Stanley and Jones 2012). As indicated earlier, Performance Funding 2.0 has the backing of some of the largest foundations and higher education policy non-profits and institutes in the country (Dougherty and Reddy 2013; Rabovsky 2012). These resources are being directed towards the development of new performance funding programs with little to no evidence of its effectiveness and with very few examples of states being willing to maintain their programs beyond a few years. In fact, this study is the first we know of to assess the average effects of performance funding programs on baccalaureate degree completions, and overall (the non-significant findings from Table 3 and the modest results found in Table 4) we do not find a strong endorsement of performance funding in the four-year college sector.

Nevertheless, we do find a positive association between performance funding and completions at and beyond seven years of treatment. This leads us to wonder whether one reason so little evidence exists tying performance funding to positive outcomes is that so few states persist with those programs long enough to experience any advantageous outcomes. In fact, of the 21 states that have experimented with performance funding (some of whom experimented more than once) only six maintained their program for seven years or more while the same number of states ended their programs in three years or less. That said, it is difficult to advocate for (and to sustain) a program solely on the *potential* of generating positive benefits several years down the road; especially with so little evidence linking performance funding to positive outcomes. Additional research is needed to examine the specific design elements of the various performance funding programs, to determine if there are characteristics which are associated with positive or negative outcomes or which have no effect. Further, additional qualitative studies might examine the implementation and design aspects of current performance funding programs to extend the ongoing work of Dougherty et al. (2011, 2012, 2013).

The evidence here leads us to believe that state policy makers must also be open to the possibility that performance funding, in whatever form, may not be a suitable finance policy for the four-year sector. Based on the results from this study, it may be ineffective to allocate resources to this new funding model if states want to increase degree completions in the short run. Simply put, there is no quick fix; when states commit to performance funding, they will likely need to sustain their efforts for several years before experiencing positive outcomes. There is the possibility that with careful attention to program design and implementation, and with the appropriate amount of patience to maintain the program long enough, performance funding may positively affect completions in the four-year sector. However, it is imperative that we empirically analyze the policy effects and evaluate the claims of its proponents. Previous experience and research have shown that educational change can be either ineffective or (in some cases) harmful, where advocates equivocate that such failures are due to improper implementation (Birnbaum, 2000). Such rationalizations ought to be met with appropriate skepticism by questioning the underlying theory of action. In higher education, we must understand whether and to what extent public four-year colleges will respond to state performance-funding programs. It also requires state policy makers to have a more complete understanding of what colleges can (and cannot) do to support students through graduation. To the extent that states are moving towards "new public management" models for financing higher education, it will become increasingly necessary that we

have stronger evidence about what works (and what does not) with regard to achieving state educational policy objectives.

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