

## High School Preparation and Post-Secondary Educational Attainment: An Analysis of Race and Gender Differences for a Cohort of Missouri Public High School Students

Darrin DeChane

Takako Nomi\*

Michael Podgursky

Sinquefield Center for Applied Economic Research  
Saint Louis University

### Abstract

This paper is a descriptive analysis of the 2009 Missouri public high school freshman cohort who were tracked through high school and into post-secondary education for six years beyond on-time graduation in Spring 2014. Our focus is post-secondary degree attainment gaps between four student populations which together comprise 94 percent of public school students in Missouri: white males, white females, black males, and black females. To measure pre-college academic preparation, we construct a composite measure based on various 8<sup>th</sup>-grade and high school test scores, GPA and attendance, which we label Academic Index (AI). There are large black-white gaps in AI, with the largest difference for black males, who are heavily concentrated in the lowest quintile. College enrollment is higher for minority students of both genders in the average and lower AI quintiles, but this enrollment advantage completely disappears for degree completion. An important finding is the much lower performance of high-achieving black males. While only 12 percent of black males are in the top two AI quintiles, their post-secondary degree attainment is well below that of their AI quintile peers. Controlling for academic preparation, black males also underperform whites and black females regardless of the type of initial post-secondary education institution entered. While pre-college preparation can explain most within-gender racial gaps in degree completion, a significant unexplained share remains.

JEL codes: I21, I24

Key words: Race and Gender Education Attainment Gaps, Post-Secondary Education

Working Paper 22-03

Date: July 19, 2022

*The authors gratefully acknowledge the Missouri Department of Elementary and Secondary Education (DESE) for providing the deidentified data for this study. Any opinions expressed here are those of the authors and not those of the center or DESE. Research disseminated by SCAER may include views on policy, but the center itself takes no policy positions.*

# High School Preparation and Post-Secondary Educational Attainment: An Analysis of Race and Gender Differences for a Cohort of Missouri Public High School Students

Darrin DeChane, Takako Nomi\*, Michael Podgursky  
Sinquefeld Center for Applied Economic Research  
Saint Louis University

## Abstract

This paper is a descriptive analysis of the 2009 Missouri public high school freshman cohort who were tracked through high school and into post-secondary education for six years beyond on-time graduation in Spring 2014. Our focus is post-secondary degree attainment gaps between four student populations which together comprise 94 percent of public school students in Missouri: white males, white females, black males, and black females. To measure pre-college academic preparation, we construct a composite measure based on various 8<sup>th</sup>-grade and high school test scores, GPA and attendance, which we label Academic Index (AI). There are large black-white gaps in AI, with the largest difference for black males, who are heavily concentrated in the lowest quintile. College enrollment is higher for minority students of both genders in the average and lower AI quintiles, but this enrollment advantage completely disappears for degree completion. An important finding is the much lower performance of high-achieving black males. While only 12 percent of black males are in the top two AI quintiles, their post-secondary degree attainment is well below that of their AI quintile peers. Controlling for academic preparation, black males also underperform whites and black females regardless of the type of initial post-secondary education institution entered. While pre-college preparation can explain most within-gender racial gaps in degree completion, a significant unexplained share remains.

Key Words: Race and Gender Education Attainment Gaps, Post-Secondary Education

\*Corresponding Author: [tnomi@slu.edu](mailto:tnomi@slu.edu)

## **Introduction**

Post-secondary enrollment and educational attainment increased considerably in the US over the last several decades. Moreover, racial gaps in college enrollment between black and white young adults have slowly narrowed since 2000, due to greater increases in college enrollment by blacks versus whites. Specifically, college enrollment increased by six percentage points from 31% to 37% for black 18- to 24-year-olds, as compared to an increase of three percentage points from 39% to 42% for their white counterparts. This was preceded by a narrowing of race/ethnic gaps in high school graduation rates of 16- to 24-year-olds (US Department of Education, 2020).

By contrast, substantial disparities have persisted in degree completion rates between white and minority adults. For example, the disparity in bachelor's degree completion between black and white 24- and 29-year-olds has held steady at 19% for nearly two decades.<sup>1</sup> Importantly, for both race groups, gender gaps have risen considerably, and black males are falling further behind other race and gender groups. Between 2000 and 2015, black males made the smallest gains in bachelor's degree attainment, while all the other groups, and particularly females of both races have made substantial improvements in bachelor's degree completion (Reeves & Guyot, 2017). The steady overall racial gap in degree completion masks a relative decline of black males and gains by black females.

College completion disparities, and the lagging performance of black males, has important implications for income inequality. Educational attainment gaps are a key driver of income inequality (Goldin & Katz, 2008). Since the 1960's wage returns to education have grown steadily, and are currently higher in the U.S. than in many other developed countries

(Autor, 2014; Hanushek, Schwerdt, Wiederhold, & Woessmann, 2015). Gaps in compensation between jobs that do and do not require a college degree have also grown substantially (James, 2012), while low-skilled jobs are decreasing due to automation and offshoring (Goos, Manning, & Salomons, 2014). A recent study by Thompson (2021) finds that the explanatory power of human capital (e.g., degree attainment and test scores) for black-white earning gaps has grown substantially over the last few decades.

In this study, we investigate patterns of race and gender gaps in college enrollment, the choice of the first college, and degree attainment, and examine how the key pre-college factors explain disparities in college attendance and degree completion. This study makes several contributions to the existing literature. First, in estimating the relationships between student characteristics and post-secondary outcomes, many prior studies have not addressed sample selection or censoring bias. For example, previous studies examining college enrollment often use data based on high school graduates, hence exclude high school dropouts. Studies on racial gaps in bachelor's degree attainment often rely on post-secondary administrative data and the analytic sample typically consists of first-time college freshmen who started at 4-year public colleges, or specific 4-year institutions. This ignores racial differences in the rate of high school graduation, post-secondary participation, and initial 2-year college attendance. Many students begin in community colleges and transfer to a 4-year college to complete a bachelor's degree. While prior studies examined race and/or gender differences in transfer behavior of those who first enrolled in community college, these studies do not address systematic subgroup differences in initial community college enrollment. In contrast, we show how students of different race and gender subgroups utilize community college in different ways. Furthermore, studies based on state post-secondary administrative data do not include those who initially enrolled in private or

out-of-state colleges. This may be problematic if such choices of college differ by race and gender (as they do in Missouri). Finally, many studies have examined average racial gaps. Our results show that the group average masks important subgroup differences, such as race-by-gender or pre-college achievement levels.

This study contributes to the literature on post-secondary degree attainment gaps by analyzing data on the entire cohort of first-time ninth-grade students attending Missouri public high schools. These students started high school in Fall 2009 and were followed for six years after on-time high school graduation. We replicate the results of prior studies examining average racial gaps: on average, black students are more likely to attend college after controlling for pre-college characteristics, and of those who initially enrolled in public 4-year institutions, average race gaps in bachelor's degree attainment are largely explained by academic preparation.

We contribute to the literature by conducting subgroup analysis by race and gender and high school preparation quartiles for all 9<sup>th</sup>-graders, high school graduates, and all college enrollees, including those who first attended 2-year institutions. Missouri, like many other states, heavily subsidizes attendance at 2-year institutions. Under the A+ Scholarship Program, students who meet certain requirements receive full tuition for community college, and their credits are fully accepted by Missouri public 4-year universities. Our data show that the road to a 4-year degree differs considerably by race and gender subgroups. Restricting attention only to students who initially enroll in a four-year institution misses not only an important part of the post-secondary education sector (community colleges) but also ignores important pathways by which many students obtain four year degrees.

Lastly, the analysis by academic preparation quintiles reveals that the college enrollment advantage for black students of both genders primarily comes from the lower end of the

preparation distribution. However, this advantage disappears for college degree completion. A notable finding is that higher-achieving black males have substantially lower college completion rates. While the type of first college choice differs by these subgroups, low degree completion rates among high-achieving black males are consistent across the analytic populations (all 9<sup>th</sup>-graders, high school graduates, or college enrollees) and initial college choice.

The remainder of this paper is organized as follows: The next section provides a brief literature review on the race and gender gaps in post-secondary enrollment and attainment. We then discuss our data and methods, followed by the findings of our analyses. We conclude with a summary of findings and implications for policy and future research.

## **Literature Review**

### **College Enrollment and Completion**

Between 1970 to 2000, an increasing proportion of young adults attended college. However, *of college attendees*, degree completion rates declined during the same time (Bound, Lovenheim, & Turner, 2010). To explain this decline, Bound et al (2010) examined the change in the characteristics of college attendees using two nationally representative samples of high school cohorts (high school class of 1972 and 1992). They found that academically weaker students were increasingly entering post-secondary education. However, importantly, declines in institutional resources played a larger role in lower college completion rates for later cohorts.

In a study of college enrollment patterns over time by race, Backer, Klask, and Reardon (2018) found narrowing black-white differences in college selectivity among the population of 18 year olds. This study includes not enrolling in college as a choice (lowest selectivity), and the narrowing total selectivity gap is attributable to more minority students entering post-secondary institutions than not enrolling in college. However, among those who enter 4-year institutions,

college selectivity gaps are growing as fewer minority students are entering more selective colleges.

However, when the researchers control for students' pre-college characteristics, different patterns emerge. Numerous studies showed that minority students have higher college enrollment rates, conditioning on such pre-college characteristics as family socio-economic backgrounds and high school achievement (Cameron & Heckman, 2001; Davis, & Otto, 2016; Eller & DiPrete, 2018; Bennett & Lutz, 2009; Kane and Spizman 1994; Rivkin 1995). This "minority advantage" was larger for selective 4-year college enrollment than that for less selective, or HBCU enrollment (Benenett and Xie, 2003). Moreover, the advantage of minority students was only found among low-income students in some studies (Benenett and Xie, 2003; Black and Sufi, 2002).

Prior studies on college completion show sizable gaps in bachelor's degree completion by race. In general, the majority of the racial college completion gap is explained by pre-college characteristics, suggesting that improving college readiness of minority students can substantially improve their college completion. However, non-negligible completion gaps remain even after controlling for pre-college characteristics, and much of the remaining difference seems to come from which college students attend, and not the process within the same college. For example, Flores, Park & Baker (2017) show that 61% of 4-year degree attainment gaps are due to pre-college characteristics and 35% is explained by postsecondary factors (the percentage of tenured faculty members, the faculty-to-student ratio, full-time-equivalent enrollment, per-pupil instructional expenditures, and whether the institution was designated an HSI or HBCU).

Similarly, using the data on all first-time full-time college students attending Missouri public 4-year institutions across multiple cohorts, Arcidiacono and Koedel (2014) showed most

racial college completion gaps are explained by pre-college student demographic and academic characteristics and high school quality. This indicates college choice matters to some extent. Similarly, Fletcher & Tienda (2010) analyzed racial gaps in post-secondary outcomes (GPA and bachelor's degree attainment) using data on students who enrolled in two most selective and two less selective public colleges in Texas. Their findings show, in each college, racial/ethnic gaps in graduation rates are reduced considerably, but not eliminated, after controlling for high school achievement levels and high school characteristics.

This study contributes to the literature by addressing two limitations in prior studies examining college completion. The first problem is sample selection or censoring. While the college enrollment advantage of minority students, given high school achievement, is well documented, many studies on college completion rely on college administrative data and only include those who enrolled in 4-year public institutions and examine 4-year degree attainment. As we will show, college enrollment patterns and college choice differ systematically by race, including two to four-year transfer rates. Second, while most prior studies focus on average racial gaps, educational trajectories are very different among race-by-gender subgroups. We will show that the size of these gaps also depends on high school achievement levels as well as the outcomes considered (e.g., college enrollment and degree attainment). These limitations are likely to arise due to data limitations. For example, studies based on national surveys allow researchers to follow high school cohorts over time and examine their post-secondary outcomes to avoid censoring problems. However, these survey data do not have large enough sample sizes to conduct subgroup analyses by race, gender and pre-college achievement levels. In contrast, studies using college administrative data do not have information on students who did not enroll in the particular colleges under study. The current study attempts to address these limitations by



following the entire cohort of Missouri public school high school freshmen through high school and into post-secondary training – whether two or four year, public or private, and in-state or out-of-state.

### **Data and Method**

Student longitudinal data were made available to us by the Missouri Department of Elementary and Secondary Education (DESE). Our analytic sample consists of first-time 9<sup>th</sup>-grade students who enrolled in Missouri public high schools in Fall 2009. We further restrict our sample to four race gender groups – white females, white males, black females, and black males -- who together account for 94 percent of Missouri public high school freshmen. The total number of students is 65,047 attending 545 high schools, of whom, 19.3 percent are black males or females.

The DESE data include the following information: student high school enrollment and graduation status; demographic characteristics (e.g., gender, free/reduced lunch status, race/ethnicity, birth date); 8<sup>th</sup>-grade Missouri Assessment Program (MAP) scores in mathematics, science, and communication arts; 9<sup>th</sup>- and 10<sup>th</sup>-grade GPAs<sup>2</sup>; End of Course Exams in Algebra I, English II, Biology I, and Government (required for high school graduation) and the date of the exam taken; year specific attendance rates from 9<sup>th</sup> through 12<sup>th</sup> grades. High school student data are linked to six years of the National Student Clearinghouse (NSC) data following expected on-time high school graduation in May, 2013. NSC data provides information on college enrollment (e.g., start and end date, full-time or half-time status, majors), institution types (e.g., 2-year vs 4-year and private vs public), and degree completion. NSC data are supplemented by Barron's college selectivity index, which is used to classify students' initial college type into the following categories: 2-year college, non-competitive 4-year, competitive 4-

year, and very competitive 4-year.

The outcome variables for this study, all based on NSC data, are: whether students enrolled in college, attained any post-secondary degree or certificate, and attained a bachelor's degree or higher. The average outcomes of the four groups differ considerably. For example, on average, white females are more likely to attend college and complete any degrees (61% and 35%, respectively, of the 9<sup>th</sup>-grade population), and black males least likely to do so (33% attend college and 8% complete any degree). Within racial group, females are more likely to attend college and earn degrees than males. Regarding students' characteristics, Black students have higher rates of FRL-eligibility (60% vs 29% for white students) and are more likely to attend schools in urban areas with more minority and FRL-eligible students. See Appendix Table A.1 for descriptive statistics.

A key variable for this study is the academic index (AI), a comprehensive measure of academic preparedness for college. Specifically, the AI is a student's predicted probability of earning a four-year degree (within six years of expected HS graduation) given pre-college academic performance (similar to Arcidiacono and Koedel, 2014). This is constructed based on a logit model estimated across all 9<sup>th</sup>-grade cohort students using the following predictors: 8<sup>th</sup>-grade MAP scores, high school GPAs; EOC scores; year of EOC exams; year-specific attendance rates from grades 9<sup>th</sup> through 12<sup>th</sup>, and high school fixed effects. Missing data were imputed using SAS's Markov Chains Monte Carlo (MCMC) option in the multiple imputation (PROC MI) command.<sup>3</sup> In addition, the AI model included high school fixed effects to capture the high school contribution to academic preparedness for college.<sup>4</sup> After estimating this model, students are sorted into quintiles based on their predicted probability of earning a four-year degree (i.e., AI measure).

College academic preparation levels measured by AI differ widely across the four race-gender groups. Figure 1 shows the AI quintile distributions for the four groups. The lowest quintile is the modal group for black males and females, with a particularly large concentration for black males (44 percent). Relatively few black females or males are found in the top quintile (7 and 3 percent, respectively). By contrast, the modal group for white females is the highest quintile (28 percent). White males have a nearly uniform distribution across the quintiles. In an Appendix, Figure A.1 shows the strong association between AI and highest educational attainment for all groups.

(Figure 1)

Our main analysis investigates the relationship between pre-college academic preparation and post-secondary outcomes by estimating the following model:

$$Y_i = B_1(RG_i \times FRL_i) + B_2(RG_i \times AGE_i) + B_3(RG_i \times AIQuintile_i) + \varepsilon_i. \quad (1)$$

Model 1 controls for students' FRL eligibility and age (centered on the grand mean), RG is a set of race-gender subgroup indicators, and AIQuintile are the quintile indicators. The parameter of interest is the coefficient vector  $B_3$  which represents the average outcome for each of the AI quintiles by the race-gender groups. Race-gender gaps in the outcome are measured by comparing  $B_3$  estimates within the same AI quintile.<sup>5</sup>

## Results

The left panel of Figure 2 shows that college enrollment rises with AI quintile for all four groups. However, for the lowest three quintiles, the point estimate of the enrollment rate for male and female black students is above that of white males and females. Within each AI quintile, white males have the lowest college enrollment rates. When we reach quintiles four and five, the enrollment rates for the four groups largely converge.

(Figure 2)

The picture changes considerably when we turn to degree completion (any degree) in the right panel of Figure 2. The completion rates largely overlap in the lowest three quintiles, but then begin to diverge. Now higher achieving black males in quintiles four and five have lower rates of degree completion. Within any quintile, white females are most likely to complete degrees, and black females complete degrees at a roughly comparable rate to white males. The enrollment advantage of minority students observed at lower quartiles in the left panel completely disappears, or is reversed. This suggests higher rates of dropping out for lower achieving minority college goers. In the Appendix, we show similar patterns of results for four-year degree completion (Figure A.2), although the gap between higher achieving black males and other groups narrows somewhat, indicating lower rates of degree completion for black males attending two year institutions.

All of the results thus far are from models estimated on the full 2009 high school freshman cohort, which includes students who did not complete high school. It is possible that the general patterns noted above, including the underperformance of higher achieving black males, is driven by differential effects of AI on the high school dropout rates of black males versus other groups. However, this is not the case. The results on degree completions follow very similar patterns when we restrict the sample to high school graduates. The underperformance of higher achieving black males remains (these results are available in an Appendix, Figure A.3).<sup>6</sup>

The pattern of black male divergence is even greater when we restrict our sample to college attendees. As shown in Figure 3, left panel, black males are less likely to complete degrees within any AI quintile. The underperformance of black males remains, but is less

pronounced, when we restrict attention to four-year degrees (Figure 3, right panel) .

(Figure 3)

We next examine whether the lower degree attainment among black males is explained by (or differs by) the type of initial college students attend. First, we note that initial college choice differs by race-gender subgroups within the same AI quintile (See Appendix Figure A.5). For example, white students of both genders are more likely to choose two year colleges, while minority students are much more likely to choose nonselective four year colleges. Community college enrollment is notably higher for white students with relatively higher academic preparation levels (i.e., quintiles 3 and 4). This could be explained by the fact that white students are more likely to take advantage of the Missouri A+ program, which provides free tuition for community college attendance for students who meet certain (fairly minimal) academic criteria. Also, enrollment in very competitive colleges is higher for white females and white males in the bottom two quintiles. In the top quintile, black males are least likely to enroll in competitive colleges.

We next examine degree attainment gaps given initial college type. However, unlike our earlier analyses, this analysis relies on a parametric model to improve the precision of our estimates. A problem arises when we classify students into race x gender x AI quintile x college type cells (i.e.,  $2 \times 2 \times 5 \times 4 = 80$  cells). Even with a relatively large data set, this makes some cells too sparse or nearly empty. Thus, we estimated a somewhat more restrictive version of model (1), in which degree completion is specified as a quadratic function of AI by race and gender. This captures parametrically the non-linearity seen in Figures 2 and 3.

Since degree attainment gaps vary by AI, we present two sets of results from this analysis. The left panel of Figure 4 plots the forecast degree completion rates at the mean of all

covariates, including AI. The right panel plots the forecast graduation rate at 85<sup>th</sup> percentile of AI and the mean of the other covariates. In general, the results show, conditioning on the type of initial college of choice and AI, black males have lower degree attainment rates than their peers although the differences are not consistently significant. Black female degree completion is similar to that for white males. White females have the highest graduation rates. These results suggest that the low degree attainment of black males overall is not likely to be explained by student selection into, or factors associated with, particular types of colleges.

(Figure 4)

The analyses so far have highlighted the underperformance of black males in the upper two AI quintiles. However, it is important to recall from Figure 1 that only roughly 12 percent of black males are in the upper two AI quintiles. Thus, most of the underperformance of black males *overall* is unlikely to be explained by underperformance of this relatively small group of high achievers. Figure 5 provide some insight into this issue. In these figures, we compute, based on Model 1, the predicted educational attainment outcomes if the black distribution of AI is replaced by the white distribution within gender group. In other words, this demonstrates how much of the total outcome gaps would be closed if minority students had the same pre-college academic performance as their white counterpart of the same gender.

We make this calculation for three populations: the full 9<sup>th</sup>-grade cohort, high school graduates, and college enrollees. The left panel of Figure 5 shows the result for males. Starting on the left, the first two bars of each triplet give the unconditional mean high school graduation rates for white males and black males. The third bar (stripped) reports the predicted rate for black males by assigning them the AI distribution of the white males. In the case of high school graduation, we see that the AI distribution “explains” nearly all of the gap for males. When we

turn to college attendance, the striped bars are above the white male means. These gaps are similar whether we look at all 9<sup>th</sup> graders or just high school graduates, indicating that AI fully explains observed college attendance gaps. A similar pattern is seen for females in the right panel of Figure 5.

(Figure 5)

Once we move from college attendance to degree completion, however, the pattern changes. Now the striped bars are well below the white male means – swapping the white for the black AI distribution cannot explain the full attainment gap. Indeed, now the share explained by AI falls to roughly 60-70 percent, depending on the population. The underperformance of the higher achieving black males in college relative to their male quintile peers becomes more important. The right panel reports a roughly similar story for females, with AI explaining roughly 60-70 percent of the degree completion gap depending on the population.

Finally, it is also worth noting that if black females are given the white female AI distribution, their performance generally matches or exceeds that of white males (i.e., compare the first bars in the left panel of Figure 5 to the striped bars in the right panel for the same outcome and population).

These findings suggest that high school AI, as a proxy for high school preparation can go a long way toward explaining gaps in high school graduation and initial college attendance. However, it cannot fully explain gaps in degree completion. Moreover, the pattern of degree attainment gaps is relatively consistent across the type of institutions in which students initially enroll. To get a better understanding of why these gaps in degree completion emerge, we need to explore further differences in our four groups in high school preparation or household factors (e.g., advanced credits from high school, fiscal constraints, education aspirations) or aspects of

the college experience (e.g., credit accumulation, financial aid, developmental education).

### **Conclusion**

In this paper we provided a descriptive analysis of the 2009 high school freshman cohort of Missouri public school students. Unlike other studies that are based on students who enter 4-year institutions, this study tracked 9<sup>th</sup>-grade students through high school and into post-secondary training for six years beyond on-time high school graduation. Our primary focus is on the relationship between a measure of high school preparation, which we label Academic Index (AI). We show that for most post-secondary outcomes, students' outcomes rise monotonically with AI.

Our focus was on post-secondary attainment gaps between four student populations who together comprise 94 percent of public school students in Missouri: white males, white females, black males, and black females. This study offered a more complex picture of subgroup differences in post-secondary trajectories than previous studies.

As in prior studies, the most significant factor explaining degree attainment gaps are pre-college academic skills: there are large black-white gaps in AI, but by far the largest difference is for black males. Forty four percent of black males are in the lowest AI quintile, as compared to 13 and 18 percent of white females and males, respectively. The first quintile share for black females is 32 percent. Interestingly, college enrollment is higher for minority students of both genders in the lower AI quintiles, but this enrollment advantage completely disappears for degree completion. This suggests higher likelihood of dropping out of college for black students among college enrollees. Also, for both race groups, females outperform males, and within the same gender, from 60-70 percent of racial degree attainment gaps are explained by AI.



A striking finding is the much lower performance of high achieving black males. While only 12 percent of black males are in the top two GPA quintiles, their higher education degree attainment is well below that of their quintile peers. This result is not likely due to college choice, or exceptionally low performance of high achieving black males in particular types of higher education institutions (e.g., different selectivity). For example, both black males and females are more likely to attend nonselective 4-year institutions than their white counterparts. Yet our analysis finds that, conditional on AI, black males tend to underperform whites and black females regardless of the type of the initial post-secondary education institution. This calls for more detailed examination of the factors associated with students' post-secondary experiences.

---

<sup>1</sup> The gap in bachelor's degree attainment between Hispanics and whites has held steady at 24%. (US Department of Education, 2018).

<sup>2</sup> DESE administrative data do not include 11<sup>th</sup> and 12<sup>th</sup> grade GPA

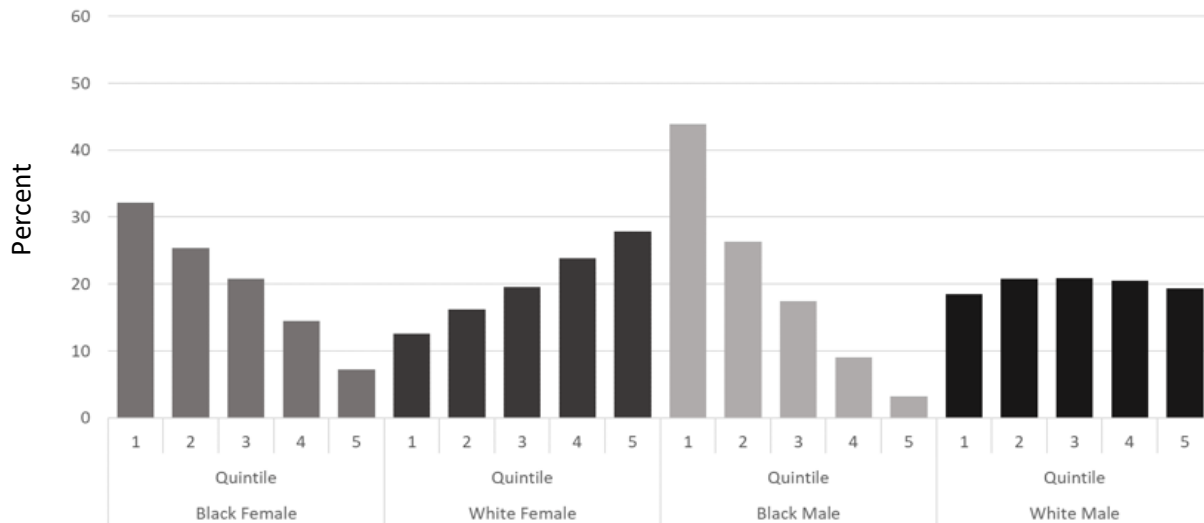
<sup>3</sup> In our data, 71.6% of students had complete data. The results reported here are based on all students, using multiple imputation to construct AI. The results using students with complete data are very similar and available upon request.

<sup>4</sup> The correct prediction rate of AI for a bachelors' degree completion is 89.2% using all students and 87.1% using students with complete data.

<sup>5</sup> Note that we included high school fixed effects in the construction of AI and not in Model 1 to predict post-secondary outcomes. We also analyzed a model where AI is estimated without high school fixed effects, and high school fixed effects are added to Model 1. The pattern of results is similar.

<sup>6</sup> In addition, when we analyzed high school graduation as an outcome, using data on all 9<sup>th</sup>-grade students, the pattern of result follows that of college enrollment. High achieving black males are equally likely to graduate from high school as the other three groups, and both black males and females in the bottom three quintiles are more likely to graduate from high school (See Appendix Figure A.4).

Figure 1: Histograms of Academic Index (AI) Quintiles by Race and Gender



Note: Missouri Public High School Freshman in 2009.

Figure 2: College Enrollment and Any Degree Attainment by Race, Gender, and AI Quintile: All 9<sup>th</sup>-graders

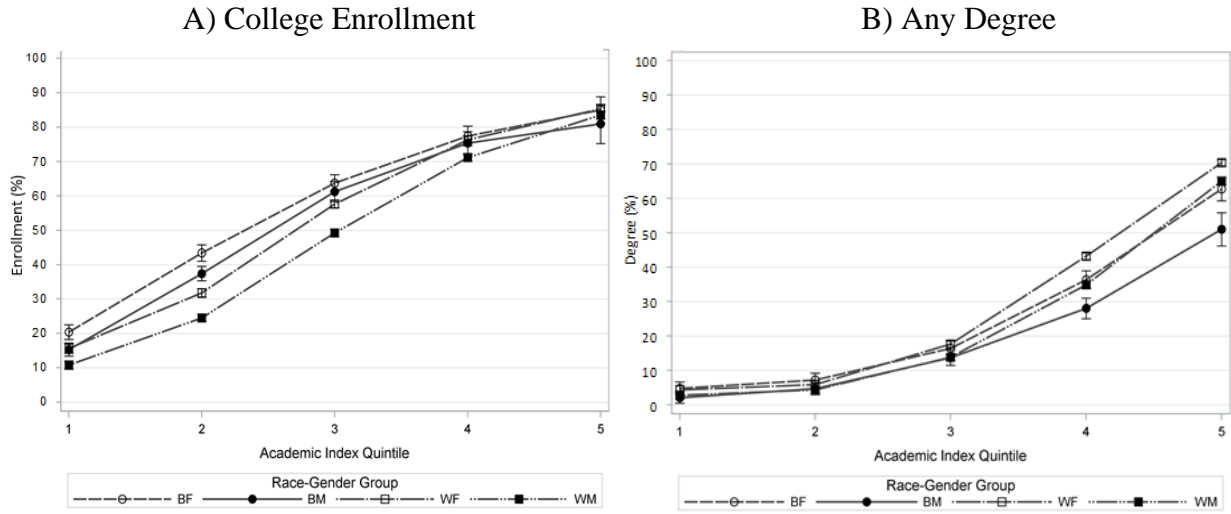


Figure 3: Degree Attainment by Race, Gender, and AI Quintile: College Attendees

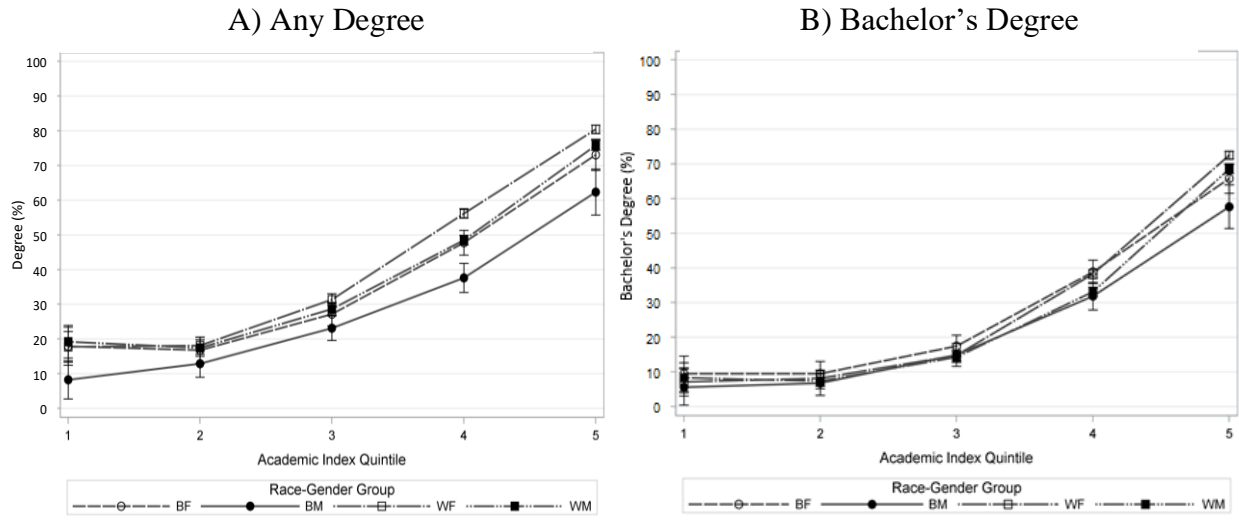


Figure 4: Any Degree Attainment by Type of Initial College: College Attendees

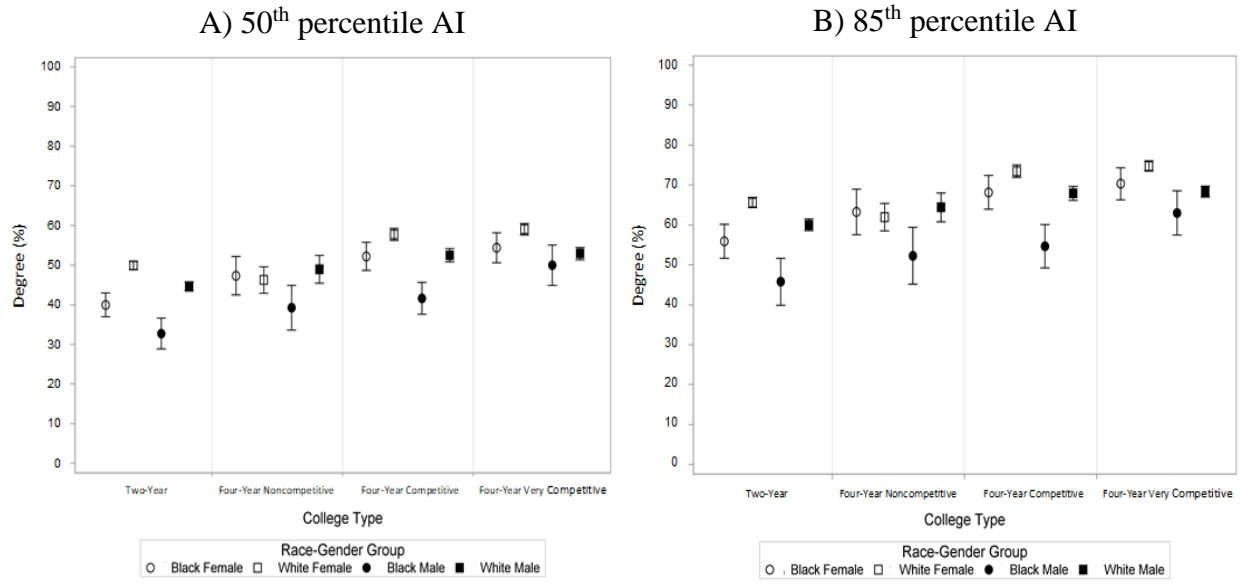
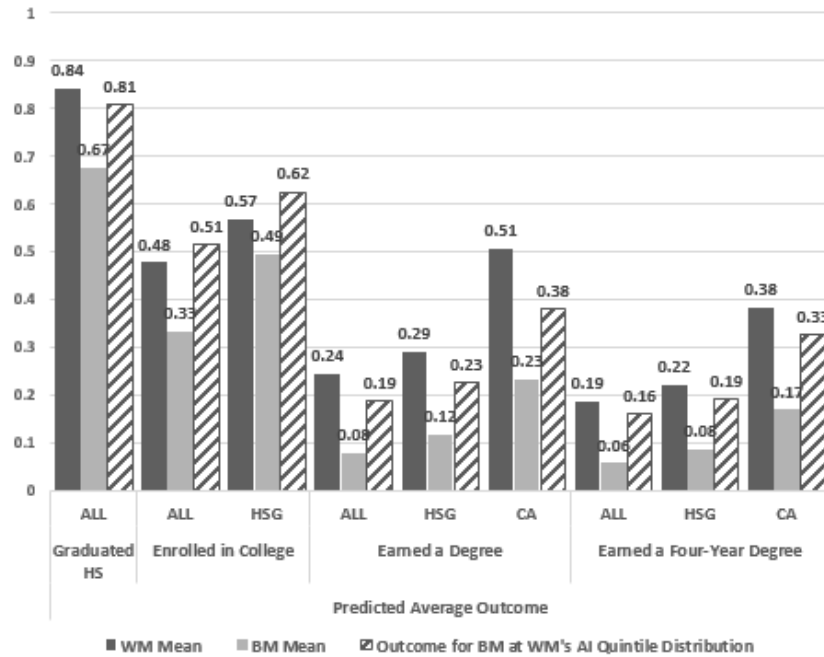
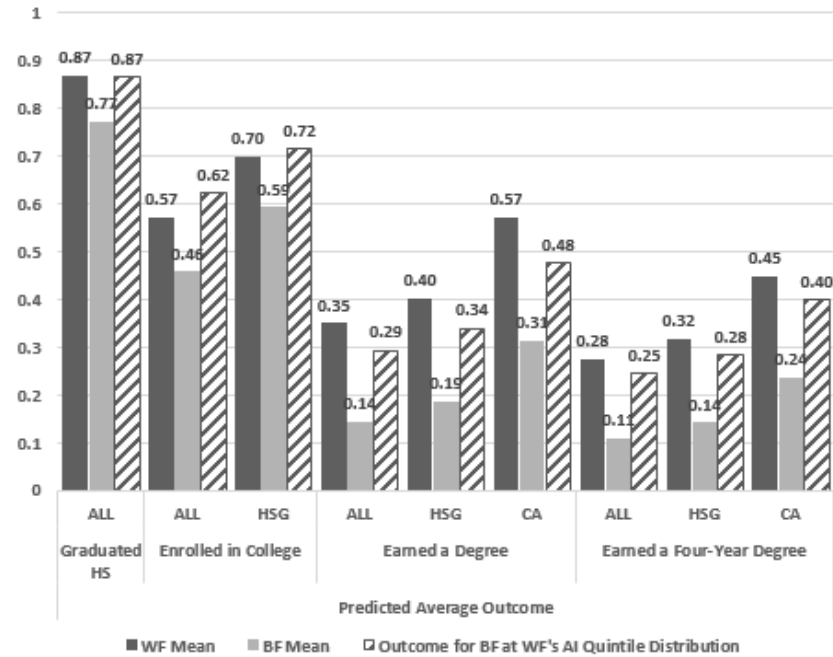


Figure 5: Effect of AI Quintile on White-Black Educational Attainment Gaps: All 9<sup>th</sup>-grade students

A) Males



B) Females



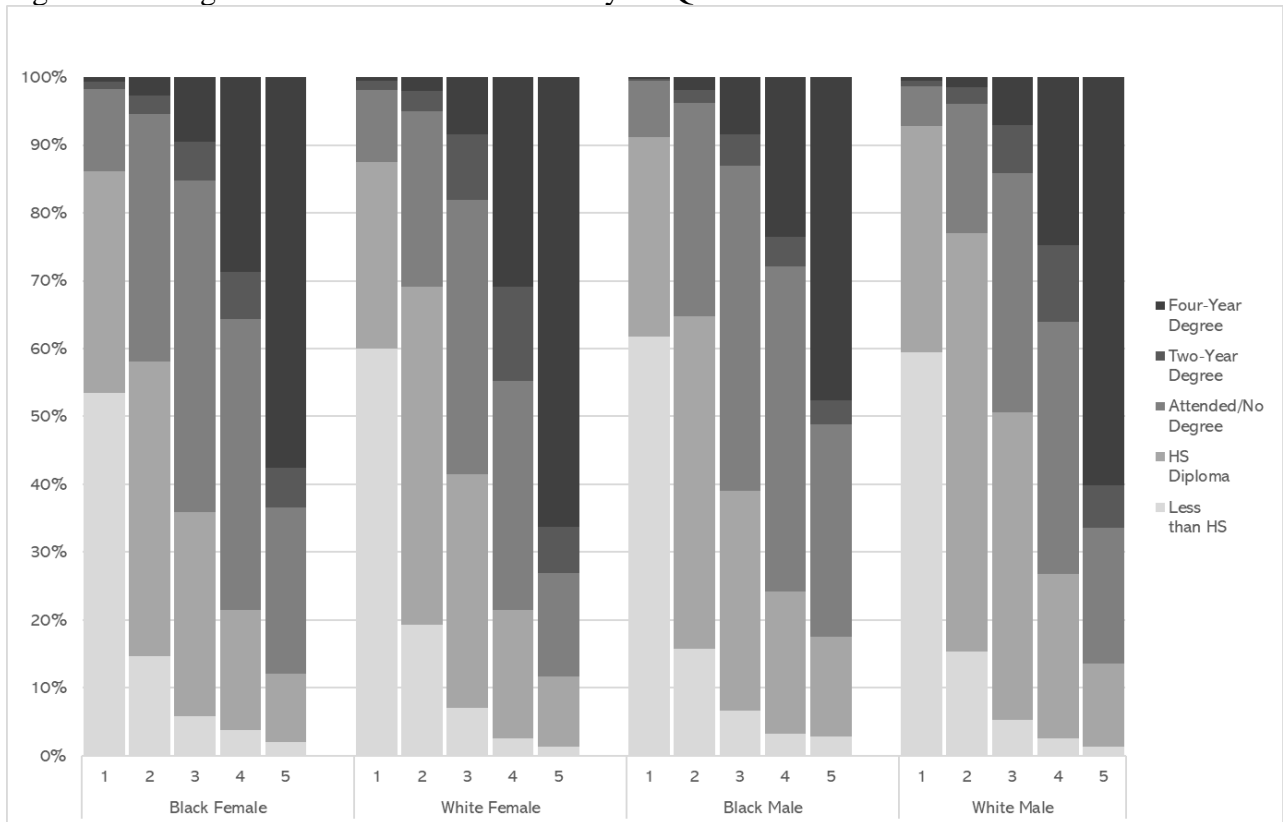
## Appendix

Table A.1. Sample Descriptive Statistics: Missouri Public High School Freshman in 2009

	All	Black Female	Black Male	White Female	White Male
Total N	65,047	6,045	6,582	25,282	27,138
%	100.0	9.2	10.1	38.9	41.7
<b>Dependent Variables</b>					
Graduated from MO public high school	0.83	0.77	0.68	0.87	0.84
Attended College	0.51	0.46	0.33	0.61	0.48
Earned a college degree	0.26	0.14	0.08	0.35	0.24
Earned a four-year college degree	0.20	0.11	0.06	0.28	0.19
<b>Independent Variables</b>					
<i>Student-Level</i>					
Age (9 <sup>th</sup> grade)	14.72	14.82	15.00	14.62	14.72
Free/Reduced Lunch (FRL) Status	0.35	0.60	0.59	0.28	0.29
9 <sup>th</sup> Grade GPA	2.45	2.00	1.58	2.79	2.45
8 <sup>th</sup> Grade Mathematics MAP score	704.75	681.64	675.95	710.33	710.21
MAP Score Missing	0.11	0.17	0.23	0.09	0.10
<i>HS-Level Variables</i>					
Student-to-Teacher Ratio	20.29	20.54	20.69	20.20	20.22
Fall Enrollment	1043.87	1121.27	1095.99	1033.52	1023.64
% FRL	41.56	59.43	59.47	37.17	37.32
% IEP	11.92	13.95	14.37	11.34	11.41
% taking ACT	63.85	63.42	61.83	64.20	64.10
% Dropout	2.93	7.24	7.72	1.81	1.86
% minority students	24.27	66.43	66.64	14.00	14.18
District Expenditures per Average Daily Attendance	9406.65	11500.17	11766.48	8870.76	8868.41
<i>HS Locale</i>					
City	16.76	39.54	39.02	11.28	11.39
Suburban	27.61	6.12	6.94	32.32	33.01
Town	33.92	47.59	46.93	30.95	30.48
Rural	21.71	6.75	7.11	25.44	25.11

Note: Sample is restricted to white females, white males, black males, and black females.

Figure A.1. Highest Educational Attainment by AI Quintile



Note: Missouri Public High School Freshman in 2009.



Figure A.2. Bachelor's Degree Attainment by Race, Gender, and AI Quintile: All 9<sup>th</sup>-graders

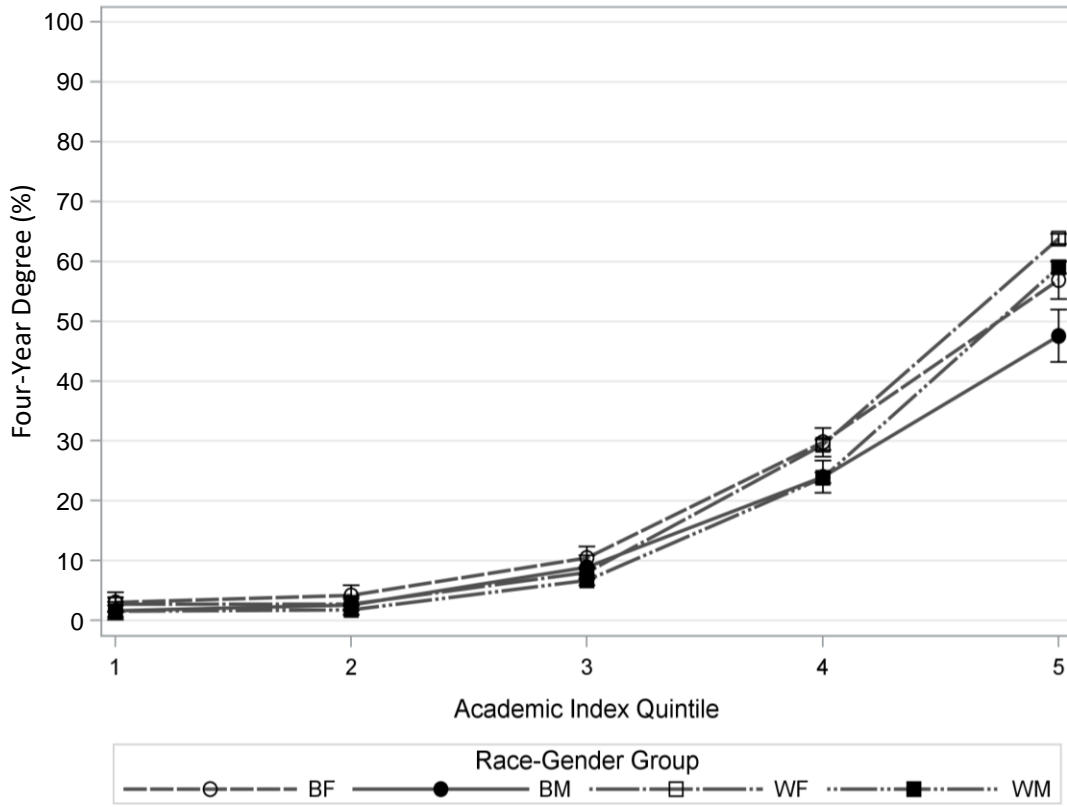
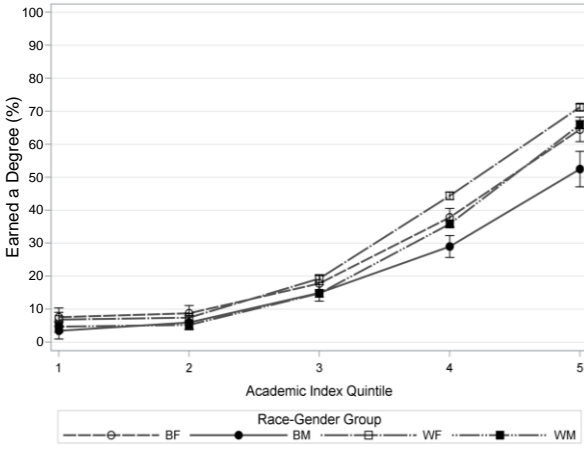


Figure A.3. Degree Attainment by Race, Gender, and AI Quintile: High School Graduates

A) Any Degree



B) Bachelor's Degree

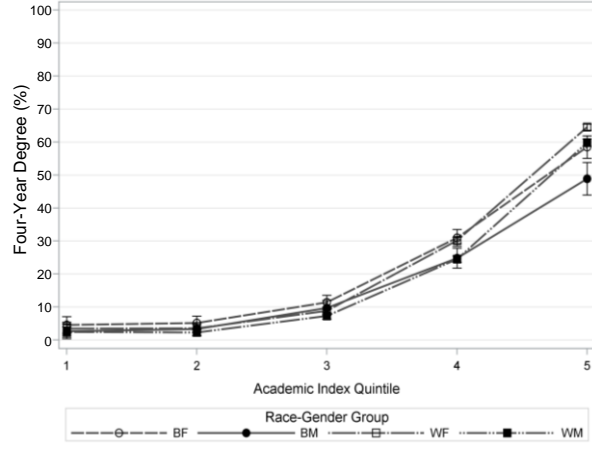


Figure A.4. High School Graduation by Race, Gender, and AI Quintile: All 9<sup>th</sup>-graders

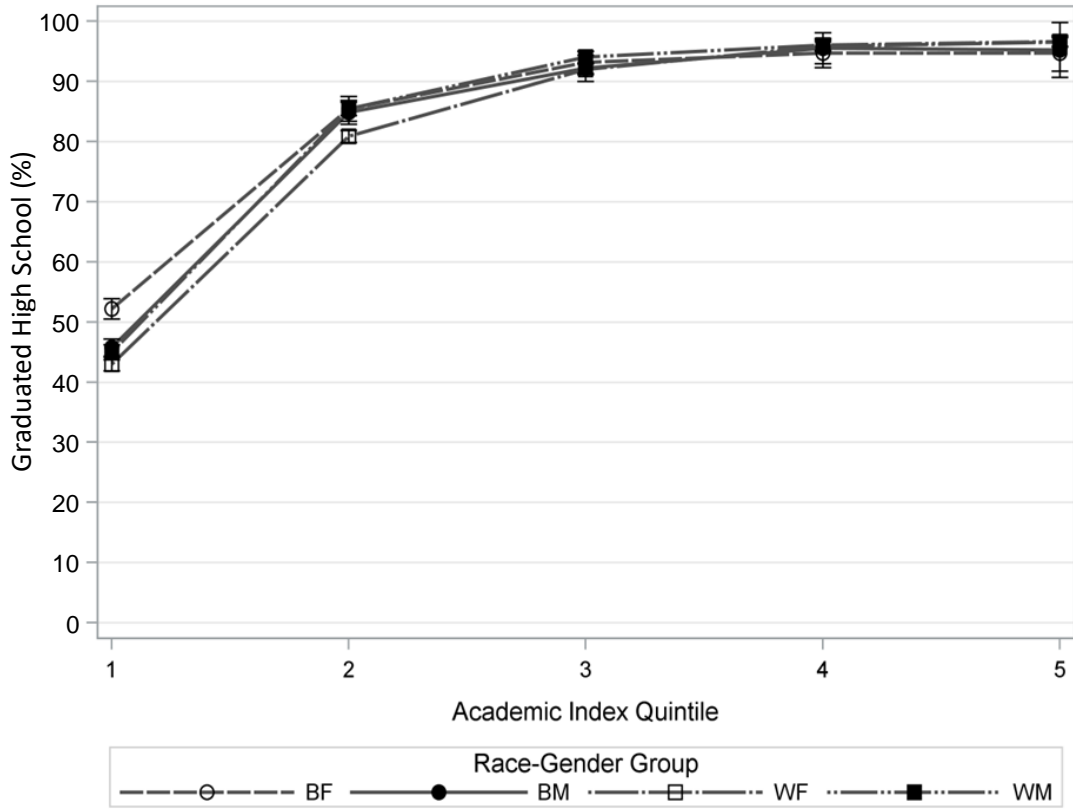
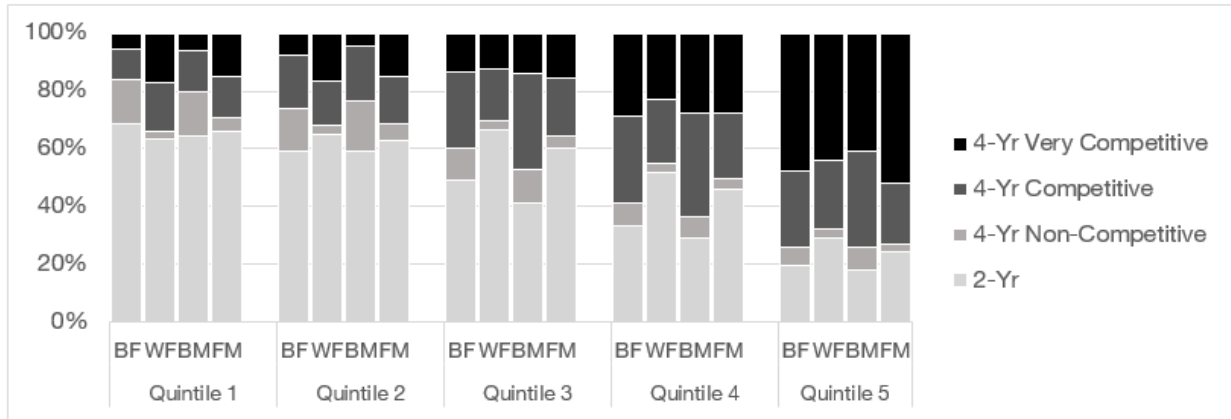


Figure A.5. College Selectivity by Race, Gender, and AI Quintiles



## References

- Allensworth, E., & Clark, K. (2020). High School GPAs and ACT Scores as Predictors of College Completion: Examining Assumptions About Consistency Across High School. *Educational Researcher, 49*(3), 198-211.
- Allensworth, E., & Easton, J. Q. (2007). *What Matters for Staying On-Track and Graduating in Chicago Public Schools*. Retrieved from Chicago, IL:
- Arcidiacono, P., & Koedel, C. (2014). Race and College Success: Evidence from Missouri. *American Economic Journal: Applied Economics, 6*(3), 20-50.
- Autor, D. H. (2014). Skills, education, and the rise of earnings inequality among the “other 99 percent.” *Science, 344*(6186), 843-851.
- Baker, R., Klasik, D., & Reardon, S. (2018). Race and Stratification in College Enrollment Over Time. *AERA Open, 4*(1), 1-28.
- Bennett, P. R., & Lutz, A. (2009). How African American Is the Net Black Advantage? Differences in College Attendance among Immigrant Blacks, Native Blacks, and Whites. *Sociology of Education, 82*(1), 70–100.
- Bennett, P. R., & Xie, Y. (2003). Revisiting Racial Differences in College Attendance: The Role of Historically Black Colleges and Universities. *American Sociological Review, 68*(4), 567–580.
- Black, S., & Sufi, A. (2002). *Who Goes to College? Differential Enrollment by Race and Family Background*. Cambridge, MA.
- Bound, J., Lovenheim, M. F., & Turner, S. (2010). Why Have College Completion Rates Declined? An Analysis of Changing Student Preparation and Collegiate Resources. *American Economic Journal: Applied Economics, 2*(3), 129-157.

- Bowen, W. G., Chingos, M. M., & McPherson, M. S. (2009). *Crossing the finish line: Completing college at America's public universities*. Princeton, NJ: Princeton University Press.
- Camron, S., & Heckman, J. J. (2001). The Dynamics of Educational Attainment for Black, Hispanic, and White Males. *Journal of Political Economy*, 109(3), 455-499.
- Davis, T., & Otto, B. (2016). Juxtaposing the Black and White Gender Gap: Race and Gender Differentiation in College Enrollment Predictors. *Social Science Quarterly*, 97(5).
- Ellera, C. C., & DiPretea, T. A. (2018). The Paradox of Persistence: Explaining the Black-White Gap in Bachelor's Degree Completion. *American Sociological Review*, 83(6), 1171–1214.
- Fletcher, J. M., & Tienda, M. (2010). Race and Ethnic Differences in College Achievement: Does High School Attended Matter? *Annals of the American Academy of Political and Social Science*, 627(1), 144–166.
- Flores, S. M., Park, T. J., & Baker, D. J. (2017). The Racial College Completion Gap: Evidence From Texas. *Journal of Higher Education*, 88(6), 894-921.
- Geiser, S., & Santelices, M. V. (2007). *Validity of high-school grades in predicting student success beyond the freshman year: High-school record vs. standardized tests as indicators of four-year college outcomes*. Retrieved from <https://cshe.berkeley.edu/publications/validity-high-school-grades-predicting-student-success-beyond-freshman-yearhigh-school>
- Goldin, C., & Katz, L. F. (2008). *The Race Between Education and Technology* Cambridge, MA: Harvard University Press.

- Goos, M., Manning, A., & Salomons, A. (2014). Explaining Job Polarization: Routine-Biased Technological Change and Offshoring. *American Economic Review* 104 (8), 2509-2526.
- Hanushek, E. A., Schwerdt, G., Wiederhold, S., & Woessmann, L. (2015). Returns to skills around the world: Evidence from PIAAC. . *European Economic Review*, 73, 103-130.
- James, J. (2012). *The College Wage Premium* Retrieved from Cleveland, OH:  
<https://www.clevelandfed.org/newsroom-and-events/publications/economic-commentary/economic-commentary-archives/2012-economic-commentaries/ec-201210-the-college-wage-premium.aspx>
- Kane, J., & Spizman, L. M. (1994). Race, Financial Aid Awards and College Attendance: Parents and Geography Matter. *American Journal of Economics and Sociology*, 53(1), 85–97.
- Kelly, S. (2008). What Types of Students' Effort Are Rewarded with High Marks? *Sociology of Education*, 81, 32-52.
- Kobrin, J. L., Patterson, B. F., Shaw, E. J., Mattern, K. D., & Barbuti, S. M. (2008). *Validity of the SAT® for predicting first-year college grade point average* Retrieved from
- Reeves, R. V., & Guyot, K. (2017). *Black women are earning more college degrees, but that alone won't close race gaps*. Retrieved from <https://www.brookings.edu/blog/social-mobility-memos/2017/12/04/black-women-are-earning-more-college-degrees-but-that-alone-wont-close-race-gaps>
- Rivkin, S. G. (1995). Black/White Differences in Schooling and Employment. *Journal of Human Resources*, 30(4), 826-852
- Rosenbaum, J. E. (2001). *Beyond College for All: Career Paths for the Forgotten Half*  
 New York: Russell Sage Foundation.

Thompson, O. (2021). *Human Capital and Black-White Earnings Gaps, 1966-2017*. (NBER Working Paper 28586).

U.S. Department of Education. (2018). *The Condition of Education 2018 (NCES 2018-144)*.

Retrieved from Washington DC:

<https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2018144>

U.S. Department of Education. (2020). *The Condition of Education 2020 (NCES 2020-144)*.

Retrieved from Washington DC:

<https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2020144>