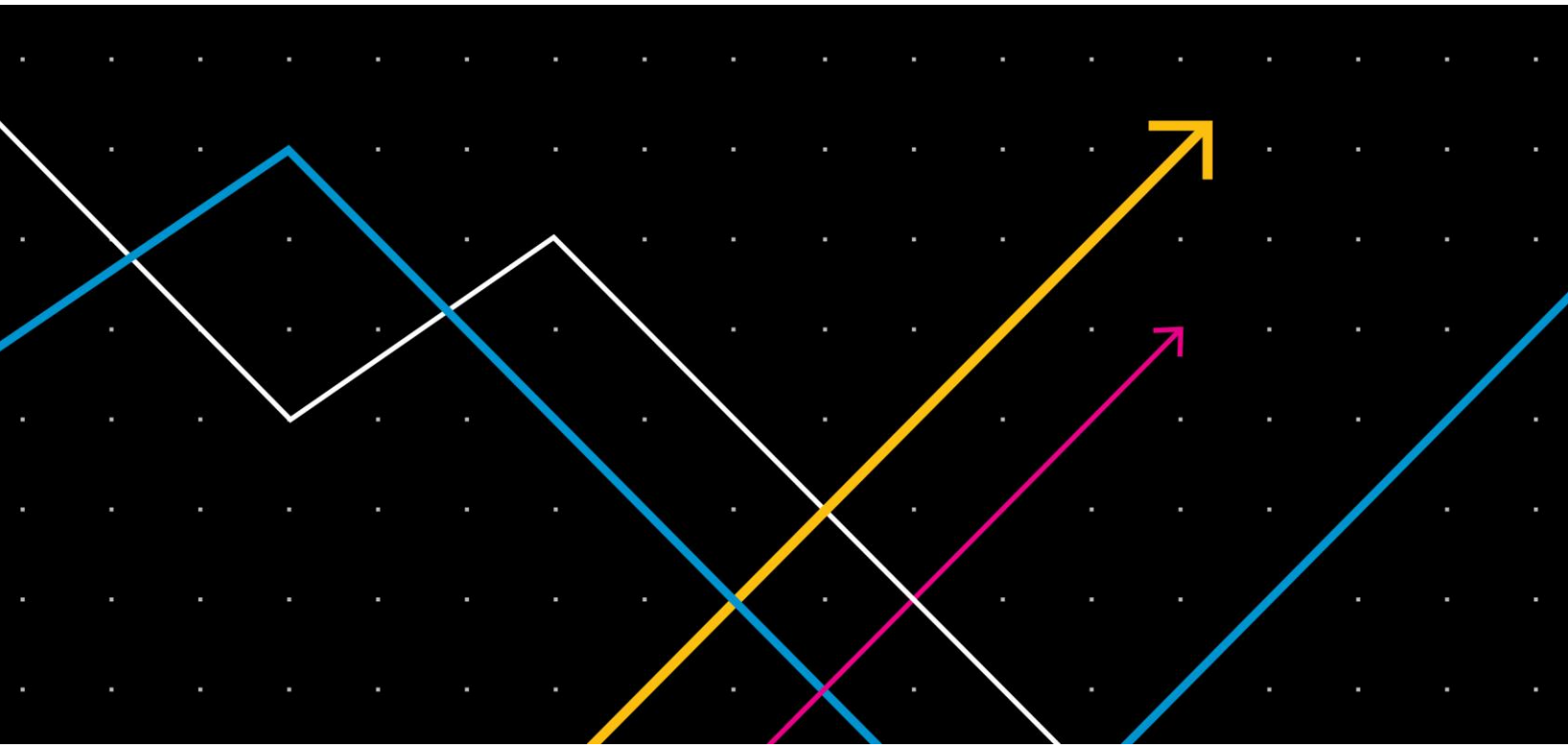

RESEARCH REPORT

Racial and Ethnic Segregation within Colleges

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Executive Summary

Discussions of racial equity in postsecondary education often focus on enrollment and completion rates for Black and Hispanic students. These metrics are important, but even equitable access and outcomes do not guarantee equal labor market opportunities. Although the rate at which Black and Hispanic students enroll in college has increased over the past few decades, Black and Hispanic students remain underrepresented in high-growth industries, including science, technology, engineering, and mathematics (STEM). To better understand whether the higher education system is providing equal access to opportunity, we examine racial and ethnic representation across college majors over time, finding that Asian, Black, and Hispanic students are often concentrated in majors with other students of the same race or ethnicity and that at institutions where Black and Hispanic segregation is worst, these students are least likely to graduate with high-paying degrees.

To capture how this plays out at the institutional level, we analyze whether different racial and ethnic groups are over- or underrepresented across various majors relative to their share of the student body. For example, we would not expect 50 percent of math majors to be Black at a school where 10 percent of the student body is Black, but we would expect such numbers from a college whose student population is 50 percent Black.

Asian students are the most segregated group within higher education institutions (i.e., they are most likely to be enrolled in majors where most of their fellow students are Asian), followed by Black and Hispanic students, who are moderately segregated. White students, on the other hand, tend to be relatively integrated, meaning the share of white students in a given major more or less reflects the share of white students at an institution. This suggests that white students are fairly represented in most fields of study, while other groups are clustered in certain majors and absent from others. Black and Hispanic students tend to be underrepresented in STEM fields, while Asian students are highly overrepresented in these fields.

Our results show that these broad patterns changed little between 2005 and 2015, with the exception of Hispanic students, who used to be about as segregated as Black students but became increasingly integrated across fields of study. There is also evidence that more selective institutions tend to have higher levels of stratification for Black and Hispanic students across fields of study, especially in private colleges.

Finally, we examine the link between within-college segregation and equality of access to high-paying careers. Using a broad definition of "high-paying" degrees (e.g., in STEM, architecture, business,

and health) and comparing colleges that are otherwise similar, we show that in colleges that are more segregated, Black graduates earn fewer high-paying degrees. In contrast, within-college segregation does not affect the number of white students earning high-paying degrees, but it does seem to lead to more high-paying degrees for Asian students. The impact for Hispanic students is similar to that of Black students but is noisier and less conclusive.

Our findings underscore that segregation within colleges has a negative impact on equity of opportunity for Black and Hispanic students. The finding that higher within-college segregation is robustly associated with fewer high-paying degrees being awarded to Black and, to a lesser extent, Hispanic college students is alarming. Both "demand-side" and "supply-side" policy responses could remedy within-college racial and ethnic inequity, but more research is needed to fully understand the trade-offs at play and the approach that might be most effective. Finally, we cannot understate the importance of structural inequities earlier in the education pipeline and their bearing on the higher education outcomes of Black and Hispanic students.

Racial and Ethnic Segregation within Colleges

Increasing the number of Black and Hispanic people with college degrees is a key component of any broad policy agenda aimed at reducing structural inequality in the United States. But access to higher education does not always equate to graduation or equal labor market opportunities. The Black and Hispanic college participation rate has increased over the past few decades (Espinosa et al. 2019), but Black and Hispanic students are underrepresented in some of the economy's high-growth industries, including science, technology, engineering, and mathematics (STEM) fields (Ferrare and Lee 2014).

Today's colleges are uniquely positioned to increase diversity and racial and ethnic representation across the spectrum of disciplines and fields of study. For any discipline, the benefit of diversity of thought in the profession cannot be understated. In some fields (e.g., medicine and real estate), lack of diversity of thought and background among practitioners can result in dangerous and pernicious practices. One example of these practices is "steering" by real estate agents, driving racial and ethnic minorities away from predominantly white neighborhoods (Rothstein 2017).[1] For colleges, students, and society to reap the benefits of racial and ethnic diversity, there needs to be more than just a diverse student population in colleges. All racial and ethnic groups should be represented across all fields of study.

In this report, we provide novel evidence on these issues. We develop a descriptive analysis of racial and ethnic imbalance within higher education institutions. Using segregation indexes to summarize sorting inside universities, we analyze whether students of certain races or ethnicities are over- or underrepresented in certain fields and how this differs across institutions. The descriptive analysis highlights changes in sorting patterns over time and across different college types. We then show that within-college segregation may lead to inequity in the chances that Black and Hispanic students graduate with high-paying degrees.

In the next section, we discuss the literature on this topic, providing a theoretical framework for racial and ethnic diversity within colleges and reviewing the existing evidence. Next, we describe our data and measurement framework, discussing the various assumptions needed for interpreting our results. The next section presents the results, which focus on the four most populous racial and ethnic groups. We conclude with remarks on the policy implications of our findings and some thoughts for future research.

Theory and Literature Review

Social separation occurs when people of differing backgrounds or identities do not interact socially. This can manifest on college campuses in cross-racial interactions. The lack of cross-racial interactions in casual or meaningful settings increases social separation.

Cross-racial interactions are a necessary component of achieving the benefits of diversity. Social psychologists have proposed a framework of different types of racial and ethnic diversity on a college campus: structural diversity, informal interactional diversity, and classroom diversity (Gurin et al. 2002). Structural diversity refers to achieving baseline levels of representation of various groups on a campus (akin to a quota system), which by itself may not lead to between-group social interactions. Informal interactional diversity refers to frequent and meaningful interactions in casual settings. Classroom diversity is defined as students learning from and about diverse people in the classroom. The literature suggests that informal interactional diversity and classroom diversity are more likely to lead to cross-racial interactions and less social separation (Gurin et al. 2002).

Increasing racial and ethnic diversity among students increases the likelihood that a student interacts with someone of a different race or ethnicity, but it does not guarantee meaningful cross-racial interactions. It does not ensure that students receive the touted benefits of attending a more diverse college. In fact, students are most likely to interact with students of the same race or ethnicity (Espenshade and Radford 2009). If colleges create more opportunities for students to experience more classroom diversity and informal interactional diversity, there would be less social separation. Colleges have little control over how students interact informally, so classroom diversity provides one of the few opportunities for colleges to provide students with meaningful cross-racial interactions.

The literature suggests a multiplicity of "demand-side" mechanisms to explain racial and ethnic differences in choice of college major (Arcidiacono, Aucejo, and Hotz 2016; Baird, Buchinsky, and Sovero 2016). Beyond personal preferences about fields of study, budget constraints during college can affect how students choose majors. If STEM majors are more difficult to complete in four years, financially constrained students may be more likely to switch out of a STEM major to graduate on time. Researchers have also attributed differences in sorting among majors to such factors as expectations about workplace environment (Patnaik et al. 2020). Additionally, Zafar (2009) identified that nonpecuniary factors can vary by gender and that women may value parents' approval and enjoying coursework while men value pecuniary outcomes.

Nevertheless, "supply-side" factors—stemming from structural challenges, college practices, and campus culture—can work against classroom diversity as well. These factors can act as gatekeepers,

keeping out students interested in pursuing certain programs or majors. Structural challenges include differences in academic preparedness that students come to college with, stemming from disparities in high school and primary school offerings (Riegle-Crumb, King, and Irizarry 2019). These differences in preparedness reveal themselves in introductory and prerequisite courses, particularly in STEM courses (Daempfle 2003; Gasiewski et al. 2012; Riegle-Crumb, King, and Irizarry 2019). The culture around STEM courses and how they are taught can be a major source of gatekeeping, though Ferrare and Lee (2014) summarized that differences in preparation did not entirely explain gender differences in persistence through STEM programs. Faculty and curriculum can have a "chilling" effect on students, especially Black and Hispanic students (Daempfle 2003; Gasiewski et al. 2012). STEM courses in college, especially introductory courses, largely focus on knowledge acquisition through memorizing and focus less on developing other important skills (Daempfle 2003). Paired with faculty views that feed into the notion that scientists are born and not made (Gasiewski et al. 2012), this form of knowledge acquisition can limit the support students may need to be successful. These factors can lead students, particularly Black and Hispanic students, to switch out of their major, transfer to another college, or even drop out of college altogether (Daempfle 2003; Ferrare and Lee 2014; Gasiewski et al. 2012; Riegle-Crumb, King, and Irizarry 2019).

In expanding college access to underrepresented groups, colleges also expand the opportunities students from diverse backgrounds can pursue. These opportunities include the ability to improve racial and ethnic diversity in industries that are severely lacking, such as STEM (Ferrare and Lee 2014) and education (Boser 2014). But program-level stratification by race or ethnicity threatens the individual, institutional, and societal benefits of diversifying college campuses. When Black and Hispanic students graduate at disproportionately low rates with degrees that prepare them for high-growth, high-paying industries, our ability to achieve racial and ethnic equity becomes impaired.

Few studies have comprehensively evaluated within-college stratification with respect to race or ethnicity (Carnevale et. al 2018; Hinrichs 2015). Evidence suggests that college major choice is associated with resources in high school (Teranishi, Allen, and Solrzano 2004). College major choice has been studied with an eye toward racial and ethnic differences, specifically with respect to STEM, business, and economics majors (Arcidiacono, Aucejo, and Hotz 2016; Baird, Buchinsky, and Sovero 2016; Dickson 2010). Dickson (2010) shows that differences in college major choice by race or ethnicity, while smaller than differences by gender, cannot be explained away using common measures of college preparedness and student background. In Missouri colleges, although the share of Black students interested in natural science, engineering, and economics majors initially was 1 percentage point higher than the share of white students interested in these majors, Arcidiacono, Aucejo, and Hotz

(2016) report that the final share of Black graduates in these fields is more than 20 percentage points lower than the share of white graduates.

Data and Measurement

We measure racial and ethnic segregation within colleges using data from the Integrated Postsecondary Education Data System (IPEDS), which reports data on undergraduate degrees awarded by detailed field of study and race or ethnicity. We obtained these data tables for the years 2005 to 2015 using the Urban Institute's Education Data Portal. Field of study is defined using Classification of Instructional Programs (CIP) codes, standardized field of study categories defined by IPEDS for administrative purposes. Like industry and occupation codes, CIP codes have a hierarchical structure and varying levels of detail. We use four-digit and two-digit CIP codes. Four-digit CIP codes correspond to what we would commonly think of as a "major" in a four-year college (e.g., mechanical engineering, chemistry, classics, or economics). Two-digit CIP codes correspond to broader groupings of majors (e.g., engineering, physical sciences, humanities, or social science).[2]

Before conducting our analysis, we enforce the following sample restriction on our IPEDS dataset of the universe of annual undergraduate awards by race or ethnicity for each unique college-by-major combination. We focus on public and nonprofit private four-year colleges that primarily award bachelor's degrees and are Title IV eligible. We exclude majors that award fewer than 5 degrees a year and exclude colleges that award fewer than 100 degrees in a given year. We exclude historically Black colleges and universities and tribal colleges.[3] We also exclude colleges with fewer than three fields of study. The rationale for this last restriction is that we seek to focus on colleges with substantial scope for within-college segregation. Our final sample contains 1,489 institutions, 372 CIP-4 major identifiers, and 38 CIP-2 major categories. For most of the analysis, we use a college-level panel dataset of within-college segregation indexes, summarized in appendix table A.1. When analyzing the dissimilarity index of segregation, we exclude colleges whose share of enrollment of the group in question makes up more than 90 percent or less than 1 percent of total awards.[4]

Our examination of racial and ethnic segregation within colleges focuses on within-major interactions as an important mechanism for social interaction on college campuses. Our measures ignore cross-major interactions, which are obviously possible and potentially important. One may worry that social interactions vary substantially between students' first and final years or that our assumption is overly simplistic for interdisciplinary fields. It may also be unrealistic to assume a lack of interaction across different majors. These caveats should be kept in mind as we present our results. Be that as it

may, racial and ethnic stratification across field of study is relevant not only because of potential social interaction and network formation but because of racial and ethnic representation gaps in majors that command high wages in the labor market. Our descriptive work has a bearing on both these dimensions.

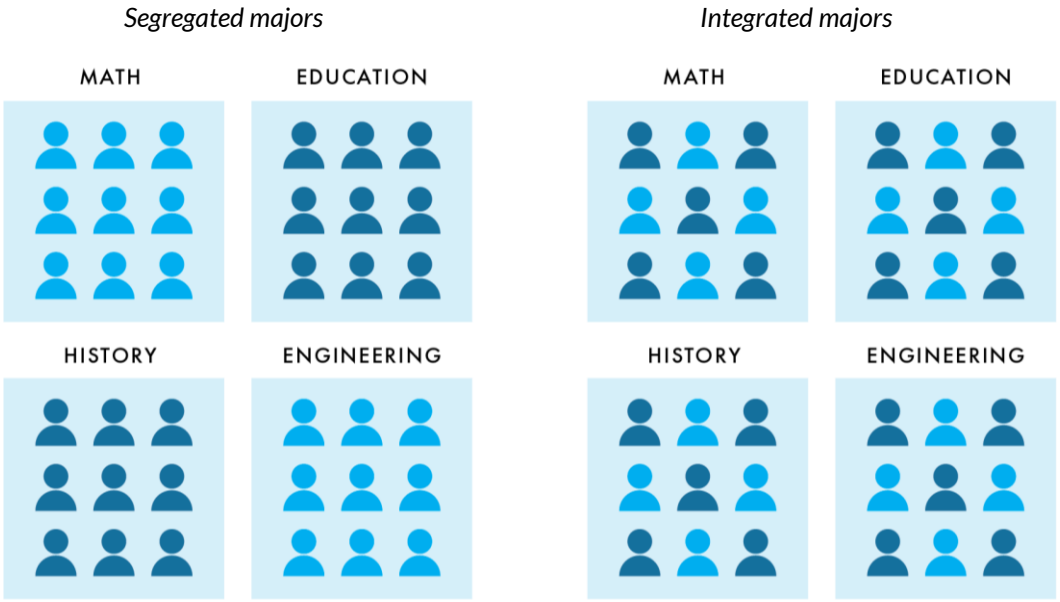
Given these assumptions, we develop a measurement framework for within-college racial and ethnic stratification that follows the literature on segregation across neighborhoods and schools. Commonly used measures of residential segregation, such as the dissimilarity index, measure how much neighborhood racial or ethnic composition departs from the composition of a larger geography, such as a city or metropolitan area. Similarly, the segregation indexes we compute here ask whether the composition of a given major within a college reflects the composition of the college as a whole.

Importantly, the indexes we use adjust for the share of a college's population that is from a given racial or ethnic group, which has pros and cons. Take, for example, a college whose breakdown of total awards is 5 percent Black and 95 percent white. We are not comparing the Black share of total awards in a major with the white share in that major, as this would almost surely report large gaps in Black representation in all majors for a college with such a lopsided composition. Instead, our statistic measures how the Black share in a major compares with the Black share of the whole college, making the comparison benchmark 5 percent. If around 5 percent of students in every major are Black, we would find low segregation for this college. But if Black students make up much more or much less than 5 percent of students in some majors, segregation will be high. Figure 1 provides an intuitive visualization of this measurement logic. The key advantage of this approach is that it accounts for differences in racial and ethnic composition between colleges. But a drawback of making this adjustment is that these indexes do not tell us much about racial and ethnic inequality at point of entry into the college, which may be the most important concern for many colleges.

This approach makes our estimates comparable with the existing literature on segregation. Nonetheless, setting the college-wide composition of the college as a goalpost for the composition of majors may seem arbitrary if policies are geared toward increasing representation of some groups in certain fields of study. We keep these trade-offs in mind when presenting results.

FIGURE 1

Measurement Framework for Within-College Segregation



We also want to highlight measurement issues related to the education pipeline. The data we use to measure stratification are at the level of degrees awarded by race or ethnicity and field of study. This approach is partly driven by data limitations: IPEDS does not provide complete breakdowns of college enrollment by race or ethnicity and field of study. In some measures, the lack of data on enrollment by major is caused by the difficulty of defining field of study in students' early years, before they officially declare majors (Blagg and Rainer 2020). IPEDS does provide tables showing enrollment by race or ethnicity for some CIP-2 major categories, including education, business, engineering, biology, physical sciences, and mathematics.

We assess the extent to which racial and ethnic differences in the college pipeline could be a concern in our examination of stratification across majors (appendix figures A.1 and A.2). To do so, we construct the racial and ethnic composition of CIP-2 degree awards for the categories or majors for which we observe enrollment by race or ethnicity and take the difference between a group's share of enrollment and its share of awards for each category or major.[5] If this difference is zero, the enrollment and award shares for that major are equal. If the difference is positive, the group's share of enrollment is larger than its share of awards, and if the difference is negative, the opposite is true. This would signal issues in the educational pipeline, potentially racial or ethnic differences in dropout rates or changes in field of study. (With the college-level data we have, we cannot separately identify these mechanisms.)

Our estimates show that there is considerable cross-college variability in the compositional difference between enrollment and awards, but these differences tend to be small. For Black students, the mean difference in the enrollment share versus the award share is positive, signaling pipeline issues that cause Black students to earn degrees at a rate lower than their share of enrollment in that major. The mean enrollment-award gap hovers around 2 percentage points across majors, with an interquartile range between 0 percent and 4 percent. In appendix figure A.2, we show that, for Black students, this general finding holds even as we break down colleges by selectivity, though pipeline gaps are somewhat more worrisome in less selective colleges.

For Hispanic and Asian students, the average difference between the enrollment share and the award share is closer to zero, though there are substantial differences by major. Thus, even though evidence indicates worrying trends, the average patterns show that an analysis of racial and ethnic stratification in awards has a bearing on racial and ethnic stratification for the entire college pipeline. These findings may seem somewhat surprising, considering some of the literature on racial and ethnic issues in the pipeline from choice of college major to graduation. We attribute the low magnitude of the mean gap to our national focus on students who have already enrolled in college, whereas greater racial and ethnic inequity lies at earlier junctures of the education pipeline, such as college access and entry. We hypothesize that there could be considerable variability in this metric by place, which may explain why our results may contradict earlier studies focusing on institutions in specific states.

Results

Is there evidence of racial and ethnic stratification in US colleges by field of study? Are certain racial and ethnic groups more likely to enroll in certain majors than in others? We provide evidence on these questions by examining sorting across CIP-2 categories of majors in 2015–16 (figure 2). (For reference, appendix table A.2 shows a list of CIP-2 codes and their names.) Each panel plots the share of a group's total enrollment in a given major, averaged across colleges. These statistics can also be interpreted as the mean probability that a randomly drawn graduate from a given racial or ethnic group is graduating with a degree in a given category of major.

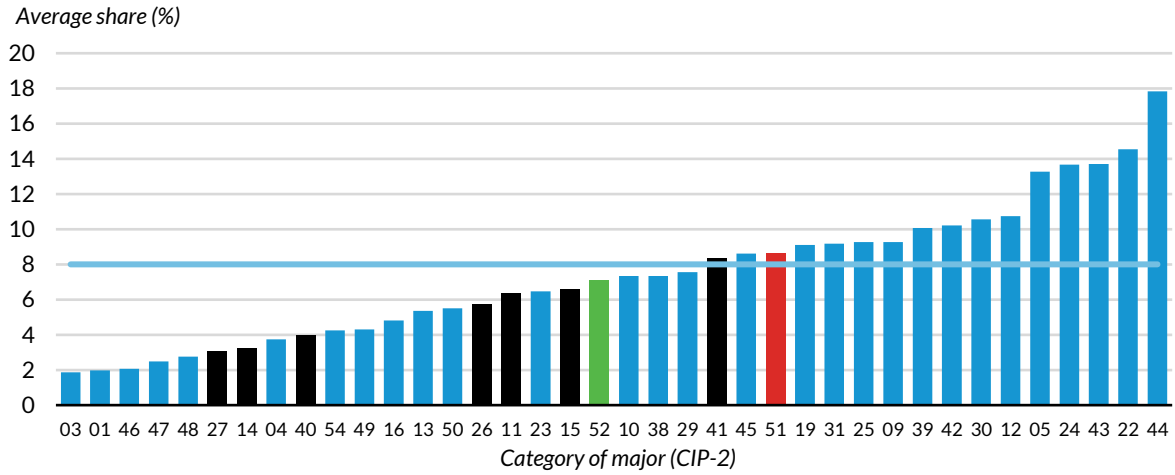
Figure 2 provides compelling evidence that different racial and ethnic groups are stratified in different ways by field of study. For Black students, the most common category of major is public administration and social services, which, on average, graduates slightly more than 15 percent of Black students at a college (figure 2A). Relative to their average share of total institution awards (i.e., about 8 percent, as denoted by the horizontal line), this means that Black students are overrepresented in public

administration and social services majors. In sharp contrast, Black graduates are underrepresented in such categories of majors as engineering, mathematics, and statistics, as less than 5 percent of Black graduates receive degrees in these majors.

Average sorting patterns for Hispanic and Asian students are unique in their own regard (figures 2B and 2C). Hispanic students are most likely to graduate with majors related to foreign languages, literatures, and linguistics or area, ethnic, cultural, and gender studies, and they are least likely to receive bachelor's degrees in library science, military technologies, and theology and religious vocations. Hispanic students are, on average, underrepresented in STEM fields but not as severely as Black students. On the other hand, the five most common categories of majors among Asian students are all STEM fields. Asian students, like Hispanic students, are underrepresented in library science, military technologies, and theology and religious vocations.

FIGURE 2A

Average Share of Black Students in CIP-2 Majors



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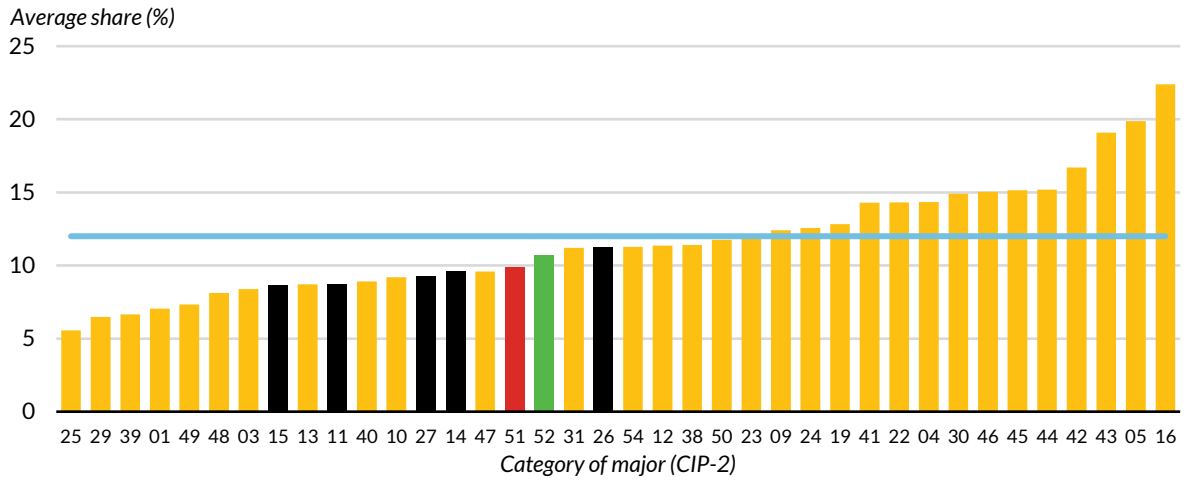
Source: Integrated Postsecondary Education Data System, 2015.
Notes: CIP-2 = two-digit Classification of Instructional Programs codes. Black bars indicate science, technology, engineering, or mathematics fields; green bars indicate business fields; and red bars indicate health fields. Observations are weighted by total awards. The horizontal line denotes the group's share of total awards nationwide.

FIGURE 2B

Average Share of Hispanic Students in CIP-2 Majors



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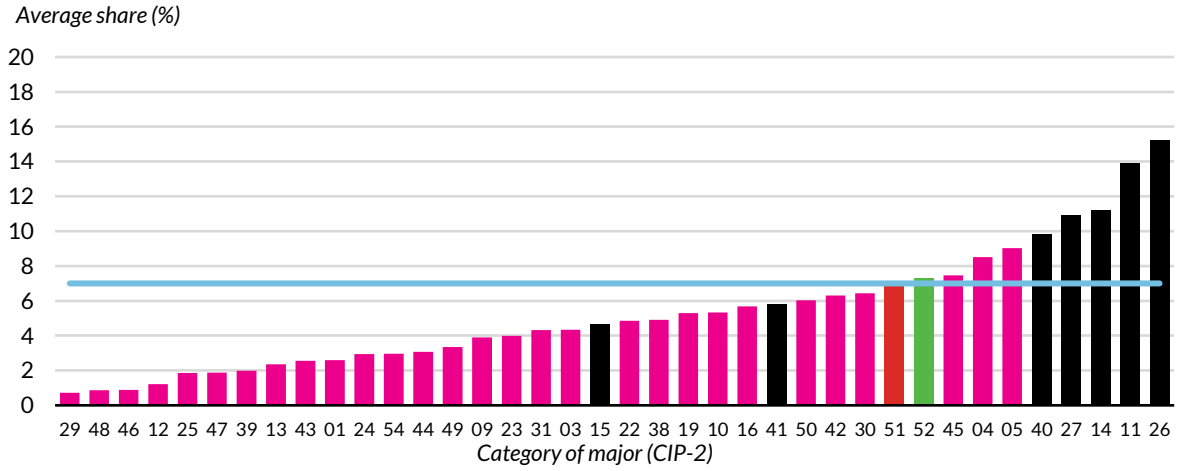
Source: Integrated Postsecondary Education Data System, 2015.
Notes: CIP-2 = two-digit Classification of Instructional Programs codes. Black bars indicate science, technology, engineering, or mathematics fields; green bars indicate business fields; and red bars indicate health fields. Observations are weighted by total awards. The horizontal line denotes the group's share of total awards nationwide.

FIGURE 2C

Average Share of Asian Students in CIP-2 Majors



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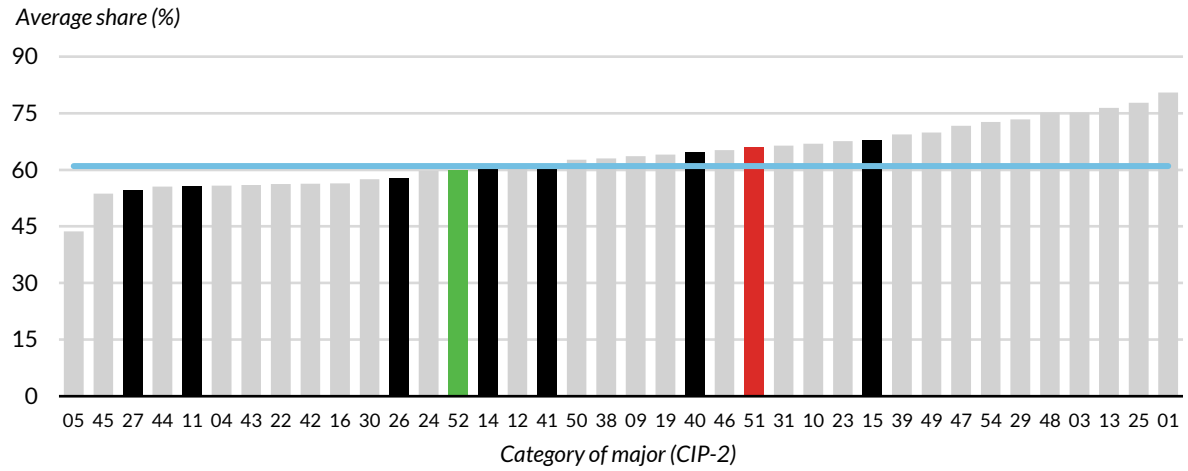
Source: Integrated Postsecondary Education Data System, 2015.
Notes: CIP-2 = two-digit Classification of Instructional Programs codes. Black bars indicate science, technology, engineering, or mathematics fields; green bars indicate business fields; and red bars indicate health fields. Observations are weighted by total awards. The horizontal line denotes the group's share of total awards nationwide.

FIGURE 2D

Average Share of White Students in CIP-2 Majors



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Source: Integrated Postsecondary Education Data System, 2015.
Notes: CIP-2 = two-digit Classification of Instructional Programs codes. Black bars indicate science, technology, engineering, or mathematics fields; green bars indicate business fields; and red bars indicate health fields. Observations are weighted by total awards. The horizontal line denotes the group's share of total awards nationwide.

Racial and ethnic differences in sorting by major translate into differences in exposure to different groups. Figure 3 plots average college exposure rates in CIP-4 majors for different racial and ethnic groups for the years 2005, 2010, and 2015. This type of figure is sometimes called an "exposure matrix," as it describes average between-group exposure rates across every combination of the most populous racial and ethnic groups. The exposure index is defined as the share of classmates who are from group A for the average student from group B. When the two groups coincide, the index is commonly referred to as the "isolation index," because it captures the share of one's classmates who are from the same group.

Patterns of average exposure within colleges reveal that for all racial and ethnic groups, the group that college students are exposed to most frequently are white students, because they tend to be the majority group in many college majors. For example, in 2005, Black students' classmates were slightly more than 65 percent white. In that same year, white students composed 70 percent of college enrollment. Exposure to white classmates for Black and Asian students also hovered around 65 percent. In 2015, exposure to white students had declined to 57 percent for Black and Asian students and to 58 percent for Hispanic students. The decline was mainly driven by a reduction in white students' average share of total enrollment, which was 62 percent in 2015. In a similar vein, all racial and ethnic groups have seen increases in their exposure to Hispanic students, which is primarily driven by mean increases in the group's share of the college's total awards.

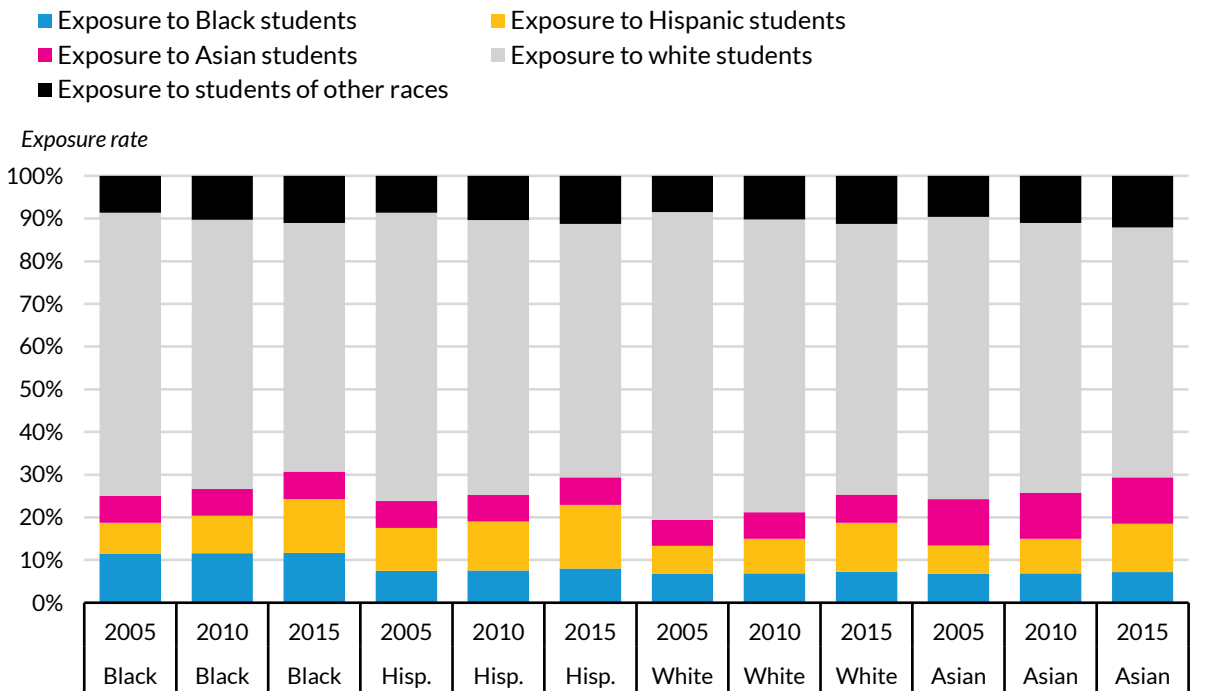
Even though college students are mostly exposed to white classmates, the estimates in figure 3 also highlight some degree of racial and ethnic isolation within colleges. For example, in 2015, the average Black student's classmates were 12 percent Black, but for white, Hispanic, and Asian students, this figure was between 6 and 7 percent. Similarly, the average Asian student's classmates were 11 percent Asian, but for white, Black, and Hispanic students, this share was around 6 percent. These "exposure gaps" constitute prima facie evidence of racial and ethnic stratification within colleges, which we explore further below. Nonetheless, it is worth highlighting that racial and ethnic isolation within colleges is remarkably lower than in the K–12 education system. Monarrez and Chingos (2020) have documented that in 2015, Black student isolation in K–12 education was above 50 percent, while white exposure to Black peers was less than 10 percent, even though Black students composed slightly less than 20 percent of K–12 students in 2015.

This evidence speaks to some of the issues brought up in the theoretical framework regarding social interactions, role models, and network formation. Average exposure rates tell us who students interact with in university classrooms. The evidence presented here shows that, on average, students are mostly exposed to white peers. If one thinks that white students tend to be better connected to good job networks and that classroom interactions with white peers may allow Black and Hispanic students to benefit from these networks, high exposure to white students may increase racial equity. But it may also be the case that white dominance in college classrooms could have adverse effects on learning outcomes for Black and Hispanic students. Both these mechanisms are potentially at play, and it is important for future research to study how they affect equity.

Nevertheless, the relative patterns of exposure across groups also suggest segregation by field of study.

FIGURE 3

Average Between-Group Exposure within Universities



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Source: Authors' calculations of the exposure index based on data from the Integrated Postsecondary Education Data System.
Note: Observations are weighted by total awards.

Patterns of exposure within colleges have important policy implications in their own right, but they conflate sorting patterns with college composition. To better understand within-college racial and ethnic stratification, we compute a within-college segregation index, which measures how evenly a given group is distributed across majors relative to their share of the college's total awards. Intuitively, the index asks how segregated the group is from every other racial or ethnic group in the college. We use the dissimilarity index of segregation, which compares the composition of a major with the composition of the college and averages out the absolute gaps between these using the following formula:

$$D = \sum_i \frac{p_i \, |m_i - M|}{2PM(1 - M)}$$

where p_i is the total number of awards in major category i, m_i is a racial or ethnic group's share of enrollment in major i, M is the group's share of awards in the entire college, and P is the college's total number of awards. Dissimilarity is commonly interpreted as the share of the total group in a college that would have to switch majors to achieve a perfectly balanced distribution of their group within the

college.[6] Importantly, dissimilarity does not focus on the peers that a group is exposed to but rather how evenly a group is distributed across majors, giving the index a different interpretation. All else equal, the further a group's share in a given major departs from its share of total degrees at the college, the more it contributes to segregation (Monarrez, Kisida, and Chingos 2019). Massey and Denton (1993, 20) suggest that a dissimilarity index below 30 corresponds to a relatively integrated distribution, one between 30 and 60 corresponds to a moderately segregated distribution, and one greater than 60 corresponds to a highly segregated distribution.

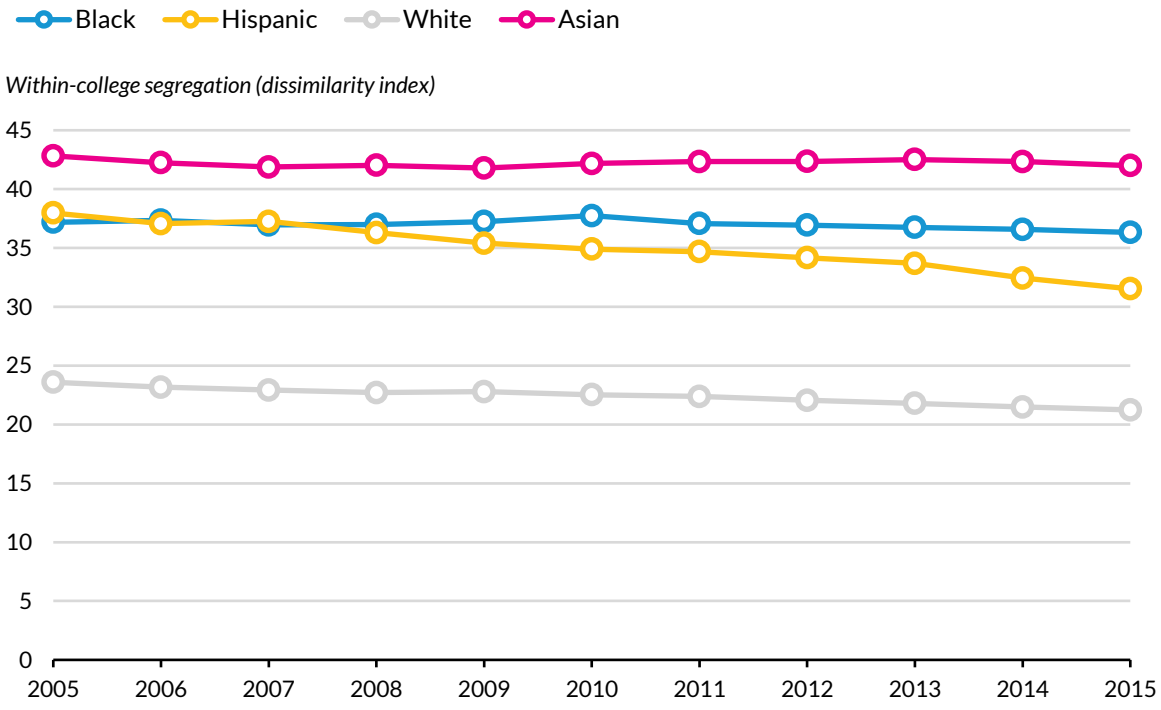
Figure 4 presents our estimates of average dissimilarity in CIP-4 majors within colleges over time, after adjusting for various college characteristics. Our adjustment of these trends is based on the regression model presented in appendix table A.1. We find the adjustment useful, as our within-college dissimilarity indexes are somewhat sensitive to the college's number of majors, number of awards (i.e., college size), racial and ethnic composition, and control and selectivity. The trends present average segregation estimates by year for a college with average characteristics.

The results in figure 4 suggest two key takeaways. First, within-college segregation is highest for Asian students, followed by Black students, Hispanic students, and white students. Asian, Black, and Hispanic students are moderately segregated, while white students are relatively integrated. In light of the patterns in figure 2, we hypothesize that Asian student segregation across college classrooms may be driven by their overrepresentation in STEM fields. In appendix figure A.2, we present histogram plots of the unadjusted within-college dissimilarity distribution for 2015. It is clear that the distribution of Asian segregation is wider than that of other groups, suggesting that there is a substantial number of colleges in which Asian students are highly segregated.

Second, over time, within-college segregation has been stable for white, Black, and Asian students; Hispanic students have become increasingly integrated across majors. The trends in figure 4 show that the dissimilarity index for Asian students has remained between 40 and 45 from 2005 to 2015. Segregation within colleges for Black students has declined slightly, with the index staying between 37 and 35 during the whole period. The segregation of Hispanic students, on the other hand, steadily declined, going from 40 to 30 on the index. In tandem, the index for white students decreased from 25 to 20.

FIGURE 4

Average Within-College Segregation, Adjusted for Institutional Characteristics



Source: Authors' calculations using data from the Integrated Postsecondary Education Data System.
Notes: CIP = Classification of Instructional Programs. CIP code definitions are harmonized to 2010 CIP codes. The figure shows the year fixed effect estimates from an ordinary least squares model of within-college dissimilarity on institutional characteristics, including institution control and selectivity, total degrees awarded, total number of majors, racial and ethnic composition, and state fixed effects. We scale the estimates by using the coefficients from the model and average levels of the covariates in the model. See also appendix table A.3.

The trend in within-college segregation has been relatively flat, but the same cannot be said of differences across colleges based on institution control and selectivity. Figure 5 shows adjusted differences in field-of-study segregation by institution control and selectivity. Our regression adjustment (based on the model in appendix table A.1) takes care of confounding factors that drive differences in segregation between these types of colleges but that are not meaningful for policymakers concerned with addressing within-college segregation. For instance, public colleges often tend to award more degrees than do private colleges, and this affects the segregation metrics mechanically. Another confounder is racial and ethnic representation gaps by institution selectivity, gaps that are large for Black and Hispanic students at highly selective institutions (Monarrez and Washington 2020) but show more complexity among less selective colleges (Hinrichs 2020). By controlling for institution size, composition, and other factors, we can rule out that the trends reported here could be explained by

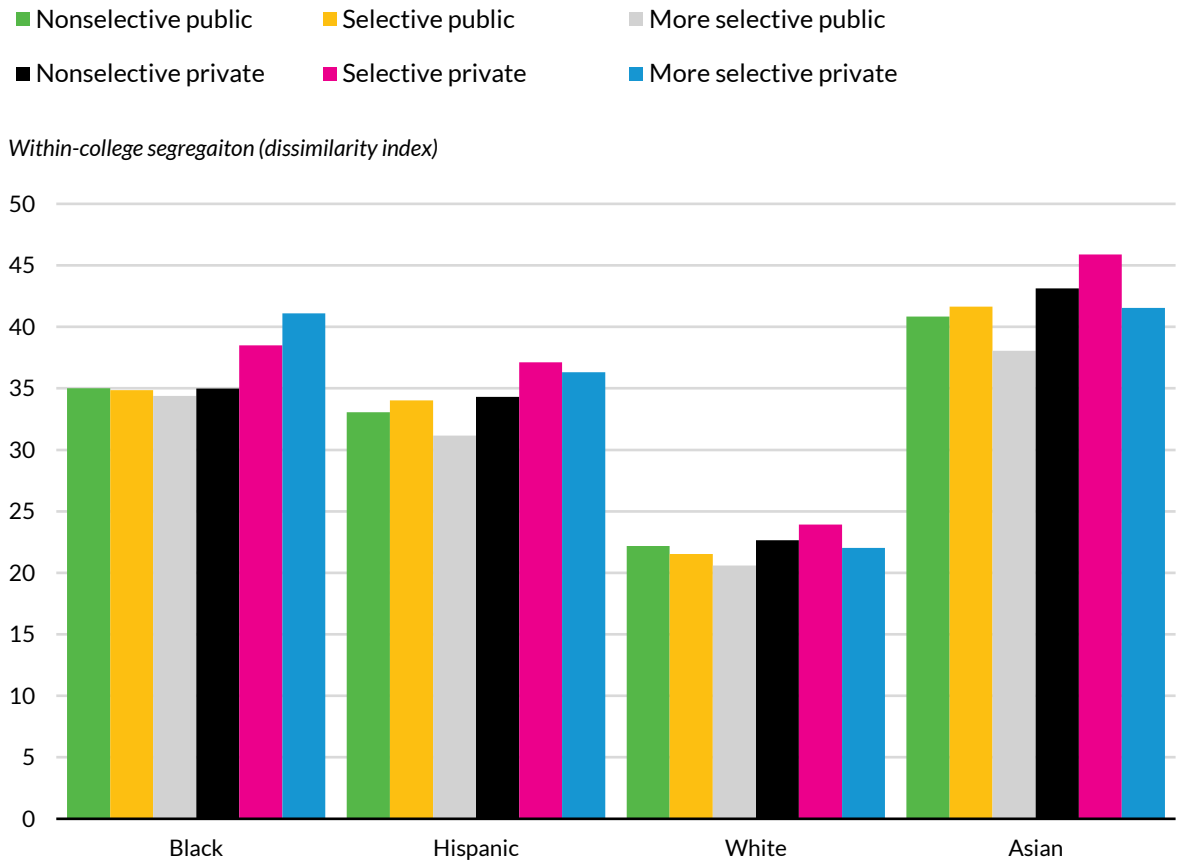
changes in racial and ethnic sorting patterns and other changes in colleges over time, allowing us to focus on racial and ethnic sorting patterns inside colleges.

Figure 5 shows higher within-college segregation levels in private colleges for Black and Hispanic students. The index for Black students is about 35 at public colleges and about 40 at private colleges. Differences in Hispanic segregation between public and private colleges are of similar magnitude, though lower than Black segregation overall. A similar pattern emerges for Asian students, although public-private differences are less pronounced. For white students, there is not a significant difference between public and private colleges.

The gradient in Black student segregation across college selectivity is remarkable, and it is unique to them. Black students are more segregated between majors in more selective institutions (i.e., selective in terms of SAT scores). Most starkly, more selective private universities have between-major dissimilarity of 41, on average, relative to nonselective private colleges and most public colleges, where the index is closer to 35. Higher segregation in private selective institutions could be caused both by Black students choosing or being steered toward a handful of majors or by their being excluded from or disinterested in other majors. Future research should look at the mechanisms that drive disparate racial and ethnic sorting patterns across different types of colleges.

FIGURE 5

Differences in Within-College Segregation, by Institution Control and Selectivity



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Source: Authors' calculations using data from the Integrated Postsecondary Education Data System.
Notes: The figure shows coefficient estimates on college selectivity and control indicators from an ordinary least squares model of within-college dissimilarity on institutional characteristics, total degrees awarded, total number of majors, racial and ethnic composition, and state and year fixed effects. We scale the estimates by using the coefficients from the model and average levels of the covariates in the model. See also appendix table A.3.

We conclude our analysis by examining potential consequences of within-college racial and ethnic segregation across field of study. Thus far, our analysis of stratification across majors has been agnostic to differences in field of study beyond racial and ethnic composition. One could argue that there is nothing negative about stratification across majors, saying, perhaps, that it is unsurprising that most German studies majors are white and most African studies majors are Black. But it is clear that certain degrees are remunerated better than others in the labor market. It is also clear that there are large differences in income and wealth by race or ethnicity (Chetty et al. 2020). Part of the racial and ethnic income gap is attributable to differences in occupation, which themselves are partly caused by differences in sorting into majors during college.

We conducted this analysis using a coarse definition for "high-paying" undergraduate degrees. Following the literature and striving to be parsimonious, we define high-paying majors at the CIP-2 level as a combination of STEM fields and other select fields of study, including these:

- computer and information sciences
- engineering
- architecture
- biological and biomedical sciences
- mathematics and statistics
- physical sciences and science technologies
- business and management
- health professions

This definition is based on work by Carnevale, Cheah, and Hanson (2015), who report, for example, that recent college graduates who majored in architecture or engineering earn $50,000 annually, while those who majored in industrial arts, consumer services, or recreation earn $27,000 annually. Their report also shows that occupations in STEM, business, and health pay above-average wages. This definition of high-paying fields constitutes 157 of 372 (42 percent) individual CIP-4 majors in our data. We do this to construct a simple college-level measure of racial and ethnic representation in high-paying degrees, defined as the share of total awards in the college that are in the high-paying category, by race or ethnicity. This share captures the probability that a randomly drawn graduate in a given college and from a given racial or ethnic group received a degree in a high-paying major.

We examine the potential impact of within-college segregation on inequality of opportunity by looking at adjusted correlations between our dissimilarity measures and shares of each racial and ethnic group earning high-paying undergraduate degrees. Consider two colleges that are similar in terms of size, control, selectivity, and racial and ethnic composition. In one college, Black students are integrated across majors—that is, their share of seats in each major is approximately equal to their share of total college enrollment. But in the other college, Black students are lumped into a few majors. Our examination asks the following questions: What is going on inside the university in which Black students are grouped in a few classrooms? Do these colleges have special programs promoting STEM professions for Black students? Or do they funnel their Black students into non-high-paying majors, limiting their entry into occupations where they are already underrepresented? The answers to these questions hinge

on the college's individual sorting dynamics, an outcome of both demand-side forces (e.g., Black students are not interested in majoring in economics) and supply-side forces (e.g., the university fails to encourage Black students to pursue certain career paths).

Although we make no attempt to disentangle colleges' sorting mechanisms, one could imagine a policy change in which the administrators of segregated colleges attempt to create a more balanced distribution of Black or Hispanic students across majors. Our analysis attempts to answer the following question: For the average college, would such a policy change increase the numbers of high-paying degrees awarded to Black and Hispanic students? Although we cannot claim that the relationships we describe are causal, our regression models allow us to rule out that any of the correlations we document could be driven by commonly referenced college characteristics.

Figure 6 presents binned scatterplots depicting the adjusted correlation between within-college segregation and shares of students earning high-paying degrees by race or ethnicity.[7] The results indicate that within-college segregation may lead to lower shares of Black students graduating with high-paying undergraduate degrees. Among colleges of the same control and selectivity, located in the same state, and of similar size and overall racial and ethnic composition, institutions with greater Black segregation across majors tend to graduate lower shares of Black students in high-paying majors in business, health, and STEM fields. Our estimates suggest that moving from a moderately segregated college to an integrated college leads to a 4.5 percentage-point increase in the share of Black graduates earning high-paying degrees. Appendix table A.4 shows that this relationship is statistically significant at conventional confidence levels.

We do not observe the same negative relationship for other racial and ethnic groups. For Hispanic students, the empirical relationship is noisier, and although our estimate of the adjusted correlation between within-college segregation and the share of students earning high-paying degrees is negative, we cannot reject that the correlation is zero and that our estimate is driven by sampling error. Interestingly, for white students, there is essentially no residual variation in the share of students earning high-paying degrees once we control for college characteristics, and we end up with a precisely estimated null relationship between white segregation and the share of white students earning high-paying degrees.

In contrast, for Asian students, we find a positive relationship between within-college segregation and probability of graduating with a high-paying degree. This is perhaps not surprising, given the patterns in figure 2 that showed that Asian students are overrepresented in STEM fields. Still, the disparate results between Asian students and Black students show that reducing stratification within

colleges would result in different impacts on access to opportunity for different racial and ethnic groups.

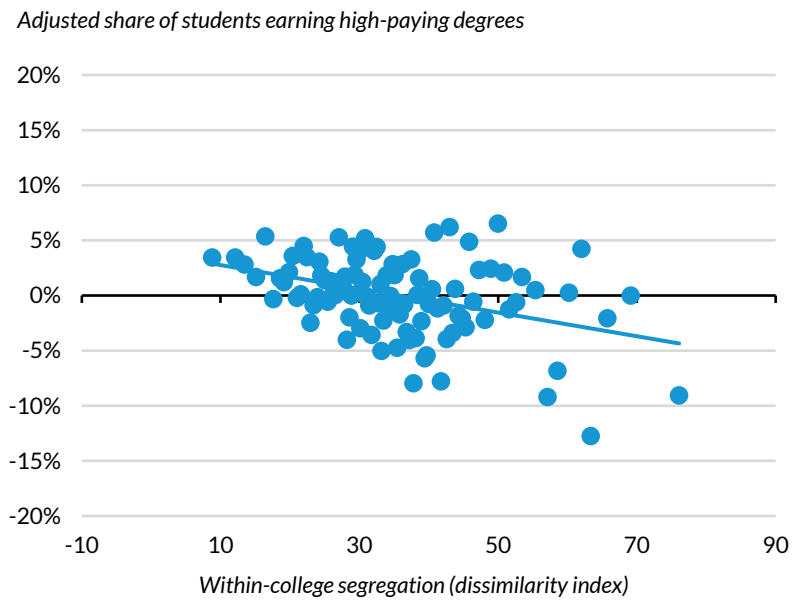
We hope that future research investigates the mechanisms that drive these effects, which is outside the scope of our study. In particular, we hope researchers and practitioners investigate the role of college counseling practices and policies for declaring majors in determining access to high-paying majors for Black and Hispanic students.

FIGURE 6A

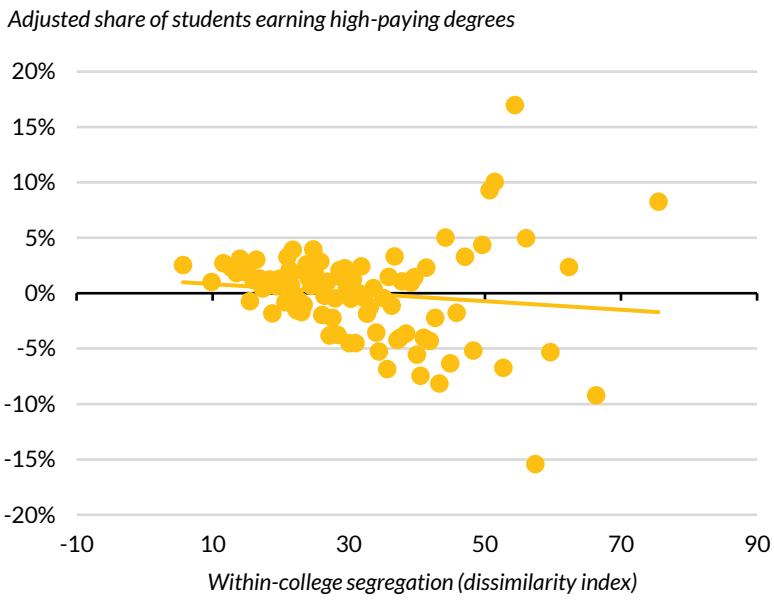
Within-College Segregation and Shares of Black and Hispanic Students Earning High-Paying Degrees in 2015

Adjusted for college composition, size, and type

Black



Hispanic



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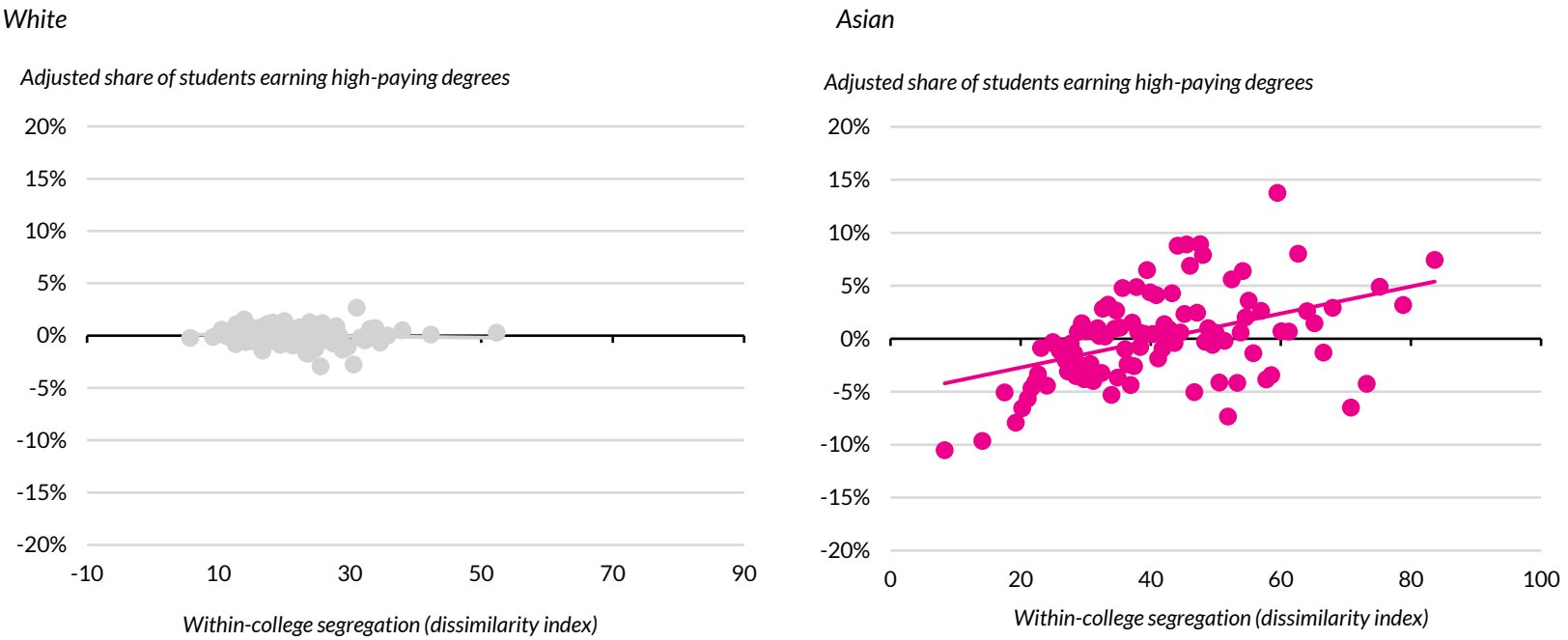
Source: Authors' calculations using data from the Integrated Postsecondary Education Data System.

Notes: The plot shows a binned scatterplot summarizing the conditional expectation function of the share of students earning high-paying degrees and group segregation within the college. Dots correspond to average shares within each percentile of the cross-college distribution of within-college segregation. The trend line is the ordinary least squares estimate of this relationship. See appendix table A.4 for models estimating this relationship.

FIGURE 6B

Within-College Segregation and Shares of White and Asian Students Earning High-Paying Degrees in 2015

Adjusted for college composition, size, and type



URBAN INSTITUTE

Source: Authors' calculations using data from the Integrated Postsecondary Education Data System.

Notes: The plot shows a binned scatterplot summarizing the conditional expectation function of the share of students earning high-paying degrees and group segregation within the college. Dots correspond to average shares within each percentile of the cross-college distribution of within-college segregation. The trend line is the ordinary least squares estimate of this relationship. See appendix table A.4 for models estimating this relationship.

Conclusion

This report has provided a national look at racial and ethnic segregation within higher education institutions. We provided two broad rationales for stakeholder and policymaker concerns over racial and ethnic segregation within colleges. First, colleges are uniquely positioned to reap the benefits of diversity of background and thought across fields of study. Social interaction between groups is key for addressing racist attitudes and racially myopic practices in important professions such as public policy and medicine. Second, underrepresentation of Black and Hispanic students in highly remunerated college majors perpetuates income inequality by race or ethnicity.

Our findings suggest that Black and Hispanic college students are moderately segregated across majors within colleges. Except for the segregation of Asian students, within-college segregation for most racial and ethnic groups is not as dramatic as benchmark levels of segregation across neighborhoods or in K–12 schools. White students are the most racially integrated group within colleges, as the share of white students in most majors is fairly representative of the share of the overall student population that is white. Further, we have documented that these patterns have changed little over time and that stratification patterns vary by different types of colleges. In particular, we show that Black students at more selective private universities tend to be considerably more segregated than in other types of colleges.

Our descriptive work has important implications for policymakers, administrators, and policy advocates in higher education. Our results confirm that segregation within colleges is pervasive and enduring. These segregation patterns are worrying, especially because they are associated with fewer high-paying degrees being awarded to Black students and, to a lesser extent, Hispanic students. Our models suggest that policies aimed at ending segregation within colleges could help more Black students graduate with degrees in highly remunerated fields.

Both demand-side and supply-side policy responses could help remedy within-college racial and ethnic inequity. On the demand side, increasing the number of Black and Hispanic faculty members and providing major-specific information to students may encourage Black and Hispanic students to pursue majors in STEM and other high-paying fields. Such actions may get Black and Hispanic students to opt in to highly remunerated majors more frequently. On the supply side, college officials could support Black and Hispanic students declaring such majors as engineering and business, perhaps by shifting the focus of introductory courses to be more intriguing.

Finally, one cannot understate the importance of structural inequities taking place earlier in the education pipeline. Deep and pervasive segregation in K–12 schools means that Black and Hispanic students have fewer resources and less experienced teachers to prepare them for the rigors of college coursework (reardon and Owens 2014). Financial constraints may also impede Black and Hispanic students from remaining in college for as long as it takes to complete a degree.

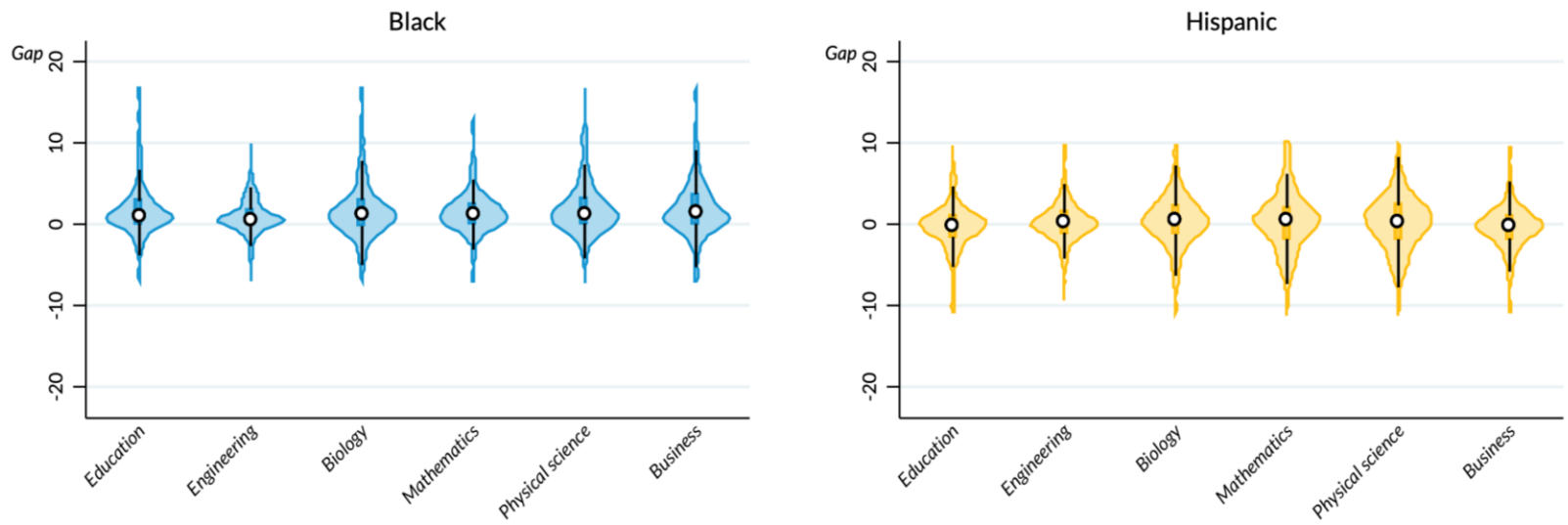
We hope our work can empower policymakers and stakeholders to implement reforms to address these inequities. To further spur such change, more research is needed to understand how college- and classroom-level mechanisms determine the number of Black and Hispanic students who graduate with degrees in high-paying fields. Having a better sense of the trade-offs at play will aid the cost-benefit analysis leaders face when limited resources are available for addressing these issues.

Appendix

FIGURE A.1A

Summary of Percentage-Point College Gaps in Group Enrollment Share versus Award Share

By race or ethnicity and CIP-2 categories of majors, 2015



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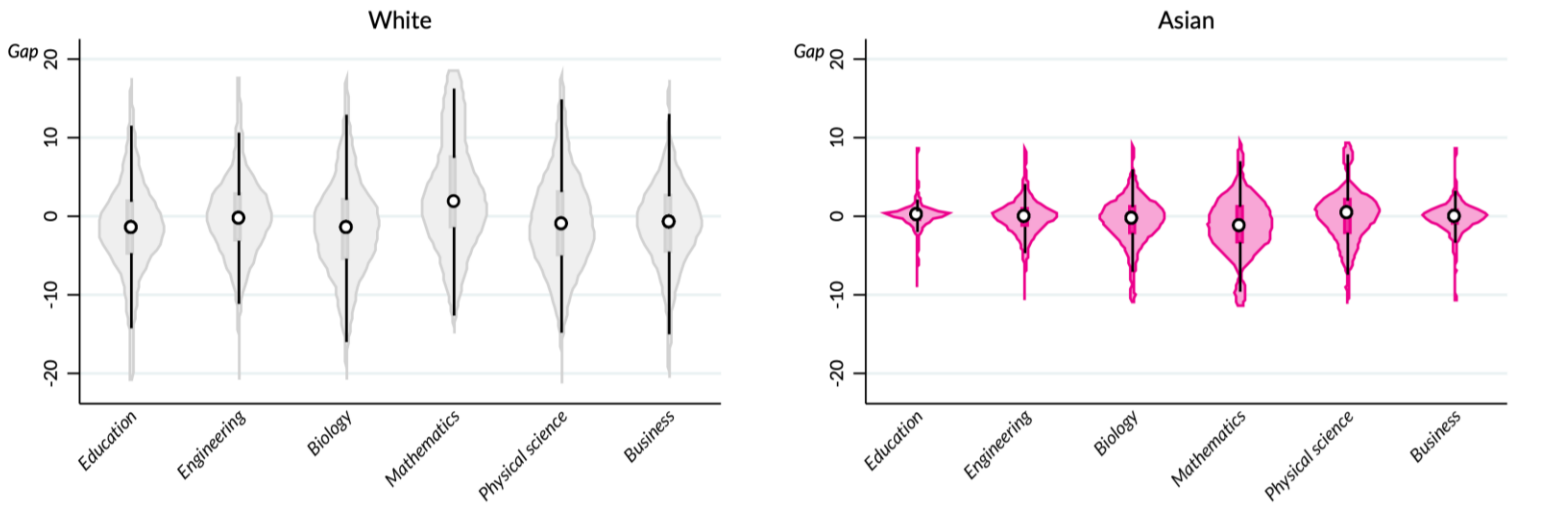
Source: Integrated Postsecondary Education Data System.

Notes: CIP-2 = two-digit Classification of Instructional Programs codes. The vertical axis values are percentage points. These violin plots summarize the cross-college distribution of the difference between enrollment and award share, by race or ethnicity or category of major. The density plots are from a kernel density estimation (symmetric on each side). The white dot is the median of the distribution. The rectangle denotes the interquartile range, while the black spike denotes the 10th and 90th percentiles of the distribution.

FIGURE A.1B

Summary of Percentage-Point College Gaps in Group Enrollment Share versus Award Share

By race or ethnicity and CIP-2 categories of majors, 2015



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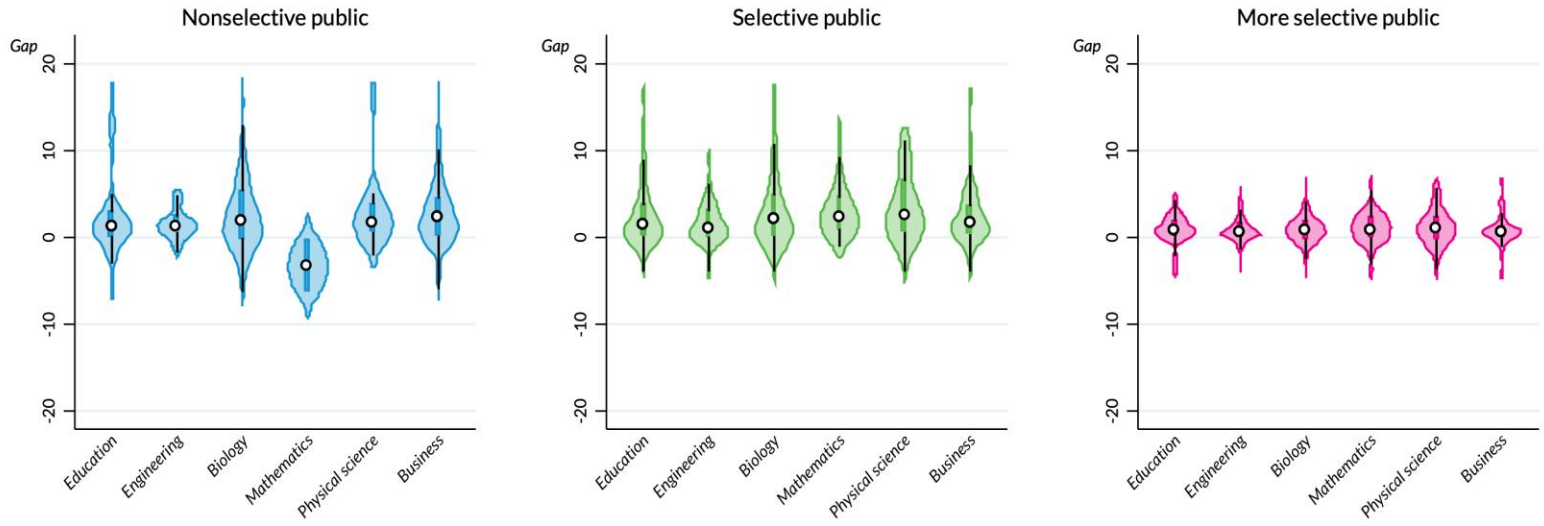
Source: Integrated Postsecondary Education Data System.

Notes: CIP-2 = two-digit Classification of Instructional Programs codes. The vertical axis values are percentage points. These violin plots summarize the cross-college distribution of the difference between enrollment and award share, by race or ethnicity or category of major. The density plots are from a kernel density estimation (symmetric on each side). The white dot is the median of the distribution. The rectangle denotes the interquartile range, while the black spike denotes the 10th and 90th percentiles of the distribution.

FIGURE A.2A

Summary of Percentage-Point College Gaps in Group Enrollment Share versus Award Share, by Institution Type

Black students in public institutions, 2015



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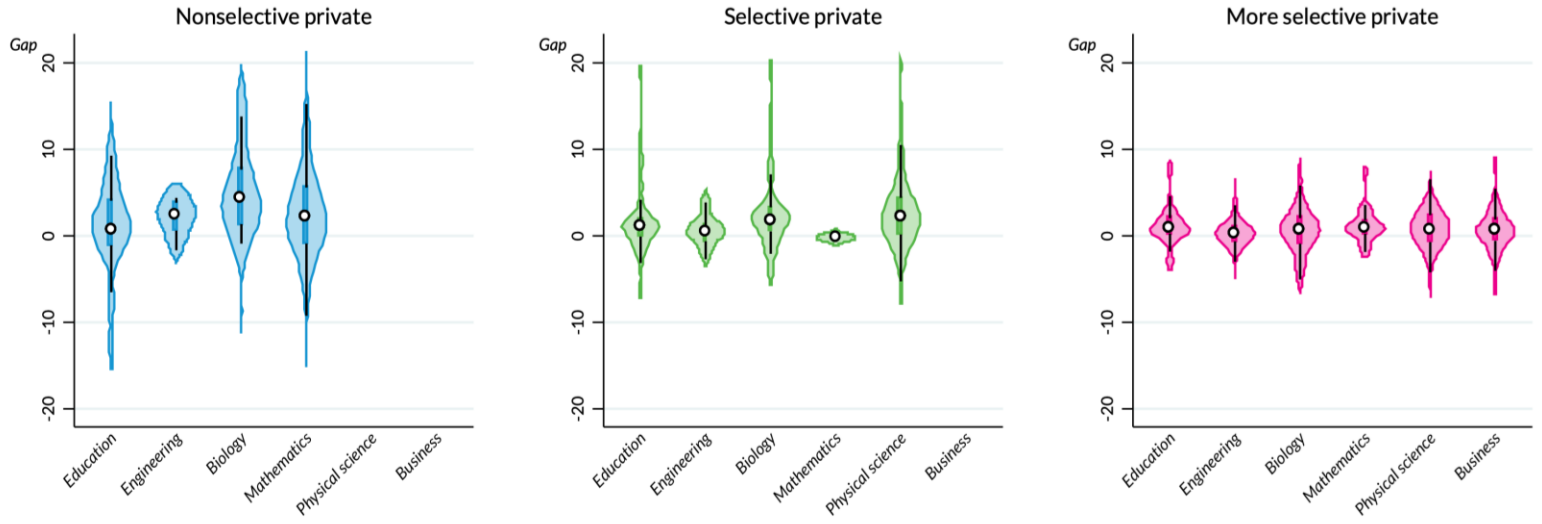
Source: Integrated Postsecondary Education Data System.

Notes: The vertical axis values are percentage points. These violin plots summarize the cross-college distribution of the difference between enrollment and award share, by college type and category of major. The density plots are from a kernel density estimation (symmetric on each side). The white dot is the median of the distribution. The rectangle denotes the interquartile range, while the black spike denotes the 10th and 90th percentiles of the distribution. We drop the 1st and 99th percentiles of the gap in each distribution.

FIGURE A.2B

Summary of Percentage-Point College Gaps in Group Enrollment Share versus Award Share, by Institution Type

Black students in private institutions, 2015



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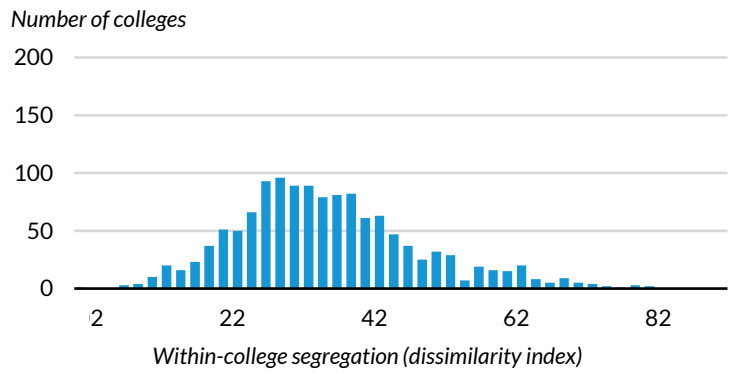
Source: Integrated Postsecondary Education Data System.

Notes: The vertical axis values are percentage points. These violin plots summarize the cross-college distribution of the difference between enrollment and award share, by college type and category of major. The density plots are from a kernel density estimation (symmetric on each side). The white dot is the median of the distribution. The rectangle denotes the interquartile range, while the black spike denotes the 10th and 90th percentiles of the distribution. We drop the 1st and 99th percentiles of the gap in each distribution.

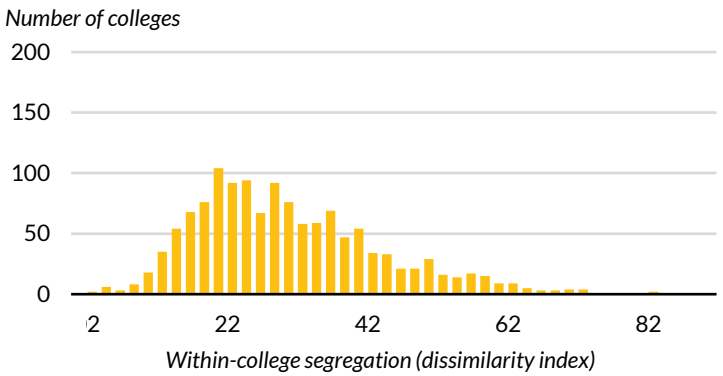
FIGURE A.3

The Distribution of Within-College Segregation, 2015

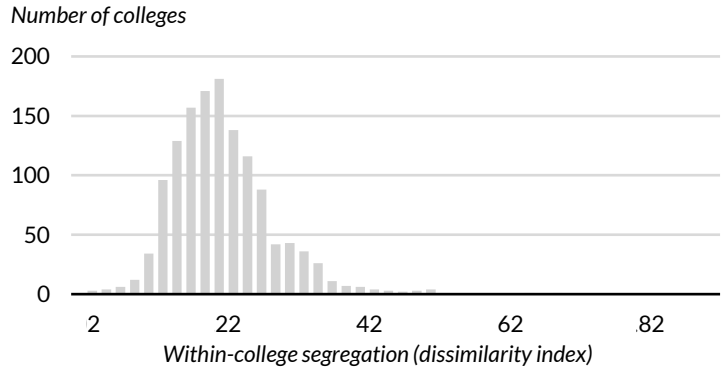
Black



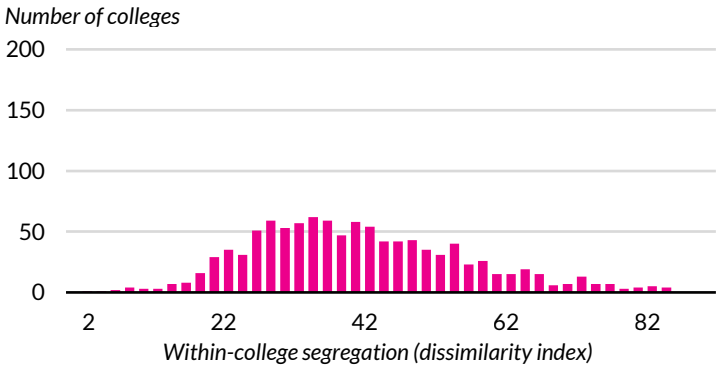
Hispanic



White



Asian



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Source: Authors' calculations of the within-institution dissimilarity index using data from the Integrated Postsecondary Education Data System.

TABLE A.1

Summary Statistics

Four-year colleges

	Black		Hispanic		White		Asian	
	2005	2015	2005	2015	2005	2015	2005	2015
College composition and segregation								
Group share of awards	0.08	0.09	0.06	0.09	0.74	0.66	0.04	0.04
Exposure to Black students	0.13	0.13	0.07	0.08	0.07	0.07	0.07	0.07
Exposure to Hispanic students	0.05	0.09	0.10	0.13	0.05	0.09	0.05	0.09
Exposure to white students	0.64	0.57	0.65	0.58	0.71	0.64	0.64	0.58
Exposure to Asian students	0.04	0.04	0.04	0.04	0.04	0.04	0.09	0.09
Exposure to students of other races	0.08	0.11	0.08	0.11	0.08	0.10	0.09	0.11
Group dissimilarity	0.41	0.37	0.43	0.32	0.25	0.22	0.49	0.46
High-paying majors								
As a share of total awards	0.44	0.49	0.44	0.49	0.44	0.49	0.44	0.49
As a share of group awards	0.42	0.43	0.42	0.45	0.43	0.48	0.57	0.62
College characteristics								
Total awards	1,050.27	1,291.29	1,050.27	1,291.29	1,050.27	1,291.29	1,050.27	1,291.29
Number of CIP-4 majors	23.39	25.54	23.39	25.54	23.39	25.54	23.39	25.54
Private control	0.63	0.62	0.63	0.62	0.63	0.62	0.63	0.62
Public control	0.37	0.38	0.37	0.38	0.37	0.38	0.37	0.38
Selective	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
More selective	0.29	0.28	0.29	0.28	0.29	0.28	0.29	0.28
N	1,342	1,390	1,342	1,390	1,342	1,390	1,342	1,390

Source: Integrated Postsecondary Education Data System.

Note: CIP-4 = four-digit Classification of Instructional Programs codes.

TABLE A.2

Classification of Instructional Programs Titles

Code	Title
01	Agriculture, agriculture operations, and related sciences
03	Natural resources and conservation
04	Architecture and related services
05	Area, ethnic, cultural, and gender studies
09	Communication, journalism, and related programs
10	Communications technologies/technicians and support services
11	Computer and information sciences and support services
12	Personal and culinary services
13	Education
14	Engineering
15	Engineering technologies/technicians
16	Foreign languages, literatures, and linguistics
19	Family and consumer sciences/human sciences
22	Legal professions and studies
23	English language and literature/letters
24	Liberal arts and sciences, general studies and humanities
25	Library science
26	Biological and biomedical sciences
27	Mathematics and statistics
28	Reserve Officers' Training Corps (JROTC, ROTC)
29	Military technologies
30	Multi-/interdisciplinary studies
31	Parks, recreation, leisure, and fitness studies
32	Basic skills
33	Citizenship activities
34	Health-related knowledge and skills
35	Interpersonal and social skills
36	Leisure and recreational activities
37	Personal awareness and self-improvement
38	Philosophy and religious studies
39	Theology and religious vocations
40	Physical sciences
41	Science technologies/technicians
42	Psychology
43	Security and protective services
44	Public administration and social service professions
45	Social sciences
46	Construction trades
47	Mechanic and repair technologies/technicians
48	Precision production
49	Transportation and materials moving
50	Visual and performing arts
51	Health professions and related clinical sciences
52	Business, management, marketing, and related support services
53	High school/secondary diplomas and certificates
54	History
60	Residency programs

Source: National Center for Education Statistics 2010.

TABLE A.3

Correlates of Within-College Segregation

By race or ethnicity, 2005–15

	Black (1)	Hispanic (2)	White (3)	Asian (4)
Nonselective public	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
Selective public	0.020***	0.005	0.002	0.023***
	(0.006)	(0.007)	(0.004)	(0.008)
More selective public	0.027***	-0.016*	-0.003	-0.010
	(0.009)	(0.010)	(0.005)	(0.010)
Nonselective private	0.026***	0.023***	0.008*	0.019**
	(0.007)	(0.007)	(0.005)	(0.008)
Selective private	0.060***	0.041***	0.023***	0.064***
	(0.008)	(0.008)	(0.006)	(0.010)
More selective private	0.083***	0.029***	0.004	0.016
	(0.008)	(0.008)	(0.005)	(0.010)
Group share of awards	-0.421***	-0.158***	-0.016	-0.767***
	(0.054)	(0.057)	(0.014)	(0.082)
White share of awards	0.146***	0.185***		0.102***
	(0.021)	(0.019)		(0.022)
Number of majors	-0.000*	-0.001***	-0.000	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
Total awards	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
2005	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
2006	0.002	-0.010**	-0.004**	-0.006
	(0.003)	(0.004)	(0.002)	(0.004)
2007	-0.002	-0.007*	-0.006***	-0.008*
	(0.003)	(0.004)	(0.002)	(0.004)
2008	-0.001	-0.016***	-0.009***	-0.007
	(0.003)	(0.004)	(0.002)	(0.004)
2009	0.001	-0.025***	-0.008***	-0.009**
	(0.003)	(0.004)	(0.002)	(0.005)
2010	-0.020***	-0.037***	-0.014***	-0.020***
	(0.005)	(0.006)	(0.003)	(0.008)
2011	-0.025***	-0.039***	-0.015***	-0.018**
	(0.005)	(0.006)	(0.004)	(0.007)
2012	-0.027***	-0.044***	-0.019***	-0.018**
	(0.005)	(0.006)	(0.004)	(0.007)
2013	-0.029***	-0.049***	-0.022***	-0.016**
	(0.005)	(0.006)	(0.004)	(0.008)
2014	-0.031***	-0.061***	-0.024***	-0.018**
	(0.005)	(0.006)	(0.004)	(0.008)
2015	-0.034***	-0.069***	-0.026***	-0.019**
	(0.005)	(0.006)	(0.004)	(0.008)
State fixed effects	X	X	X	X
R^2	0.37	0.43	0.13	0.33
N	13,619	13,242	13,477	11,042

Source: Integrated Postsecondary Education Data System.

Notes: Standard errors are clustered at the institution level in all models. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

TABLE A.4

Within-College Segregation and Group Share Earning Degrees in High-Paying Fields

Ordinary least squares models, by race or ethnicity, 2015

	Black				Hispanic			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Within-college segregation	-0.29***	-0.13***	-0.15***	-0.15***	-0.08	-0.02	-0.06	-0.05
	(0.05)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
High-paying majors as a share of awards		0.94***	0.95***	0.95***		0.93***	0.93***	0.94***
		(0.02)	(0.02)	(0.02)		(0.02)	(0.02)	(0.02)
Group share of awards		0.04	-0.03	-0.08*		-0.05**	-0.07***	-0.04
		(0.03)	(0.03)	(0.04)		(0.02)	(0.02)	(0.03)
Controls			X	X			X	X
State fixed effects				X				X
R^2	0.03	0.64	0.65	0.68	0.00	0.64	0.65	0.67
N	1,300	1,300	1,300	1,299	1,325	1,325	1,325	1,324

	White				Asian			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Within-college segregation	-0.28***	-0.02	-0.02	-0.03	-0.09	0.15***	0.19***	0.19***
	(0.08)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.05)	(0.05)
High-paying majors as a share of awards		1.00***	1.00***	1.00***		0.94***	0.95***	0.97***
		(0.01)	(0.01)	(0.01)		(0.02)	(0.02)	(0.02)
Group share of awards		0.02	0.03**	0.02*		0.15***	0.17***	0.08
		(0.01)	(0.01)	(0.01)		(0.06)	(0.06)	(0.06)
Controls			X	X			X	X
State fixed effects				X				X
R^2	0.01	0.95	0.95	0.96	0.00	0.56	0.58	0.62
N	1,338	1,338	1,338	1,337	1,042	1,042	1,042	1,041

Source: Authors' calculations of the within-institution dissimilarity index using data from the Integrated Postsecondary Education Data System.

Notes

[1] See also Khiara M. Bridges, "Implicit Bias and Racial Disparities in Health Care," American Bar Association, accessed October 1, 2020, https://www.americanbar.org/groups/crsj/publications/human_rights_magazine_home/the-state-of-healthcare-in-the-united-states/racial-disparities-in-health-care/.

[2] The CIP definitions changed in 2010. Our statistics over time account for this, using the 2010 CIP definitions across all years.

[3] Historically Black colleges and universities and tribal colleges and universities are historical designations with unique missions to provide educational opportunities to Black and Indigenous populations who have been discriminated against within higher education. Therefore, comparing racial and ethnic stratification within these colleges with other colleges that do not have these designations would not be equal.

[4] We choose this lopsided sample restriction to account for the fact that Black, Asian, and Hispanic students frequently make up less than 10 percent of the college population. When analyzing high-paying majors, we exclude colleges that do not offer any high-paying fields of study.

[5] To make the measurement exercise as realistic as possible, we link the racial and ethnic composition of degrees awarded to the enrollment composition four years before the award year.

[6] The common interpretation of the dissimilarity index is not fully accurate. The correct interpretation of dissimilarity is the share of students in a group that would need to move to achieve perfect integration, as a ratio of the same share that would need to move but starting from a perfectly segregated scenario (Graham 2018).

[7] To generate these scatterplots, we first estimate a model of the share of each racial or ethnic group earning a high-paying degree as a function of college characteristics, including total awards, number of majors, and racial and ethnic composition. Using estimates from the model, we remove the portion of the variation in shares of students earning high-paying degrees across colleges that is attributable to college selectivity, control, composition, and location. The remaining cross-college variation in shares of students earning high-paying degrees cannot be explained by such factors. We then correlate the unexplained variation in these shares of students with within-college dissimilarity, resulting in a clean estimated relationship between shares of students earning high-paying degrees and racial and ethnic stratification that is unconfounded by the control variables.

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