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Performance Funding 2.0 in Higher Education

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Performance Funding 2.0
in Higher Education

by

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Report

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Abstract

Performance Funding 2.0
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As tuition and student debt at public institutions of higher education have grown substantially over the last decade, state governments have looked increasingly to performance funding programs to incentivize the efficient delivery of higher education, particularly by decreasing time-to-degree. Even with hundreds of millions of dollars devoted to these efforts, however, it remains unclear whether the programs have a significant impact on an institution's operations and student outcomes or rather, for example, they simply reward those institutions which were already most able to meet the program's goals and which enroll the best prepared students. Initial performance funding systems that awarded institutions with additional funding for meeting outcomes goals have not been shown to be effective in impacting degree completions. In this paper I analyze whether new models of performance funding that tie performance to a portion of base formula funding, dubbed 2.0, are better at incentivizing institutions to increase degree completion. Considering the myriad influences on student success (and,

consequently, graduation rates), it is questionable whether the incentives provided by these programs are sufficient alone to positively influence improvements to graduation rates. Accordingly, it may be more effective for states that desire increased graduation rates and reduced student loan debt to appropriate funds to direct measures of controlling tuition costs—such as increased financial aid tied to timely graduation—than to fund performance funding programs.

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Chapter One: Introduction

In the United States there is a growing chorus from political leaders and higher education policymakers who argue that higher education institutions must become more efficient, specifically in graduating students timely and with manageable student loan debt. With limited tools to direct higher education policy other than funding, states have increasingly turned to performance funding to incentivize desired policy goals.

Currently, 37 states have some form of performance funding for higher education at either the two-year or four-year institution level. Earlier performance funding policies awarded additional funding above base operational appropriations according to performance metrics. Examinations of these programs revealed little evidence of a positive causal impact. A second wave of policy adoption now underway embeds performance funding into the base funding formula. But because of fluctuations in states' policies and leadership, which make long-term impact assessment difficult, conclusive empirical evidence regarding performance funding remains limited.

A particularly vexing problem in analyzing the impact of performance funding programs is the difficulty in identifying and controlling the myriad and complex variables and mechanisms apart from funding that affect the outcomes being studied. Though some have studied the impact from the magnitude of the incentive funding or the type of institution, the variety of performance funding programs themselves may confound successful analysis. Such variance includes how much funding is tied to the program, whether that funding is inside or outside of base operational funding formulas, which

performance metrics are the focus of the funding, and how long the program has been in place, among others.

In this paper, I examine how these differences might affect the success or failure of performance funding programs in institutions of higher education. I do this by categorizing and comparing discrete groups of performance funding programs so that the relationship between certain programs and their outcomes can be assessed individually, with the intention that such differentiation might reveal greater insight into the true impacts of these programs.

Although this approach should provide a more accurate representation of the potential for performance funding to be successful, it is likely that there will continue to be unaccounted for complexities inherent in higher education delivery that hinder the ability of any performance funding to be instrumental in causing desired outcomes.

Chapter Two: Literature Review

Using the Academic Search Complete database, I conducted a search for articles and other published material with the keywords "performance-based funding," "performance funding," and "higher education." An examination of the results from this search and cross-referenced citations within the results revealed forays into an array of different issues associated with performance funding. For the purposes of this paper, I restrict the literature review to analyses and discussions related specifically to four-year general academic institutions and omit inquiries into performance funding at the community college level.

Performance-based accountability, which in a general sense refers to a system that assesses programs or activities directly by measuring objective desired outcomes, has been in existence and utilized to varying degrees for at least the last century. This broad approach to accountability can take several related but distinct forms that have evolved over time. Performance reporting simply requires an entity to report data about its performance outcomes to decision-makers. Performance budgeting utilizes such data to help inform budget decisions, providing decision-makers with a basis upon which to determine appropriate levels of funding. Performance funding provides the most concrete connection between funding levels and performance by linking the allocation of funds directly to measures of performance (Shah & Shin, 2007). In the realm of higher education, for example, states or individual institutions may appropriate or allocate funding based on improvements in four-year graduation rates, student retention from one

year to the next, or the growth in the number of degrees awarded. Because performance funding creates a discrete relationship between how an entity performs and the level of funding it will receive, it is appealing to policymakers who want to implement strong accountability measures. It also is relatively straightforward to assess the success of a performance funding program because the outcomes the program is intended to produce are identified specifically by the program.

To make sense of and properly assess the state of the literature, it is important to distinguish between two separate waves of performance funding in higher education. Starting with the very first implementation of a performance funding program in Tennessee in 1979 and continuing, slowly and in fits and starts, through to approximately the turn of the last century, these programs typically authorized state legislatures to provide an additional amount of funding beyond standard operational formula funding to reward institutions for meeting desired performance goals (Dougherty et al, 2014). What's more, these "bonus" awards often were only a small fraction of the total state funding for an institution, sometimes as little as only one percent and not greater than six percent (Dougherty and Reddy, 2013).

This first wave of policy implementation, which is commonly referred to as "performance funding 1.0," was driven largely by institutions and higher education coordinating boards searching for increased funding and aided by political policymakers intent on inserting the semblance of accountability into higher education funding (Dougherty et al, 2013). As a result, one might expect the causal impact of these

programs on the purported goals to be weak at best since relatively little incentive is presented to change institutional behavior.

Indeed, the literature studying performance funding 1.0 programs does not support the conclusion that such programs are effective in their nominal purpose. Individual quantitative case studies of performance-based funding programs implemented at the University of Minnesota (Hearn, et al, 2006) and in the state of South Dakota (Martinez and Nilson, 2006) have found these programs to be somewhat successful. They are limited, however, in their scope because they fail to compare the performance of these individual institutions impacted by the specific state program with similar peer institutions in other states that are not participating in a performance-based funding program.

A number of studies that analyzed longitudinal data across institutions in all fifty states found that performance funding 1.0 did not have a positive impact on desired outcomes, although the studies take care to note that the relatively short age of most states' programs and a myriad of other confounding factors at the institution and state level make definitive conclusions difficult. Volkwein and Tandberg (2008) studied institutions in all 50 states using a cross sectional time series analysis of data from 2000-2006 and found that performance funding program did not have a significant positive impact on completion rates. Similarly, Shin and Milton (2004) analyzed multiple states and also concluded that performance funding did not impact graduation rates.

Perhaps one of the most comprehensive studies of this issue analyzed performance funding impacts on graduation, persistence, and degree attainment through a

longitudinal study of more than 500 institutions in all fifty states over 18 years and concluded there was no impact and, in fact, some evidence that there was a negative impact on graduation rates after seven years (Rutherford and Rabovsky, 2014). It is difficult to draw from this study any definitive conclusions about performance funding as a concept because of the substantial variance between the individual performance funding programs, both over time and between states.

Given the scarcity of definitive evidence of the positive impact of these original performance funding programs in higher education, many studies have taken a qualitative analysis approach to attempt to explain why these programs would fail to achieve their desired results. Some present neo-institutionalism arguments which suggest that the particular culture within a higher education institution, including its history and mission, may prevent funding incentives from being effective (Brennan and Shah, 2000). Another explanation is that the inherent complexity of the higher education system makes it entirely unfit for incentive funding based on performance outcomes (Nisar, 2015).

Fortunately, certain qualitative theories give reason to be optimistic about the potential for the right kind of performance funding system to be effective. One theory that supports this possibility is resource dependence theory, which postulates that the impact of performance funding programs is related to the degree to which the institutions impacted are dependent upon the amount of funding involved. Sanford and Hunter (2011) support this rationale and conclude that performance funding programs fail when they do not increase overall funding. We also will see this concept explored more later as it

relates to more recent forms of performance funding that implicate a greater percent of total state funding.

Some quantitative analytical studies corroborate this argument. For example, while Rutherford and Rabovsky (2014) found that traditional performance funding programs have little, and perhaps a negative, impact on graduation rates, they found some evidence that newer models which base performance on an increased portion of core funding might have a more positive effect.

Similarly, Tandberg and Hillman (2014) also found little evidence that performance funding increased degree completion on average. They did conclude, however, that there is a positive association for programs that persist for seven years or more, indicating that performance funding efficacy may depend less on the amount of funding involved or the metrics measured and more on the duration of the program.

What these and other later studies address, and find some limited signs of effectiveness for, is a revised form of incentive-based funding dubbed "performance funding 2.0." This new wave of program implementation began in the late 2000's, after the last national economic downturn, and is characterized by programs that incorporate the conditional funding directly into an institution's base operations funding, as opposed to rewarding institutions with additional funding outside of their normal funding formulas (Dougherty, et. al., 2014). In contrast to the first programs which largely were driven by institutions and coordinating boards searching for additional funding, adoption of performance funding 2.0 programs is promoted heavily by state governors and other political policymakers focusing sharply on accountability and efficiency, especially in the

context of decreased state financial support for higher education as a share of institutions' total funding (Dougherty, et. al., 2014). This second, more mature evolution of the performance funding concept also has been bolstered by the support of several policy organizations, including the Gates Foundation, Lumina, and Complete College America (Dougherty, et al., 2014).

Though different from performance funding 1.0 programs in the critical aspect of the percent of funding at stake dependent on performance measures, the limited number of studies that have examined these programs have not yet revealed that performance funding 2.0 programs are any more effective than the older performance based programs. Hillman and colleagues (2014) analyzed Pennsylvania's system using a difference in differences analysis with comparisons to neighboring states' institutions and institutions with similar characteristics and found no evidence that the program increased degree completions. They theorized that institutions might not be capable of improving their degree completions, no matter what effort or motivation employed, because institutions may lack the capacity to improve beyond current performance (Hillman et al., 2014).

As this review indicates, there is a general consensus that performance funding 1.0 programs in higher education do not produce the desired outcomes, even if it is not clear why this is so. Less obvious, however, is whether the modern iteration, performance funding 2.0, can be more effective. There is some evidence that by making larger portions of core funding contingent on performance measures, these programs can produce a positive impact (Rutherford and Rabovsky, 2014). There also is evidence,

though mixed, that when programs are continued for more than seven years, they begin to show signs of effectiveness (Tandberg and Hillman, 2014).

While some comprehensive, longitudinal studies include both performance funding 1.0 and 2.0 in their analysis, there is a gap in the literature for a precise examination of the degree to which the primary factor in 2.0 programs, the proportion of funding in the base operations formula tied to outcomes, impacts effectiveness. Studies which simply categorize a state's program as either 1.0 or 2.0 fail to account for the vast differences within 2.0 systems: some 2.0 systems utilize only a marginal portion of base funding while others tie an institution's entire amount of state funding directly to performance outcomes. What's more, since the literature has unveiled some evidence that performance funding 1.0 programs may impact outcomes positively only after seven years of continuous implementation, we may just now be reaching the right time to evaluate the new wave of performance funding which began in the late 2000's.

Chapter Three: Design

Previous studies have compared higher education outcomes nationally between states with performance-based funding and those without. Not all performance-based funding programs, however, are the same. Performance funding 1.0 and 2.0 differ markedly in the degree to which necessary base funding is made contingent on performance, with 1.0 implicating only additional, bonus funding. What's more, even within performance funding 2.0 there is a substantial range of the portion of base funding tied to the program, from a small percentage to the entire amount. While overall differences in the amount of state funding as a percentage of overall funding have been considered, the literature does not include a specific assessment of how the range of contingent funding in 2.0 programs influences whether those programs will be effective.

This design proposes to address this major deficiency by differentiating between 2.0 programs through including variables to account for the variety of percentage of overall funding associated with each. This should strengthen previous studies by controlling for the different approaches of the programs instead of conflating them and potentially skewing the analysis of their impact.

Specifically, I examine each performance funding program based on whether it offers funding inside or outside of the formulas. I then note of those that offer funding inside of the formulas what percent of the total funding is impacted. A difference in differences comparison is conducted between institutions in states that do not have any performance funding program, those who still retain a performance funding 1.0 system,

and for institutions in states with varying degrees of core formula funding impacted by their performance funding 2.0 programs.

I control for both known and unknown state and institutional characteristics. For example, I control for common covariates that impact student performance, such as college readiness and demographics, and common institutional characteristics that would also impact performance, such as the type of institution. In addition, I account for unknown variables using fixed effects both for within institutions and over time across all institutions.

Even controlling for these specific program characteristics, however, some limitations will remain. For example, even within performance funding programs that implicate the same portion of core operational funding, the individual metrics used to measure performance may vary. What's more, some programs focus on mandatory metrics, others allow institutions to tailor their participation by choosing from a suite of metrics, while still others use some combination of mandatory and optional metrics. Some performance funding programs measure milestones (like the number of students who complete 30, 60, or 90 semester credit hours), and some strictly focus on ultimate outputs (that is, degrees awarded). Accordingly, the characteristics of the program beyond the funding component may have a significant impact on whether the program is successful. Further study would focus on individual categories of programs and how their specific characteristics impact their performance.

Chapter Four: Data

This study uses data from 547 public, four-year, baccalaureate-awarding institutions in all fifty states to evaluate the effectiveness of different levels of the portion of base formula funding used in a state's performance funding 2.0 program. Data is taken from the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS) and covers the years 2005-2015.

Because every performance funding program includes either a metric for degree completions or one for graduation rates (which directly impacts the number of degree completions), I chose bachelor degree awards as the performance output to serve as the dependent variable. Covariates were used to control for confounding effects from students and institutions.

Student-specific covariates included key student demographic measures known to impact degree completion, including economic status—as indicated by Pell Grant distributions—race, and ethnicity. SAT and ACT scores also were included to account for college readiness. Institution covariates included the Carnegie classification of the institution to control for the institutions' missions and focus and the selectivity of the institution in terms of admissions per applicants.

Finally, to account for the differences between the portion of base funding allocated in a state's performance funding system, I used the National Conference of State Legislatures survey of performance funding programs by state and researched individual states to determine when these programs were implemented. This produced

two sets of variables, one to indicate the years a state's program has been in effect and another to indicate the level of funding associated with a state's program.

As shown in Table 1, 24 states have never implemented a performance funding program and 26 states have some form of one currently. Four states have switched from performance funding 1.0 to performance funding 2.0, and nine states have adopted a program in just the last two years for which data is available in the study: six of those are 2.0 programs and three are 1.0 programs.

Table 1: Status of performance funding systems by state, 2004-2015.

Table 1.0 Performance Funding Programs in Years Studied									
State	No PF	PF 1.0	PF 2.0	PF 2.0 %	State	No PF	PF 1.0	PF 2.0	PF 2.0 %
AL	2004-2015	-	-	-	MT	2004-2014	-	2015	5
AK	2004-2015	-	-	-	NE	2004-2015	-	-	-
AZ	2004-2012	2013-2015	-	-	NV	2004-2014	-	2015	5
AR	2004-2011	-	2012-2015	5-10	NH	2004-2015	-	-	-
CA	2004-2015	-	-	-	NJ	2004-2015	-	-	-
CO	2004-2015	-	-	-	NM	2004-2012	-	2013-2015	3.6-11
CT	2004-2015	-	-	-	NY	2004-2015	-	-	-
DE	2004-2015	-	-	-	NC	-	2004-2015*	-	-
FL	2004-2012	2013-2015	-	-	ND	2004-2015	-	-	-
GA	2004-2014	2015	-	-	OH	2004-2009	-	2010-2015	20-50
HI	2004-2015	-	-	-	OK	-	2004-2015*	-	-
ID	2004-2015	-	-	-	OR	2004-2011	2012-2015	-	-
IL	2004-2012	-	2013-2015	0.5	PA	-	2004-2010*	2011-2015	2.4
IN	-	2004-2010*	2011-2015	5-6	RI	2004-2015	-	-	-
IA	2004-2015	-	-	-	SC	2004-2015	-	-	-
KS	-	2004-2015*	-	-	SD	2004-2012	2013-2015	-	-
KY	2004-2015	-	-	-	TN	-	2004-2009*	2010-2015	100
LA	2004-2007	2008-2010	2011-2015	15	TX	2004-2015	-	-	-
ME	2004-2013	-	2014-2015	5-10	UT	2004-2013	2014-2015	-	-
MD	2004-2015	-	-	-	VT	2004-2015	-	-	-
MA	2004-2014	-	2015	50	VA	2004-2010	2011-2015	-	-
MI	2004-2011	2012-2015	-	-	WA	2004-2015	-	-	-
MN	2004-2013	-	2014-2015	5	WV	2004-2015	-	-	-
MS	2004-2013	-	2014-2015	10	WI	2004-2015	-	-	-
MO	2004-2013	2014-2015	-	-	WY	2004-2015	-	-	-

* Performance funding program predates study range

Chapter Five: Methods

Regression analyses were conducted to compare institutions in states with other institutions based on the existence of a performance funding program (either 1.0 or 2.0), and an analysis of the impact of the age of a program and, for 2.0 programs, the level of funding within the base formula that is contingent on performance. Four sets of four general models were used, each of which measured the impact of sets of independent variables on the dependent variable of annual undergraduate degrees awarded. The first set of models included a dummy variable to indicate the presence of a 1.0 or 2.0 performance funding program as the base variables, and the second set, which analyzed a performance funding program's age and percent of funding implicated in the formula, used those two base variables. The third and fourth sets of models repeated this analysis, but substituted a logarithmic equivalent of degrees awarded to control for the disparate impact that increases in total degrees awarded have based on the relative size of the institutions.

Model 1 for each set included only the base variables. Subsequent models included the base variables and added possibly relevant covariates. Model 2 included the base variables and variables related to student body characteristics, specifically total enrollment, percentage of enrollment made up of four major race and ethnic groups (Asian, Black, Hispanic, and White), and admissions rate (as a measure of selectivity). Model 3 included the base variables and variables related to funding, specifically state appropriations for instruction and operations, the percentage of that funding as compared

to total revenues, the total revenues, and the amount of funding expended for instruction and for research. Model 4 combined all of these variables.

All models utilized fixed effects to control for unknown confounding variables within institutions and across time and improve internal validity. Institutional characteristics controlled for in this manner and through a cluster fixed effect included those specific to an institution that do not change over time, such as mission and culture. Time-based fixed effects for each year also were included to control for outside forces such as economic conditions that impact student and institutional behavior.

Chapter Six: Results

Descriptive statistics are shown in Table 2 for institutions without a performance funding program and with performance funding version 1.0 and version 2.0 programs. Student body characteristics include total undergraduate enrollment and the percentage of undergraduates by four major ethnic classifications. Also included are the SAT and ACT test scores at the 25^{th} and 75^{th} percentile for admitted students, the percentage of applicants admitted, and the total dollar amount of Pell grants disbursed.

Performance metrics assessed include the most commonly measured outputs in performance funding systems. These are the total number of undergraduate degrees awarded, year-to-year retention rate, and four-, five-, and six-year graduation rates. A variable was created to indicate the number of degrees awarded as a percentage of the total undergraduate enrollment to provide a sense of standardization among different institutional student body sizes.

Variables also were included to describe the annual level of funding provided by state appropriations in total dollars and as a percentage of all available revenues. Institutional expenditures are provided for annual measures of several discrete categories as defined by IPEDS, including Instruction (defined as total of all operational expenses associated with instruction), Research (defined as total operating expenses associated with activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution), Academic Support (defined as total operating expenses

Table 2: Descriptive Statistics	No PF		PF v1.0		PF v2.0	
	Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**
Student Body						
Enrollment	10597.4	8617.4	9932.9	8214.2	10463.4	9621.5
Asian Percentage	5.6%	8.5%	2.7%	2.9%	2.6%	3.0%
Black Percentage	13.6%	20.8%	16.4%	24.0%	16.7%	22.2%
Hispanic Percentage	10.1%	13.6%	4.3%	3.9%	6.6%	9.2%
White Percentage	61.0%	24.7%	66.3%	23.2%	65.2%	22.3%
SAT Reading 25th Percentile	463.2	54.3	456.3	56.6	450.4	49.5
SAT Reading 75th Percentile	571.7	58.1	561.7	62.4	559.6	51.1
SAT Math 25th Percentile	477.7	62.5	466.1	59.5	462.8	56.1
SAT Math 75th Percentile	586.2	63.6	573.5	62.6	574.0	56.7
SAT Writing 25th Percentile	450.2	89.3	445.3	67.4	436.8	52.2
SAT Writing 75th Percentile	554.2	102.2	544.5	73.4	542.0	50.8
ACT Composite 25th Percentile	19.7	2.8	19.3	2.8	19.6	2.6
ACT Composite 75th Percentile	24.7	2.9	24.2	3.0	24.6	2.7
ACT Evaluation 25th Percentile	18.6	3.1	18.3	3.2	18.8	2.9
ACT Evaluation 75th Percentile	24.8	3.2	24.4	3.4	24.9	3.1
ACT Math 25th Percentile	18.9	2.9	18.6	2.8	18.8	2.7
ACT Math 75th Percentile	24.7	3.2	24.2	3.1	24.6	2.8
ACT Writing 25th Percentile	7.4	3.6	7.0	2.9	6.4	0.8
ACT Writing 75th Percentile	9.5	4.7	9.0	3.6	8.1	0.5
Admittance Rate	66.1%	18.4%	72.5%	15.2%	70.4%	16.3%
Pell Expenditures (millions)	$ 13.1	$ 12.5	$ 12.4	$ 9.7	$ 17.9	$ 13.0
Performance						
Undergraduate Degrees Awarded Annually	1966.1	1871.5	1788.6	1768.7	1982.0	2240.1
Degrees Awarded per Undergraduate Enrollment	18.1%	32.9%	16.2%	4.7%	16.7%	5.0%
Retention Rate	74.5%	11.3%	73.7%	10.2%	72.7%	10.6%
Four-year Graduation Rate	25.2%	16.8%	24.9%	14.9%	25.1%	14.9%
Five-year Graduation Rate	42.0%	18.0%	42.5%	16.7%	41.6%	17.1%
Six-year Graduation Rate	47.8%	17.0%	48.0%	15.9%	46.3%	16.2%
Funding (millions)						
State Operational Funding	$ 80.8	$ 101.0	$ 83.9	$ 99.8	$ 78.2	$ 98.3
State Financial Aid Grants	$ 8.0	$ 17.0	$ 6.7	$ 10.2	$ 10.8	$ 25.9
State Appropriations as Percent of Total Revenues	27.5%	11.7%	29.9%	9.4%	24.5%	7.8%
Endowment	$ 142.0	$ 507.0	$ 218.0	$ 732.0	$ 187.0	$ 446.0
Total Revenues	$ 393.0	$ 674.0	$ 376.0	$ 673.0	$ 423.0	$ 748.0
Expenditures (millions)						
Instruction	$ 108.0	$ 151.0	$ 112.0	$ 149.0	$ 131.0	$ 174.0
Research	$ 50.9	$ 126.0	$ 43.0	$ 104.0	$ 44.5	$ 107.0
Acadaemic Support	$ 30.2	$ 50.5	$ 27.4	$ 40.7	$ 35.6	$ 53.3
Institutional Support	$ 27.6	$ 31.7	$ 24.7	$ 29.2	$ 33.2	$ 42.1
Student Services	$ 18.3	$ 19.7	$ 14.5	$ 14.5	$ 19.9	$ 19.6
Public Service	$ 18.1	$ 46.7	$ 18.8	$ 43.1	$ 23.3	$ 59.0
Scholarships	$ 14.5	$ 19.5	$ 15.0	$ 18.8	$ 18.4	$ 23.8

associated with activities and services that support the institution's primary missions), Institutional Support (defined as total operating expenses associated with the day-to-day operational support of the institution, or administrative costs to operate the institution), Student Services (defined as total operating expenses associated with admissions, registrar activities, and activities whose primary purpose is to contribute to students' emotional and physical well-being and to their intellectual, cultural, and social development outside the context of the formal instructional program, for example, student organizations and intramural activities), Public Service (defined as total operating expenses associated with activities established primarily to provide noninstructional services beneficial to individuals and groups external to the institution, for example conferences and other forms of external outreach), and Scholarships (defined as total operating expenses associated with scholarships and fellowships treated as expenses because the institution incurs an incremental expense in the provision of a good or service).

The trend in number of degrees awarded is shown in Figure 1.0, which charts the average number of degrees awarded each year for institutions in states without performance funding programs and with performance funding 1.0 or 2.0 programs from 2005 to 2015. As shown, there has been a general overall increase in the number of degrees awarded in all states regardless of the existence of a performance funding system.

Interpreting the trendline for performance funding 2.0 programs is complicated by the outsized impact of adding new states to the category has on the average number of degrees awarded. When these programs were first implemented in 2010, only Ohio and

Tennessee had these systems and these two states averaged approximately 2,000 and 2,700 degrees awarded, respectively. In 2011, Indiana, Louisiana, and Pennsylvania transitioned to performance funding 2.0 programs. Including these states in the performance funding 2.0 category dropped the overall average of degrees awarded because their higher education systems are significantly smaller, especially Louisiana and Pennsylvania which averaged only 1,200 degrees awarded in 2011. Accordingly, the graph in Figure 1 shows a dip in 2011 for average degrees awarded in performance funding 2.0 institutions, but as more states adopted the system the total average number of degrees awarded shows the same general increase as was occurring throughout the country in all institutions. Similarly, the noticeable increase in degrees awarded in performance funding 1.0 systems from 2010-2012 is largely attributable to the additions of Michigan and Virginia, both of which had average degrees awarded of more than 2,000 degrees annually (2,800 for Michigan and 2,100 for Virginia) and thereby had a dramatic impact on the overall average of degrees awarded which had been approximately 1,500 before 2011.

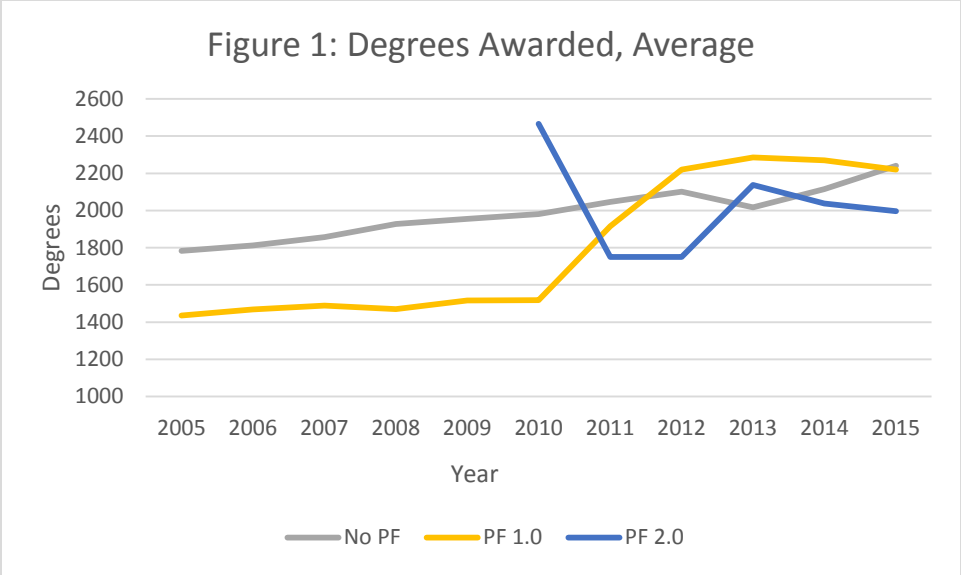

Figure 1: Average number of degrees awarded annually in states with and without performance funding systems.

Figures 2 and 3 show four- and six-year graduation rates for institutions in states without performance funding programs and with performance funding 1.0 or 2.0 programs from 2008 to 2015. The starting point of 2008 was chosen because that is the first year that IPEDS began collecting the new uniform graduation rate data. Similar to the impact on average degrees awarded in performance funding 2.0 systems when Indiana, Louisiana, and Pennsylvania were added in 2011, the transition of Virginia from a non-performance funding system to a performance funding 1.0 system in 2011 heavily influenced the data because Virginia's four- and six-year graduation rates at that time were 46 percent and 63 percent, respectively. These levels were far greater than the overall average rates of 23 percent and 45 percent for performance funding 1.0 states in 2010. Aside from this, however, the average four- and six-year graduation rates tended to gradually improve for all performance funding categories, though performance funding

1.0 system institutions began to see a small decrease in their average graduation rates starting in 2014. This could be attributable in part due to the inclusion of Missouri and Utah in the category that year, both of which have subpar average graduation rates as compared nationally (e.g., four-year average graduation rates of 24 and 18, respectively).

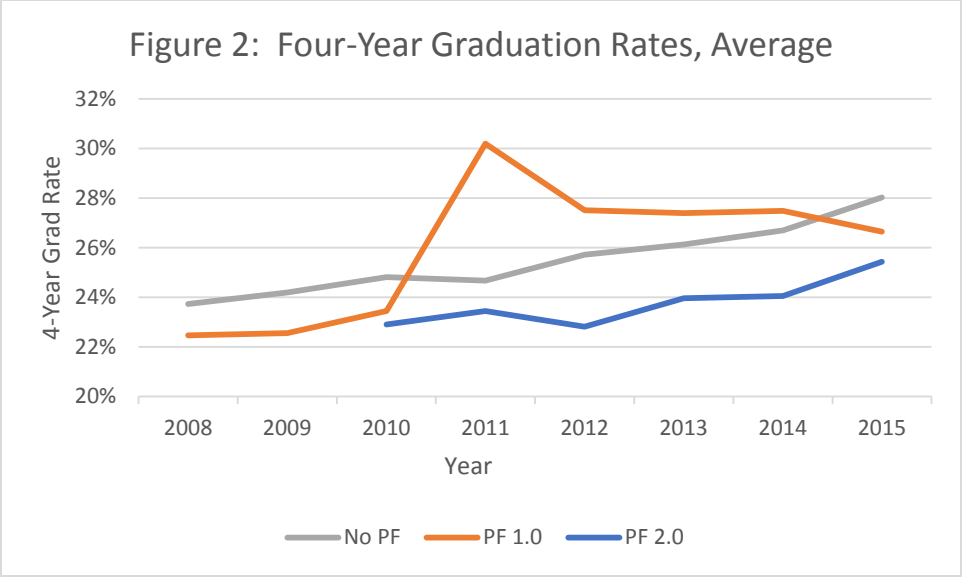

Figure 2: Average four-year graduation rates in states with and without performance funding systems.

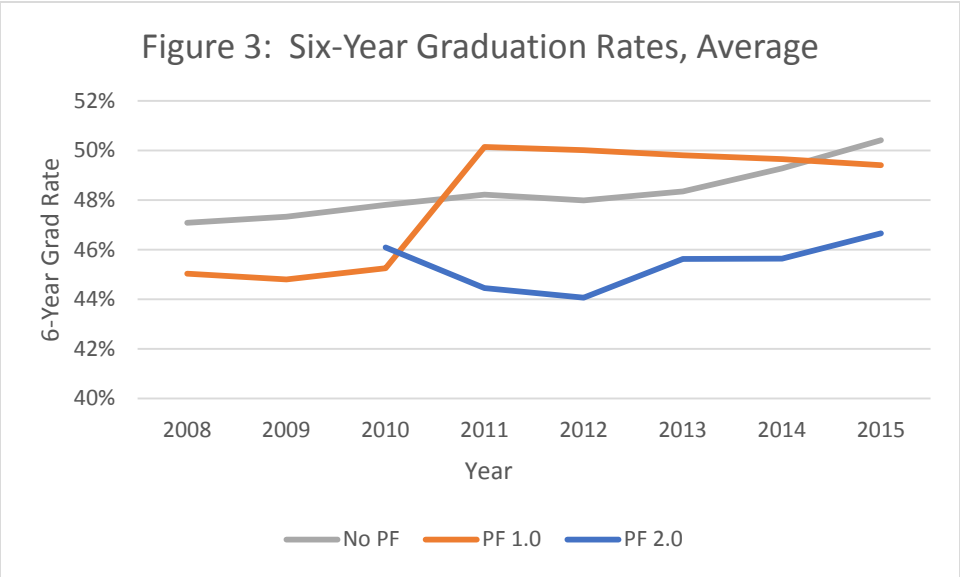

Figure 3: Average six-year graduation rates in states with and without performance funding systems.

IMPACT ON DEGREES AWARDED

Table 3 lists the results of the models that analyzed the impact of performance funding systems on the annual number of degrees awarded. Model 1, which included only a dummy variable to indicate the existence of a performance funding 1.0 or 2.0 program, resulted in no statistically significant impact for either types of programs.

The impact and correlation increased noticeably in Model 2, which introduced student body characteristic variables. Still, there is no statistically significant impact of either program on degrees awarded. Perhaps unsurprisingly, total enrollment indicated the most causal impact on degrees awarded, with an increase of 14.7 degrees awarded predicted for every 100 additional undergraduates enrolled. All of the demographic variables except for percent of white undergraduate enrollment were statistically

Table 3: Regression Results for Effects of Performance Funding Systems on Undergraduate Degrees Awarded

	Model 1	Model 2	Model 3	Model 4
Performance Funding 1.0	37.79	38.51	9.252	21.58
	(1.02)	(1.56)	(0.26)	(0.81)
Performance Funding 2.0	-17.77	50.85	0.0384	53.29
	(-0.41)	(1.66)	(0.00)	(1.58)
Undergraduate Enrollment		0.147***		0.128***
		(9.01)		(6.00)
Percent Enrollment Asian		563.9*		838.7**
		(2.30)		(2.94)
Percent Enrollment Black		-936.0**		-687.7*
		(-3.27)		(-2.44)
Percent Enrollment Hispanic		1041.4*		1317.4**
		(2.51)		(3.16)
Percent Enrollment White		-175.3		-147.1
		(-1.23)		(-1.09)
Admission Rate		-0.870*		-0.583
		(-2.10)		(-1.44)
State Instructional Funding			0.000000886	-0.000000463
			(1.55)	(-1.07)
State Funding as Percent of All Revenues			-602.2***	-17.58
			(-4.22)	(-0.15)
All Revenues			-3.32e-08	-7.70e-08
			(-0.48)	(-1.56)
Instruction			0.00000271**	0.00000115
			(3.01)	(1.89)
Research			0.000000524	0.00000107**
			(0.87)	(2.60)

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

significant, though decidedly less so than overall enrollment. While increases in the admission rate was shown to be statistically correlated with decreases in the number of degrees awarded, it was at the lowest level of significance. This could be because, although admission rates are a measure of selectivity, the rate itself does not capture the characteristics of the pool of applicants. Two institutions with the same admission rate but two very different caliber of student applicants would expect to see a difference in degrees awarded, which would not be determinative of the admission rate itself.

Model 3, which introduced funding variables instead of student body characteristics, showed an even more pronounced diminishing of performance funding program impacts as compared to Model 1, but still was not statistically significant. Both the coefficients and t-statistics for 1.0 and 2.0 programs were less than Models 1 and 2. In fact, the t-statistic was zero for 2.0 programs, indicating no correlation whatsoever. The amount of expenditures for Instruction purposes predictably was estimated to have a significant impact on degrees awarded. Curiously, however, the model predicted with strong confidence that as the percentage of state funding as it relates to overall revenues increased, the number of degrees awarded decreased.

Finally, Model 4 included both the student body characteristics and funding variables and again predicted no significant impact of performance funding programs on degrees awarded. Total enrollment and demographics remained a significant driver of degrees awarded, but admission rate was not significant. Similarly, state funding, total revenues, and amount of expenditures on Instruction were not significant, but expenditures on Research was found to have an impact.

IMPACT FROM CHARACTERISTICS

The second set of models shown in Table 4 mirrored the first set but instead of analyzing the existence of performance funding systems replaced those variables with the age, or length of time, that a state's system has been active and, relevant for 2.0 systems, the percentage of an institution's state funding contingent on the performance funding system. Overall, the impact was only occasionally found to be significant and only for the percentage of performance funding.

Model 1, which includes independent variables for only age and percentage of funding of the performance funding system, predicts no significant impact on degrees awarded. After introducing student body characteristics in Model 2, the impact of performance funding system age and percentage of state funding at stake actually increased slightly, but only was significant for the percentage of performance funding. The percent of state funding in the system was shown to have only a slight impact on degrees awarded. For every percentage of state funding included in the performance system, degrees awarded are predicted to increase by just more than two, with a level of significance indicated by a p-score of less than .05. Of all the student body demographic data analyzed, the total enrollment was shown to have the greatest statistically significant

impact on degrees awarded, predicting 13.9 more degrees for each additional 100 undergraduates enrolled.

Table 4: Regression Results for Effects of Performance Funding System Age and Percent of Funding Implicated on Undergraduate Degrees Awarded

	Model 1	Model 2	Model 3	Model 4
Performance Funding Age	2.203	6.191	1.674	6.353
	(0.41)	(1.57)	(0.31)	(1.30)
Performance Funding Percentage	1.021	2.041*	0.854	1.945*
	(0.87)	(2.41)	(0.77)	(2.01)
Undergraduate Enrollment		0.139***		0.121***
		(9.00)		(5.63)
Percent Enrollment Asian		565.2*		828.2**
		(2.39)		(3.00)
Percent Enrollment Black		-878.5**		-654.0*
		(-3.20)		(-2.43)
Percent Enrollment Hispanic		1057.8**		1311.4***
		(2.76)		(3.45)
Percent Enrollment White		-151.8		-117.1
		(-1.09)		(-0.89)
Admission Rate		-0.864*		-0.535
		(-2.09)		(-1.32)
State Instructional Funding			0.000000745	-0.000000483
			(1.33)	(-1.09)
State Funding as Percent of All Revenues			-575.7***	-24.31
			(-4.18)	(-0.21)
All Revenues			-1.42e-08	-6.28e-08
			(-0.22)	(-1.35)
Instruction			0.00000253**	0.00000112
			(2.94)	(1.86)
Research			0.000000640	0.00000112**
			(1.12)	(2.73)

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

In Model 3 which examines funding variables, the performance funding characteristics' impact on degrees awarded were again found to not have a statistically significant impact on the number of degrees awarded. As was the case above in analyzing the impact of the existence of a performance funding system, the amount of state funding as a percentage of all revenues was shown to have a sizeable and significant impact on degrees awarded, with a surprisingly negative correlation. The model predicted that each percentage of state funding was associated with 575 less degrees awarded. There also was a fairly strongly-associated correlation between degrees awarded and the amount of Instruction funding, though it was less statistically significant than the percentage of state funding.

Finally, Model 4 included both student body characteristics and funding variables and predicted for the second time a very small, but statistically significant, impact of the percentage of state funding within a performance funding system 2.0 on degrees awarded. Model 4 predicted a slightly smaller effect than Model 2, with less than two additional degrees for each percentage point of state funding within the performance funding system. The other statistically significant drivers of degrees awarded in the model were total enrollment, research expenditures, and percentage of the undergraduate student enrollment who are Asian, Black, and Hispanic.

CONTROLLING FOR INSTITUTION SIZE

To account for the relative impact of increases or decreases in degrees awarded at institutions with different sizes of undergraduate enrollment, these models were run again with a new variable indicating the logarithmic equivalent of degrees awarded replacing the previous dependent variable of degrees awarded. The results better controlled for disparate impacts of student body demographics that often are more pronounced at smaller institutions that typically are more homogenous and generally corroborated the lack of evidence for a causal impact of performance funding systems on degrees awarded.

Table 5 shows the results for analyzing the impact of the existence of performance funding systems on degrees awarded as expressed in logarithmic terms. Model 1 indicates a minimal and not statistically significant impact of performance funding systems on degrees awarded. Model 2 introduced student body characteristics and likewise shows no impact from performance funding programs, but does indicate, as expected, a strongly significant impact of total enrollment on degrees awarded. This model also no longer shows any significant impact as a result of demographic makeup of the student body, suggesting that the logarithmic version of degrees awarded is controlling well for the disparate effects from different-sized institutions.

Model 3, which introduces only funding variables, showed just one statistically significant independent variable. The amount of state instructional funding was predicted

Table 5: Regression Results for Effects of Performance Funding Systems on the Logarithmic Equivalent of Undergraduate Degrees Awarded

	Model 1	Model 2	Model 3	Model 4
Performance Funding 1.0	-0.0131	-0.0120	-0.0228	-0.0125
	(-0.94)	(-1.05)	(-1.78)	(-1.19)
Performance Funding 2.0	-0.0239	0.00804	-0.0268	0.00576
	(-1.45)	(0.63)	(-1.61)	(0.41)
Undergraduate Enrollment		0.0000282***		0.0000270***
		(7.38)		(5.45)
Percent Enrollment Asian		-0.510		-0.643
		(-0.80)		(-0.96)
Percent Enrollment Black		-0.253		-0.335
		(-1.31)		(-1.65)
Percent Enrollment Hispanic		1.117		1.200
		(1.56)		(1.41)
Percent Enrollment White		0.211		0.177
		(1.77)		(1.47)
Admission Rate		-0.000594		-0.000335
		(-1.68)		(-1.03)
State Instructional Funding			1.15e-09**	6.30e-10*
			(2.79)	(2.07)
State Funding as Percent of All Revenues			-0.345	0.162
			(-1.13)	(0.62)
All Revenues			-3.57e-11	-2.55e-11
			(-1.37)	(-1.25)
Instruction			2.36e-10	-2.59e-10
			(1.83)	(-1.34)
Research			-1.51e-10	7.43e-11
			(-1.41)	(0.64)

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

Table 6: Regression Results for Effects of Performance Funding System Age and Percent of Funding Implicated on the Logarithmic Equivalent of Undergraduate Degrees Awarded

	Model 1	Model 2	Model 3	Model 4
Performance Funding Age	-0.00162	-0.00123	-0.00148	-0.000332
	(-0.75)	(-0.69)	(-0.57)	(-0.15)
Performance Funding Percentage	0.0000480	0.000609	-0.000149	0.000579
	(0.11)	(1.82)	(-0.31)	(1.25)
Undergraduate Enrollment		0.0000280***		0.0000268***
		(7.04)		(5.20)
Percent Enrollment Asian		-0.503		-0.643
		(-0.79)		(-0.96)
Percent Enrollment Black		-0.266		-0.337
		(-1.37)		(-1.65)
Percent Enrollment Hispanic		1.140		1.236
		(1.59)		(1.44)
Percent Enrollment White		0.201		0.173
		(1.71)		(1.45)
Admission Rate		-0.000591		-0.000332
		(-1.65)		(-1.01)
State Instructional Funding			1.17e-09**	6.62e-10*
			(2.79)	(2.11)
State Funding as Percent of All Revenues			-0.344	0.165
			(-1.12)	(0.62)
All Revenues			-3.82e-11	-2.85e-11
			(-1.48)	(-1.42)
Instruction			2.28e-10	-2.52e-10
			(1.78)	(-1.32)
Research			-1.13e-10	9.59e-11
			(-1.07)	(0.81)

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

to have a positive impact on degrees awarded. In Model 4, which includes both student body characteristics and funding data, performance funding systems still did not have a significant impact on degrees awarded. Only student enrollment and state instructional funding were predicted to have a significant positive impact on degrees awarded, but both the magnitude and significance of these impacts were decreased by the existence of both variables as compared to the models that included them separately.

Table 6 shows analogous results when analyzing the impact of performance funding program age and percentage of funding on the logarithmic equivalent of degrees awarded. Specifically, the models showed no significant impact of these performance funding characteristics on degrees awarded, but an expected positive and significant impact of student enrollment and state instructional funding on degrees awarded in each model in which those variables were included.

Chapter Seven: Discussion and Conclusion

One major finding that emerges from this analysis confirms previous conclusions that there is a lack of evidence supporting the idea that performance funding in higher education positively impacts the number of degrees awarded. What this report further adds is that newer 2.0 versions of performance funding systems that implicate core state appropriations to institutions of higher education (compared to additional funding outside of core formulas that reward institutions for performance) also have not caused an increase in degrees awarded.

While the existence of a performance funding system, whether 1.0 or 2.0, in and of itself does not seem to impact the number of degrees awarded, there is some limited evidence to suggest that for those states that have implemented a 2.0 system the larger the percentage of funding associated with performance, the greater the impact on the number of degrees awarded. This important, yet cautious, finding is at the heart of the initial inquiry of this report. There are several reasons that caution is prudent in this conclusion and more research warranted, however.

First, of the 14 states with performance funding 2.0 programs, nine of them have implemented their programs within the last two years for which data for this study was available. It is not prudent to expect measurable changes in such a short time period, especially considering that a cohort of undergraduate students requires at least four years of treatment exposure to reach the measured outcome, degree completion. Accordingly, it is unclear how much weight we can give to the effect these nascent programs are having.

Indeed, if we remove these nine programs from consideration, four of the remaining five states with performance funding 2.0 programs actually transitioned from an existing 1.0 program. Two of these states, Indiana and Tennessee, first began a form of performance-based funding in 2003 and 1990, respectively. What's more, Tennessee's program apportions 100 percent of all funding based on the performance funding system.

Accordingly, it is not clear if the percentage of funding within a performance funding 2.0 systems impacts degrees awarded because of its impact on an institution's core state funding, or, rather, because the most longstanding program driving the available data is overwhelmingly based on this specific variable. In other words, the results of this report may be a product of Tennessee's unique circumstances and not a generalizable aspect of that state's program which could be replicated elsewhere. Future research will be critical to ascertain the effectiveness of performance funding 2.0 systems as the available data increases with the length of the programs.

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