Assessing Racial Disparities in Postsecondary Education

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Abstract

This study provides an overview of racial inequalities in higher education. First, we broadly characterize current racial gaps in educational attainment and compare them with gender gaps within racial groups. Second, we discuss the role of the main barriers to higher education (i.e., financial constraints, informational frictions, and academic preparation) in shaping racial disparities. Finally, we study what type of academic skills are most important in explaining current gaps in higher education.

1 Introduction

Education plays a central role in shaping labor market opportunities. In particular, educational wage differentials have expanded critically since 1980. According to Autor *et al.* (2020), returns to a year of college have risen by 6.5 log points from 0.076 in 1980 to 0.141 in 2017.[1] Consistent with this trend, Thompson (2021) has shown a growing contribution of human capital in explaining racial differences in earnings.[2] Therefore, given that educational attainment constitutes a key component of the human capital accumulation process, characterizing current racial inequalities in the higher education system is highly relevant for understanding racial disparities in labor market outcomes.

[1] Doepke & Gaetani (2020) indicate that the wage gap between workers with and without college education has risen by more than 30 percentage points since the 1980s.

[2] Thompson (2021) shows that controlling for human capital reduces black-white disparities in total earnings by approximately 10% in data from the late 1960s and the 1970s, by approximately 15% in data from the 1980s and 1990s, and by approximately 30% in data from the 2000s and 2010s.

The aim of this study is threefold. First, we provide a broad characterization of the current racial gaps in educational attainment and compare them with gender gaps within racial groups. More specifically, we describe racial and gender disparities in college enrollment and completion by type of institution (e.g., four-year vs two-year colleges). Second, we provide a brief discussion of the primary barriers to college attendance and completion, and how they connect with racial inequalities in higher education. In particular, we focus on the role of financial constraints, informational frictions, and academic preparation.[3] Finally, we perform an exploratory analysis of the types of academic skills that are most relevant for explaining racial gaps in college completion. More specifically, we study how high school academic preparation in math and English differentially contributes to racial and gender inequalities in college graduation.

Four main empirical regularities emerge from the characterization of the racial and gender gaps in college. First, underrepresented minorities (URM) have experienced an important increase in postsecondary participation over the last two decades, leading to a decrease in racial gaps (i.e., URM-white).[4] However, this reduction in racial gaps is not observed when considering Bachelors' degree attainment conditional on enrolling in any postsecondary education institution. This dichotomy is in part driven by URM students being relatively more likely than white students to enroll in two-year institutions, and by their lower graduation rates from four-year institutions. Second, gender gaps in postsecondary participation among URM students are at least as large as the racial gaps. This empirical regularity suggests more nuances than previously thought when considering the barriers that underrepresented minorities face by the age of enrollment in postsecondary education. For example, URM students are a priori more likely to face borrowing constraints than white students, however the data show that black and Hispanic females are more likely to enroll in postsecondary education than white males.[5] Third, the proportion of black four-year college enrollees by institution rank follows a U-shape, in that they tend to be relatively more represented in the highest ranked institutions as well as those of lower rank, but relatively less represented in between.[6] Finally, an analysis of racial gaps in STEM fields demonstrates that black students are 33% less likely to obtain a degree in these fields when compared to white students, which may have consequences for

[3] Long & Riley (2007) and Page & Scott-Clayton (2016) grouped barriers in access to higher education into these three categories.

[4] We use the term underrepresented minorities to refer to black and Hispanic individuals.

[5] Given that males and females come from families with similar background characteristics, other underlying factors than income/wealth have to be operating to explain the large differences postsecondary enrollment between black males and females.

[6] This U-shape has previously been highlighted by Arcidiacono *et al.* (2011). The authors point out that this result is likely to be driven by racial preferences in college admissions.

labor market outcomes given the larger returns to STEM degrees.[7]

A review of the findings on the main barriers to higher education (i.e. financial constraints, informational frictions, and academic preparation) suggest three main takeaways. First, while the evidence indicates that financial constraints can be important in explaining college educational outcomes, the mechanisms through which they operate to shape racial disparities may be less straightforward than previously thought. In particular, focusing on the role of credit constraints from a life cycle perspective rather than (mainly) at the time of enrolling in college may be more effective in closing current gaps. Second, there is evidence on the role of informational frictions in preventing low-income, high-achieving students from attending selective institutions. However, the importance of this channel in explaining racial gaps in enrollment at more selective institutions is less clear. In particular, the data in recent studies (e.g. Hoxby & Avery (2013) and Black *et al.* (2020b)) suggest that these frictions do not play a primary role in explaining current racial disparities.[8] Finally, differences in academic preparation between racial and gender groups at the time of enrollment in college is substantial. The evidence suggests that this factor in fact plays an important role in explaining racial and gender gaps in educational attainment.

To conclude, we use data from the National Longitudinal Survey of Youth 1997 (NLSY97) to show evidence suggesting that English skills play a larger role than math skills in explaining racial and gender gaps in obtaining a college degree. In particular, our findings indicate that the skills acquired in high school English classes are twice important as the skills acquired in high school math classes in explaining racial gaps in college completion.

The rest of the paper is organized as follows. Section 2 provides a characterization of the racial and gender gaps in college enrollment and graduation. Section 3 discusses different empirical patterns and findings associated with the main barriers to higher education. Section 4 studies the differential role of math and English skills on explaining gaps in college completion. Section 5 concludes.

2 Characterizing Racial Gaps in Higher Education

To provide a complete characterization of current racial disparities in postsecondary education, this section focuses on whether students from different racial groups enroll (graduate)

[7] Mismatch into selective institutions and academic preparation explain part of the racial disparities in obtaining a STEM degree (see Arcidiacono *et al.*, 2016).

[8] However, the larger proportion of minorities enrolling in two-year institutions could be driven in part by information frictions.

from higher education, as well as the types of institutions into which they enroll. In addition, the analysis brings gender to the center of the discussion, given that male-female disparities within racial groups are large and highly comparable to the racial gaps.

2.1 Racial Disparities in College Enrollment

We begin by analyzing trends in college enrollment by race and gender. Figure 1 displays the weighted share of individuals (by race and gender) in the United States aged 18-24 who report having received at least some college credit in 2005, 2010, 2015, and 2019.[9] Three important takeaways can be drawn from this figure. First, the share of underrepresented minorities (URM) enrolled in college has increased considerably over the last two decades. For example, the proportion of black males enrolled in any type of postsecondary education has grown from 0.33 to 0.45 between 2005 and 2019, while for Hispanic males this proportion has grown from 0.25 to 0.43. Similar increases in enrollment are observed for underrepresented minority females. Finally, whites and Asian/Pacific Islanders show much more modest increases in enrollment shares.

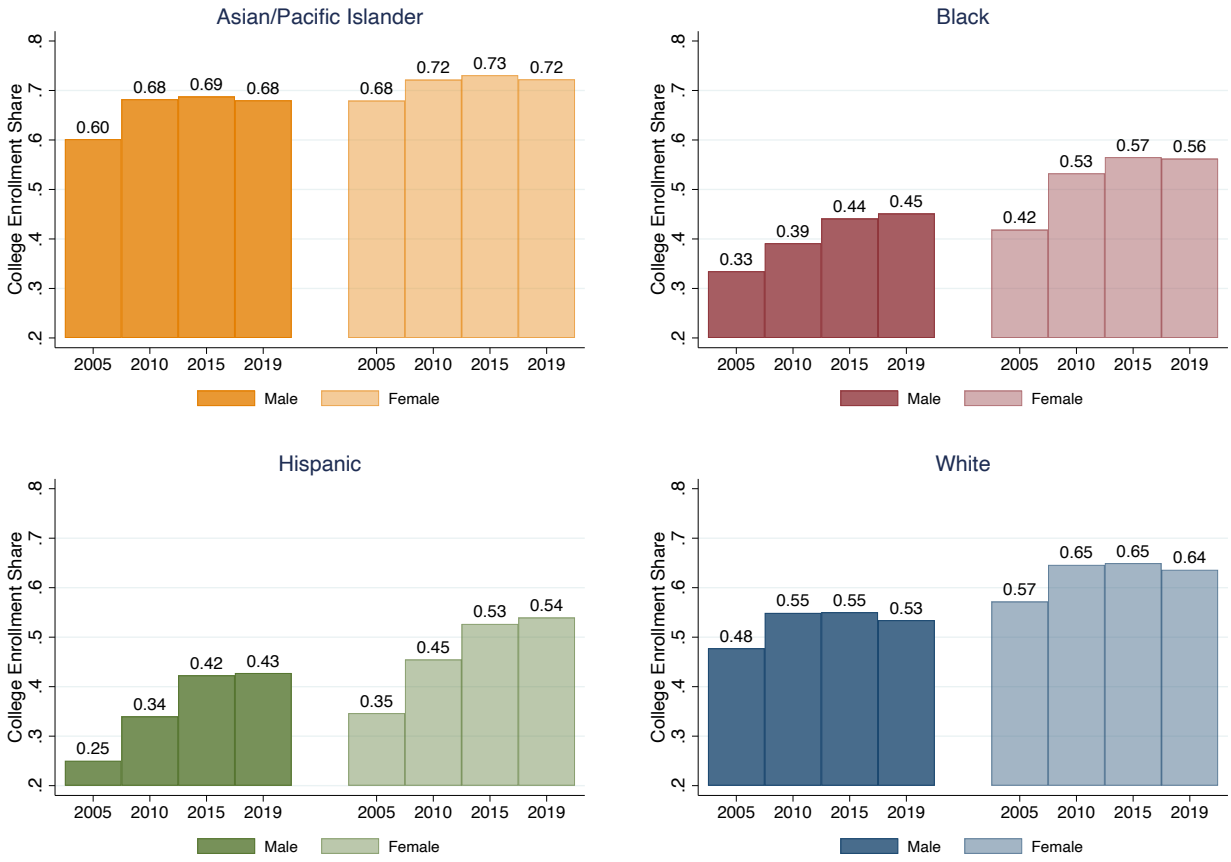
Second, consistent with the previously described empirical regularities, the racial gaps in college enrollment between white and black (Hispanic) individuals have decreased substantially during the period 2005-2019. For example, the black-white male (female) gap in college enrollment was -15.8 (-11.4) percentage points (pp) in 2010, but it dropped to -8.3 (-7.4) pp in 2019. Similar patterns can be observed for the trends in the Hispanic-white gaps. Baker *et al.* (2018) find that the decrease in racial gaps in college enrollment during this time period was importantly related to increasing rates of high school graduation for black and Hispanic students relative to non-URMs.[10]

Finally, there are large and persistent gender gaps (within race) in having received some college credit, particularly for black and Hispanic students. The size of the gender gap in some cases is even larger than the racial gap. For example, the gender gap (female-male difference) in college enrollment among black students in 2019 was 11pp, while the white-black male (female) racial gap was 8.3 (7.4 pp). In addition, it is interesting to highlight that black and Hispanic females are more likely to enroll in postsecondary education than white males. The fact that males and females within the same racial group display large differences in college enrollment

[9] We use data from the American Community Survey (ACS), which is an annual demographic survey conducted by the US Census Bureau. In addition to demographic and family background characteristics, this survey contains detailed information about educational attainment and labor market outcomes.

[10] The authors also point out that the reduction in these racial gaps appears to be largely driven by students on the margin of no postsecondary enrollment and enrollment into non-degree-granting programs.

Figure 1: Probability of Any College Enrollment for Ages 18-24



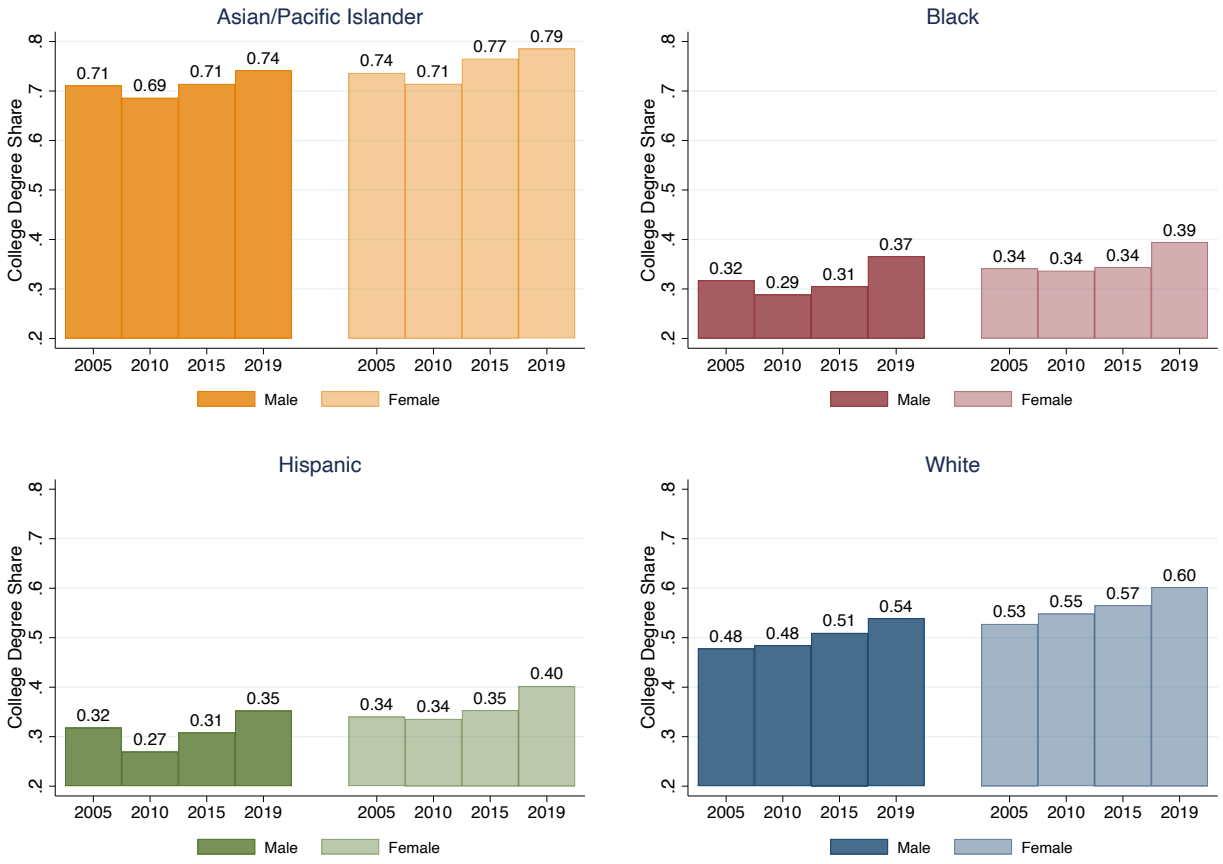
This figure displays the weighted share of individuals by demographic group in the United States aged 18-24 to have enrolled in at least some college in 2005, 2010, 2015, and 2019.

while at the same time facing a priori similar family background characteristics and overall barriers to higher education access suggests that the mechanisms driving racial disparities in postsecondary education enrollment may have more nuances than previously thought.

2.2 Racial Disparities in Bachelor's Degree Conditional on Enrollment in Postsecondary Education

Racial gaps are larger when focusing on the share of postsecondary education enrollees aged 24-30 that attained at least a Bachelor's degree conditional on having received at least some college credit. For example, Figure 2 shows that 0.37 (0.40) of age 24-30 black males (females) with at least some college credit had attained a Bachelor's degree in 2019, while the analogous probability for white males (females) was 0.54 (0.60) (i.e., a gap of -17.3 (-20.7) pp). Similar patterns are documented between Hispanic and white students. While the data suggest

Figure 2: Probability of Attaining at Least a Bachelor's Degree Conditional on Any College Enrollment for Ages 24-30



This figure displays the weighted shares by demographic group of individuals aged 24-30 that had enrolled in at least some college to have completed at least a Bachelor's degree in 2005, 2010, 2015, and 2019.

improvements in terms of graduation rates of underrepresented minorities between 2005 and 2019, these trends tend to be much more modest than those documented for enrollment, and further these increases are less than those documented for white students.[11] This implies that the racial gaps in obtaining a degree conditional on enrollment have slightly increased during this period. Finally, while gender gaps in Bachelor's degree attainment within racial groups tend to be small relative to college enrollment, they are still sizable. It is worth noting that these smaller gender gaps are largely a result of selection, as the sample used to generate Figure 2 includes only individuals that received at least some college credit.

[11]It is also worth noting that the U-shape in the Bachelor's degree share visible over this time period for many demographic groups is largely driven by non-traditionally college-aged individuals that enrolled in postsecondary education for reasons related to the Great Recession, but may not have completed at least a Bachelor's degree. For example, enrollment in two-year institutions peaked in 2010 (Juszkiewicz, 2020).

2.3 Understanding the Different Racial Patterns in Enrollment and Graduation

At least two potential explanations are consistent with larger racial gaps in graduation (conditional on receiving at least some college credit) than in postsecondary enrollment. First, underrepresented minority students may be proportionally more likely than white students to enroll in institutions that do not grant Bachelor's degrees as a terminal degree (e.g. two-year institutions). Second, underrepresented minorities may be less likely to graduate from four-year institutions conditional on enrollment. In order to explore the importance of these two explanations in contributing to disparities in postsecondary educational attainment, we use enrollment and graduation data from the Integrated Postsecondary Education Data System (IPEDS). Conducted by the National Center for Education Statistics, IPEDS is a system of surveys of all postsecondary institutions across the United States that contains detailed information on admissions, enrollment, completions, and many other institutional characteristics.

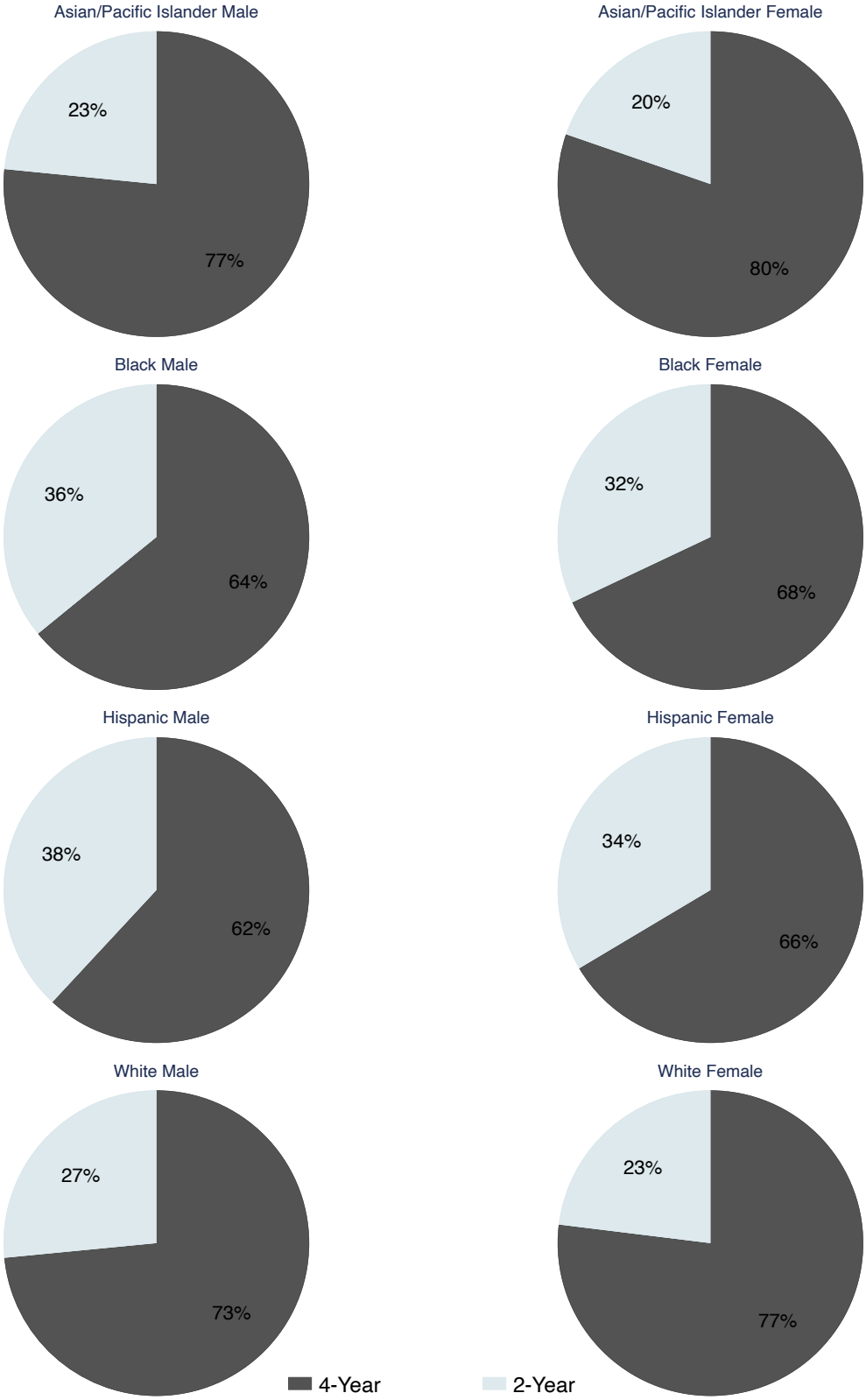
Figure 3 breaks down first-time, full-time, degree-seeking enrollment into levels (i.e. four-year vs. two-year) by both race and gender.[12] Each row of the figure represents a different race, and the left subfigure in each row corresponds to males, while the right subfigure corresponds to females. These figures demonstrate that among all black males (females) enrolled in postsecondary education, 36% (32%) attended two-year colleges, while only 27% (23%) of white enrollees attended these institutions. These shares imply a gap of around 9 pp. Hispanics are even more likely to enroll in two-year institutions conditional on any postsecondary enrollment, with 38% of males and 34% of females doing so. On the contrary, Asian and Pacific Islander students display the lowest shares of two-year college enrollment conditional on attending any postsecondary institution. Finally, in terms of gender gaps within race, we find that among underrepresented minorities, females are approximately 4 pp more likely to attend four-year institutions relative their male counterparts, and the size of this gap is almost half the size of the racial gap in this type of enrollment.[13]

In terms of graduation outcomes conditional on enrollment in four-year institutions, Figure 4 shows that underrepresented minorities are substantially less likely to graduate in 150% of normal time than white students. More specifically, this figure presents six-year graduation rates by race and gender at four-year institutions for the cohort that first enrolled in those

[12]These figures were generated using IPEDS data from the year 2017-2018. In total, 1,769,021 (70%) students enrolled in four-year universities and 674,417 (27.0%) students enrolled in two-year universities. The remaining 3% of total postsecondary enrollment was into less than two-year institutions, but these enrollees are excluded from Figure 3.

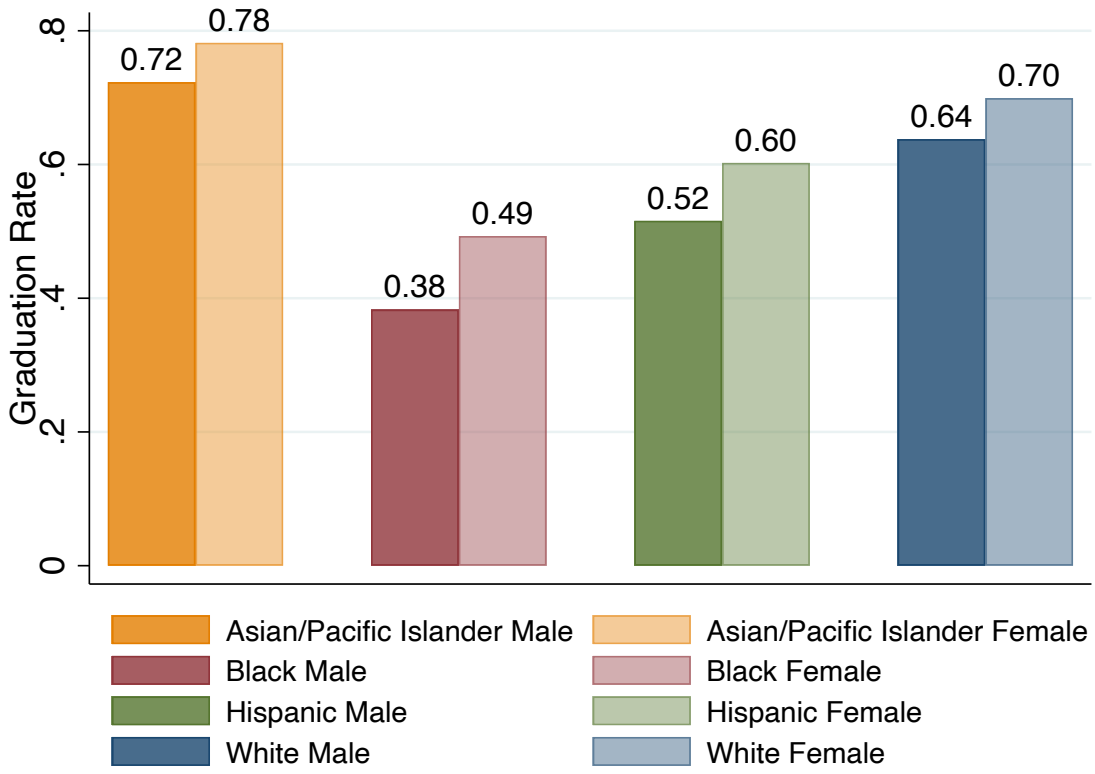
[13]The gender gap for white (Asian/Pacific Islander) students is 4 (3) pp.

Figure 3: Composition of Enrollment by Race, Gender and Level



This figure describes the breakdown of college enrollment by level for each race and gender in 2017-2018.

Figure 4: Graduation Rates in 150% of Normal Time by Race and Gender at Four-Year Institutions



This figure displays graduation rates in 150% of normal completion time by race and gender at four-year institutions for the cohort that first enrolled in postsecondary education in 2013-2014.

institutions in 2013-2014. Black males (females) are 26 (21) pp less likely to obtain a bachelor's degree in 150% of normal time relative to their white counterparts, while the Hispanic-white male (female) gap is 12 (10) pp. Finally, Asian/Pacific Islander students display the highest completion rates. To conclude, it is important to highlight that differences in completion rates by gender within racial group are also substantial. URM Females are approximately 10 pp more likely than males to graduate from four-year institutions conditional on enrollment, representing approximately half the size of the URM-White gap.

In summary, the differential racial patterns across enrollment and graduation outcomes are likely a function of minorities being less likely to enroll in four-year institutions conditional on enrollment in any college, and also by their lower graduation rates from four-year institutions conditional on being enrolled in them. Finally, gender gaps within racial groups are sizable and highly comparable to gaps across racial groups.

2.4 Racial Gaps by Institutional Ranking

In order to get a sense of racial disparities by institution ranking, Figure 5 provides the racial composition of first-time, full-time, degree-seeking, postsecondary enrollees in 2017-2018 by institution rank. Each subfigure represents a different ranking tier within the top 80 institutions on the most recent US News Best Colleges list. The top left panel corresponds to institutions ranked 1-20, the top right panel corresponds to institutions ranked 21-40, the bottom left panel corresponds to institutions ranked 41-60, and the bottom right panel corresponds to institutions ranked 61-80. The representation of black students across these rankings follows a U-shape, where 7.2% of the students in the top 20 institutions are black, but this proportion is reduced to 4.4% and 5.35% in institutions ranked 21-40 and 41-60, respectively, and it increases back to 6.5% in institutions ranked 61-80.[14] As Arcidiacono & Lovenheim (2016) point out, this empirical regularity could be driven by racial preferences in college admissions.[15]

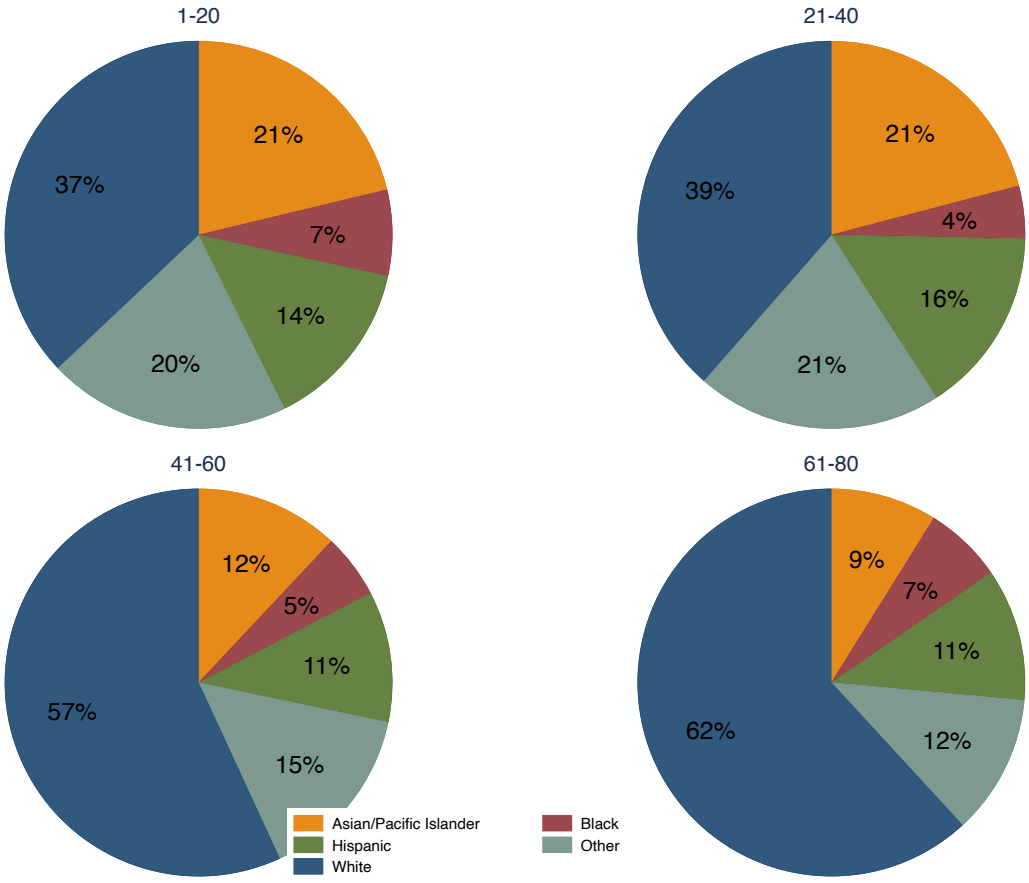
The share of Hispanics across institution ranking tiers is somewhat different when compared to black students. Their representation is greater in the top-40 institutions (approximately 15%) than in the institutions ranked 41-80 (approximately 10%). Asian/Pacific Islanders also show a larger share (approximately 21%) in highly ranked universities (i.e. top 40) relative to lower ranks (i.e. ranked 41-80), which is the opposite of what is observed for white students.

Finally, Figure 6 displays the racial distribution across ranking tiers for only female students in order to explore whether the racial composition of these institutions differs across genders. Relative to Figure 5, we see that black and Hispanic females are better represented than males across all ranking tiers. This empirical finding is consistent with the fact that URM females tend to be better prepared for college than their male counterparts (Aucejo & James, 2019). This pattern of enrollment among URMs stands in contrast to the case of white females, who are underrepresented relative to white males in the highest tier.

[14] The increase in the share of black enrollees in institutions ranked 61-80 relative to institutions ranked 41-60 is partially driven by the inclusion of Howard University, a Historically Black College or University (HBCU) for which over 90% of first-time enrollees in 2017-2018 were black, and for which nearly 75% of these black enrollees were women.

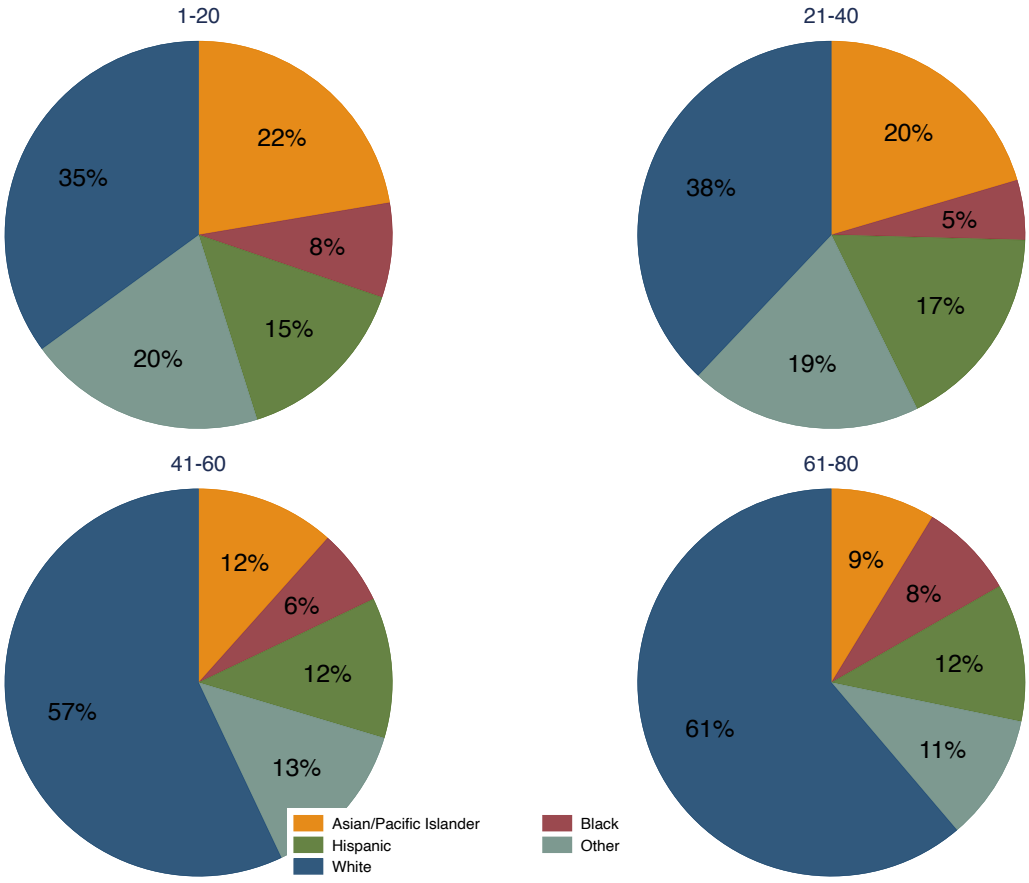
[15] Affirmative action at the highest ranked schools can reduce the proportion of black students in the schools ranked just below them for two main reasons. First, black students may prefer not to enroll in mid-ranked institutions because they do not have a critical mass of minority students, to the extent that they were absorbed by better-ranked institutions. Second, mid-tier institutions may be less vigorous in implementing affirmative action.

Figure 5: Racial Composition of Enrollees by Institution Ranking



This figure describes the racial composition of first-time, full-time, degree-seeking enrollees in 2017-2018. The subfigures each represent a different ranking tier for the top 80 institutions on the most recent US News Best Colleges list. The top left panel corresponds to institutions ranked 1-20, the top right right panel corresponds to institutions ranked 21-40, the bottom left panel corresponds to institutions ranked 41-60, and the bottom right panel corresponds to institutions ranked 61-80.

Figure 6: Racial Composition of Female Enrollees by Institution Ranking



This figure describes the racial composition of first-time, full-time, degree-seeking, female enrollees in 2017-2018. The subfigures each represent a different ranking tier for the top 80 institutions on the most recent US News Best Colleges list. The top left panel corresponds to institutions ranked 1-20, the top right right panel corresponds to institutions ranked 21-40, the bottom left panel corresponds to institutions ranked 41-60, and the bottom right panel corresponds to institutions ranked 61-80.

2.5 Gaps in Majors

In order to characterize differences in fields of study across racial and gender groups, Figure 7 shows the proportion of graduates by race and gender that obtained their primary degree in a STEM field.[16] Black (Hispanic) male graduates are 6 (2) pp less likely to obtain a degree in a STEM field relative to white male students, while Asian/Pacific Islander male students are among the most likely to obtain a STEM degree (25%). The presence of these gaps is important because they may contribute to labor market outcomes, given that STEM fields tend to be associated with higher-paying jobs (Altonji *et al.*, 2016). To conclude, the share of black, Hispanic and white females obtaining a STEM degree is quite comparable across groups, though females are substantially less likely than males of their same racial group to pursue a degree in a STEM field (approximately 50% less).[17] However, it is interesting to note that conditional on graduation, Asian females are more likely to receive a STEM degree relative to black and Hispanic male students.

In summary, the descriptive statistics displayed in this section indicate that while there has been some progress regarding the participation of underrepresented minorities in postsecondary education over the last two decades, racial disparities are still substantial. Finally, it is important to highlight that gender gaps in postsecondary participation within racial groups are even larger than current racial gaps. Therefore, a better understanding of the racial gaps in higher education also requires an understanding of why large gender gaps arise within racial groups.

3 Primary Barriers to Postsecondary Education Access

3.1 The Role of Financial Constraints

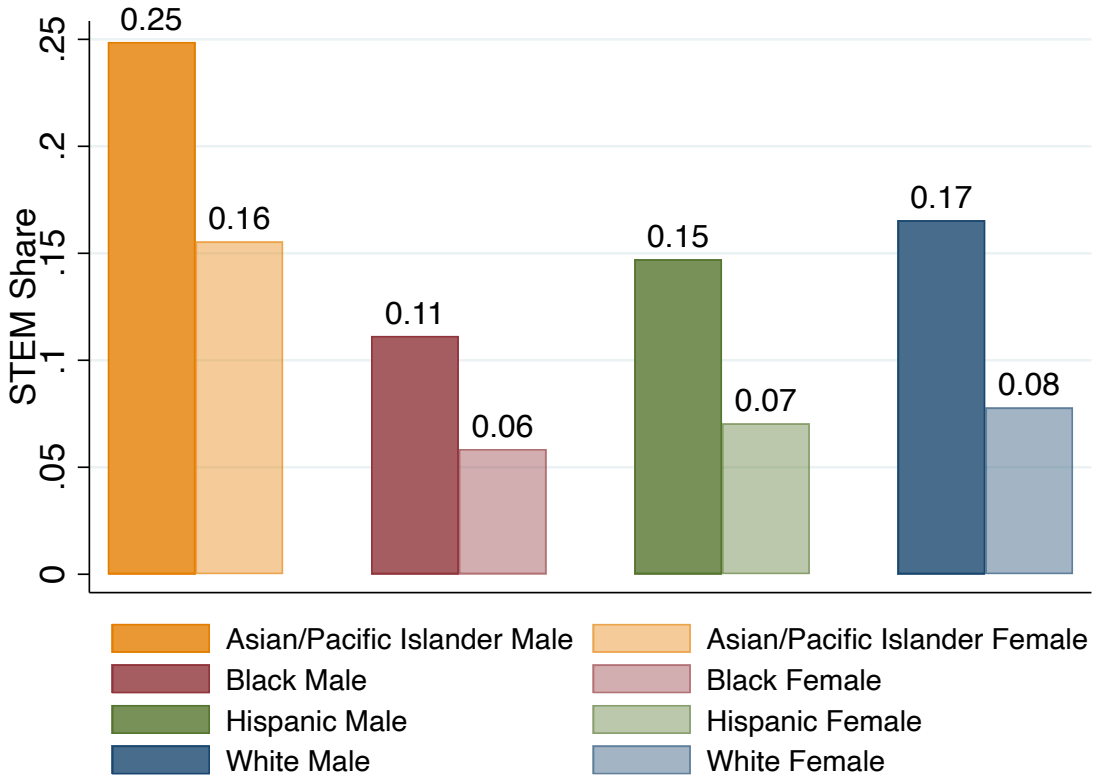
Inflation-adjusted tuition and fees at public and private four-year colleges have more than doubled since 1990, representing 21% of the median annual household income for black families in 2020.[18] This proportion is almost two times larger than in 2000, when the cost of tuition

[16] Fields of study are classified as STEM based on whether or not they appear on the US Department of Homeland Security STEM Designated Degree Program List for the 2010 Classification of Instructional Program (CIP) codes.

[17] It is worth noting that there is some heterogeneity in these patterns within subcategories of STEM. For example, black-white gaps in the attainment of engineering degrees in particular are larger than when we focus on all STEM degrees. Further, there are virtually no gender gaps within any race in biological and biomedical sciences.

[18] See "Trends in College Pricing and Student Aid 2020," College Board (2020) for a detailed analysis on trends in college prices. In a similar vein, the article "College Tuition Is Rising at Twice the Inflation

Figure 7: Composition of 2017-2018 Bachelor's Degree Awardees by Degree Type



This figure describes the share of individuals by demographic group awarded Bachelor's degrees in 2017-2018 for which a STEM field of study was listed as the primary major.

and fees was 12% of median black household income.[19] Similarly, the cost for white families has increased as a share of median household income to 13%, up from 8% in 2000.[20] The immediate consequence of this empirical regularity is a higher dependence on federal and private loans to pay for postsecondary education, which has an asymmetric effect across racial groups (Chakrabarti *et al.*, 2020).[21] For example, Scott-Clayton & Li (2016) show that black college graduates owe $7,400 more on average than their white peers ($23,400 versus $16,000, where the averages include non-borrowers) at the moment they earn their bachelor's degree.

The impact of borrowing constraints on educational attainment can be tackled from two different perspectives. One perspective is the increasing concern about the importance of credit constraints at the time of enrolling in college (or while in college) given the rising cost of higher education. To the extent that certain demographic groups may face more stringent borrowing constraints at the time that they enroll their children in college (or while their children are in college), then this channel could be important in shaping current racial gaps in educational attainment. A second approach is to study the problem of credit constraints from a life-cycle perspective, where instead of focusing on relaxing borrowing limitations at a given point in time (e.g. when enrolling in college), the analysis is centered on alleviating them at multiple stages of the schooling career. Therefore, parents can make persistent investments in the human capital of their children. This perspective tends to consider that focusing on tackling borrowing constraints at one specific stage of the schooling career is likely to have a small impact on educational outcomes.

The evidence regarding the importance of credit constraints at the time of enrolling in college is somewhat mixed. For example Hilger (2016), which analyzes how parental layoffs affect children's long-term outcomes in the United States, shows that parental layoffs during adolescence have very small causal effects on children's long-term outcomes. This study concludes that late childhood parental borrowing constraints do not seem important for explaining educational outcomes.[22] In a similar vein, using federal tax records to examine the

Rate—While Students Learn At Home," (Forbes, August 31, 2020) indicates that the average cost of attending a four-year college or university in the United States rose by more than twice the rate of inflation between the 1985-86 and 2017-18 academic years.

[19]However, it is important to point out that in many cases colleges offer large discounts, particularly to low-income students (Fillmore, 2016). In 2013-2014, institutions provided $37.9 billion in grant aid, which exceeded the size of the Pell grant program ($33.7 billions). Fillmore (2016) also indicates that 69% of the freshmen at private and selective public universities received on average discounts equal to 36% of the average sticker price in 2007-2008.

[20]Source: "The Student Loan Debt Crisis is Reinforcing the Racial Wealth Gap," Joint Economic Committee, United State Congress.

[21]Chakrabarti *et al.* (2020) provide an analysis on how the increase in tuition and fees has disproportionally affected minority students in terms of loan debt size.

[22]Hilger (2016) finds that parental layoffs reduce annual college enrollment by less than half of one percentage

college outcomes of children whose parents won a state lottery between 2000 and 2013, Bulman *et al.* (2021) find that small-to-moderate increases in resources (which should help to overcome most immediate household financial constraints) have little effect on college attendance. More specifically, their analysis rules out that lottery wins averaging $50,000 (before taxes) increase enrollment by more than 0.4 percentage points. Moreover, they show that responsiveness is, if anything, smaller among households with lower earnings, less wealth, and with the highest propensity to be credit constrained. They conclude that their estimates are not particularly consistent with children forgoing college due to a lack of household resources alone.[23]

However, a group of studies have shown that expanding access to credit, need-based grants, and subsidies can help to increase college enrollment (Dynarski, Susan, 2000; Dynarski, 2003; Castleman & Long, 2016; Teng Sun & Yannelis, 2016; Bettinger *et al.*, 2019). For example, Teng Sun & Yannelis (2016) study the impact of banking deregulation that resulted in increased credit supply for college enrollment, and show that enrollment increased by roughly 2.6 percentage points (4.9%). In terms of grant availability, findings in Castleman & Long (2016) indicate that an additional $1,300 in grant aid eligibility (in 2000 dollars), within the context of the Florida Student Access Grant, increased the probability of enrollment at a public four-year university by 3.2 percentage points. Similarly, Bettinger *et al.* (2019) finds that California's Cal Grant significantly increases the probability of earning a bachelor's or graduate degree, though they do not find that the Cal Grant program has meaningful effects on overall college attendance. Finally, a large set of studies (Barr, 2019; Denning & Jones, 2021; Black *et al.*, 2020a; Denning, 2019; Denning, 2017 among others) have shown that increasing borrowing constraints among college enrollees has led to increases in borrowing, suggesting the presence of credit constraints. For example, Denning & Jones (2021) use administrative data from all public universities in Utah to analyze how eligibility for higher student loan amounts affects borrowing outcomes for enrolled college students. They show that having access to higher loan limits does increase borrowing. In particular, they find that at least one quarter of borrowers in their sample change their student loan amounts in response to higher student loan limits, suggesting that credit constraints are important for this group of students. Similarly, Black *et al.* (2020a) find that higher loan limits significantly increased constrained students' year-to-year college persistence and, among four-year entrants, significantly increased bachelor's degree receipt. The authors argue that these gains are consistent with models of educational credit constraints and suggest that providing certain students with

point for individuals that are 18-22 years old.

[23] More specifically, the analysis reveals modest effects for wins sufficient to cover the cost of college and for households that are most likely to face constraints.

additional liquidity enables them to make costly human capital investments that yield positive returns.

The life cycle approach to studying the role of borrowing constraints hinges on the importance that it assigns to dynamic complementarities in child investments (i.e. complementarities between early and late investments in human capital). If families are constrained when their children are young, then they may be unable to benefit from college-related subsidies or loans, because early barriers may make late investments unproductive (Hai & Heckman, 2017; Caucutt & Lochner, 2020). For example, Caucutt & Lochner (2020) show that when parents of college-age children experience a large unanticipated income shock, its impact on child educational outcomes tends to be small. However, they argue that these effects are much larger if the income transfer is anticipated and parents can adjust early investments accordingly. Finally, they conclude that while eliminating credit constraints at a single stage of the human capital accumulation process is likely to have small effects on college enrollment, removing all life-cycle borrowing constraints simultaneously would generate substantial increases in human capital investments and educational attainment.

In summary, the literature suggests that financial constraints can be important in explaining college educational outcomes. However, the mechanisms through which they operate may be more complex than previously thought. Given that black or Hispanic families are more likely to face borrowing constraints due to their lower levels of wealth on average, financial constraints could be playing an important role in determining racial disparities in college enrollment.[24] However, the fact that black and Hispanic females are substantially more likely than their male counterparts to enroll in postsecondary education, when both males and females a priori face similar credit constraints, suggests that other factors are also shaping racial inequalities in college education.

3.2 Informational Frictions

Hoxby & Avery (2013) show that a large fraction of high-achieving students from low-income families do not apply to any selective college or university. This empirical regularity is somewhat puzzling given that selective institutions generally offer high-achieving, low-income students sufficient financial aid such that they would ultimately end up paying less to attend a

[24] White families' median and mean family wealth are $188,200 and $983,400, respectively. Black families' median and mean wealth are $24,100 and $142,500, respectively. Finally, Hispanic families' median and mean wealth are $36,100 and $165,500, respectively. Source: Bhutta, Neil, Andrew C. Chang, Lisa J. Dettling, and Joanne W. Hsu. September 28, 2020. "Disparities in Wealth by Race and Ethnicity in the 2019 Survey of Consumer Finances." The Federal Reserve Board of the United States.

selective institution relative to the less selective/non-selective postsecondary institutions that most of these students attend instead. In this regard, Hoxby & Turner (2015) show that providing information about college admissions and financial aid to high-ability, low-income students increased applications and attendance at selective institutions.

Given this fact, it is reasonable to ask whether barriers associated with information frictions at the time of applying to college could shape racial inequalities in selective institutions.[25] Hoxby & Avery (2013) show that underrepresented minorities constitute a relatively small fraction of all high-achieving, low-income students.[26] Therefore, overcoming frictions for this group of students in particular would be unlikely to reduce racial disparities at selective institutions, and if anything might further exacerbate them. In a similar vein, Black *et al.* (2020b) analyzes application patterns across racial and ethnic groups in order to determine whether students from different demographic groups have biased beliefs over college admission probabilities. To study this hypothesis, the authors rely on an institutional feature of the Texas public university system, where two types of admission systems are used: a percent plan and holistic admissions. The percent plan established that students who graduated from the top 10% of their senior class at public high schools were automatically admitted to all Texas public universities (including the most selective campuses). Applicants that do not qualify for the top 10% program are then considered for admission under a more traditional, holistic process. The authors compare the application behavior of students above and below the cutoff value (10%) within race, given that those above the cutoff value do not face any uncertainty associated with the college admissions process, while this is not the case for those below the cutoff value. The findings show that graduating in the top 10 percent of a high school class is associated with a similar increase in the likelihood of applying to a flagship institution for black, Hispanic and white students. If information frictions related to admission rates at selective institutions were substantially different across racial groups, then we should expect larger effects for minorities, but this is not the case.

Finally, Schneider & Saw (2016) also investigate the factors that influence enrollment in postsecondary education across racial groups with a particular emphasis on the importance of college knowledge. More specifically, they show that interventions designed to increase students' information about postsecondary education, such as meeting a college counselor, have a limited impact on college enrollment and the racial gap. They conclude by highlighting the importance of academic preparation in understanding determinants of college enrollment

[25]The fact that minorities are more likely to enroll in two-year institutions could be another symptom of information frictions.

[26]Only 15.4 percent of the students in this group are underrepresented minorities.

across racial groups, which is our next object of study.

3.3 Academic Preparation/Skills

Aucejo & James (2019) show that differences in human capital play an important role in explaining racial gaps in college enrollment. Based on data from the NLSY97, they present a decomposition analysis showing that equalizing proxies for academic skills of black and white students can explain a large share of the racial gap in college enrollment. This finding regarding the importance of pre-entry skills is consistent with the larger literature that considers black-white success gaps in different settings (e.g., see Neal & Johnson, 1996; Rivkin, 1995; Cameron & Heckman, 2001).

Differences in academic achievement across racial groups are present at all stages of compulsory education. For example, the share of black (Hispanic) fourth graders performing below basic level in reading on the National Assessment of Educational Progress (NAEP) of 2019 was 52% (45%), while the corresponding share for white students was 23%.[27] Similarly, if we focus on twelfth graders, the shares of students performing below basic level in reading were 50%, 39% and 21% for black, Hispanic and white students, respectively. Performance in mathematics follows a very similar pattern, where 66% (54%) of black (Hispanic) students in grade 12 performed below basic level, while this was the case for 29% of white students.

Consistent with these patterns, evidence from the High School Longitudinal Study of 2009 shows that the percentage of white students earning any credit in Advanced Placement or International Baccalaureate courses is 40%, while for black and Hispanic students these shares are 23% and 34%, respectively. Moreover, Riegle-Crumb & Grodsky (2010) show that the mathematics achievement gap, particularly for black and Hispanic students, is most pronounced among students completing the most demanding courses.

Therefore, it is expected that these racial differences in academic preparation will not only impact college enrollment, but also performance while in college. In this regard, Arcidiacono & Koedel (2014) show in the context of the Missouri University system that the racial gap in college graduation for black-white women is -15 percentage points and for men it is -18 percentage points, and these gaps are mostly explained by differences in pre-college skills (i.e. 65.3 percent of the gap for women and 85.7 percent of the gap for men). Similarly, Oreopoulos (2021) shows descriptive evidence that high school performance is the main predictor of college performance when compared to other factors. Therefore, Oreopoulos (2021) concludes that

[27]The National Assessment of Educational Progress (NAEP) evaluates student performance in grades 4, 8, and 12 in both public and private schools. Reading and math assessments have been administered since 1992.

improvements in college student performance are likely to be modest if *"the characteristics most associated with performance are fixed at the time of entry or they have limited scope for change."*

4 The Role of Math and English Skills in Explaining the Racial Gap in Educational Achievement

Given the relevance of skills to explain racial and gender gaps in educational attainment, we explore what types of academic skills play a larger role in predicting educational attainment and how they impact racial and gender gaps. In particular, we focus on the relative importance of math and English skills. While Aucejo & James (2021) show that verbal skills are more important than math skills to explain college enrollment and graduation outcomes in England, there is not much evidence on the differential impact of these skills in the US context.

To perform this analysis, we rely on data from the National Longitudinal Survey of Youth of 1997 (NLSY97). The NLSY97 is a longitudinal survey of a nationally representative sample of individuals born between 1980-1984 that collects extensive information about demographic and household characteristics, educational attainment, and labor market outcomes. Two features of this dataset make it particularly attractive for this analysis. First, it contains high school transcript details for a subsample of the individuals. Second, it collects vast information on the individuals' background characteristics and educational experiences.

Table 1: Summary Statistics

	Black			Hispanic			non-URM			Racial Gaps	
	Total	Female	Diff.	Total	Female	Diff.	Total	Female	Diff.	Black	Hispanic
College Enrollment	0.74	0.79	-0.12***	0.67	0.72	-0.09**	0.75	0.78	-0.07***	0.01	0.07***
College Degree	0.33	0.37	-0.10***	0.28	0.35	-0.14***	0.41	0.48	-0.13***	0.08***	0.13***
Degree | Enrollment	0.45	0.47	-0.06	0.41	0.48	-0.15***	0.55	0.61	-0.11***	0.10***	0.14***
Mother Enrollment	0.40	0.40	0.01	0.30	0.31	-0.01	0.53	0.52	0.02	0.13***	0.23***
Absence of a Parent	0.70	0.72	-0.05	0.38	0.42	-0.08*	0.40	0.42	-0.04*	-0.31***	0.01
Ever Suspended	0.44	0.38	0.14***	0.30	0.22	0.18***	0.21	0.13	0.17***	-0.23***	-0.09***
Ever Attacked	0.38	0.31	0.18***	0.29	0.23	0.14***	0.25	0.17	0.16***	-0.14***	-0.05**
Algebra 1 GPA	2.21	2.35	-0.30***	2.42	2.49	-0.16**	2.58	2.70	-0.23***	0.37***	0.17***
9th Grade English GPA	2.33	2.52	-0.43***	2.53	2.63	-0.22***	2.70	2.89	-0.39***	0.37***	0.17***

This table displays a set of summary statistics across races and across genders within race from the NLSY97. The first panel corresponds to black individuals, the second panel to Hispanic individuals, the third panel to non-URM individuals, and the fourth panel to racial gaps between non-URM individuals and black and Hispanic individuals. The first column in each of the first three panels displays sample means for a variety of characteristics for all individuals of a given race, the second for only females of the given race, and the third displays the results of a difference-in-means test across genders for the given race. In the fourth panel, the columns correspond to the results of a difference-in-means test between non-URM individuals and black and Hispanic individuals, respectively. "Mother Enrollment" represents the probability that the mother of an individual from a given demographic group ever enrolled in college, "Absence of a Parent" represents the probability that an individual from a given demographic group was not living with both biological parents at age 17, and "Ever Attacked" represents the probability that an individual from a given demographic group ever attacked someone.

Table 1 displays summary statistics by race and gender for NLSY97 respondents conditional on having high school transcript records available. The aim is to characterize educational attainment, performance in math and English while in high school, and background characteristics across racial and gender groups within this sample. Racial and gender inequalities in educational attainment follow a similar pattern to those reported in Figures 1 and 2.[28] For example, the gender gap in postsecondary enrollment among black individuals is larger than the black-white gap. Moreover, it shows that black females are more likely to enroll in any type of college than white males. Also, black-white racial disparities become more important than gender disparities when considering obtaining a college degree conditional on any type of enrollment in postsecondary education. In terms of family background characteristics, black and Hispanic individuals are less likely to have a mother that enrolled in college than non-URMs, and black individuals are substantially less likely than Hispanic and non-URM individuals to belong to a family were both biological parents are present at home. Males, and in particular black males, are substantially more likely to have been suspended from school and to have attacked someone. Finally, to analyze academic performance in high school, we focus on Algebra 1 and English in grade 9 because these are classes that are taken by most students and are relatively comparable across high schools. The last two rows of Table 1 show the presence of large black-white (Hispanic-white) gaps in grade point averages in both English and math of around -0.37 (-0.17). Finally, it is also important to highlight that the gender gaps in performance are highly comparable to the racial gaps, where for example, the gender gaps in English tend to be larger than the racial gaps.

4.1 Explaining Racial and Gender Differences in College Degree

In order to illustrate how academic performance in math and English could help to explain racial and gender gaps in graduating from a four-year college, we performed a simple regression analysis. In particular, we aim to understand how performance in algebra 1 and English in grade 9 correlates with college graduation and to what extent it contributes to explaining gaps across demographic groups. Column (1) of Table 2 shows a baseline specification where the binary variable college degree is regressed on race and gender. Results show, as expected, large gender and racial gaps in college graduation.

Column (2) adds performance in algebra 1 and English in grade 9. Three main takeaways can be obtained from this specification. First, the gap between non-URM and black individuals

[28] There are some differences in the levels of attainment because this sample does not condition on any age range.

Table 2: Attainment of Bachelor's Degree or Higher

	(1)	(2)	(3)	(4)
Male	-0.125***	-0.048**	-0.071***	-0.049**
	(0.024)	(0.022)	(0.022)	(0.022)
Black	-0.083***	-0.008	0.029	0.050*
	(0.031)	(0.030)	(0.029)	(0.029)
Hispanic	-0.116***	-0.061*	-0.034	-0.026
	(0.036)	(0.035)	(0.034)	(0.034)
Male*Black	0.000	0.015	0.024	0.022
	(0.044)	(0.042)	(0.041)	(0.041)
Male*Hispanic	-0.019	-0.055	-0.049	-0.042
	(0.048)	(0.047)	(0.045)	(0.045)
Algebra 1 GPA		0.077***	0.069***	0.062***
		(0.011)	(0.010)	(0.010)
English GPA		0.152***	0.133***	0.123***
		(0.011)	(0.011)	(0.011)
Mother HS			-0.001	-0.003
			(0.026)	(0.026)
Mother Enrolled			0.126***	0.125***
			(0.028)	(0.028)
Mother 4+ Years			0.234***	0.227***
			(0.028)	(0.028)
Absence of a Parent			-0.125***	-0.108***
			(0.018)	(0.018)
Ever Suspended				-0.102***
				(0.020)
Ever Attacked				-0.059***
				(0.020)
Mean	0.39	0.39	0.39	0.39
R2	0.03	0.16	0.21	0.23
N	3,009	3,009	3,009	3,009

This table displays a set of regression results for which the dependent variable is an indicator that represents whether an individual ever attained at least a Bachelor's degree. The coefficients in the first column represent race and gender, while subsequent columns include additional coefficients that represent household characteristics, behavior, and performance in high school Algebra 1 and English classes. Standard errors are robust to heteroskedasticity.

in college completion is fully explained once we account for academic performance, while almost 50% of the gap between Hispanic and non-URM individuals is explained. Second, the gender gap is reduced by more than 60%. Third, the effect of performance in English is almost twice the size of the effect of math. For example, moving from a C to B in Algebra 1 is associated with an increase in the probability of obtaining a college degree by 7.7 pp while a similar increase in English leads to an effect of 15.2 pp. These findings are consistent with Aucejo & James (2021), where the authors show similar differences in the role of math and verbal skills in explaining college enrollment in the context of the British educational system.[29] In order to illustrate the differential contribution of each skill in explaining the racial gap, we performed an Oaxaca decomposition. This analysis indicates that performance in English explains 70% (21%) of the black-white (Hispanic-white) gap in college degree attainment while performance in Algebra 1 explains approximately 30% (9%) of the gap.

The fact that English shows much larger effects than math begs the question whether performance in English is capturing some other effect like family background characteristics or other types of skills (e.g., soft skills). To this end, column (3) includes controls for mother education and family composition (i.e. whether the individual lived with both biological parents at the age of 17), while column (4) further controls for rough proxies of soft skills (i.e. ever suspended in school and being involved in fights). Results indicate that adding family background characteristics and proxies for soft skills have almost no impact on the importance of English in grade 9 relative to algebra 1.[30] This is important because much of the literature regarding the role of math and verbal skills on labor market outcomes has focused on the importance of math skills (Levine & Zimmerman, 2020; Rose & Betts, 2004; Joensen & H.S., 2009; Altonji *et al.*, 2012; Dougherty *et al.*, 2015), but neglecting to directly consider the direct contribution of verbal skills to educational attainment may substantially understate the impact of verbal skills on longer-term outcomes. Partially motivated by these studies, policymakers also tend to prioritize the development of math skills over verbal skills (Loveless, 2008; Long *et al.*, 2012), but the results of this analysis suggest that programs focused on improvements in verbal skills may be significantly more effective in reducing racial disparities in postsecondary education.

In summary, the findings of this section suggest that math and English skills display large

[29]If we instrument performance in algebra 1 and English in grade 9 with ASVAB test scores (i.e. mathematical knowledge -or arithmetic reasoning- and paragraph comprehension) in order to account for problems of measurement error, the effect of English becomes even larger relative to the effect of algebra 1.

[30]It is worth noting that the increase in the magnitude of the male coefficient in between column 2 and column 3 is not driven by gender differences in the sample in parental presence or education. Instead, this occurs because the effect of a mother graduating high school (relative to not graduating high school) has no effect on the college degree attainment of a female child, but for a male child is associated with an increase in the probability of degree attainment.

differences in their impact on college graduation outcomes and in their role in explaining black-white disparities in educational attainment. Future research should focus on further understanding the role of different types of skills in explaining educational outcomes in order to develop more effective policies to close educational gaps in the population.

5 Conclusions

This paper shows that while there have been substantial improvements in closing racial gaps in college enrollment, large differences in graduation outcomes still persist. We also show that gender gaps within race are in some cases even larger than the racial gaps. This empirical regularity suggests that bringing the racial-gender dimension to the center of the analysis may be important to understand the main drivers of inequalities in higher education.

We presented preliminary evidence suggesting that English skills are substantially more important than math skills to explain racial disparities in college degree completion. In this regard, we believe that a better understanding of what type of skills are most relevant in explaining education outcomes could help to develop more efficient policies in closing current racial gaps in educational attainment.

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