# Statistical Discrimination and Optimal Mismatch in College Major Selection

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# Mismatch and Major Choice

- College major decision is one of most important investment choices for high skill workers
- Wage difference between college graduates with high paying and low paying degrees about as large as gap between high school and college graduates (Altonji et al., 2012)
- Central argument against affirmative action in admissions preferences is potential effect on major choice (e.g., *Students for Fair Admissions v. Harvard*)
- Black students attempt lower paying majors at more prestigious institutions than they would have if they attended less prestigious institutions (e.g., Arcidiacono et al., 2012, 2016).

# Information and Major Choice

Our paper focuses on two types of information frictions in major choice:

- Mismatch literature (Arcidiacono et al. 2011)
  - Students have incomplete information on their own aptitude
  - Admissions decisions cause students to update their beliefs
  - Black students who are admitted due to diversity preferences will form overly positive beliefs about their aptitude, make too difficult human capital investments which lower welfare
- Statistical discrimination literature (Lang and Manove 2011)
  - Employers have less precise information on the productivity of Black applicants than White applicants
  - Rely more heavily on observable indicators for Black applicants
  - Incentivizes Black students to overinvest in education

# Our Model of Majors

- Students with incomplete information on their aptitude choose from a menu of majors that differ in their human capital production function
- Black students have less precise beliefs about their aptitude than White students
- Employers cannot initially observe accrued human capital but they do observe major, college grades, and a signal of productivity
- Following standard assumptions in statistical discrimination literature, signal is more precise for White students

# Tensions of Information Frictions

- Student incomplete information
  - *Lowers* the value of Black major choice as a signal to employers since Black students are less informed of their aptitude when choosing their major
  - *Reduces* incentive for Black students to choose more difficult majors
  - Causes Black students in equilibrium to attempt *less* difficult majors than similar White students
- Statistical Discrimination
  - *Raises* value of Black major choice as a signal to employer since labor market signal less reliable
  - *Increases* incentive for Black students to choose a more difficult major leading Black students to attempt less difficult majors than similar white students
  - Causes Black students in equilibrium to attempt *more* difficult majors than similar White students

# Empirical Results

- Test for which of these two frictions are more important using three different data sets
- Find support that statistical discrimination is dominant force
- Black students take higher paid and more STEM-focused majors than white students conditional on SAT, high school grades
- Disparity grows when moving up the SAT distribution
- Black students earn lower wages than White students in same major, both conditional and unconditional on SAT scores
- Largest racial wage disparity is among those in highest earning majors
- Find evidence that Black students have less precise beliefs about their aptitude when choosing college major using racial differences in labor market return to college grades

# Related Literature

- University Admissions and Mismatch
  - Sander (2004)
  - Arcidiacono et al. (2011)
  - Mountjoy and Hickman (2021)
  - Bleemer and Mehta (2022)
  - Akhtari et al. (2024)
- Racial Differences in College Major Selection
  - Arcidiacono et al. (2012)
  - Arcidiacono et al. (2016)
  - Hill (2017)
  - Sovero et al. (2021)
  - Bleemer and Mehta (2021)
- Effect of market conditions on major choice
  - Ersoy (2020)
  - Han and Winters (2020)
  - Blom et al. (2021)
  - Weinstein (2022)

# Theory

# Workers

- Large number of (b)lack and (w)hite students possess normally distributed, unbiased beliefs about their aptitude, with Black students having a higher variance in their beliefs than White students
- Choose from continuum of investment technologies $m$ which differ in complementary with aptitude (difficulty)
- Conditional on aptitude, human capital production function single-peaked, choosing too easy ("undermatch") or too difficult ("mismatch" or "overmatch") major will lead to lower realized productivity

▸ Formal Model

# Employment

- Employers do not observe realized productivity, instead observe major choice, college grades, and an unbiased labor market signal
- Labor market signal more precise for White workers, unobservable to econometrician
- Grades equally precise across race, observable to econometrician

# Equilibrium Major Selection

- Focus on separating equilibrium
- Race-specific one-to-one mapping of student beliefs to major
- Major choice reveals student's beliefs about their type
- Lowest types choose the major which maximizes their human capital
    - Standard equilibrium refinement: Firms believe off-equilibrium major choices are lowest type
    - Lowest type can maximize human capital without changing firm beliefs

# Racial Differences

- All other students choose more difficult majors than human capital maximum (signaling incentives)
- Whether Black students overmatch or undermatch relative to White students depends on whether employers put more or less weight on Black students' major choice

# When Student Information Frictions Dominate

- Because Black students have worse information about their type when they select their majors, employers view their major choice as a less reliable indicator of their productivity
- If this effect dominates:
  - White workers overcredentialize more than Black workers
  - White workers are less productive then Black workers in the same major
  - White workers have lower observed return to major difficulty than Black workers (compared to lowest type)

# When Statistical Discrimination Dominates

- Because employers receiving noisier signals about Black workers' true productivity, employers will put more weight on the informational content of the observable major choice
- If this effect dominates:
  - Black students overcredentialize more than White students
  - Black workers are less productive then White workers with the same major
  - Black workers have lower observed return to major difficulty than White workers (compared to lowest type)

# Grades

- Previous tests only differentiate between whether statistical discrimination is stronger or weaker than student information frictions
- Do not tell us if weaker force exists at all
- From econometrician's perspective regression of wages on grades and major choice is simply $E[w|m, g]$ (law of iterated expectations)
- That is, regression coefficients will tell us which is a stronger predictor of worker productivity: major or grades
- Grades are equally precise across race, but major less correlated with black student's productivity only if black students had worse information about their aptitude when making major choice
- Provides independent test of information friction hypothesis

# Testable Predictions

- Black students should graduate in more (less) difficult majors conditional on measures of college preparation (SAT scores) if statistical discrimination (information frictions) dominates
- This gap should increase (decrease) as we move up the SAT score distribution if statistical discrimination (information frictions) dominates
- Black workers will earn less (more) than similar white workers within major if statistical discrimination (information frictions) dominates
- Black workers should have a lower (higher) observed return to major difficulty (i.e., this gap should grow as we move up the major difficulty distribution) if statistical discrimination (information frictions) dominates
- Black workers should have a higher observed return to college grades if they face stronger information frictions about their preparation than white workers

# Empirics

# Data

- MIDFIELD State School Sample Data
  - Administrative data from 12 large public universities: Clemson, Colorado, Colorado State, Florida, Florida State, Georgia Tech, North Carolina State, North Carolina - Charlotte, Oklahoma, Purdue, Utah State, Virginia Tech
  - Include courses taken, majors, grades, test scores, GPAs for students between 1987-2018
- American Community Survey 2011-2021 (wages and college major)
- Baccalaureate and Beyond
  - Nationally representative longitudinal data of college students in 2007-2008 graduating class
  - Information on major, grades, test scores, and institution
  - Wage data for 2009, 2012, 2018

# Major Difficulty

- Compute two wage-based metrics from the ACS
  - Average residual from regression of log wage on age and year fixed effects for native-born full-time year-round employed 25-54 year old whites with at least a four-year college degree
  - Percentile ranking of majors from those residuals
- Lowest Return Majors:
  - Human Services and Community Organization; Early Childhood Education; Theology and Religious Vocations; Cosmetology Services and Culinary Arts; Library Science
- Highest Return Majors:
  - Petroleum Engineering; Actuarial Science; Chemical Engineering; Pharmacy, Pharmaceutical Sciences, and Administration; Aerospace Engineering
- 173 majors: Economics $10^{th}$, Computer Sci $18^{th}$, Finance $22^{nd}$
- Compute one course-based metric from State School Sample: fraction of course credits in STEM for average graduate of each major

State School Summary Statistics

| | White (1) | Black (2) | $p$-value (3) |
|---|---|---|---|
| Female | 0.475 | 0.562 | 0.000 |
| Transfer Student | 0.151 | 0.123 | 0.000 |
| Year Entered College | 2001.7 | 2000.2 | 0.000 |
| High School GPA | 3.003 | 2.934 | 0.000 |
| SAT Score | 1144.6 | 1033.4 | 0.000 |
| First-Year College GPA | 2.848 | 2.459 | 0.000 |
| College GPA at Graduation | 2.899 | 2.441 | 0.000 |
| First Major Wage Return | -0.0029 | 0.0117 | 0.000 |
| First Major Percentile Return | 0.497 | 0.516 | 0.000 |
| First Major STEM Courses | 0.354 | 0.352 | 0.006 |
| Graduation Major Wage Return | 0.0363 | 0.0251 | 0.000 |
| Graduation Major Percentile Return | 0.551 | 0.535 | 0.000 |
| Graduation Major STEM Courses | 0.333 | 0.302 | 0.000 |
| Graduated College | 0.489 | 0.394 | 0.000 |
| Observations | 873,662 | 60,786 | |

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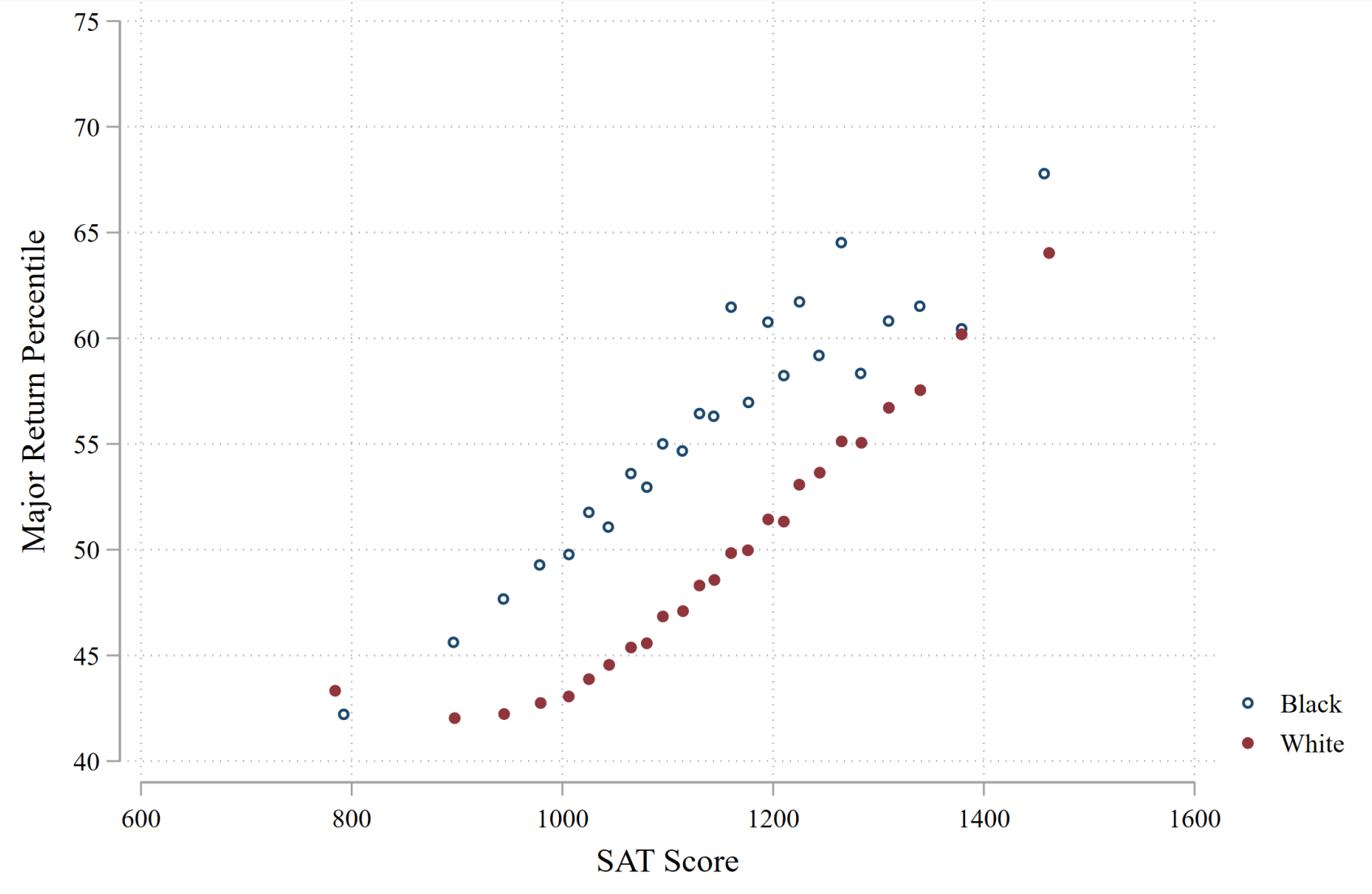
ACS Summary Statistics

| | White | Black | $p$-value |
|---|---|---|---|
| | (1) | (2) | (3) |
| Female | 0.465 | 0.628 | 0.000 |
| Age | 43.43 | 42.99 | 0.000 |
| Log Earnings | 11.17 | 10.91 | 0.000 |
| Major Wage Return | -0.0022 | -0.0308 | 0.000 |
| Major Percentile Return | 0.504 | 0.470 | 0.000 |
| Major STEM Courses | 0.278 | 0.246 | 0.000 |
| Observations | 2,585,094 | 200,428 | |

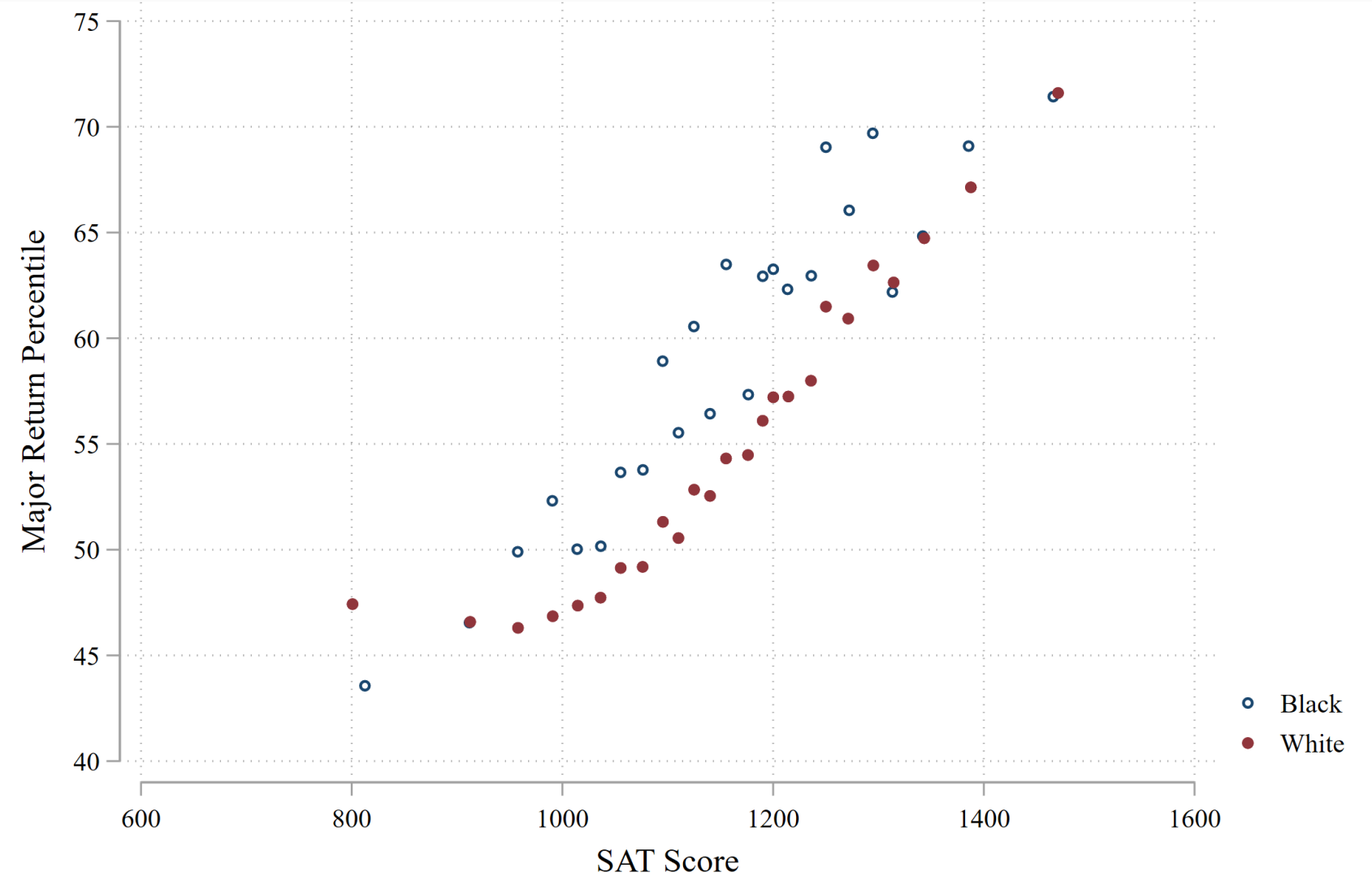
Baccalaureate and Beyond, 2007-2008 College Graduates

| | White | Black | $p$-value |
|---|---|---|---|
| | (1) | (2) | (3) |
| Female | 0.578 | 0.674 | 0.000 |
| SAT Score | 1099.2 | 949.0 | 0.000 |
| GPA at graduation | 3.347 | 3.089 | 0.000 |
| Age at graduation | 22.80 | 22.99 | 0.000 |
| First Generation Student | 0.412 | 0.604 | 0.000 |
| Major Wage Return | -0.0194 | -0.0117 | 0.210 |
| Major Return Percentile | 0.476 | 0.491 | 0.066 |
| Major STEM Courses | 0.340 | 0.326 | 0.051 |
| Log Earnings 2009 | 10.16 | 10.10 | 0.025 |
| Log Earnings 2012 | 10.58 | 10.50 | 0.000 |
| Log Earnings 2018 | 11.08 | 10.94 | 0.000 |
| Observations | 10,420 | 1,200 | |

# SAT Scores and First Major Percentile Return by Race: State School Sample



# SAT Scores and Graduation Major Percentile Return by Race: State School Sample



# SAT Scores and Major Percentile Return by Race: B&B Sample

# Major Selection by Race and SAT Score

| | State Schools | | | | B&B | |
|---|---|---|---|---|---|---|
| | 1st-Yr. Major | | Grad. Major | | Grad. Major | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | **Panel A: Major Wage Return** | | | | | |
| Black | 0.031*** | 0.037*** | 0.029*** | 0.037*** | 0.058*** | 0.070*** |
| | (0.002) | (0.002) | (0.003) | (0.003) | (0.007) | (0.009) |
| Black × SAT | | 0.005*** | | 0.007*** | | 0.007** |
| | | (0.001) | | (0.001) | | (0.003) |
| | **Panel B: Major Percentile Return** | | | | | |
| Black | 0.042*** | 0.048*** | 0.037*** | 0.046*** | 0.082*** | 0.098*** |
| | (0.002) | (0.002) | (0.004) | (0.004) | (0.009) | (0.012) |
| Black × SAT | | 0.006*** | | 0.010*** | | 0.010** |
| | | (0.001) | | (0.001) | | (0.004) |
| | **Panel C: Major STEM Courses** | | | | | |
| Black | 0.030*** | 0.036*** | 0.021*** | 0.032*** | 0.044*** | 0.061*** |
| | (0.002) | (0.002) | (0.004) | (0.004) | (0.008) | (0.012) |
| Black × SAT | | 0.006*** | | 0.011*** | | 0.010** |
| | | (0.001) | | (0.001) | | (0.004) |
| Student Characteristics | X | X | X | X | X | X |
| Student SAT FE | X | X | X | X | X | X |
| Institution × Start Year FE | X | X | X | X | | |
| Institution SAT Percentiles | | | | | X | X |
| Observations | 934,456 | 934,456 | 450,994 | 450,994 | 11,550 | 11,550 |

# Major Choice Results

Results strongly consistent with statistical discrimination having a larger impact on major choice than student information frictions:

- Conditional on SAT score, Black students select and graduate in higher return (more difficult) majors
- No gap among lowest preparation students, gap emerges among higher SAT students

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- Conditional on SAT score, Black students select and graduate in higher return (more difficult) majors
- No gap among lowest preparation students, gap emerges among higher SAT students

- Implies that Black students graduate with less human capital (lower wages) on average than white students who graduated in the same major

# Adult Log Earnings by Graduation Major Selection and Race

| | ACS | | | B&B | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | **Panel A: Major = Wage Return** | | | | | |
| Black | -0.220*** | -0.227*** | | -0.068*** | -0.068*** | -0.039** |
| | (0.016) | (0.017) | | (0.017) | (0.015) | (0.019) |
| Major | 0.862*** | 0.831*** | 0.831*** | 0.564*** | 0.568*** | 0.559*** |
| | (0.019) | (0.028) | (0.028) | (0.131) | (0.132) | (0.131) |
| Major × Black | -0.331*** | -0.331*** | -0.334*** | -0.131* | -0.137* | -0.140* |
| | (0.059) | (0.058) | (0.058) | (0.073) | (0.075) | (0.071) |
| College GPA | | | | | | 0.061*** |
| | | | | | | (0.018) |
| College GPA × Black | | | | | | 0.113*** |
| | | | | | | (0.035) |
| | **Panel B. Major = Percentile Return** | | | | | |
| Black | -0.097*** | -0.105*** | | -0.066*** | -0.065*** | -0.037* |
| | (0.015) | (0.016) | | (0.017) | (0.015) | (0.019) |
| Major | 0.646*** | 0.624*** | 0.624*** | 0.402*** | 0.403*** | 0.398*** |
| | (0.017) | (0.025) | (0.025) | (0.104) | (0.105) | (0.104) |
| Major × Black | -0.250*** | -0.249*** | -0.251*** | -0.094* | -0.099* | -0.101* |
| | (0.042) | (0.042) | (0.042) | (0.054) | (0.056) | (0.053) |
| College GPA | | | | | | 0.062*** |
| | | | | | | (0.018) |
| College GPA × Black | | | | | | 0.113*** |
| | | | | | | (0.035) |
| State FE | | X | | X | X | X |
| State × Race FE | | | X | | | |
| Student SAT FE | | | | | X | |
| Institution SAT Percentiles | | | | X | X | X |
| Observations | 2,011,969 | 2,011,969 | 2,011,969 | 26,400 | 26,400 | 26,400 |

# Wage Results

Results strongly consistent with statistical discrimination having a larger impact on major choice than student information frictions:

- Black workers receive lower wages than similar White workers who graduated in the same major
- Statistical discrimination induces a productivity gap in favor of White students that is increasing in major difficulty

Results confirm the presence of student information frictions:

- Black students have a higher return to college grades
- Consistent with Black students having less precise beliefs about their aptitude when choosing college major

# Other Results

- Race or SES? ▸ Results
  - Alternative hypothesis that low SES students have different major choices/outcomes and race correlated with SES
  - Results are all robust to controlling for SES of home zip code and interactions with major
  - SES interactions inconsistent across specifications, sometimes opposite of prediction
- No evidence of heterogeneity by age or gender
- Results robust to major return measures where we include non-white workers in calculation, as well as including only white men
- Results robust to using a direct measure of major difficulty (subset of majors)
- Institution fixed effects reduce precision in B&B but have little impact on point estimates

# Discussion

# Summary of Results

- Results strongly indicate that Black students choose more difficult majors due to anticipated statistical discrimination
- This "mismatch" is optimal behavior of students, not distorted behavior due to institutional factors, therefore moving a Black student to a "better matched" major is harmful
- Increases productivity but must be more than offset by lower employer beliefs about worker
- Important implications for current methodologies that test mismatch hypothesis on university admissions

# A Simple Extension

- Consider simple extension of model where Black students face barriers to human capital investments, $c(m)$, that are increasing in difficulty
- Such barriers will reduce Black student investment choices (potentially even beneficially)
- Policymakers concerned with equity can give Black students an affirmative action subsidy $b(m)$ which will induce Black students to attempt higher levels of $m$
- If $b(m)$ is too low, Black students will "undermatch" and would see better outcomes if they attempted more difficult $m$
- If $b(m)$ is too high, Black students will "overmatch" and lowering affirmative action subsidies will raise average Black outcomes
- When $b(m) = c(m)$ Black students will optimally mismatch as in our model, and a reduction in $b(m)$ is arguably beneficial

# Some Definitions

- Weak mismatch: Lowering $b(m)$ on the margin would improve Black outcomes
- Strong mismatch: $b(m) = 0$ (i.e., abolishing racial admissions preferences) would lead to better Black outcomes than current $b(m)$
- Strong mismatch implies weak mismatch but not vice versa

# Pseudo-Random Assignment

- Consider a natural experiment which leads to a small number of Black students to randomly attend a more difficult institution (e.g., a RD around an admissions cutoff)
- If information is incomplete, these students will be paid a higher wage than those who attend a less difficult institution *even if* they are less productive
- Thus cannot reject weak or strong mismatch
- Signaling value of institution will lead to sharp increase in wages at discontinuity
- If information is complete (older workers) this provides test of weak mismatch because it compares outcomes from marginally changed students whose matriculation decisions depend on $b(m)$

# Affirmative Action Ban

- Several states have banned affirmative action in admissions
- Frequent empirical strategy is to compare Black outcomes before and after affirmative action ban
- Whether ban harms minority students seems to depend on state and minority group studied
- This provides a test of strong mismatch regardless of whether information is complete or incomplete, but cannot reject weak mismatch
- Natural that results could vary dramatically across studies, since each study is comparing a different level of affirmative action subsidies (state policy differences towards different classes) to same $b(m) = 0$ treatment

# Conclusion

# Summary

- Developed a new model of human capital investment when students have incomplete information about their aptitude and anticipate statistical discrimination
- Two different information channels have opposing effects on major selection
- Empirical evidence suggests statistical discrimination is stronger than student information frictions
- Find that Black students enroll in more difficult majors, and have a lower return to majors in the labor market
- Because behavior is optimal, in equilibrium moving Black students to "better matched" investments is harmful
- Researchers must think carefully about policy question of interest and level of information possessed by employers when evaluating empirical studies of racial admissions preferences

# Theory

# Student Beliefs

- Large number of (b)lack and (w)hite students who vary in initial aptitude $a_i$
- Students do not observe own aptitude but have beliefs about aptitude with mean $\rho_i$ and variance $\varsigma_r$
- $\varsigma_b^2 \geq \varsigma_w^2$.
- Black students may have less precise beliefs about their ability due to racial differences in quality of preparation or home environment
- Alternatively, because racial admissions preferences make university acceptance a less reliability indicator of one's aptitude
- $\rho$ distributed over $[0, 1]$ according to twice differentiable cdf $F_r(\rho)$.
- $f_r(\rho) > 0, \forall \rho \in [0, 1]$ but otherwise no assumptions on distribution or differences in distribution across race

# College Major Choice

- Students must choose from a continuum of investment technologies $m$ (majors) which differ in complementary with aptitude to produce human capital $p_i$

$$p_i = ma_i - m^2$$

- Higher values of $m$ indicate stronger complementarity with $a_i$ (difficulty)
- Functional form assumption allows for tractability (conjugate priors) but otherwise inconsequential
- Note that for each $a_i$ or $\rho_i$ there is a unique $m$ which maximizes human capital and any $m$ choice above that leads to lower $p_i$
- Thus, "mismatch" or "overmatch" leads to worse economic outcomes.

# Employment

Firms do not observe $p_i$ or $a_i$. They observe $m_i$, student grades $g_i$, and a job market signal $s_i$:

$$s_i = a_i + \epsilon_i$$
$$g_i = a_i + \zeta_i$$

- $\epsilon_i$ is distributed normally with mean 0 and standard deviation $\sigma_r$, with $\sigma_b > \sigma_w$. (Noisier for Blacks than Whites)
- $\zeta_i$ is distributed normally with mean 0 and standard deviation $\varrho$. (Equally informative across race)
- $\epsilon_i$ and $\zeta_i$ independent
- $\sigma_b > \sigma_w$ (i.e. Black workers have noisier signals than White workers)

# Well-Behaved Equilibrium

Denote $M_r(\rho)$ as the race-specific mapping from student beliefs to major choice, and $P_r(m)$ as its inverse.

**Definition**
(Lang and Manove 2011) A well-behaved equilibrium is an equilibrium with the following properties:

1. $M_r$ is smooth, continuous, differentiable, and monotonically increasing in $\rho$
2. For any $m$ which is not utilized by any students of race $r$ in equilibrium, $P_r = 0$

# Firm Beliefs

Firms use all information when forming beliefs and making wage offers. Applying Bayes' Rule, equilibrium firm beliefs will be:

$$\pi_r(m, s, g) = \tau_r^{-1} \left[ \varsigma_r^{-2} P_r(m) + \sigma_r^{-2} s + \varrho^{-2} g \right]$$
$$\tau_r \equiv \varsigma_r^{-2} + \sigma_r^{-2} + \varrho^{-2}$$

- Key principle: More weight is put on information with lower relative variance

Wages then follow as:

$$w_r(\pi_r) = m\pi_r(m, s, g) - m^2 \tag{1}$$

# Over Education

- Denote $M^*(\rho)$ as the productivity maximizing level of investment for a worker with aptitude $\rho$
- $M_r(\rho) \geq M^*(\rho) \forall \rho$
- All students will select an investment that is at least as high as the one which maximizes their expected productivity
- Suppose $M_k(\rho) < M^*(\rho)$; student could increases investment to both raise their productivity and the market's beliefs about their type

# Lowest Type Major Selection

- $M_b(0) = M_w(0) = M^*(0)$
- The lowest type student will choose the productivity maximizing investment
- Suppose not
  - if $M(0) < M^*(0)$ raising $m$ to $M^*(0)$ would both raise productivity and raise employer beliefs about type
  - if $M(0) > M^*(0)$ employers still believe workers is lowest type; could reduce $m$ to $M^*(0)$ to raise productivity without harming beliefs

# Solving the Equilibrium

- Now consider investment decision of individual with aptitude $\rho > 0$
- Raising investment above $M^*(\rho)$ will
  - Provide benefit by raising markets' beliefs about productivity via major choice
  - Provide cost of lowering actual productivity which lowers expected value of signal $(s)$ and grades $(g)$.
  - Whether Black or White students will take more difficult majors depends on whether their race-specific signaling value outweighs their lost productivity ▸ Back

# Race or SES?

- Alternative hypothesis is that results driven by low SES students having a stronger desire for monetary rewards
- Correlation between SES and race drives results
- Unlikely statistical discrimination mechanism holds for low SES white students
- Can compare effects on low SES White students to Black students to test our mechanism
- While data on students own childhood SES is not available, both State School Sample and B&B data include home ZIP code
- Include ZIP code conventional SES measures, as well as intergenerational mobility statistics computed as part of Opportunity Insights (Chetty et al., 2018)

# Graduation Major Selection by Race, SAT Score, and Neighborhood Characteristics, State School Sample

| | State Schools | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Black | 0.039*** | 0.040*** | 0.040*** | 0.040*** |
| | (0.004) | (0.004) | (0.004) | (0.004) |
| Black × SAT | 0.009*** | 0.009*** | 0.009*** | 0.008*** |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| Median Income (10,000s) | | 0.001* | | |
| | | (0.000) | | |
| Median Income × SAT | | -0.001* | | |
| | | (0.000) | | |
| Median Education | | | 0.001 | |
| | | | (0.001) | |
| Median Education × SAT | | | -0.001* | |
| | | | (0.000) | |
| Income Mobility | | | | 0.077*** |
| | | | | (0.019) |
| Income Mobility × SAT | | | | -0.087*** |
| | | | | (0.012) |
| Student Characteristics | X | X | X | X |
| Student SAT FE | X | X | X | X |
| Institution × Start Year FE | X | X | X | X |
| Institution SAT Percentiles | | | | |
| Observations | 312,538 | 312,538 | 312,538 | 312,538 |

# Graduation Major Selection by Race, SAT Score, and Neighborhood Characteristics, Baccalaureate and Beyond Sample

| | B&B | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Black | 0.073*** | 0.072*** | 0.073*** | 0.073*** |
| | (0.010) | (0.010) | (0.010) | (0.010) |
| Black × SAT | 0.007* | 0.006* | 0.006* | 0.007* |
| | (0.004) | (0.004) | (0.004) | (0.004) |
| Median Income (10,000s) | | -0.002* | | |
| | | (0.001) | | |
| Median Income × SAT | | -0.000 | | |
| | | (0.001) | | |
| Median Education | | | -0.002 | |
| | | | (0.002) | |
| Median Education × SAT | | | -0.000 | |
| | | | (0.001) | |
| Income Mobility | | | | -0.058 |
| | | | | (0.053) |
| Income Mobility × SAT | | | | -0.001 |
| | | | | (0.025) |
| Student Characteristics | X | X | X | X |
| Student SAT FE | X | X | X | X |
| Institution × Start Year FE | | | | |
| Institution SAT Percentiles | X | X | X | X |
| Observations | 8,370 | 8,370 | 8,370 | 8,370 |

# Log Earnings by Graduation Major Selection, Race, and Neighborhood Characteristics

| | B&B | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Black | -0.059*** | -0.044** | -0.056*** | -0.058*** | -0.059*** |
| | (0.021) | (0.021) | (0.021) | (0.020) | (0.021) |
| Major | 0.589*** | 0.498*** | 0.528*** | 0.553*** | 0.532*** |
| | (0.127) | (0.152) | (0.143) | (0.193) | (0.156) |
| Black × Major | -0.328*** | -0.338*** | -0.323*** | -0.321*** | -0.263*** |
| | (0.092) | (0.090) | (0.093) | (0.087) | (0.094) |
| Median Income (10,000s) | | 0.028*** | | | 0.027*** |
| | | (0.003) | | | (0.004) |
| Median Income × Major | | 0.018 | | | 0.010 |
| | | (0.013) | | | (0.013) |
| Median Education | | | 0.018*** | | |
| | | | (0.005) | | |
| Median Education × Major | | | 0.012 | | |
| | | | (0.017) | | |
| Income Mobility | | | | 0.902*** | |
| | | | | (0.149) | |
| Income Mobility × Major | | | | 0.267 | |
| | | | | (0.777) | |
| Student Characteristics | X | X | X | X | X |
| Student SAT FE | | | | | X |
| Year FE | X | X | X | X | X |
| Institution SAT Percentiles | X | X | X | X | X |
| Observations | 22,670 | 22,670 | 22,670 | 22,670 | 20,500 |

# Race, not SES

- Find predicted racial effects regardless of SES controls used
- SES interactions have inconsistent effects across specifications, sometimes opposite of predictions (if main mechanism)

▸ Back