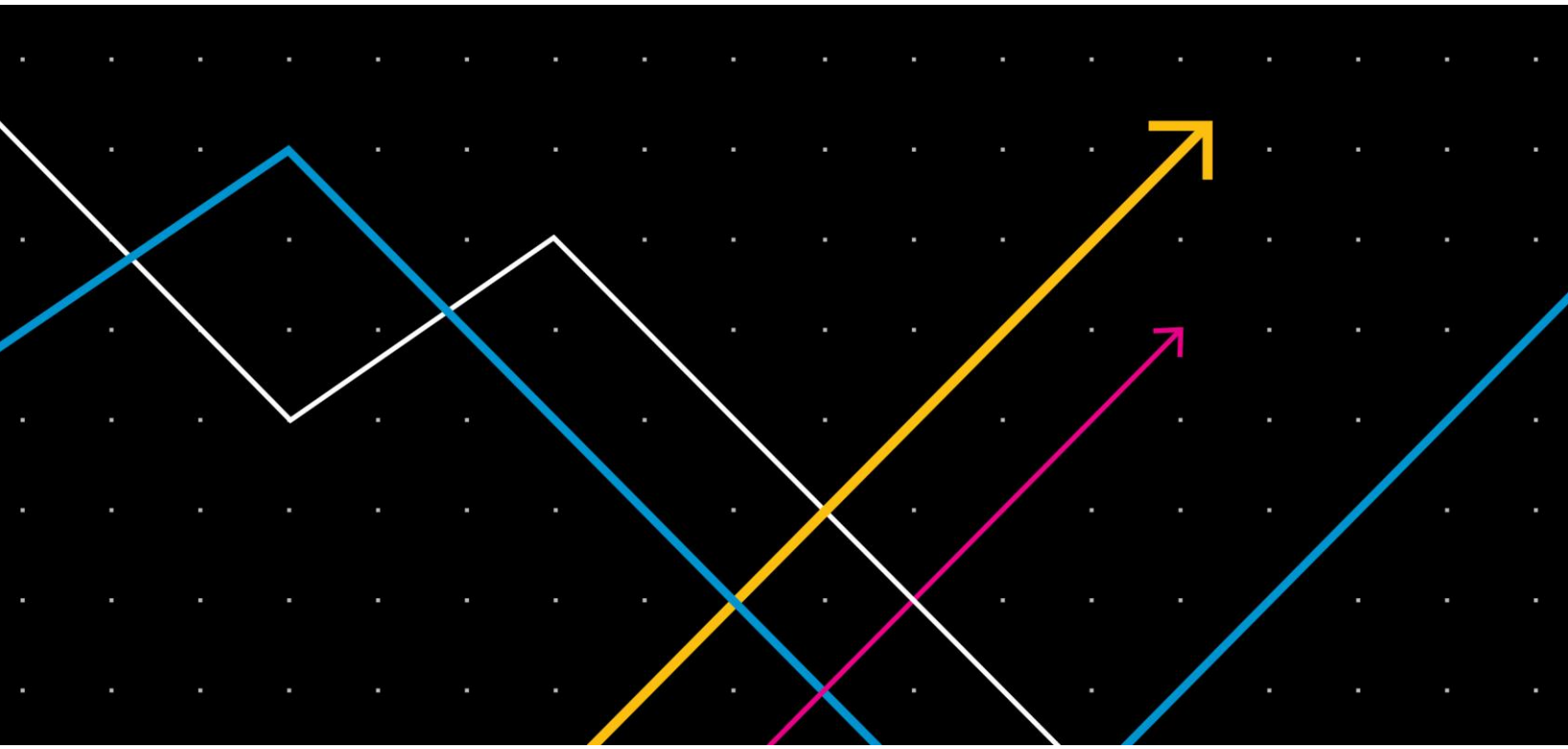


RESEARCH REPORT

Understanding Equity Gaps in College Graduation

Erica Blom *Tomas Monarrez*

January 2020

URBAN INSTITUTE · ELEVATE · THE · DEBATE

ABOUT THE URBAN INSTITUTE

The nonprofit Urban Institute is a leading research organization dedicated to developing evidence-based insights that improve people's lives and strengthen communities. For 50 years, Urban has been the trusted source for rigorous analysis of complex social and economic issues; strategic advice to policymakers, philanthropists, and practitioners; and new, promising ideas that expand opportunities for all. Our work inspires effective decisions that advance fairness and enhance the well-being of people and places.

Contents

Acknowledgments

This report was supported by Arnold Ventures. We are grateful to them and to all our funders, who make it possible for Urban to advance its mission.

The views expressed are those of the authors and should not be attributed to the Urban Institute, its trustees, or its funders. Funders do not determine research findings or the insights and recommendations of Urban experts. Further information on the Urban Institute's funding principles is available at urban.org/fundingprinciples.

The authors wish to thank Macy Rainer and Kelia Washington for excellent research assistance and David Hinson for copyediting. Matthew Chingos and Dominique Baker provided valuable and thoughtful feedback on earlier versions of this brief. In addition, the authors wish to thank the participants at convenings held in Hartford, Connecticut, and Richmond, Virginia, in 2018 and 2019, particularly Jan Kiehne and Tod Massa.

Executive Summary

Policies and practices throughout the educational pipeline harm the educational attainment of black and Hispanic Americans, who are 14 to 20 percentage points less likely than white Americans to have at least a bachelor's degree. Racial and ethnic gaps in graduation rates at public colleges and universities are a significant part of the problem.

In Virginia, there is a 16 percentage-point gap in graduation rates between minority students and white and Asian students at four-year colleges and a 12 percentage-point gap at two-year colleges. ("Minority students" refers to students who identify as black, Hispanic, American Indian or Native Alaskan, Native Hawaiian or Pacific Islander, or multiple races. We group Asian students with white students because both groups tend to have high college graduation rates, on average. This grouping is for the purposes of illustration. The methods we use here can be used to understand disparities between many different groups of interest.) These gaps vary dramatically by college. At some colleges, the gap is as large as 35 percentage points. At others, minority students graduate at higher rates than white and Asian students. These gaps are smaller in Connecticut and at two-year colleges but are still worrisome.

This report draws on detailed student-level data from Virginia and Connecticut to help institutional leaders and state policymakers better understand equity gaps in college completion rates at two- and four-year colleges. We examine how academic preparation, financial circumstances, individual institutions, segregation, and structural factors affect these gaps.

We first take the view of institutional leaders trying to understand how much differences in student characteristics might drive racial or ethnic gaps in graduation rates at individual colleges by adjusting these gaps for such factors as academic preparation and family circumstances. We find that the gap shrinks at nearly all colleges once we make this adjustment. In other words, differences in student background and academic preparation explain a great deal, but not all, of the graduation rate gap.

But even after adjustments, the gaps at some colleges remain high—in one instance, nearly 20 percentage points—and vary widely across colleges. We cannot rule out the possibility that gaps could be further reduced by factors we do not observe (e.g., the racial wealth gap), but the evidence suggests that colleges vary in how much they support their minority students as compared with their white and Asian peers.

We next take a statewide view concerning long-standing historical inequities in higher education systems—and American society more broadly—that harm the outcomes of black students relative to white students. We provide a statistical decomposition of the black-white gaps in graduation rates statewide into different components, including academic preparation, financial circumstances, college segregation, and other structural factors.

Consider the nearly 20 percentage-point black-white graduation gap at four-year colleges in Virginia. Equalizing the average difference in SAT scores and high school grade point average (GPA) across races would close this gap by 45 percent. Differences in student financial circumstances (measured as reported household income in financial aid applications) explain another 16 percent of the gap. In other words, about 60 percent of the black-white disparity in college-level success stems from precollege inequality in college readiness and financial strain.

Racial and ethnic inequity in access to high-graduation-rate colleges also plays a sizable role in the statewide graduation gap. Colleges, especially four-year colleges, do not enroll students of different races or ethnicities in equal proportions, even after controlling for SAT scores and high school GPA. Our estimates suggest that if black students attended each college in the state at similar rates as white students, and black students received the same benefit from attending these schools that white students do, the gap would close an additional 29 percent.

This finding is driven by white students being more likely to attend high-graduation-rate colleges, controlling for preparedness and financial need. Together with the estimates above, our results suggest that about 90 percent of the black-white gap in university graduation rates in Virginia is associated with gaps in college readiness, financial strain, and access to high-quality colleges (segregation). We find similar results for four-year colleges in Connecticut and two-year colleges in both states, although college segregation is not a significant factor in the two-year sector.

These approaches to understanding equity gaps in college graduation rates could be incorporated into equity audits conducted by institutional leaders and state policymakers, such as those currently being considered.[1] Understanding the roles played by factors both inside and outside higher education is critical to designing higher education policies that equitably serve all students.

Understanding Equity Gaps

Differences in educational attainment by race and ethnicity are well documented. In 2016, 21 percent of black people had a bachelor's degree or more, compared with 35 percent of white people, 15 percent of Hispanic people, and 54 percent of Asian people.[2] These differences in degree attainment reflect policies and practices throughout the educational pipeline that lead black and Hispanic students to graduate from high school, enroll in college, and graduate from college at lower rates than white and Asian students (Bowen, Chingos, and McPherson 2009).

Gaps in college graduation rates persist across sectors of higher education in both Connecticut and Virginia, where we have access to detailed data. In Virginia, college graduation rates differ between minority students and white and Asian students by 16 percentage points at four-year colleges and 12 percentage points at two-year colleges. In Connecticut, these figures are 8 and 7 percentage points, respectively. ("Minority students" refers to students who identify as black, Hispanic, American Indian or Native Alaskan, Native Hawaiian or Pacific Islander, or multiple races. We group Asian students with white students because both groups tend to have high college graduation rates, on average. This grouping is for the purposes of illustration. The methods we use here can be used to understand disparities between many different groups of interest.) These gaps are even larger between black and white students. Moreover, they vary substantially across colleges. At some colleges, the gap is as large as 35 percentage points. At others, minority students graduate at higher rates than white and Asian students.

Policymakers seeking to narrow equity gaps in college graduation rates need to understand what causes these gaps, both within and across colleges. Do they reflect differences in student characteristics correlated with race or ethnicity, such as family income or academic preparation? Are they the result of minority students attending lower-quality institutions than white and Asian students?

We first take the view of policymakers at individual colleges, who are most interested in what may explain differences in outcomes at their institution. Drawing on related work (Blom, Rainer, and Chingos 2020), we calculate adjusted differences in graduation rates that account for factors likely to affect student outcomes, such as family income and academic preparation. At some colleges, these factors entirely explain gaps in graduation rates by race or ethnicity. At others, sizeable gaps remain.

In the second section of this report, we take the view of state policymakers who are interested in what happens in individual colleges and statewide. For example, state policies can affect both where students enroll in college and what happens to them when they get there. We measure how much the

statewide black-white gap in college graduation rates can be explained by differences in student characteristics, differences in where students enroll, and other factors. We find that a large share of the graduation gap can be explained by differences in average student college preparedness by race or ethnicity, but another important determinant is unequal access to colleges with high graduation rates.

Adjusted Gaps in Graduation Rates

Graduation rates by race or ethnicity are a commonly used metric in higher education. The federal government has required institutions to report these measures annually since 1990 (Cook and Pullaro 2010). Disaggregated graduation rates are an important metric summarizing how likely different groups are to earn a degree. But the raw data provide an incomplete picture, as they reflect which students enroll in a college (the result of decisions made by students and the college itself) and how well they are served.

Attempting to separate the role race and ethnicity play from potentially correlated factors can be useful. In this section, we calculate adjusted gaps in graduation rates to determine how likely minority students are to graduate, compared with white and Asian students with similar characteristics.

We are not the first to attempt to understand how student characteristics affect the racial and ethnic gap in graduation rates. Carnevale and Strohl (2013) show not only that postsecondary access as a whole—as well as by institution—differ by race or ethnicity but that these differences persist even after measures of college readiness are taken into account. Flores, Park, and Baker (2017) show that more than half the gap can be explained by precollege characteristics. Similarly, Fletcher and Tienda (2010) show that controlling for class rank and test scores shrinks but does not eliminate the achievement gap for college students in Texas. They further show, however, that the gap can be eliminated or even reversed by accounting for the high school attended, underlining the importance of precollege investment in student preparation.

Others have studied differences in achievement for minorities by type of institutions. Using propensity score matching technique to match students at minority-serving institutions to those at traditional institutions, Flores and Park (2015) find no significant differences in minority completion rates between the two types of institutions. Melguizo (2010), on the other hand, finds that students of color are more likely to graduate from more-selective institutions.

Our adjustment takes into account student gender, measures of family income (e.g., Pell grant receipt, family income, free and reduced-price lunch status, dependent or independent status, and

family size), whether the student is out of state, and student preparation (measured using college entrance exam scores, weighted high school GPA, high school standardized test scores, whether the student graduated from high school in the previous year, and high school attendance rates). The models differ slightly between Virginia and Connecticut (because of differences in data availability) and between two- and four-year colleges (because of differences in student characteristics and data availability). Two-year models also full-time or part-time status. We estimate separate models for each institution, so the relationship between student characteristics and graduation rates can differ across institutions. But within an institution, the relationships between graduation and each covariate is assumed to be the same for all students. In other words, the likelihood of graduation given a particular test score is assumed to be the same for all students. We relax this assumption in the next section.

Data

We use student-level data from the Virginia Longitudinal Data System and the Connecticut Preschool through Twenty and Workforce Information Network. For the two-year college analysis in Connecticut, we use cohorts entering college in fall 2010, 2011, and 2012. For all other analyses, we use cohorts entering college in fall 2009, 2010, 2011, and 2012. The Virginia data include all public and private nonprofit four-year colleges and all community colleges. The Connecticut data include all five public four-year colleges, two private nonprofit four-year colleges, and all community colleges.[3] To be included, students must have complete data for all variables. We do not report results when there are fewer than 30 minority students or 30 white and Asian students.

Appendix tables A.1 through A.4 summarize the graduation rates and characteristics included in the model for community colleges in Virginia, community colleges in Connecticut, four-year colleges in Virginia, and four-year colleges in Connecticut.

Community Colleges

Figure 1 shows the raw and adjusted six-year graduation rates for community colleges in Virginia. Raw gaps, indicated by blue dots, range from more than 30 percentage points to less than 10 percentage points, but all gaps are positive. In other words, at no Virginia community college do minority students graduate at a higher rate than white and Asian students. Accounting for gender; Pell status; income; family size; high school achievement, attendance, and graduation status; full-time and part-time status; and independent or dependent status, the adjusted gaps (yellow dots) are lower in every case. In other words, some of the difference in graduation rates by race or ethnicity can be explained by factors in our

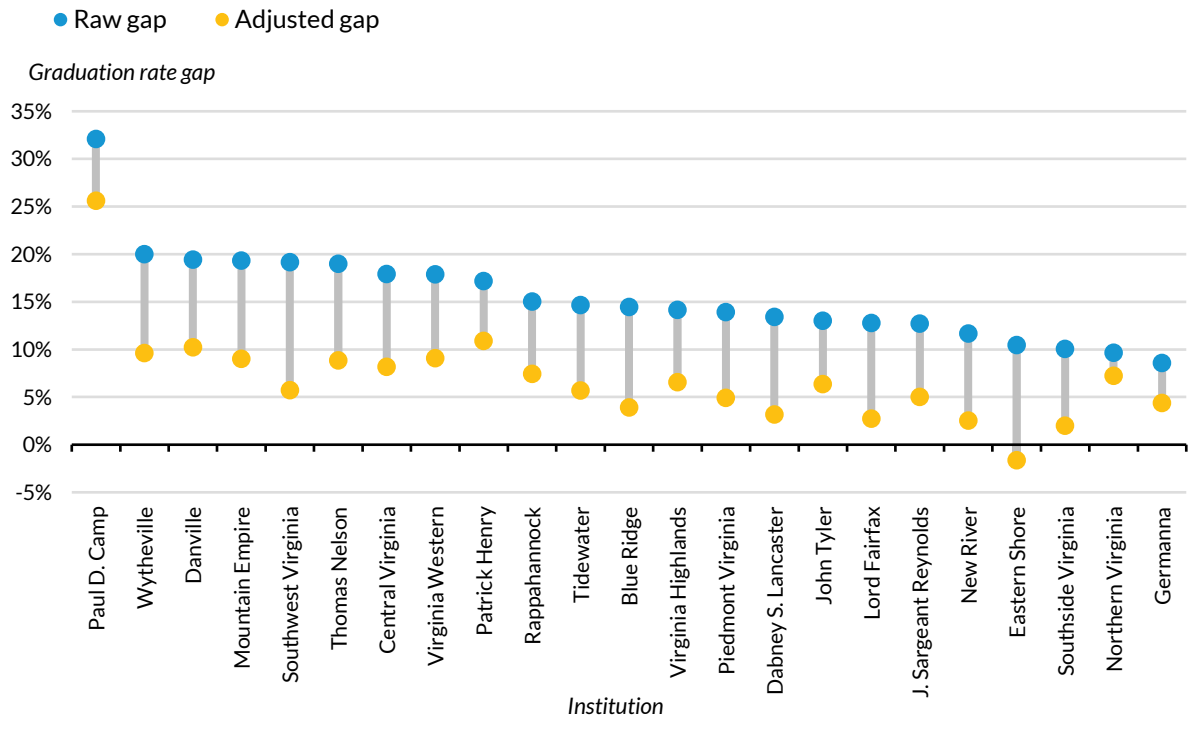
model, such as family income and academic preparation. At the same time, many of these gaps remain high, even after adjustments: some are still close to, or even greater than, 10 percentage points, and the gap at one college is more than 25 percentage points.

The order in which colleges rank by graduation rate gap also changes after adjustments, but this affects some colleges more than others. Southwest Virginia Community College has the 5th-highest raw gap in graduation rates, but after adjustments, it drops to 13th. Conversely, Northern Virginia Community College has the 2nd-smallest unadjusted gap but the 10th-largest adjusted gap. As a whole, the raw and adjusted gaps are about 0.88 correlated for these institutions, suggesting that although it is important—especially for certain institutions—to incorporate these adjustments, student characteristics do not explain the disparate outcomes between racial and ethnic groups.

FIGURE 1

Raw and Adjusted Six-Year Graduation Gaps between Minority Students and White and Asian Students

Community colleges, Virginia, 2009–12



URBAN INSTITUTE

Source: Analysis of Virginia Longitudinal Data System data.

The story is different in Connecticut. Raw gaps are never more than 15 percentage points. After adjustments, two colleges end up with negative gaps (white and Asian students graduate at lower rates

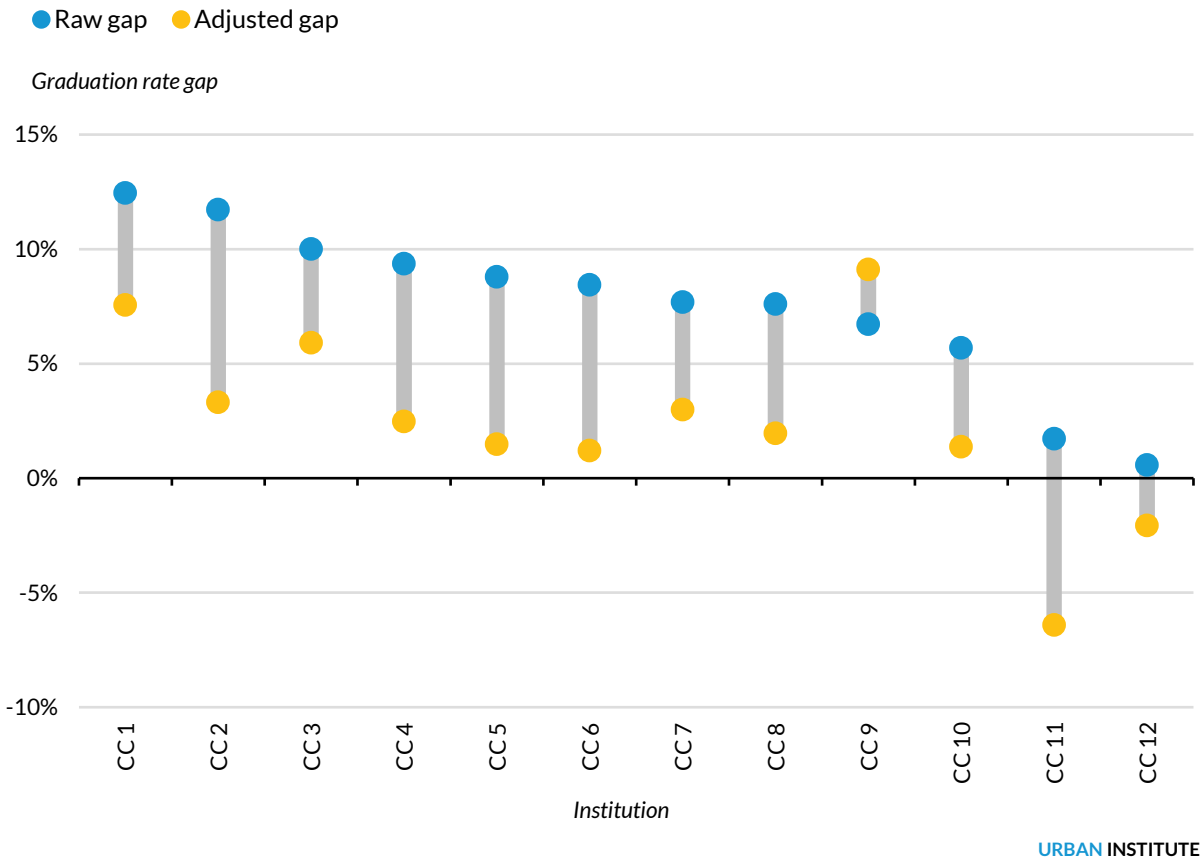
than minority students), and many colleges decrease their graduation gaps by 50 percent or more (although most still exhibit some gap). The gap at one college increases.

In general, the graduation gap is larger among Virginia community colleges than among Connecticut community colleges, both in raw and in adjusted terms, despite a richer set of controls in Virginia. State context matters.

FIGURE 2

Raw and Adjusted Six-Year Graduation Gaps between Minority Students and White and Asian Students

Community colleges, Connecticut, 2009–12



Source: Analysis of Connecticut Preschool through Twenty and Workforce Information Network data.
Note: CC = community college.

Four-Year Colleges

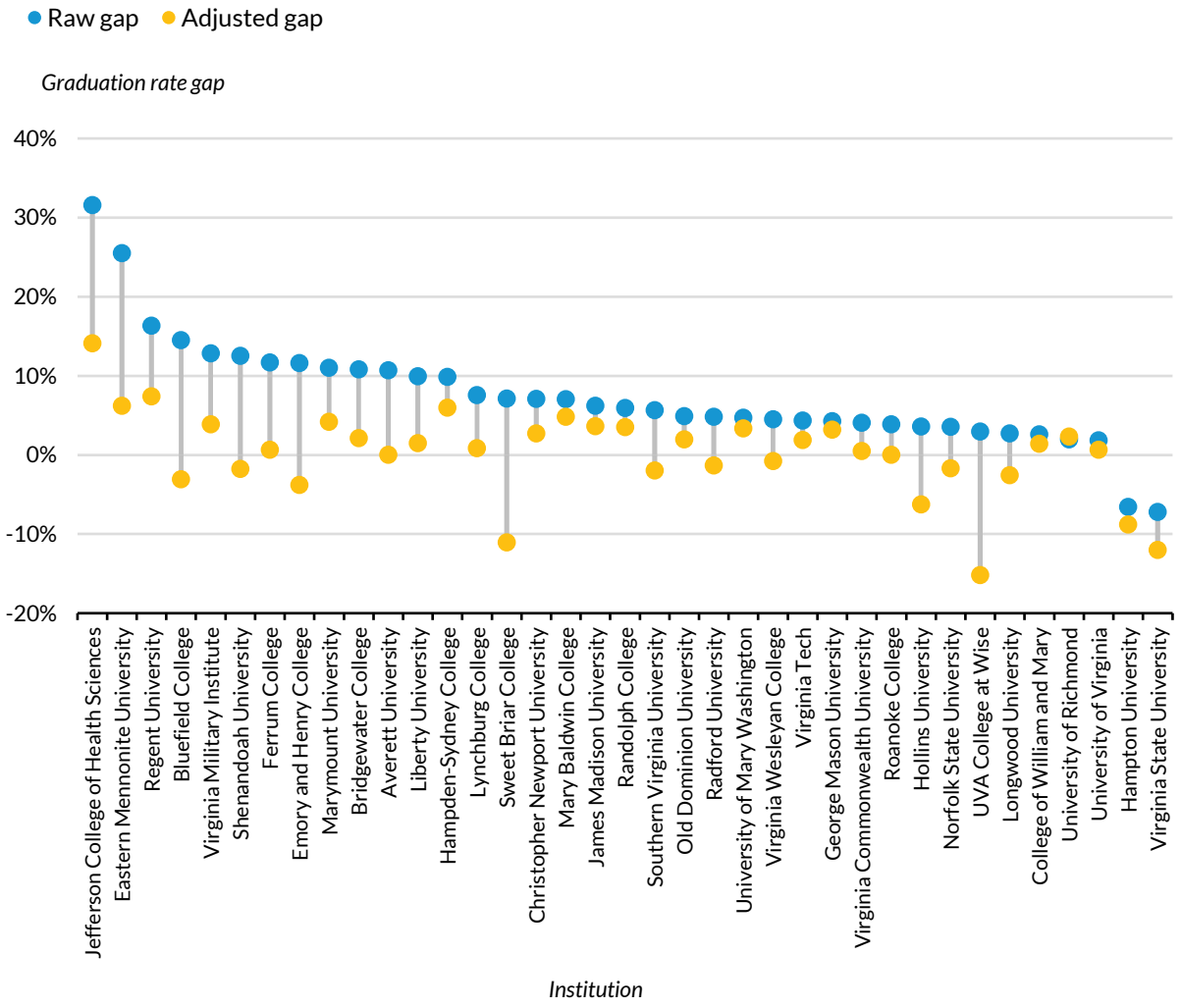
The story with four-year colleges is different yet again. As with the two-year colleges in Virginia, we see wide variation in graduation gaps, with a 32 percentage-point gap at one end and two colleges

(Hampton University and Virginia State University, both historically black colleges and universities, or HBCUs) where minority students out-graduate white and Asian students. In nearly all instances, the adjustment does make the gap smaller (or more negative, at the University of Virginia or Virginia State University), but the size of the adjustment varies dramatically. In several instances, after adjustments, the gap has a negative sign, indicating minority students graduate at *higher* rates than white and Asian students.

FIGURE 3

Raw and Adjusted Six-Year Graduation Gaps between Minority Students and White and Asian Students

Four-year public and private nonprofit colleges, Virginia, 2009–12



URBAN INSTITUTE

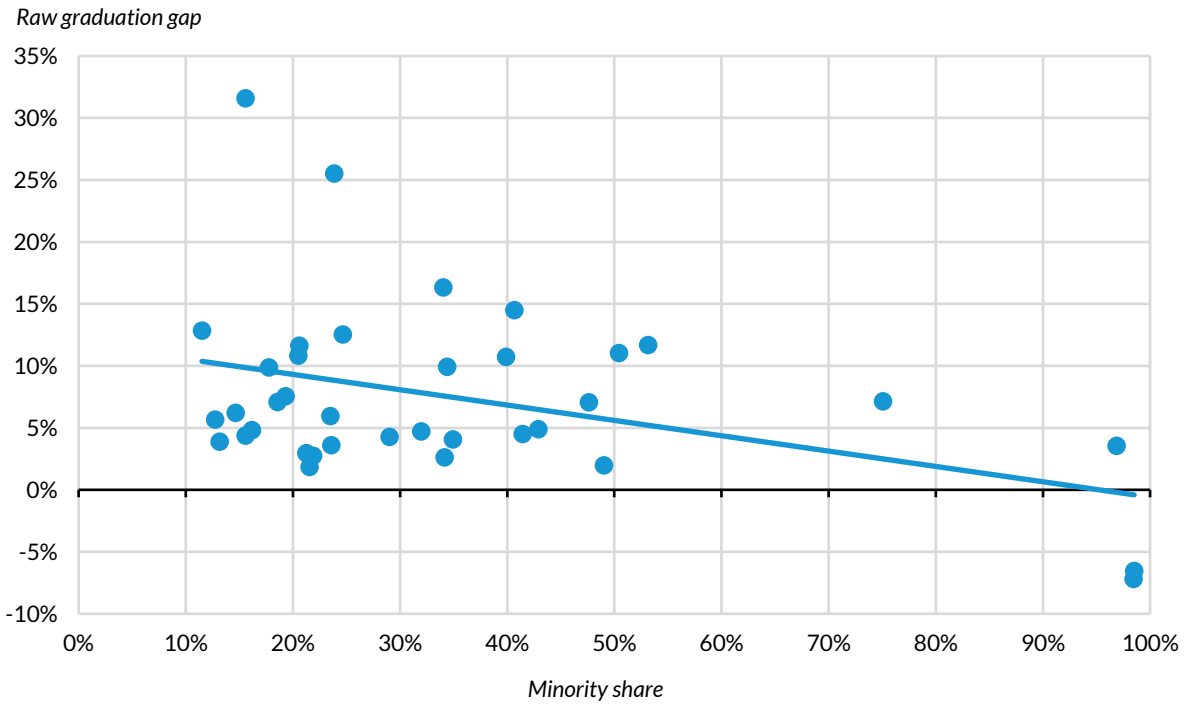
Source: Analysis of Virginia Longitudinal Data System data.
Note: UVA = University of Virginia.

What types of institutions might have larger gaps? For both raw and adjusted graduation gaps, we see that schools with larger shares of minority students have smaller graduation gaps (figures 4 and 5). In other words, at the institutions, minority students tend to do as well as, or better than, their white and Asian peers (although the relationship is attenuated after adjustments). This does not appear to be the case for Virginia community colleges, where the relationship is effectively flat.

FIGURE 4

Raw Graduation Gaps and Minority Share

Four-year colleges, Virginia, 2009–12



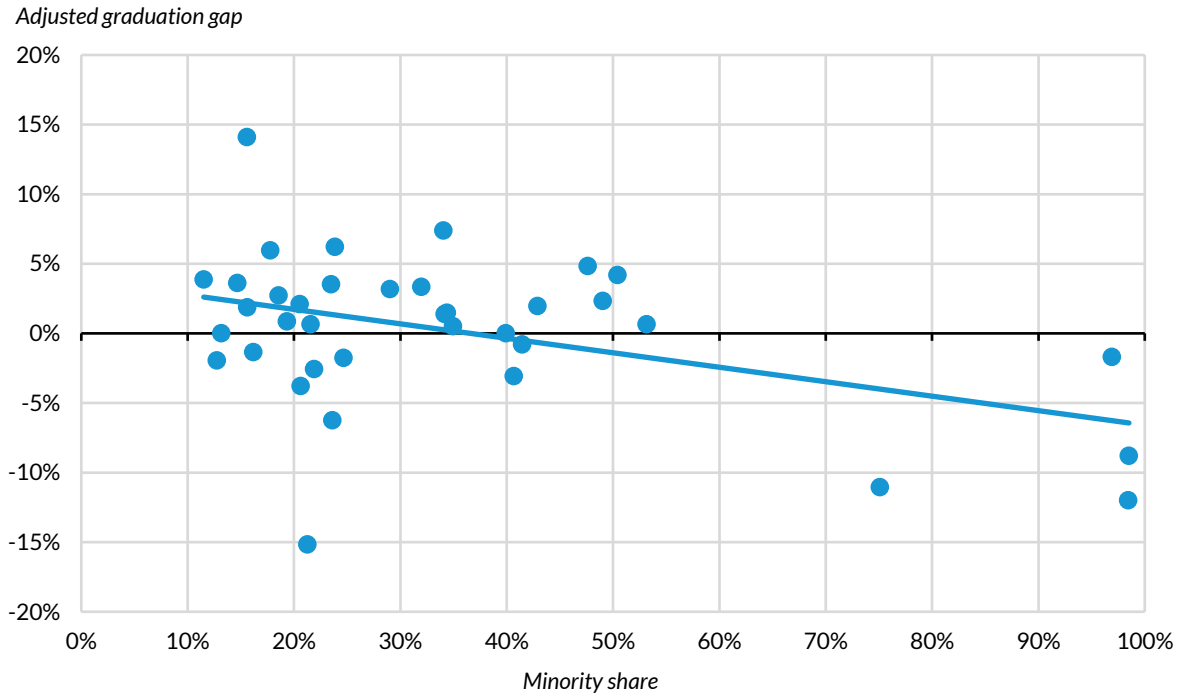
URBAN INSTITUTE

Source: Analysis of Virginia Longitudinal Data System data.

FIGURE 5

Adjusted Graduation Gaps and Minority Share

Four-year colleges, Virginia, 2009–12



URBAN INSTITUTE

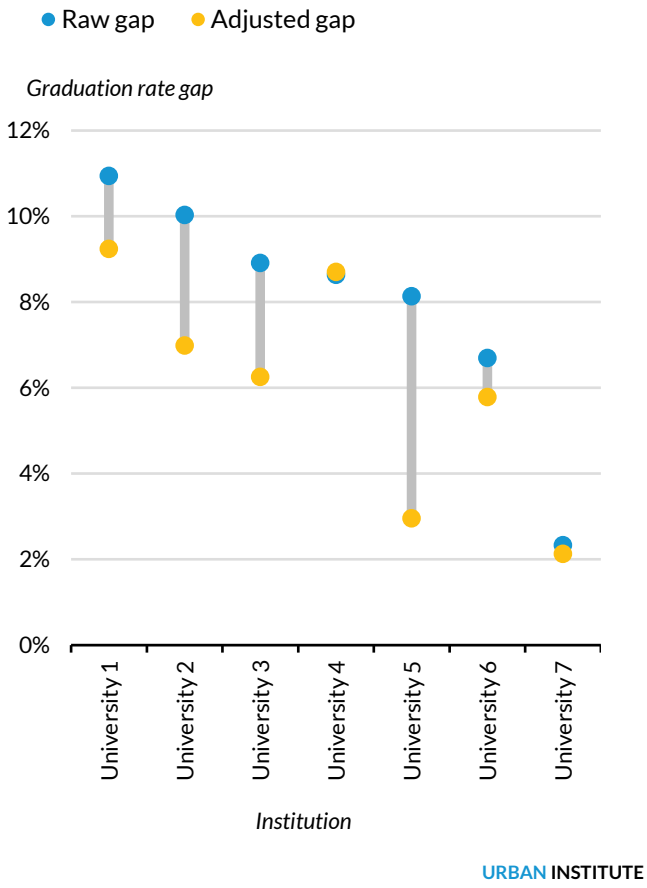
Source: Analysis of Virginia Longitudinal Data System data.

The pattern at Connecticut four-year colleges resembles that of Connecticut two-year colleges, with lower raw gaps than in Virginia, though the adjustments have less impact than they do on four-year colleges in Virginia or two-year colleges in Connecticut. This is perhaps surprising: one might expect larger adjustments among four-year colleges than among two-year colleges within a state. One explanation may simply be that there is less variation to begin with, since our sample includes only seven four-year colleges (excluding many private nonprofit colleges). But taken as a whole, these analyses point to idiosyncratic factors at each institution that lead to gaps in adjusted graduation rates.

FIGURE 6

Raw and Adjusted Six-Year Graduation Gaps between Minority Students and White and Asian Students

Four-year public and selected private nonprofit colleges, Connecticut, 2009–12



Source: Analysis of Connecticut Preschool through Twenty and Workforce Information Network data.

Decomposing Statewide Racial Gaps in College Graduation Rates

The previous section shows that adjusting for student characteristics does not fully explain differences in graduation rates between racial and ethnic groups on most college campuses. But it does not explore how student sorting across colleges or other factors potentially explain the statewide gap in graduation rates.

In this section, we focus on the statewide gap in graduation rates between white and black college students in Virginia and Connecticut. Our reasoning for this is largely historical: black people in these

states have suffered the worst injustices over the longest period, going back hundreds of years, beginning with slavery. Understanding how much the higher education system reduces or perpetuates inequities between white and black people is important to both researchers and society in general. Other disparities are also important, but we focus on the black-white gap for these reasons. The methods presented in this section, as with those in the previous section, can be applied to other groups of interest.

Here, we indentify the main determinants of the statewide black-white gap in college graduation rates, for both four- and two-year institutions. Racial differences in college matriculation and completion are of interest to policymakers and researchers alike and have been studied in other contexts (Arcidiacono and Koedel 2014; Bowen, Chingos, and McPherson 2009; Flores, Park, and Baker 2017; Hoxby and Turner 2013; Koedel 2017).

Following the applied literature in labor economics on describing equity gaps in outcomes, we use a *Oaxaca decomposition*, a standard tool pioneered by Oaxaca (1973) that provides a statistical decomposition of the gap in average outcomes between two groups—in our case, the six-year graduation gap between white and black students. The first component of the gap is the *explained component*, or the share of the gap attributable to racial gaps in student characteristics correlated with graduation, such as SAT scores. The other component of the gap, the *unexplained component*, is not accounted for by differences in predictors of success and instead indicates racial differences in the statistical link between these predictors and outcomes. This second component is frequently attributed to discrimination in the wage economics literature, but in our case, it captures a mix of factors related to how different racial groups interact with the higher education system and structural racial inequities such as discrimination (Card, Cardoso, and Kline 2016; Gerard et al. 2018).

The mechanics of our Oaxaca decompositions are based on the estimation of linear probability models of college graduation separately by race, using various predictor variables, including college indicators. See appendix B for a technical description of the Oaxaca decomposition framework we use.

Oaxaca decompositions also incorporate an important implicit assumption. The decomposition formula relies on a counterfactual, which assigns the coefficients of one group to the other group (appendix B). We follow the literature by using the counterfactual assigning the white students' estimated coefficients to black students. Theoretically, this assumes that structural factors are "undistorted" for white students but are "distorted" for black students. Thus, intuitively, our counterfactual assumes that the status quo of white students in higher education is what black students

would experience were it not for structural factors stemming from long-standing racial inequities in higher education.

We first look at Virginia's four-year colleges in 2009–12. We delineate our analysis sample as follows. Because our analysis focuses on understanding disparities between black and white students in higher education, we drop HBCUs from the analysis. Our estimates will be based on within-school racial disparities, and making such comparisons for HBCUs does not make sense.

We also drop schools that do not have at least one black and one white student or have total enrollment lower than 30 students.[4] In addition, we restrict the sample to full-time students with college preparedness data, as we anticipate that preparedness will be an important predictor of graduation gaps.[5] These restrictions result in a sample of 85,078 white and 14,684 black students.

TABLE 1

Summary Statistics of Our Sample of Virginia University Students

	White		Black	
	Mean	**SD**	**Mean**	**SD**
Female	0.55	(0.50)	0.59	(0.49)
Six-year graduation rate	0.75	(0.43)	0.58	(0.49)
Took SAT	0.97	(0.18)	0.93	(0.25)
SAT mathematics (std.)	0.07	(0.86)	-0.69	(0.73)
SAT reading (std.)	0.13	(0.89)	-0.58	(0.79)
High school GPA	3.60	(0.52)	3.26	(0.53)
Did not file for financial aid	0.24	(0.43)	0.07	(0.25)
Household income	111,045	(72,106)	64,829	(54,069)
Family size	4.00	(1.29)	3.58	(1.48)
Out-of-state student	0.22	(0.41)	0.21	(0.41)
International	0.01	(0.07)	0.02	(0.15)
N	**85,078**		**14,684**	

Source: Analysis of Virginia Longitudinal Data System data.
Note: GPA = grade point average; SD = standard deviation; std. = standardized to have mean = 0 and standard deviation = 1 in the population.

Four-Year Colleges in Virginia

Table 1 summarizes the characteristics of the Virginia sample of four-year college students. Black students had a six-year graduation rate of about 58 percent, and white students had a 74 percent graduation rate, resulting in a 17 percentage-point black-white graduation gap. For both groups, a slight majority of students are female. There are notable racial gaps in measures of student college preparedness, most prominently in standardized SAT mathematics and reading scores but also in high school GPAs and the share of students who took the SAT. The average white university student in

Virginia had a 97 percent likelihood of having taken the SAT and scored 0.07 standard deviations above the state average in SAT math. The average black student had a 93 percent likelihood of taking the SAT and scored 0.69 standard deviations below the state mean in SAT math.

We are interested in unpacking how much the graduation gap is associated with these differences in college readiness, relative to other factors. If preparedness explains a large share of the gap, this may indicate that policies aimed at improving these aspects of college readiness could improve graduation rates, but these policy recommendations should be approached with caution, as our decomposition exercise is not meant to indicate causal relationships. Notably, all the empirical statements we make here are "partial equilibrium" relationships. That is, we cannot be sure that implementing a policy to equalize student preparedness would not have marketwide impacts on higher education systems that would change the statistical relationships we used to perform our decomposition exercise.

There are also notable differences by race in financial need and other student characteristics. Ninety-three percent of black students filed for financial aid at their institutions and had an average household income of about $65,000. Seventy-six percent of white students filed for financial aid and had an average household income of $111,045. Our decomposition framework allows us to estimate how much of the graduation gap is caused by differences in student financial circumstances versus differences in the way that race interacts with financial need and whether this matters for the overall graduation racial gap.

We estimate linear models of graduation status as a function of these variables, as well as cohort indicators and indicators for the 36 universities in the data, separately for black and white students. We perform the Oaxaca decomposition and report the results in table 2. Out of the 17 percentage-point graduation gap between black and white students, 45 percent of the gap (7.6 percentage points) is caused by mean differences in our measures of student preparedness, namely SAT scores and high school GPA. This means that if black students enjoyed the same return on college preparation that white students do, closing the gap in high school test scores and grades would eliminate 45 percent of the college graduation gap, all else equal. This component is precisely estimated, as noted by the small standard error.

Observed racial differences in student financial circumstances explain about 16 percent of the gap. This is in line with the literature documenting the impact of economic instability on educational attainment (Bowen and Bok 1998). Black students are more likely to experience financial need than white students, and this explains a significant portion of the gap (table 1). This evidence supports the

claim that alleviating economic inequality between racial groups would improve black educational attainment.

Unexplained components of financial need are also large, albeit imprecisely estimated and not statistically different from zero. This suggests that increases in income are less predictive of college success for black students, relative to white students.

We now report on the component of the gap attributable to college indicators (i.e., variables equal to 1 if a student attended that college and 0 otherwise), which relates the gap to college segregation and differences in college "value-add," as we explain below. If we include only college indicators in the regression, their coefficient estimates would simply reflect raw average differences in graduation rates between colleges. Once we add the additional control variables, the typical language used to describe these coefficients is college "effects" or "value added," though such causal language is most likely unwarranted. More precisely, the coefficients on college indicators capture the residual correlation between attending a given college and the chance of graduation, net of selection into colleges based on students' college readiness, financial circumstances, and other variables. This means the differences in the value-added coefficients cannot be explained by differences in, say, the average SAT scores or students' household income.

Noting that the average of college indicators equals the statewide share of university students that attend that college, one can see that the explained component of the graduation gap driven by college indicators represents racial differences in exposure to different colleges. In other words, this is the portion of the graduation gap attributable to the fact that, on average, white and black students are exposed to different colleges, which is a way of defining colleges' racial segregation.

What do we mean by "segregation"? Attending an institution of higher education is the outcome of a complex process that depends on college admission policies, geographic dispersion of colleges and students, the preferences and resources of students and families, and other factors. When we analyze racial stratification in college attendance, which we call segregation, we acknowledge that it is the outcome of this complex process.

College racial stratification explains 29 percent (4.9 percentage points) of the racial gap in university graduation rates in Virginia. The estimate strongly suggests that unequal access to high-quality colleges based on race—an inequity that cannot be explained by racial differences in college readiness or finances —is the second-largest component of the graduation gap, behind only racial gaps in college readiness. This estimate assumes that colleges would give black students the same value-add they give white students if black students were "integrated"—that is, if their distribution among colleges

mimicked that of white students. Thus, if one were to place black students across colleges using the same rate as white students and provide black students the same value-add provided to white students (and keeping all else equal), the graduation gap would close by slightly less than a third, which is 13 percentage points more than we would expect from closing gaps in financial need.

The unexplained component for these college indicators measures how differences in race-specific college value-add drive the gap in graduation rates—that is, racial differences in the college indicators. Perhaps surprisingly, this component is negative and sizable (-11 percent), but it is noisily estimated and not statistically different from zero. This means our estimates of college value-add tend to be higher for black students at colleges black students are more likely to attend, because these averages are weighted by the distribution of black students among colleges. This would seem to suggest that the average black university student attends a college that provides slightly higher value-add to black students than to white students. But given the imprecision of this estimate, we lend little credence to this finding.

TABLE 2

Oaxaca Decomposition of the Virginia Black-White Gap in University Six-Year Graduation Rates

	Graduation Rate		Preparation		Finances		College Indicators		Other
	Black	Gap	Exp.	Unexp.	Exp.	Unexp.	Exp.	Unexp.	factors
All	0.58	0.17	0.076	0.001	0.027	0.036	0.049	-0.018	-0.002
(%)			45.0	0.6	16.0	21.3	29.0	-10.7	-1.2
SE			(0.017)	(0.015)	(0.003)	(0.031)	(0.013)	(0.011)	
Male	0.50	0.21	0.089	-0.003	0.026	0.041	0.048	0.001	0.009
(%)			42.6	-1.4	12.4	19.6	23.0	0.5	4.3
SE			(0.019)	(0.019)	(0.004)	(0.040)	(0.012)	(0.011)	
Female	0.64	0.15	0.073	-0.021	0.028	0.022	0.049	-0.011	0.006
(%)			50.3	-14.5	19.3	15.2	33.8	-7.6	4.1
SE			(0.015)	(0.025)	-0.004	(0.034)	(0.013)	(0.011)	

Source: Analysis of Virginia Longitudinal Data System data.

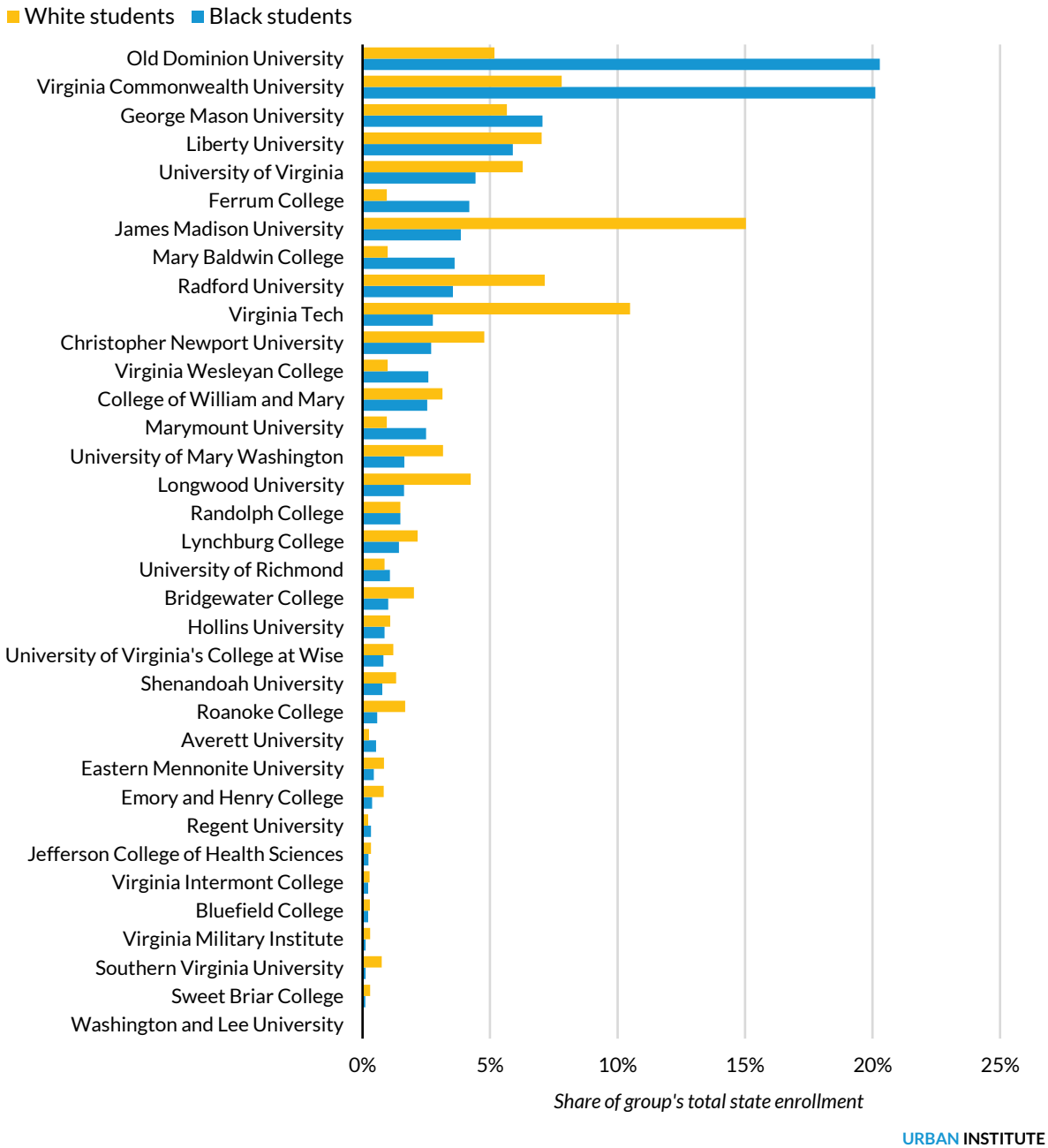
Notes: Exp. = explained; SE = standard error; Unexp. = unexplained. Standard errors (reported in parenthesis) are clustered at the college level. Full-time and out-of-state status variables also include cohort effects. Out-of-state status is not included in the two-year college models.

These seemingly contradictory findings warrant further investigation of the relationship between college value-add and college segregation. In figure 7, we present evidence on the segregation of Virginia universities, reporting the share of each racial group attending each of the 36 universities in our data. Colleges are ordered from highest to lowest based on the share of the statewide black university student population that they serve. It is notable that three universities serve about 50 percent of the state's black students. Moreover, the schools with the highest representation of white students have relatively low black enrollment. Finally, there are several small schools in which there is a considerable

exposure gap: some have a much larger black share than white share and vice versa. This figure supports the claim that universities in Virginia are racially segregated, which could be caused by demand-side factors, supply-side factors, or both.

FIGURE 7

Evidence of Racial Segregation in Virginia's Universities



URBAN INSTITUTE

Source: Analysis of Virginia Longitudinal Data System data.

Note: The share of group's total enrollment is the share of all Virginia university students that attend a given college, computed separately by race.

Given this backdrop of racial stratification, we estimate linear regression models in which the race-specific coefficients on our college indicators are the outcome of interest and the racial shares presented in figure 7 are the explanatory variables. These models explore the correlation between college effects (i.e., the part of the association between graduation and enrollment at an institution that cannot be explained by SAT scores, full-time status, or financial need) and the state share of white or black students at that college. These models look at the relationship between college quality (i.e., their adjusted graduation rates) and student sorting into colleges, where "sorting" refers to the complicated two-sided process of college application and admission.

Column 1 in table 3 shows that the higher the white share of students in a given college, the higher the college's estimated value-add (estimated with the sample of white students). This relationship is statistically significant even with the small number of observations (figure 8). Column 2 shows that the same is not true for black students, since the coefficient is negative and indistinguishable from zero and the model has essentially zero explanatory power. Tellingly, when we estimate a model that controls for both the black and white shares of students (column 3), significant, opposing-sign coefficients emerge, a positive one for white students and a negative one for black students. What this means is that conditional on the black share of students, among colleges with similar black shares, a higher white share is associated with higher graduation rates. Conversely, among colleges with similar white shares, a higher black share predicts lower college quality. This suggests that white students attend colleges with a high value-add (i.e., higher adjusted graduation rates) while black students attend colleges with a low value-add. This finding is remarkable because it shows that—controlling for college readiness and financial need—white students attend colleges that graduate more of their pupils at higher rates than black students.

This claim is strengthened by the evidence in columns 4 through 6 of table 3, which presents estimates for a parallel set of models but instead uses college value-added estimates from the model using only black students. The relationships described above continue to hold across the board, though they are noisier (this is to be expected, given the smaller sample of black students). White students are more likely to attend the colleges that graduate black students at higher rates. Moreover, conditional on a college's white share, a higher black share is associated with lower black-specific value-add. We can be sure these patterns are not explained by racial differences in the metrics typically used to assess college readiness during the admissions process, because we control for them in our models.

TABLE 3

Correlation between College Value-Add and Segregation

	White Value-Add			Black Value-Add		
	(1)	(2)	(3)	(4)	(5)	(6)
White share	1.158***		1.531***	1.041*		1.251**
	(0.422)		(0.428)	(0.581)		(0.595)
Black share		-0.046	-0.575***		0.108	-0.325
		(0.283)	(0.160)		(0.334)	(0.199)
Constant	-0.019	0.015	-0.014	-0.068*	-0.041	-0.065
	(0.029)	(0.026)	(0.031)	(0.037)	(0.033)	(0.039)
R-squared	0.11	0.00	0.15	0.06	0.00	0.07
N	35	35	35	35	35	35

Source: Analysis of Virginia Longitudinal Data System data.

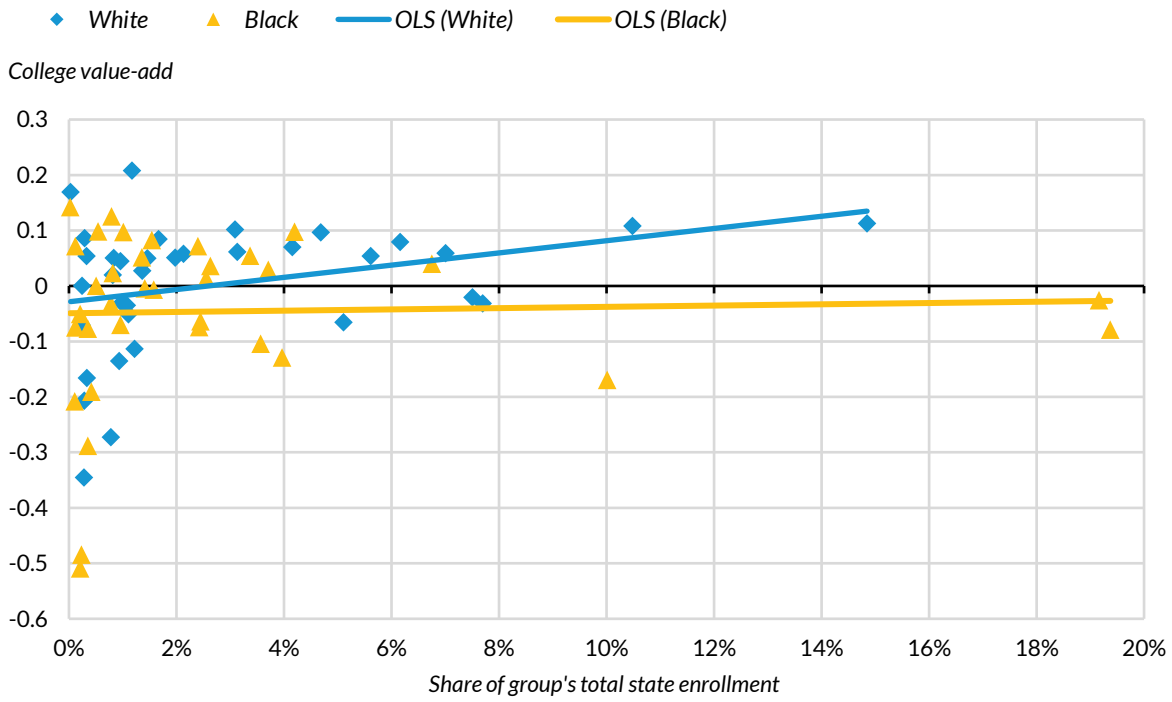
Note: Robust standard errors are reported in parenthesis.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

As noted above, however, we also find evidence that the average black student attends a college that provides slightly more value-add to black students than to white students, though the finding is noisy and not significantly different from zero. How can both these findings coexist? One explanation could be that, while black students may more frequently attend colleges that provide slightly more value to black students than to white students, this "sorting on gains" effect—whose existence is already dubious—pales in comparison with the effect of sorting on the *level* of college quality. Because white students have higher representation in colleges with high graduation rates than do black students, college segregation explains a large share of the graduation gap. More research is needed to understand the mechanisms and consequences of these student sorting patterns, which are a function of both demand-side and supply-side factors.

FIGURE 8

Race-Specific College Value-Add and College Segregation



URBAN INSTITUTE

Source: Analysis of Virginia Longitudinal Data System data.
Notes: OLS = ordinary least squares regression. College value-added measures are the ordinary least squares coefficient on college indicators in race-specific models that control for student characteristics.

Two-Year Colleges in Virginia

We now report on a parallel analysis of Virginia community colleges. Table 4 reports the average characteristics of community college students in our sample. We measure graduation from community colleges using a six-year definition that accounts for transfers to four-year institutions. The graduation rate of white community college students is 34 percent, less than half the graduation rate at four-year universities. For black students, the graduation rate is half of this, or 17 percent, making the racial gap in community college graduation rates about 17.1 percentage points.

TABLE 4

Summary Statistics of Virginia Community College Student Sample

	White		Black	
	Mean	**SD**	**Mean**	**SD**
Female	0.49	(0.50)	0.54	(0.50)
Six-year graduation rate	0.34	(0.47)	0.17	(0.37)
HS math score (std.)	0.16	(0.98)	-0.44	(0.82)
HS reading score (std.)	0.25	(0.97)	-0.49	(0.87)
Did not file for financial aid	0.45	(0.50)	0.17	(0.38)
Household income	52,096	(40,894)	33,443	(31,869)
Family size	3.63	(1.38)	3.38	(1.53)
Full-time student	0.74	(0.44)	0.65	(0.48)
N	**34,734**		**13,500**	

Source: Analysis of Virginia Longitudinal Data System data.

Note: HS = high school; SD = standard deviation; std. = standardized to have mean = 0 and standard deviation = 1 in the population.

Because most community college students did not take the SAT and because high school GPA is observed only on university records, we rely on standardized high school test scores in mathematics and reading to proxy for college readiness. On average, white students score 0.16 standard deviations higher than the state mean in math (and 0.25 in reading). In contrast, black students score 0.44 standard deviations below the state mean in math (and 0.49 in reading). This suggests that racial gaps in college readiness are more severe in the community college sector than in the university sector.

As is true of universities, community college students have large racial gaps in financial need, although all students come from lower-income backgrounds relative to students in the four-year sector. Eighty-three percent of black students filed for financial aid, with an average household income of about $33,000 (versus 55 percent and $52,000, respectively, for white students). In addition, unlike the four-year college sector, community colleges also show racial gaps in full-time student status. Seventy-four percent of white community college students enrolled full time in their first semester, while only 65 percent of black students did so. As we will see, this gap has important implications for the graduation rate gap.

TABLE 5

Oaxaca Decomposition of Virginia Black-White Gap in Community College Six-Year Graduation Rates

	Graduation Rate		Preparation		Finances		Full-Time Status		College Indicators		Other
	Black	Gap	Exp.	Unexp.	Exp.	Unexp.	Exp.	Unexp.	Exp.	Unexp.	Factors
All	0.17	0.17	0.066	-0.006	0.021	0.085	0.015	0.056	0.006	-0.018	-0.053
(%)			38.6	-3.5	12.3	49.7	8.8	32.7	3.5	-10.5	-31.0
SE			(0.005)	(0.004)	(0.005)	(0.014)	(0.00)	(0.010)	(0.004)	(0.009)	
Male	0.14	0.17	0.063	-0.007	0.018	0.08	0.018	0.05	0.008	-0.029	-0.031
(%)			36.8	-4.1	10.5	46.8	10.5	29.2	4.7	-17.0	-18.1
SE			(0.005)	(0.01)	(0.01)	(0.023)	(0.004)	(0.011)	(0.004)	(0.01)	
Female	0.19	0.18	0.072	-0.009	0.029	0.086	0.012	0.06	0.004	-0.003	-0.075
(%)			40.7	-5.1	16.4	48.6	6.8	33.9	2.3	-1.7	-42.4
SE			(0.01)	(0.004)	(0.006)	(0.013)	(0.00)	(0.014)	(0.006)	(0.008)	

Source: Analysis of Virginia Longitudinal Data System data.
Note: Exp. = explained; SE = standard error; Unexp. = unexplained.

Table 5 reports results of the Oaxaca decomposition of the black-white gap in community college graduation rates. Nearly 39 percent of the gap (6.6 percentage points) is attributable to average baseline differences in scholastic achievement, as measured by standardized high school examinations. This is of similar magnitude as our finding for four-year colleges, which is interesting, given that these are different sectors and we are using different measures of college readiness. The unexplained component of preparedness is small, negative, and statistically insignificant, suggesting that high school test scores for black students are slightly more correlated with graduation rates than they are for white students.

Average differences in financial need explain 12 percent of the gap, assuming that, were these differences equalized, financial need would link with graduation for black students in the same way it does for white students. This is again comparable with the explained share of the four-year graduation gap for financial need, though it matters less for two-year colleges. Also sizable for two-year colleges is the unexplained component of financial need, which accounts for 50 percent of the gap and is statistically significant. This implies that the rate at which increases in income are associated with increases in the likelihood of graduation is a lot higher for white students than for black students. One potential policy prescription from this result is that colleges may need to track the achievement of both relatively poor and relatively wealthy black students.

The contribution of racial differences in full-time status and how these compound racial differences in higher education account for a large portion of the graduation gap in community colleges, unlike universities. The unexplained component of the part of the gap attributable to full-time status accounts

for 33 percent of the gap in community college graduation rates. This precisely estimated result suggests full-time status is a stronger predictor of graduation among white students than among black students and that the gap could be closed by more than a third if this inequity were closed. The explained portion of this component, caused by differences in full-time status, also explain a statistically significant and sizable portion of the gap (9 percent). Altogether, issues that correlate with full-time status (e.g., being a working parent or otherwise having limited time to invest in education) can explain over 43 percent of the gap, making these issues the most important component within the scope of our analysis.

Noticeably, the explained component of college indicators, which relates to racial segregation, has little explanatory power for the graduation gap in community colleges. This is in sharp contrast to our analysis of the four-year sector, in which segregation was one of the top contributors to the gap. This leads us to conclude that sorting into higher-quality community colleges on the basis of race is not a significant issue for explaining the underperformance of black students in Virginia. Interestingly, though, the unexplained component of college indicators is of significant magnitude, somewhat precise, and negative (-10.5 percent).

This suggests that, on average, black students attend community colleges that provide higher value-add to black students relative to white students, once we control for differences in scholastic achievement and financial need. To our knowledge, this puzzling finding of community college selection on relative value-add is a novel piece of evidence that warrants further research. But we should reiterate that any statements we make regarding sorting on college quality or value-add are crucially dependent on an identification assumption claiming that students are as good as randomly assigned to colleges once we control for college readiness and financial need proxy variables. Relaxing this assumption means our estimates of college value-add may just reflect differential selection into colleges based on unobserved student attributes that are not correlated with our measures of student achievement or need.

Differences by Gender

Table 2 also reports the results of a Oaxaca decomposition of the gender-specific gap in Virginia college graduation rates. Research has documented gender differences in higher education, which motivates us to search for such differences in the determinants of the graduation gap. As is common, women in our sample tend to have higher college readiness and graduation rates than men, regardless of race (not reported). Black women attending Virginia universities had a six-year graduation rate of 61 percent,

relative to 48 percent among black men. Similarly, white women had a 78 percent graduation rate, compared with 70 percent for white men. Thus, the gender-specific black-white gap in the four-year college graduation rate was 22 percentage points for men and 17 percentage points for women (table 2).

The relative importance of the varying determinants of the graduation gap are largely similar for men and women. The largest determinant is college readiness for both men and women, explaining 40 percent and 45 percent of the total gap, respectively. These figures are close to our main estimates using the pooled sample. The same goes for almost every other component of our Oaxaca decomposition estimates, with two significant exceptions. First, unexplained components of financial-need determinants is of opposite signs by gender. Second, the component of the gap attributable to differences in college value-add is also of opposing signs by gender. While interesting, we do not spend much time analyzing these differences because neither is statistically distinguishable from zero and could be the result of measurement error.

For two-year colleges, patterns in the gender-specific Oaxaca decomposition of graduation rates are consistent with the pooled model, so we do not report on these separately. One notable difference is that our model of two-year graduation rates has less explanatory power for men than for women. Controlling for high school test scores, measures of financial need, full-time status, and college indicators, 36 percent of the gap continues to be totally unexplained for men but accounts for only 6 percent for women. These estimates are probably related to structural factors regarding racial inequality specific to men, and they should be a warning of the direct use of our estimates to inform policy.

Colleges in Connecticut

We also perform a decomposition of the black-white gap in graduation rates for four-year and two-year colleges in Connecticut, using data from the state's Preschool through Twenty and Workforce Information Network system. Because almost all the students in our data have SAT scores, we use SAT scores as our proxy of college preparedness for our analysis of both university and community college graduation, dropping students with missing test scores or high school records. In the university student sample, we focus on students seeking a bachelor's degree who first enrolled in fall semesters from 2009 to 2012. We measure financial need using indicators of free and reduced-price lunch status during the last year of high school, as well as an indicator for Pell grant receipt during the first semester of college. In addition, we include controls for full-time status.

Black-white gaps in the college graduation rate are prominent in Connecticut but less severe than in Virginia (table 5). The graduation rate of black university students in our sample was 52 percent, relative to 66 percent for white university students, a 14 percentage-point gap. In community colleges, white students had a 45 percent graduation rate and black students had a 24 percent graduation rate, yielding a 21 percentage-point gap.

There are also significant racial gaps in Connecticut's measures of college readiness. Black college students score between 0.63 and 0.67 standard deviations below the state average SAT score in math, compared with white students' mean scores, which are between 0.16 and 0.29 standard deviations above the state mean. Additionally, almost 78 percent of black community college students had free and reduced-price lunch in high school, relative to 18 percent of white students. Only 20 percent of these black students were enrolled full time, compared with 31 percent of white students. Finally, between 54 and 62 percent of black college students received Pell grants their first semester, whereas only 18 to 25 percent of white students did.

TABLE 5

Summary Statistics of Connecticut College Student Sample

	Four-Year Colleges				Two-Year Colleges			
	White		Black		White		Black	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Female	0.52	(0.50)	0.57	(0.49)	0.48	(0.50)	0.55	(0.50)
Six-year graduation rate	0.66	(0.48)	0.52	(0.50)	0.44	(0.50)	0.23	(0.42)
SAT mathematics (std.)	0.16	(0.95)	-0.67	(0.86)	0.29	(0.94)	-0.63	(0.85)
SAT reading (std.)	0.15	(0.96)	-0.58	(0.93)	0.29	(0.95)	-0.57	(0.87)
Free lunch (HS)	0.04	(0.19)	0.30	(0.46)	0.14	(0.35)	0.69	(0.46)
Reduced-price lunch (HS)	0.01	(0.12)	0.04	(0.20)	0.04	(0.20)	0.08	(0.28)
Has Pell grant	0.18	(0.38)	0.54	(0.50)	0.25	(0.43)	0.62	(0.49)
Full-time student	0.54	(0.50)	0.59	(0.49)	0.31	(0.46)	0.20	(0.40)
N	**26,395**		**3,515**		**9,272**		**2,601**	

Source: Analysis of Connecticut Preschool through Twenty and Workforce Information Network data.
Note: HS = high school; SD = standard deviation; std. = standardized to have mean = 0 and standard deviation = 1 in the population.

Table 6 reports the results of our decompositions of the Connecticut gap in graduation rates between white students and black students. Mean differences in SAT scores explain 29 percent of the gap in universities and 18 percent of the gap in community colleges. Both these components are statistically significant. Racial differences in the association between SAT scores and graduation explain none of the gap in universities, but they explain 12 percent of the gap in community colleges. This suggests that SAT scores for white students are highly predictive of graduation from community college

but are considerably less so for black students. We see the fact that this pattern does not hold for university students as consistent with earlier findings of the inadequacy of SAT scores in determining success for black students. Why this would not hold for community colleges in Connecticut is puzzling and warrants further research.

The component of the gap attributable to financial need is essentially zero because of counteracting effects. If we closed the racial gap in financial need and financial need meant the same thing for black students as it does for white students (in terms of graduation), we would expect the gap to close 22 percent, or 3 percentage points. In contrast, if we closed the gap in the correlation between financial need and graduation and gave students the same level of financial need as black students, we would expect the gap to *grow* 22 percent. Findings for community colleges are similar, though less dramatic and less precisely estimated. These puzzling findings underscore an interesting and regular finding in this study: although gaps in financial need are important determinants of the racial gap in graduation rates, financial need is less negatively correlated with graduation for black students than it is for white students. An implication of this result is that policies that reform the way colleges interact with financially constrained students of color may not close the graduation gap.

Differences in full-time status rates and how these interact with race are important determinants of the graduation gap in Connecticut, which was also true for Virginia. Interestingly, black university students enroll full time at higher rates than white students, and this helps close the gap by 12 percent (relative to the existing gap). This is not true in community colleges, where a mean racial gap in full-time enrollment explains 10 percent of the graduation gap. Moreover, full-time status interacts with race in a way akin to what we saw in Virginia: full-time status is a stronger predictor of graduation among white students than among black students, and were this not the case, the gap could be closed by almost half.

Segregation explains 15 percent of the graduation gap at universities and 5 percent at community colleges. Of course, this is assuming that college integration would also be accompanied with equalized value-add—with black students receiving the value-add white students enjoy, to be precise. As in Virginia, the unexplained component of value-add is negative, suggesting that black students are sorted into colleges that provide higher value-add to black students relative to white students. Still, this is in light of white students attending colleges with high value-add at higher rates and that any statements about value-add assume students are randomly assigned to colleges once we control for SAT scores, free and reduced-price lunch status, and Pell grant rates.

Finally, the factors we can account for with the existing data are not to be taken as the only determinant of the graduation gap. Unobserved factors—ranging from student effort and ability not

measured by college entry exams, to racial discrimination on college campuses, to other potential explanatory factors—explain 31 percent and 50 percent of the four-year and two-year gaps in graduation rates, respectively.

TABLE 6

Oaxaca Decomposition of Connecticut Black-White Gap in College Graduation

	Graduation Rate		Preparedness		Financial Need		Full-Time Status[a]		College Indicators (Value-Added)		Other
	Black	Gap	Exp.	Unexp.	Exp.	Unexp.	Exp.	Unexp.	Exp.	Unexp.	factors
Four-year colleges											
All	0.52	0.14	0.039	-0.002	0.03	-0.029	-0.016	0.068	0.021	-0.015	0.042
(%)			28.5	-1.5	21.9	-21.2	-11.7	49.6	15.3	-10.9	30.7
SE			(0.003)***	(0.008)	(0.005)***	(0.012)**	(0.003)***	(0.034)**	(0.004)***	(0.007)**	(0.032)
Two-year colleges											
All	0.235	0.21	0.038	0.025	0.045	-0.026	0.019	-0.007	0.011	-0.004	0.104
(%)			18.2	12.0	21.5	-12.4	9.1	-3.3	5.3	-1.9	49.8
SE			(0.005)***	(0.008)***	(0.008)***	(0.021)	(0.003)***	(0.048)	(0.009)	(0.020)	(0.055)*

Source: Analysis of Connecticut Preschool through Twenty and Workforce Information Network data.
Notes: Exp. = explained; SE = standard error; Unexp. = unexplained. Robust standard errors are reported in parenthesis.
[a] Full-time status components include cohort indicators.
* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Conclusion

The findings in this report do not directly suggest policy changes that would narrow equity gaps in college completion rates, but they highlight features of the higher education system where stark racial inequities seem to lie. Our work provides guidance for policymakers and institutional leaders interested in conducting equity analyses on their campuses, a practice that has become more prevalent. That gaps in outcomes exist is well established. But understanding how well these gaps can or cannot be addressed by institutional leaders has been less well investigated.

This report confirms that racial gaps in graduation rates are correlated with long-standing structural inequities that took root well before students set foot on campus. We also found that a large share of the statewide racial gap in university graduation rates is attributable to college segregation in both Virginia and Connecticut.

But institutions play an important role. At most institutions, significant gaps remain between minority students and white and Asian students and between black students and white students, even after controlling for family income and academic preparation. Unmeasured factors such as the racial

wealth gap may also play a role, but a great deal of responsibility likely falls on the colleges themselves and the state policies that affect them. We need more research to understand how institutions contribute to racial gaps in graduation rates.

Some institutions have conducted their own internal (cross-department) equity audits. Publicizing the results of these audits has sometimes led to policy changes that have reduced those gaps.[6] The approach we use in this report could be used as part of such an audit. Individual institutions, with presumably richer data at their disposal, could perform similar analyses in the spirit of those shown here to determine whether any part of the remaining gap is caused by variables not available to (or included by) us.

Equity audits could also be useful for state policymakers. Decomposing the statewide graduation gap into components associated with various parts of the higher education system could be part of such an audit. State policymakers could use the results to set priorities for existing and new investments.

Armed with a better understanding of the factors that contribute to the graduation gap, state policymakers and institutional leaders can better assess progress and implement effective policies to address the higher education system's long-standing failure to equitably serve all students.

Appendix A. Summary Statistics

TABLE A.1

Summary Statistics

Community colleges, Virginia, 2009–12

	Group	Count	Graduation rate (%)	Female (%)	Pell receipt (%)	Family income ($)	Family size (people)	Full time (%)	Independent (%)	HS attendance (%)	Graduated from HS last year (%)	Writing score	Reading score	Geometry score
Blue Ridge	W/A	1,382	40	50	39	53,460	3.7	77	8	94	88	485	502	468
	Min.	292	25	48	66	37,211	3.8	63	12	94	81	469	475	445
Central	W/A	1,273	35	49	37	48,284	3.5	73	4	93	83	487	505	462
Virginia	Min.	419	17	60	71	30,529	3.1	68	9	93	80	463	473	433
Dabney S.	W/A	384	35	48	52	41,538	3.7	84	7	93	90	475	498	453
Lancaster	Min.	46	22	61	72	28,802	3.3	70	13	92	74	467	480	431
Danville	W/A	413	41	46	50	47,767	3.5	84	8	94	85	487	506	458
	Min.	354	22	62	79	27,305	3.2	79	11	95	77	458	469	424
Eastern Shore	W/A	192	33	66	59	38,113	3.5	69	6	97	87	483	502	456
	Min.	152	22	67	87	26,425	3.4	70	7	98	83	453	464	435
Germanna	W/A	1,475	37	49	22	58,275	3.7	70	8	93	89	478	497	449
	Min.	639	28	48	32	51,212	3.7	64	11	94	87	463	475	433
J. Sargeant	W/A	1,811	28	42	26	58,513	3.7	66	7	95	88	473	489	451
Reynolds	Min.	1,134	15	51	64	33,920	3.3	55	17	94	79	461	469	427
John Tyler	W/A	16,555	30	46	32	57,366	3.8	74	8	94	85	469	494	448
	Min.	1,122	17	49	59	41,673	3.5	64	11	94	80	450	466	422
Lord Fairfax	W/A	1,756	37	49	33	51,702	3.7	66	8	94	87	481	497	458
	Min.	345	24	43	57	43,314	3.8	52	8	93	83	464	480	440
Mountain	W/A	942	31	56	68	28,039	3.4	82	10	94	88	483	502	461
Empire	Min.	32	12	68	82	21,629	3.2	74	6	94	94	457	460	430
New River	W/A	1,062	33	50	50	43,936	3.5	82	10	92	82	469	487	449
	Min.	138	21	43	68	36,790	3.3	69	19	93	74	453	459	422
Northern	W/A	9,026	41	45	23	64,001	4.2	72	3	93	91	479	490	455
Virginia	Min.	8,301	31	51	39	51,877	3.9	66	6	93	89	464	473	437
Patrick Henry	W/A	537	39	46	64	31,718	3.4	88	9	94	90	478	498	457
	Min.	276	21	51	83	25,468	3.3	82	10	95	86	456	464	428

	Group	Count	Graduation rate (%)	Female (%)	Pell receipt (%)	Family income ($)	Family size (people)	Full time (%)	Independent (%)	HS attendance (%)	Graduated from HS last year (%)	Writing score	Reading score	Geometry score
Paul D. Camp	W/A	131	44	53	44	42,394	3.5	77	12	96	81	482	503	448
	Min.	114	11	62	84	22,159	3.2	73	13	96	81	452	453	412
Piedmont	W/A	975	29	56	35	50,482	3.6	57	10	95	81	486	501	455
Virginia	Min.	410	15	60	66	33,496	3.3	47	16	95	82	459	471	430
Rappahannock	W/A	673	36	56	41	38,989	3.6	73	8	94	86	481	498	445
	Min.	286	21	54	69	30,566	3.7	69	9	95	83	459	475	428
Southside	W/A	449	33	52	65	45,376	3.7	79	7	92	87	478	496	452
Virginia	Min.	414	22	58	90	25,308	3.3	75	11	92	78	453	464	429
Southwest	W/A	715	39	52	61	35,152	3.5	89	9	93	90	491	510	456
Virginia	Min.	15	20	27	87	24,279	3.7	67	8	93	80	460	481	446
Thomas	W/A	1,548	33	50	24	61,653	3.8	72	7	94	86	484	501	452
Nelson	Min.	1,289	14	51	61	53,726	3.3	60	14	94	80	462	469	426
Tidewater	W/A	5,035	33	53	29	63,219	3.7	75	7	95	87	479	499	459
	Min.	4,847	18	59	66	35,960	3.4	71	16	94	82	456	467	430
Virginia	W/A	833	33	45	56	46,006	3.4	91	7	94	86	480	506	454
Highlands	Min.	43	19	28	77	33,322	3.1	84	12	93	88	463	489	439
Virginia	W/A	1,893	37	48	39	51,852	3.5	78	7	94	87	486	504	458
Western	Min.	444	19	53	71	31,317	3.4	78	10	94	81	458	471	428
Wytheville	W/A	914	38	56	65	42,351	3.5	86	7	94	88	470	493	449
	Min.	68	18	54	85	28,790	3.7	85	6	95	88	460	458	428

Source: Virginia Longitudinal Data System data.

Note: HS = high school; Min. = minority students; W/A = white and Asian students.

TABLE A.2

Summary Statistics

Community colleges, Connecticut, 2009–12

	Group	Count	Graduation rate (%)	Female share (%)	Pell receipt (%)	Free lunch (%)	Reduced-price lunch (%)	Full time (%)	HS attendance (%)	Math score	Reading score	Writing score
CC1	W/A	53	25	53	53	40	6	30	95	253	236	249
	Min.	455	12	64	70	80	6	26	91	218	217	235
CC2	W/A	310	28	52	44	18	7	33	94	246	231	248
	Min.	78	17	46	67	68	5	32	92	233	222	240
CC3	W/A	456	27	48	35	27	5	39	92	244	235	250
	Min.	601	17	53	62	68	9	35	93	223	217	235
CC4	W/A	679	23	46	35	21	5	36	92	243	237	252
	Min.	705	14	52	65	72	9	27	92	214	214	231
CC5	W/A	712	26	48	37	20	5	31	94	253	237	251
	Min.	258	17	52	71	59	6	20	93	226	220	236
CC6	W/A	1,290	27	46	26	10	5	32	94	254	242	257
	Min.	761	19	50	62	55	11	21	92	228	221	240
CC7	W/A	837	25	47	28	14	5	33	93	255	243	255
	Min.	272	18	50	62	57	8	24	93	231	225	239
CC8	W/A	459	27	47	28	12	5	49	94	249	239	255
	Min.	198	19	52	68	65	9	33	94	231	225	235
CC9	W/A	227	24	56	33	15	5	38	93	256	245	258
	Min.	41	17	51	68	56	2	51	92	237	233	248
CC10	W/A	1,003	26	47	33	21	6	32	93	245	234	250
	Min.	604	21	50	63	69	7	24	92	219	215	233
CC11	W/A	328	34	46	26	15	5	42	95	258	243	259
	Min.	44	32	48	43	45	9	36	94	241	234	249
CC12	W/A	500	22	47	30	19	3	28	92	250	239	255
	Min.	686	21	49	62	60	9	20	94	226	221	236

Source: Connecticut Preschool through Twenty and Workforce Information Network data.

Notes: CC = community college; HS = high school; Min. = minority students; W/A = white and Asian students. We were requested to keep the Connecticut schools anonymous, which is why we have used numbers in the first column.

TABLE A.3

Summary Statistics

Four-year colleges, Virginia, 2009–12

	Group	Count	Graduation rate (%)	Female (%)	Independent (%)	Pell receipt (%)	Family income ($)	Family size (people)	Out of state (%)	Graduated from HS last year (%)	SAT math score	SAT reading score	HS GPA
Averett University	W/A	253	49	45	3	41	81,424	3.8	41	100	495	486	3.24
	Min.	168	39	33	7	74	42,654	3.5	49	100	441	440	3.07
Bluefield College	W/A	267	37	50	3	40	75,257	3.9	22	90	477	485	3.23
	Min.	183	23	30	5	63	54,954	3.8	42	87	437	432	2.83
Bridgewater College	W/A	1,607	71	59	1	24	99,833	4.0	23	99	522	516	3.47
	Min.	415	60	50	5	47	76,517	3.8	25	100	491	492	3.33
Christopher Newport University	W/A	3,036	84	55	1	11	131,807	4.1	8	99	580	587	3.64
	Min.	692	77	51	1	24	103,583	3.9	6	100	550	555	3.50
College of William and Mary	W/A	3,115	94	52	1	7	159,519	4.1	31	95	677	689	4.11
	Min.	1,617	91	60	1	16	136,248	4.0	29	95	642	653	3.97
Eastern Mennonite University	W/A	629	72	63	1	28	63,992	4.2	52	91	553	555	3.60
	Min.	197	46	56	10	56	38,696	3.9	31	93	478	471	3.17
Emory and Henry College	W/A	832	61	47	2	37	87,639	3.9	40	99	522	520	3.52
	Min.	216	49	34	4	60	55,929	3.6	51	99	479	475	3.22
Ferrum College	W/A	781	41	45	4	43	80,325	3.9	16	98	469	466	2.91
	Min.	886	30	43	6	73	47,479	3.6	22	96	425	429	2.65
George Mason University	W/A	6,580	74	49	1	20	108,867	4.1	23	91	586	575	3.61
	Min.	2,690	70	56	2	31	89,697	4.0	26	88	560	559	3.57
Hampden-Sydney College	W/A	931	71	0	1	15	135,706	4.1	27	100	561	558	3.33
	Min.	201	61	0	1	44	86,681	3.9	25	100	539	534	3.28
Hampton University	W/A	55	47	51	9	36	72,013	3.7	44	93	517	498	3.29
	Min.	3,639	54	64	3	40	77,915	3.5	79	96	482	484	3.12
Hollins University	W/A	518	63	100	2	39	80,591	3.9	52	100	541	581	3.56
	Min.	160	59	100	4	51	63,725	38	60	100	499	517	3.35
James Madison University	W/A	11,701	87	62	0	11	135,686	4.2	25	100	582	572	3.78
	Min.	2,010	81	60	1	24	107,654	4.0	16	100	559	555	3.72
	W/A	206	50	76	6	46	64,978	3.8	4	95	476	478	3.34

	Group	Count	Graduation rate (%)	Female (%)	Independent (%)	Pell receipt (%)	Family income ($)	Family size (people)	Out of state (%)	Graduated from HS last year (%)	SAT math score	SAT reading score	HS GPA
Jefferson College of Health Sciences	Min.	38	18	87	8	68	39,922	3.6	8	92	432	447	3.15
Liberty University	W/A	6,066	59	53	2	28	110,446	4.4	65	89	513	524	3.34
	Min.	3,179	49	51	3	37	91,884	4.2	65	85	487	497	3.16
Longwood University	W/A	2,923	74	68	2	18	92,721	4.0	0	99	515	521	3.39
	Min.	819	72	61	3	32	79,951	3.9	1	99	498	511	3.30
Lynchburg College	W/A	1,762	64	58	1	24	101,642	4.0	41	100	513	513	3.20
	Min.	422	57	58	4	54	67,837	3.7	26	100	476	479	3.04
Mary Baldwin College	W/A	431	52	99	11	45	76,265	2.5	25	48	502	337	3.21
	Min.	392	45	99	15	65	46,970	2.8	34	44	464	388	3.08
Marymount University	W/A	752	64	73	1	20	112,591	4.2	51	93	509	521	3.21
	Min.	765	53	72	4	42	69,773	3.9	49	94	473	485	3.03
Norfolk State University	W/A	109	41	40	6	40	79,100	4.0	18	95	488	482	3.03
	Min.	3,398	38	55	7	65	48,614	3.5	24	93	437	437	2.82
Old Dominion University	W/A	5,744	57	46	2	21	96,235	4.0	11	63	533	524	3.30
	Min.	4,315	52	57	4	46	67,737	3.7	11	67	491	492	3.20
Radford University	W/A	5,917	67	57	2	21	105,124	4.0	7	97	505	504	3.18
	Min.	1,141	62	57	3	41	80,572	3.8	8	97	482	488	3.05
Randolph College	W/A	1,290	71	54	0	23	116,443	3.7	28	99	537	542	3.46
	Min.	396	65	56	2	46	79,055	3.6	41	95	526	516	3.43
Regent University	W/A	186	56	58	4	31	80,841	4.4	44	0	524	546	3.56
	Min.	96	40	60	7	46	55,869	4.0	35	0	466	516	3.31
Roanoke College	W/A	1,334	70	59	1	22	118,473	4.0	54	100	539	545	3.40
	Min.	202	66	63	1	36	93,412	3.9	53	100	516	527	3.30
Shenandoah University	W/A	1,183	66	57	2	22	115,098	1.8	42	98	521	516	3.40
	Min.	387	53	40	5	41	89,054	1.7	37	95	468	468	3.04
Southern Virginia University	W/A	658	22	50	1	41	87,312	5.3	86	96	529	532	3.33
	Min.	96	17	35	1	61	54,996	4.8	84	92	475	484	2.93
Sweet Brian College	W/A	160	68	100	1	24	99,247	1.1	46	87	518	552	3.40
	Min.	482	61	100	2	35	99,301	3.0	55	96	508	538	3.41
	W/A	2,438	78	66	1	13	114,234	4.1	18	99	568	589	3.60

	Group	Count	Graduation rate (%)	Female (%)	Independent (%)	Pell receipt (%)	Family income ($)	Family size (people)	Out of state (%)	Graduated from HS last year (%)	SAT math score	SAT reading score	HS GPA
University of Mary Washington	Min.	1,146	74	66	2	20	107,320	4.1	12	99	545	570	3.51
University of Richmond	W/A	1,115	90	57	1	14	123,368	4.1	79	100	654	644	3.86
	Min.	1,073	88	58	0	18	115,058	4.1	75	100	631	620	3.78
University of Virginia	W/A	6,611	97	56	0	11	126,387	4.1	0	98	679	667	4.22
	Min.	1,817	95	59	1	19	113,942	4.1	0	98	638	635	4.09
University of Virginia College at Wise	W/A	1,148	51	50	4	51	61,671	3.8	5	100	479	481	3.35
	Min.	310	48	38	10	67	51,476	3.7	9	99	442	437	2.95
Virginia Commonwealth University	W/A	8,519	67	55	1	24	98,428	4.0	8	93	553	554	3.50
	Min.	4,577	63	665	2	40	78,777	3.8	14	92	514	521	3.41
Virginia Military Institute	W/A	1,537	80	10	1	13	125,961	4.2	44	100	581	574	3.51
	Min.	200	68	13	4	29	84,598	4.0	41	100	533	523	3.22
Virginia State University	W/A	75	39	43	8	51	50,653	3.6	13	59	451	453	2.94
	Min.	4,753	46	63	6	69	45,128	35	38	45	426	429	2.79
Virginia Tech	W/A	11,780	90	47	1	14	119,494	4.1	0	98	623	599	3.95
	Min.	2,175	86	46	2	25	102,923	4.1	0	97	603	581	3.86
Virginia Wesleyan College	W/A	752	56	59	3	30	100,614	4.5	100	0	507	508	3.17
	Min.	532	52	61	3	50	69,653	3.4	53	37	478	486	3.06

Source: Virginia Longitudinal Data System data.

Note: GPA = grade point average; HS = high school; Min. = minority students; W/A = white and Asian students.

TABLE A.4

Summary Statistics

Four-year colleges, Connecticut, 2009–12

	Group	Count	Graduation rate (%)	Female (%)	Pell receipt (%)	SAT math score	SAT verbal score
University 1	W/A	5,153	56	46	23	516	506
	Min.	1,719	45	50	50	473	473
University 2	W/A	2,162	73	57	22	568	581
	Min.	3,425	63	55	33	554	566
University 3	W/A	4,638	53	61	24	518	489
	Min.	2,457	44	64	50	474	445
University 4	W/A	3,901	54	54	18	515	512
	Min.	1,363	46	57	37	476	481
University 5	W/A	12,197	78	48	14	605	581
	Min.	5,030	70	52	28	564	540
University 6	W/A	3,667	46	54	21	501	504
	Min.	1,356	39	53	42	469	476
University 7	W/A	1,531	92	49	13	705	738
	Min.	1,007	89	54	23	675	702

Source: Connecticut Preschool through Twenty and Workforce Information Network data.

Notes: Min. = minority students; W/A = white and Asian students. We were requested to keep the Connecticut schools anonymous, which is why we have used numbers in the first column.

Appendix B. Oaxaca Decomposition of Racial Gaps in Graduation Rates

The decomposition results in tables 2 and 5 are based on the following econometric framework, most of which is an application of earlier work by Oaxaca (1973) and Gerard and coauthors (2018). Let Y be a student-level indicator variable equal to 1 if the student graduated from college within six years of initial enrollment and 0 otherwise. Suppose that graduation rates can be written as follows:

$$Y_i^R = \alpha^R + \psi_{J(i)}^R + \beta^R X_i + \epsilon_i^R$$

where Y_i^R is the graduation outcome of student i belonging to racial group $R = W, B$; α^R is a race-specific intercept; $\psi_{J(i)}^R$ is a race-specific college effect and $J = 1, \ldots, N_J$ is an index of each college in the state; X_i is a measure of college readiness or financial need, such that β^R captures the race-specific association between these variables and graduation (i.e., the return on college readiness); and ϵ_i^R captures other race-specific determinants of college success our model does not capture, including structural factors in racial inequality. The model thus makes the tacit assumption that the data-generating process for college graduation is completely different between black and white students. We believe this is a fair assumption, given the vast differences in educational attainment between students of different races, not to mention historical issues of discrimination and segregation in higher education. Still, critics of such a drastic approach to building a statistical model of racial inequities can rest assured that our model also encompasses an optimistic worldview in which all parameters are equal, regardless of race. Indeed, our estimation framework will allow us to generate a simple test of such a hypothesis.

Our decomposition exercise relies on the fact that ordinary least squares (OLS) regressions fit the mean of the data:

$$\bar{Y}^R = \sum_j \pi_j^R \hat{\psi}_j^R + \hat{\beta}^R \bar{X}^R + \hat{\alpha}^R$$

Here, $\bar{Y}^R$ is the expectation of Y_i^R—the graduation rate of group R—which can be written as the sum of three components. The first is a weighted average of the OLS coefficients on college indicators $\hat{\psi}_j^R$, frequently referred to as college "value-add." The weights in this average are the "R share of college j"and π_j^R, defined as the share of total state enrollment of students in group R who attend college j. In other words, the first component measures the average college value-add experienced by students in

group R, defined as college-specific baseline graduation rates uncorrelated with the education inputs measured by X_i. The second component is average student characteristics ($\bar{X}^R$) and how much these are associated with graduation ($\hat{\beta}^R$), restricting to comparisons within colleges. Finally, the constant component $\hat{\alpha}^R$ captures an element of the graduation rate that cannot be explained by student observable characteristics or college indicators. We associate these with "deep factors," such as unobserved scholastic ability and neighborhood effects.

Following Oaxaca (1973), the graduation gap can be decomposed into a difference in mean characteristics between the two groups, weighted by the coefficients for one of the two groups, and a difference in coefficients, weighted by the mean characteristics of the other group.

$$\bar{Y}^W - \bar{Y}^B = \sum_j \hat{\psi}_j^W \left(\pi_j^W - \pi_j^B\right) + \sum_j \left(\hat{\psi}_j^W - \hat{\psi}_j^B\right)\pi_j^B + \hat{\beta}^W(\bar{X}^W - \bar{X}^B) + \bar{X}^B\left(\hat{\beta}^W - \hat{\beta}^B\right) + (\hat{\alpha}^W - \hat{\alpha}^B)$$

$$= \sum_j \hat{\psi}_j^B \left(\pi_j^W - \pi_j^B\right) + \sum_j \left(\hat{\psi}_j^W - \hat{\psi}_j^B\right)\pi_j^W + \hat{\beta}^B(\bar{X}^W - \bar{X}^B) + \bar{X}^W\left(\hat{\beta}^W - \hat{\beta}^B\right) + (\hat{\alpha}^W - \hat{\alpha}^B)$$

These two equations, while equally mathematically valid, incorporate different assumptions about racial differences in higher education. In our analysis, we focus on the version of the decomposition specified by the first equation. In this variant, the difference in college value-add white students receive versus black students is weighted by the enrollment share of black students, yielding an estimate of the effect of differential college value-add *given the actual distribution of nonwhite students across colleges*—a counterfactual we believe is most natural. Likewise, the difference in enrollment shares of white students and black students is weighted by the college value-add of white students, yielding an estimate of the effect of differential sorting of the two groups (i.e., segregation) across colleges *assuming that black students received the same college value-add as white students*—again, a counterfactual we believe is natural. The same applies for differences in student characteristics. We treat differences in the estimated intercepts as factors contributing to the graduation gap that are unexplained by our regression model.

We execute the Oaxaca decomposition using the *oaxaca* Stata package available from the Boston College Statistical Software Components archive.

Notes

[1] Office of Congresswoman Donna Shalala, "Rep. Shalala Introduces the College Equity Act," press release, April 2, 2019, https://shalala.house.gov/news/documentsingle.aspx?DocumentID=340.

[2] "Indicator 27: Educational Attainment," US Department of Education, Institute of Education Sciences, National Center for Education Statistics, accessed January 22, 2020, https://nces.ed.gov/programs/raceindicators/indicator_RFA.asp.

[3] At the request of institutional leaders, we have suppressed institution names in Connecticut.

[4] We excluded the following colleges from the pooled four-year analysis of the Virginia racial gap in graduation rates: Averett University, Saint Paul's College, Hampton University, Virginia State University, Virginia Union University, and Norfolk State University. Single-gender colleges are also dropped when we analyze the female and male racial graduation gap. We also exclude Richard Bland College from the two-year college analysis.

[5] In the four-year college data, we restrict the sample to students whose college records report high school GPA, a known strong predictor of high school graduation. This is not an innocuous restriction. Some colleges in our data report scores for a very small share of their students (e.g., Washington and Lee University) and thus get dropped from our sample. In the two-year college data, which do not report high school GPA, we drop observations that do not have records for scores in high school standardized examinations in math and reading.

[6] Marcella Bombardieri, "How to Fix Education's Racial Inequities, One Tweak at a Time," *Politico*, September 25, 2019, https://www.politico.com/agenda/story/2019/09/25/higher-educations-racial-inequities-000978.

References

Arcidiacono, Peter, and Cory Koedel. 2014. "Race and College Success: Evidence from Missouri." *American Economic Journal: Applied Economics* 6 (3): 20–57.

Blom, Erica, Macy Rainer, and Matthew M. Chingos. 2020. *Comparing Colleges' Graduation Rates: The Importance of Adjusting for Student Characteristics.* Washington, DC: Urban Institute.

Bowen, William, and Derek Bok. 1998. *The Shape of the River: Long-Term Consequences of Considering Race in College and University Admissions.* Princeton, NJ: Princeton University Press.

Bowen, William G., Matthew M. Chingos, and Michael S. McPherson. 2009. *Crossing the Finish Line: Completing College at America's Public Universities.* Princeton, NJ: Princeton University Press.

Card, David, Ana Rute Cardoso, and Patrick Kline. 2016. "Bargaining, Sorting, and the Gender Wage Gap: Quantifying the Impact of Firms on the Relative Pay of Women." *Quarterly Journal of Economics* 131 (2): 633–86.

Carnevale, Anthony P., and Jeff Strohl. 2013. *Separate & Unequal: How Higher Education Reinforces the Intergenerational Reproduction of White Racial Privilege*. Washington, DC: Georgetown University, Center on Education and the Workforce.

Cook, Bryan, and Natalie Pullaro. 2010. *College Graduation Rates: Behind the Numbers*. Washington, DC: American Council on Education.

Fletcher, Jason, and Marta Tienda. 2010. "Race and Ethnic Differences in College Achievement: Does High School Attended Matter?" *Annals of the American Academy of Political and Social Science* 627 (1): 144–66.

Flores, Stella M., and Toby J. Park. 2015. "The Effect of Enrolling in a Minority-Serving Institution for Black and Hispanic Students in Texas." *Research in Higher Education* 56 (3): 247–76.

Flores, Stella M., Toby J. Park, and Dominique J. Baker. 2017. "The Racial College Completion Gap: Evidence from Texas." *Journal of Higher Education* 88 (6): 894–921.

Gerard, François, Lorenzo Lagos, Edson Severnini, and David Card. 2018. *Assortative Matching or Exclusionary Hiring? The Impact of Firm Policies on Racial Wage Differences in Brazil*. Working Paper 25176. Cambridge, MA: National Bureau of Economic Research.

Hoxby, Caroline, and Sarah Turner. 2013. *Expanding College Opportunities for High-Achieving, Low Income Students*. Discussion Paper 12-014. Stanford, CA: Stanford Institute for Economic Policy Research.

Jann, Ben. 2008. "The Blinder—Oaxaca Decomposition for Linear Regression Models." *Stata Journal* 8 (4): 453–79.

Koedel, Cory. 2017. "Explaining Black-White Differences in College Outcomes at Missouri Public Universities." *Federal Reserve Bank of St. Louis Review* 2017 (1): 77–83.

Melguizo, Tatiana. 2010. "Are Students of Color More Likely to Graduate from College If They Attend More Selective Institutions? Evidence from a Cohort of Recipients and Nonrecipients of the Gates Millennium Scholarship Program." *Educational Evaluation and Policy Analysis* 32 (2): 230–48.

Oaxaca, Ronald. 1973. "Male-Female Wage Differentials in Urban Labor Markets." *International Economic Review* 14 (3): 693–709.

About the Authors

Erica Blom is a research associate in the Center on Education Data and Policy at the Urban Institute, where she studies higher education policy. Blom received a bachelor's degree in mathematics and political science from Queen's University and a master's degree in economics from Western University. She also earned a doctoral degree in economics from Yale University, where her research focused on students' choices in college major.

Tomas Monarrez is a research associate in the Center on Education Data and Policy. His research focuses on education policy topics as they relate to economic and racial inequality. Monarrez received bachelor's degrees in economics and mathematics from the University of Texas at Austin and earned his doctoral degree in economics from the University of California, Berkeley.

Statement of Independence

The Urban Institute strives to meet the highest standards of integrity and quality in its research and analyses and in the evidence-based policy recommendations offered by its researchers and experts. We believe that operating consistent with the values of independence, rigor, and transparency is essential to maintaining those standards. As an organization, the Urban Institute does not take positions on issues, but it does empower and support its experts in sharing their own evidence-based views and policy recommendations that have been shaped by scholarship. Funders do not determine our research findings or the insights and recommendations of our experts. Urban scholars and experts are expected to be objective and follow the evidence wherever it may lead.

500 L'Enfant Plaza SW
Washington, DC 20024

www.urban.org