

**R**elatively low graduation rates among students of underrepresented racial and ethnic backgrounds have long plagued higher education in the United States (Bowen, Chingos, & McPherson, 2009). The percentage of students starting at a public four-year institution who ultimately complete a credential within six years is much lower among Black (50%) and Latinx (59%) students than among Asian (80%) and White (73%) students (National Student Clearinghouse, 2020). While many factors might influence graduation rates, few are more directly under the control of state policymakers than the appropriations allocated to public colleges and universities. However, policymakers frequently have limited evidence that state appropriations ultimately translate into improved student outcomes, such as higher graduation rates, which can render uncertain the potential impact of strengthening financial support for public institutions. This knowledge gap was recently addressed in the MHEC report, *The Effect of State Appropriations on College Graduation Rates of Diverse Students*, which examines whether changes in state funding for public four-year institutions can be expected to affect the six-year completion rates of Black, Latinx, and White students as well as the institution's total cohort graduation rate for all students. Notably, the report did not examine how institutions specifically use appropriations revenue, which may also have a significant impact on student outcomes. The purpose of this research brief is to summarize the methodology and findings of the analyses. Results from a state simulation are then presented to show the expected effect of a 10% increase in funding on the number of first-time, full-time completers by race and ethnicity within each state.

## **THE POTENTIAL EFFECT OF STATE APPROPRIATIONS**

State appropriations play an important role in keeping college affordable by helping institutions hold down tuition rates. For example, Bound et al. (2019) concluded that a 10% reduction in state appropriations would result in a tuition increase of \$840 at research universities and \$340 at non-research universities.

## **MAIN FINDINGS**

- State appropriations constitute a significant source of educational expenditures, and thus changes in appropriations may affect an institution's human and physical capital, programs, practices, and policies that are conducive to student learning and timely degree completion.
- Depending upon the modeling approach, a 10% increase in state appropriations could yield a modest percentage point increase in graduation rates: all students (.20 to .67 percentage points); Black students (.41 to .49 percentage points); Latinx students (.38 to .44 percentage points); and White students (.28 to .74 percentage points).
- The expected effect of state appropriations is much larger than average at some institutions, and graduation rates are still expected to decrease at other institutions despite increases in state appropriations. The effect of appropriations on the graduation rates of Black students was larger at HBCUs than at other institutions.
- While holding constant other variables such as tuition revenue, a national simulation indicated that a 10% increase in state appropriations for the 2012 first-time, full-time bachelor's degree-seeking cohort could have yielded about 1,780 to 5,963 more bachelor's degrees, with the largest gains expected in the Southern and Midwestern regions. Another simulation indicated that a 10% increase in state appropriations could have yielded about 512 to 573 more bachelor's degrees to Black students; 427 to 494 degrees to Latinx students; and 1,474 to 3,897 degrees to White students.

In addition, state appropriations furnish institutions with critical resources necessary for maintaining a high-quality learning environment. State appropriations and tuition in particular are the main sources of educational expenditures (Leslie, Slaughter, Taylor, & Zhang, 2012), and thus changes in state appropriations may affect an institution's human and physical capital, programs, practices, and policies that are conducive to student learning and timely degree completion. A decline in state funding could affect expenditure levels in critical areas, such as instruction (e.g., full-time faculty, number of course offerings), academic support (e.g., academic administration, curricular development), and student services (e.g., admissions, counseling, student activities). Conversely, in the absence of adequate revenue, institutions may inadvertently create structural barriers to student progress by limiting the number and availability of courses (Bahr et al., 2015), allowing student-faculty ratios to become too high (Bound et al., 2010), and relying heavily on part-time and contingent faculty (Eagan & Jaeger, 2008).

## STUDY OBJECTIVES

As noted in the full report, two objectives guided the analysis. First, we sought to estimate the effect of appropriations on the cohort graduation rates of all students as well as the subgroup graduation rates of Black, Latinx, and White students. Second, we examined whether the presumed effect of state appropriations on graduation rates varies across institutions. This second objective was motivated by findings from an earlier MHEC analysis, which indicated that four-year institutions vary in their efficiency and effectiveness in promoting degree completion (MHEC, 2015). Moreover, the demographic characteristics of student bodies vary systematically by institutional type. Black and Latinx students comprise a smaller share of the enrollment at research universities than at baccalaureate and master's institutions, and they constitute a larger share at Historically Black Colleges and Universities (HBCUs) and Hispanic Serving Institutions (HSIs), respectively (e.g., NCES, 2019).

## DATA SOURCE

In order to estimate the effect of state appropriations on graduation rates, institution-level panel data were obtained from IPEDS for public 4-year institutions ( $n = 436$ ) representing 12 entering freshman cohorts between 2001 and 2012. Graduation rates represent the proportion of full-time, first-

time, bachelor's degree-seeking students who completed their program within six years. The six-year graduation rates were calculated for all students and three subgroups, including Black, Latinx, and White students. Structural, contextual, demographic, and affordability variables were also created to control for potentially confounding influences. Structural characteristics included Carnegie classification, minority-serving status, institutional size, graduate student presence, and admissions selectivity. Contextual characteristics included variables for urbanization and region. Relevant attributes of the undergraduate student body included gender, race/ethnicity, socioeconomic status, non-traditionality, and academic preparedness. Affordability variables gauged the institution's published in-state tuition and fees as well as various types of financial aid, including the average student loan debt, average federal grant amount, average state grant amount, and average institutional grant amount. Variables reflecting institutional resources included state appropriations and relative reliance on tuition and public funding. State appropriations include funding for current operating expenses and exclude funding for particular projects, programs, and capital assets.

## ANALYSIS AND RESULTS

Linear mixed regression analysis was used to estimate the effects of state appropriations, institutional type, and potential interactions. Two types of analyses were conducted to estimate the average effect of state appropriations on graduation rates: (a) an examination of change only within institutions over the 12-year period and (b) an examination of variation both within and between institutions over time. These two analyses provide lower and upper bounds for the potential effect of state appropriations on graduation rates. A third analysis estimated the extent to which the effect of appropriations varies by institution and institutional type (e.g., HBCU). The effect sizes are summarized below in terms of the expected percentage point increase in graduation rates within institutions if appropriations were to increase by 10%.

**Estimation of Average Effect.** Using a conservative method analyzing only change within institutions, the results indicated that a 10% increase in appropriations could yield a modest percentage point increase in graduation rates: all students (.20 percentage points); Black students (.41 percentage points); Latinx students (.38 percentage points); and White students (.28 percentage points). This pattern is consistent

with the results of past analyses that have demonstrated a positive effect of state appropriations on graduation rates for all students (Chakrabarti et al., 2020; Heck et al., 2014; Zhang, 2009). However, whereas Zhang (2009) estimated a .64 percentage point increase in graduation rates for a 10% increase in state appropriations, for example, the current study provides a more conservative estimate of a .20 percentage point increase. This difference may be attributed to distinct research methodologies.

Larger estimates were observed when analyzing variation both within and between institutions. This analysis yielded the total expected percentage point difference in graduation rates between institutions if one has 10% greater appropriations: all students (.67 percentage points); Black students (.49 percentage points); Latinx students (.44 percentage points); and White students (.74 percentage points). These results confirmed that better-funded institutions frequently have higher graduation rates than institutions with less funding.

**Variation Across Institutions.** While state appropriation levels have a positive effect on graduation rates on average, another analysis demonstrated that the effect on graduation rates varies by institution. Specifically, at some institutions, a 10% increase in appropriations would be associated with a percentage point increase in graduation rates of .64 for all students, .92 for Black students, .79 for Latinx students, and .84 for White students. At other institutions, however, a 10% increase in appropriations would be associated with a percentage point decrease in graduation rates of .30 for all students, .55 for Black students, .23 for Latinx students, and .35 for White students. Notably, the positive effect sizes indicate that the expected effect of state appropriations is much larger than average at some institutions, and the negative effects indicate that graduation rates are expected to decrease at some institutions despite increases in state appropriations.

The source of variation in the effect of state appropriations was not readily identified in the moderation analysis of most institutional types. That is, the effect of state appropriations did not vary according to whether an institution is classified as a bachelor's institution, master's university, research university, or Hispanic Serving Institution (HSI). However, the effect of appropriations on graduation rates was much larger at HBCUs than at other institutions. A 10% increase in appropriations was associated with a .83 percentage point increase in graduation rates of Black students at HBCUs

relative to other institutions (about eight times greater). HBCUs may thus benefit greatly from a significant influx of resources.

## STATE SIMULATIONS

The findings indicate that states can improve the graduation rates of diverse students by increasing institutional appropriations. Moreover, past reductions in appropriations may have thwarted progress towards state college attainment goals by limiting institutional effectiveness. Using the estimates for the average effect of state appropriations, a simulation was conducted to estimate the number of additional completions that could have resulted from the 2012 first-time, full-time, bachelor's degree-seeking cohort at public four-year institutions within each state. The simulation assumes that other variables such as tuition revenue are held constant; increases in public funding are not offset by decreases in tuition revenue. It is noteworthy that the simulation may underestimate the number of completions that could have resulted from a funding increase due to the exclusion of part-time and transfer students in the base cohort.

Based on the total cohort graduation rate model, Table 1 shows that a 10% increase in state appropriations nationally could have yielded about 1,780 to 5,963 more bachelor's degrees, with the largest gains expected in the Southern and Midwestern regions. Drawing upon the sub-group models, a 10% increase in state appropriations could have yielded about 512 to 573 more degrees to Black students; 427 to 494 degrees to Latinx students; and 1,474 to 3,897 degrees to White students. In the Midwest alone, a 10% increase in state appropriations could have yielded about 476 to 1,595 additional degrees for the total cohort; 84 to 99 degrees to Black students; 46 to 54 degrees to Latinx students; and 490 to 1,295 degrees to White students. In addition, a simulation using the interaction effects with institution type showed that a 10% increase in state appropriations could have yielded about 101 more bachelor's degrees to Black students at HBCUs alone. This increased degree production would have presumably led to greater diffusion of the private and public benefits of higher education, such as greater personal income, tax revenues, and public welfare savings (McMahon, 2009; Trostel, 2010).

**TABLE 1. Simulated Additional Completions in the 2012 First-time, Full-time, Bachelor's Degree-Seeking Cohort at Public Four-Year Institutions**

State	Number of Institutions	2013-2016 Average FTE	2013-2016 Appropriations per FTE	10% Funding Increase	Total Actual Completions	Simulated Range of Additional Completions			
						Total	Black	Latinx	White
Alabama	13	136,072	\$7,627	\$8,389	12,454	43-145	30-32	2-3	40-105
Alaska	3	19,541	\$17,899	\$19,689	524	3-10	0-0	0-0	2-5
Arizona	3	109,301	\$6,418	\$7,060	10,991	35-116	3-3	14-17	28-73
Arkansas	10	79,773	\$6,879	\$7,567	6,500	28-92	12-14	2-3	26-70
California	32	602,143	\$7,700	\$8,470	66,140	188-630	15-18	119-138	67-176
Colorado <sup>a</sup>	-	-	-	-	-	-	-	-	-
Connecticut	5	50,799	\$17,050	\$18,755	4,925	15-51	3-3	3-4	13-34
Delaware	1	4,070	\$8,621	\$9,483	408	2-7	6-6	0-0	0-1
Florida	12	281,457	\$8,043	\$8,847	25,339	74-248	25-28	33-38	56-147
Georgia	21	227,119	\$7,104	\$7,815	17,728	67-226	44-49	8-10	51-134
Hawaii	3	21,095	\$11,984	\$13,182	1,339	5-17	0-0	1-1	1-3
Idaho	4	38,890	\$7,922	\$8,714	2,448	11-36	0-0	2-2	11-28
Illinois	11	167,337	\$6,055	\$6,661	14,764	49-164	17-20	13-15	35-93
Indiana	12	170,282	\$6,757	\$7,433	18,034	58-195	8-10	5-6	60-159
Iowa	3	67,285	\$8,718	\$9,589	8,223	23-76	1-2	2-3	25-66
Kansas	7	80,516	\$7,388	\$8,126	6,827	24-80	3-3	3-4	26-68
Kentucky	8	101,492	\$7,276	\$8,003	9,238	34-113	8-9	2-2	37-99
Louisiana	14	113,672	\$4,715	\$5,187	9,574	39-132	26-29	4-4	34-89
Maine	8	23,427	\$8,193	\$9,012	2,039	8-27	0-0	0-0	9-24
Maryland	12	123,919	\$8,322	\$9,154	8,936	27-91	25-27	3-3	18-47
Massachusetts	12	101,422	\$8,136	\$8,950	9,879	30-102	4-5	4-5	30-79
Michigan	15	251,356	\$5,261	\$5,787	25,282	76-255	15-18	6-7	75-198
Minnesota	11	113,298	\$7,607	\$8,368	9,985	32-109	2-3	2-2	36-95
Mississippi	8	71,343	\$8,832	\$9,715	5,690	21-70	23-25	1-1	16-44
Missouri	13	117,299	\$6,170	\$6,787	11,118	40-133	12-13	2-3	42-111
Montana	6	33,406	\$5,871	\$6,458	2,245	9-30	0-0	1-1	11-29
Nebraska	6	45,472	\$9,217	\$10,138	4,601	16-52	1-1	2-2	17-45
Nevada	4	44,525	\$7,670	\$8,437	2,951	12-40	2-2	6-6	8-20
New Hampshire	5	26,795	\$2,689	\$2,958	3,440	10-34	0-0	1-1	11-30
New Jersey	12	146,604	\$9,229	\$10,152	13,093	37-125	7-9	12-13	25-66
New Mexico	7	47,964	\$12,021	\$13,224	3,178	14-48	1-1	14-16	7-17
New York	37	316,463	\$9,871	\$10,858	23,331	74-247	14-17	20-23	52-137

**TABLE 1. Simulated Additional Completions in the 2012 First-time, Full-time, Bachelor's Degree-Seeking Cohort at Public Four-Year Institutions (continued)**

State	Number of Institutions	2013-2016 Average FTE	2013-2016 Appropriations per FTE	10% Funding Increase	Total Actual Completions	Simulated Range of Additional Completions			
						Total	Black	Latinx	White
North Carolina	15	195,063	\$12,172	\$13,389	20,644	63-210	48-51	6-7	52-138
North Dakota	6	31,161	\$9,168	\$10,085	2,987	11-37	0-0	1-1	14-36
Ohio	23	265,183	\$5,526	\$6,079	25,438	88-294	22-25	6-6	91-241
Oklahoma	14	90,792	\$6,749	\$7,423	7,445	29-97	5-6	4-4	26-67
Oregon	7	81,839	\$4,244	\$4,668	6,744	22-74	1-1	4-5	20-53
Pennsylvania	14	100,979	\$4,149	\$4,563	11,013	38-128	10-11	3-4	42-111
Rhode Island	2	22,156	\$4,927	\$5,419	2,524	8-27	1-1	2-2	8-20
South Carolina	12	98,574	\$3,453	\$3,798	11,376	36-119	16-18	2-3	36-95
South Dakota	5	25,197	\$6,050	\$6,655	2,321	9-29	0-0	0-1	11-29
Tennessee	9	115,310	\$7,046	\$7,751	9,965	38-129	19-21	2-3	37-98
Texas	32	480,601	\$6,105	\$6,716	37,801	139-465	47-52	87-101	78-206
Utah	6	103,273	\$6,646	\$7,311	4,189	18-59	1-1	3-4	18-49
Vermont	4	16,333	\$3,678	\$4,046	2,285	7-23	0-0	1-1	8-22
Virginia	15	189,218	\$6,714	\$7,386	23,103	63-213	27-30	7-8	53-141
Washington	6	108,819	\$5,467	\$6,014	11,169	33-110	2-2	6-7	27-71
West Virginia	10	57,737	\$6,064	\$6,671	5,127	20-68	3-3	1-1	24-63
Wisconsin	13	140,724	\$5,542	\$6,096	16,146	51-170	3-4	4-5	59-155
Wyoming	1	10,671	\$22,130	\$24,343	888	3-10	0-0	0-0	4-10
Midwest	125	1,475,108	\$6,342	\$6,977	145,726	476-1,595	84-99	46-54	490-1,295
Northeast	99	804,976	\$8,721	\$9,593	72,529	227-762	39-46	45-53	198-524
South	206	2,366,210	\$7,239	\$7,963	211,328	724-2,425	364-398	165-191	584-1,543
West	82	1,221,467	\$7,554	\$8,310	112,806	353-1,182	24-29	170-197	202-535
U.S.	512	5,867,761	\$7,283	\$8,011	542,389	1,780-5,963	512-573	427-494	1,474-3,897

<sup>a</sup>Public four-year institutions in Colorado do not receive state appropriations.

Source. National Center for Education Statistics. Integrated Postsecondary Education Data System. Note. Sub-group totals do not sum to total students due to each sub-group projection being based on unique percentage point increases in graduation rates. State appropriations include funding for current operating expenses and exclude funding for particular projects, programs, and capital assets.

## CONCLUSION

Public colleges and universities are increasingly expected to do more with less, to improve student completion rates as direct appropriations decline and college costs rise. On the contrary, the findings reported here demonstrate that state funding for public institutions should be bolstered, not weakened, to help raise college completion rates. A reassessment of state appropriation levels is in particular need for under-resourced and minority-serving institutions such as HBCUs that have experienced diminished financial health in recent years (Ortagus et al., 2020). However, the allocation of additional public resources should be met with an institutional commitment to quality assurance and accountability in demonstrating that taxpayer dollars are being used efficiently. Institutions might consider conducting a comprehensive quality audit to ensure that campus-based practices and policies add value to student learning outcomes and in fact promote timely completion among diverse student groups. The provision of adequate resources and their effective utilization will ultimately help ensure that public higher education minimizes the reproduction of racial inequalities and instead realizes its potential as an equalizer of economic and civic opportunity.

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