Diversifying Society’s Leaders?
The Determinants and Causal Effects of Admission to Highly Selective Private Colleges

Raj Chetty, Harvard University
David J. Deming, Harvard University
John N. Friedman, Brown University

October 2023

The opinions expressed in this paper are those of the authors alone and do not necessarily reflect the views of the Internal Revenue Service, the U.S. Treasury Department, the College Board, or ACT.
Share of Individuals in Leadership Positions who Attended Ivy-Plus Colleges
Ivy-League, Chicago, Duke, Stanford, MIT

Benchmark: College Attendees

Income
- Top 25% Earnings: 1.4%
- Top 10% Earnings: 2.5%
- Top 1% Earnings: 7.8%
- Top 0.1% Earnings: 13.4%
- Fortune 500 CEOs: 11.6%

Arts and Sciences
- Attend Graduate School: 2.6%
- Attend Elite Graduate School: 20.3%
- MacArthur Grant Recipients: 28.6%

Public Service
- Current US Senators: 25.0%
- Journalists at NYT or WSJ: 26.1%
- US Presidents (1961 - Current): 41.7%
- Rhodes Scholars: 48.4%
- Supreme Court Justices (1967 - Current): 71.4%
Ivy-Plus College Attendance Rates Controlling for SAT/ACT Scores, by Parental Income

Students with SAT Score of 1510 (out of 1600) or ACT Score of 34 (out of 36)
Question

- Do highly selective private colleges amplify the persistence of privilege across generations?
  
  - Could they diversify society’s leaders by changing their admissions policies?
Overview

- Answer depends on two sub-questions:

  1. **[Inputs]** Why are students from high-income families more likely to attend highly selective private colleges?

     - Admissions policies or students’ choices about where to apply or matriculate?

  2. **[Outputs]** What is the causal effect of these colleges on marginal students’ post-college outcomes?

     - Perhaps students at highly selective schools would have done equally well no matter where they attended [Dale & Krueger 2002, 2014, Mountjoy & Hickman 2022 vs. Zimmerman 2019, Michelman Price & Zimmerman 2022, Bleemer 2022]
Data

1. Federal income tax records, 1996-2021


4. Applications and Admissions Records from Colleges
   - Several Ivy-Plus colleges, various years
   - Highly Selective Public institutions: UC-Berkeley, UCLA, UT-Austin, plus other most selective public flagships
   - Several college systems: UC system, Cal State, Texas system (THECB)
   - Detailed student characteristics, admissions outcomes, internal ratings
Question 1

Why Are Students from High-Income Families More Likely to Attend Highly Selective Colleges?
Disparities Before College

- Begin by adjusting for disparities by socioeconomic status **before** college application using SAT/ACT scores
  - Standardized test scores are an imperfect measure of latent potential, and may exhibit biases potentially correlated with parental income [e.g., Goodman et al. 2020]
  - Use scores as a benchmark to start from and revisit latent potential by parental income at the end of the talk by examining post-college outcomes
  - Reweight test-score distribution within each parent income group to match distribution of scores for attendees of Ivy-plus colleges
Ivy-Plus College Attendance Rates at the 99th Percentile of Test Score, by Parental Income

Students with SAT Score of 1510 (out of 1600) or ACT Score of 34 (out of 36)
Ivy-Plus Attendance Rates by Parental Income
Reweighted on SAT/ACT Scores to Match Current Attendees

+168 extra students from top 1%
(per class of 1650 students)
Attendance Rates at Selective Colleges by Parental Income
Reweighting on Test Score
Attendance Rates at Selective Colleges by Parental Income, Controlling for Test Score

[Graph showing the relationship between relative attendance rate and parent income percentile for Ivy-Plus, Flagship Public, and Other Selective Private colleges.]

Other Private: Caltech, Carnegie Mellon, Emory, Georgetown, Hopkins, NYU, Northwestern, Rice, Notre Dame, USC, Vanderbilt, WashU
Flagship Public: Florida, Georgia, Michigan, Ohio State, UC-Berkeley, UCLA, UNC-Chapel Hill, UT-Austin, Virginia
How Many “Extra” Students from Top 1% at Ivy-Plus Colleges?

- Actual attendance rate at college $c$ for students from top 1% can be written as a count-weighted average of attendance rates across test score bins $a$:

  $$Actual\ Attendance_{Top\ 1\%c} = \sum_a N_{Top\ 1\%a} \times \text{AttendRate}_{Top\ 1\%,ac}$$

- Counterfactual: suppose attendance rates of students from top 1% were equal to that of middle-class (p70-80) students with same scores

  $$Counterfactual\ Attendance_{Top\ 1\%c} = \sum_a N_{Top\ 1\%a} \times \text{AttendRate}_{p70-80,ac}$$

- Define “extra” students from top 1% as difference between these measures

  - No normative claim about whether the “extra” top 1% presence is merited
Ivy-Plus Attendance Rates by Parental Income
Reweighted on SAT/ACT Scores to Match Current Attendees

+168 extra students from top 1% (per class of 1650 students)
Pipeline Analysis

- What accounts for the “extra” 168 students from the top 1%?
  - Applications, admissions, or matriculation?

- Athletes admitted through separate recruitment process without clear distinction between different stages of process [see e.g., Bowen and Levin 2003, Arcidiacono 2019]
  - Exclude recruited athletes from what follows and return to them below
Relative Application Rates at Highly Selective Colleges, by Parental Income
Reweighted on SAT/ACT Scores to Match Current Attendees
Relative Admissions Rate for Top 0.1% (Income > $2.7 million) = 2.18

Relative Admissions Rate for P99-P99.9 = 1.26

Relative Admissions Rate for P70-P80 = 0.88
Admissions Rates for Non-Athletes at Highly Selective Colleges, by Parental Income
Reweighted on SAT/ACT Scores to Match Current Attendees
Matriculation Rates at Highly Selective Colleges, by Parental Income
Reweighted on SAT/ACT Scores to Match Current Attendees
Now measure relative contributions of admissions vs. other margins

Attendance rate at college $c$ for top 1% is:

$$Attendance_{Top \, 1\%,c} = \sum_a N_{Top \, 1\%,a} \times Apply_{Top \, 1\%,ac} \times Admit_{Top \, 1\%,ac} \times Matric_{Top \, 1\%,ac}$$

How much of the gap in attendance could be closed by eliminating differences in admissions rates, holding fixed other rates?

$$EqualAdmit \, CF_{Top \, 1\%,s} = \sum_a N_{Top \, 1\%,a} \times Apply_{Top \, 1\%,ac} \times Admit_{p70\text{-}80,ac} \times Matric_{Top \, 1\%,ac}$$
Why Are Students from High-Income Families More Likely to Attend Ivy-Plus Colleges?

Pipeline Decomposition

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Application</strong></td>
<td><strong>Non-Athletic Admissions</strong></td>
<td><strong>Matriculation</strong></td>
<td><strong>Attendance</strong></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>87</td>
<td>20</td>
<td>168</td>
<td></td>
</tr>
<tr>
<td>20.1%</td>
<td>51.9%</td>
<td>11.9%</td>
<td>Extra students from top 1%</td>
<td></td>
</tr>
</tbody>
</table>
**Share of Students Admitted to Selected Colleges who are Recruited Athletes**

Reweighted on SAT/ACT Scores to Match Current Attendees
### Why Are Students from High-Income Families More Likely to Attend Ivy-Plus Colleges?

#### Pipeline Decomposition

<table>
<thead>
<tr>
<th>Application</th>
<th>Recruited Athletes</th>
<th>Non-Athletic Admissions</th>
<th>Matriculation</th>
<th>Attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>27</td>
<td>87</td>
<td>20</td>
<td>168</td>
</tr>
<tr>
<td>20.1%</td>
<td>16.2%</td>
<td>51.9%</td>
<td>11.9%</td>
<td>Extra students from top 1%</td>
</tr>
</tbody>
</table>
Why Are Students from High-Income Families More Likely to Attend Ivy-Plus Colleges?

Pipeline Decomposition

- **Non-Athletic Admissions**: 87
- **Recruited Athletes**: 27
- **Application**: 34
- **Matriculation**: 20

---

**Attributable to Admissions**: 114 (68.1%)

**Attendance**: 168

Extra students from top 1%
Why Do Admissions Rates Differ by Parental Income?
Begin by examining contribution of other preferences in admissions documented in prior work for children of alumni ("legacies") and faculty children, excluding athletes [e.g., Bowen and Levin 2003, Arcidiacono et al. 2019]

Focus here on how much this contributes to gaps by parental income
Share of Applicants at Selected Ivy-Plus Colleges who are Legacies
Relative Admissions Rates for Legacy Applicants at Ivy-Plus Colleges
Reweighted on SAT/ACT Scores to Match Current Attendees

![Graph showing relative admissions rates for legacy students across different parent income percentiles.](image-url)
What would admissions rate be for legacy students absent legacy preference?

First estimate an admissions model for **non-legacy** students based on application characteristics [Card 2017, Arcidiacono et al. 2020]

- Observable student chars: test score, GPA, internal ratings, gender, race, first-gen, early / regular decision round, high school FE, parent income, application year

Then predict admissions rates for legacy students in this model, with their own chars
Relative Admissions Rates for Legacy Applicants at Ivy-Plus Colleges
Reweighted on SAT/ACT Scores to Match Current Attendees
Effects of Legacy Preferences

- Key assumption: observable characteristics capture all factors that differentiate legacy students from non-legacies in admissions
  - Test by examining admissions decisions at other Ivy-plus colleges
Admissions Rates for Legacy Students
Admission Rate by Legacy Status

- Admitted to Reference Ivy-Plus College:
  - Legacy at Reference College: 36.4%
  - Legacy Counterfactual at Reference College: 11.7%
  - Non-Legacy at Reference College: 9.3%

- Admitted to Other Ivy-Plus Colleges:
  - Legacy at Reference College: 11.2%
  - Non-Legacy at Reference College: 9.6%
Effect of Legacy Preferences

- **Application**: 34 (20.1%)
- **Recruited Athletes**: 27 (16.2%)
- **Legacy Preference**: 52 (31%)
- **Matriculation**: 20 (11.9%)
- **Attendance**: 168 (Extra students from top 1%)

68.1% attributable to Admissions.
Explaining Remaining Admissions Preference

- To understand source of remaining difference in admissions rates, turn to detailed information on applicant ratings

  - Focus first on non-legacy applicants (to avoid contamination from legacy effect)
Admissions Office Ratings of Applicants by Parental Income: Academic Rating
Reweighting on Test Scores, Excluding Legacies, Athletes, and Faculty Children
Admissions Office Ratings of Applicants by Parental Income: **Non-Academic Rating**
Reweighting on Test Scores, Excluding Legacies, Athletes, and Faculty Children
Non-Academic Ratings by Parental Income
Reweighting on Test Scores, Excluding Legacies, Athletes, and Faculty Children
High School Effects on Admissions and Ratings

- Differences in ratings and admissions are mediated by high schools

- Estimate HS fixed effects on admissions by regressing Ivy-plus admission indicator on HS dummies, SAT scores, & demographic controls (race, gender, parent income)
High-School Fixed Effects on Admissions vs. Parental Income

The line graph illustrates the relationship between high school fixed effects on admissions and parental income percentile. The x-axis represents the parent income percentile, ranging from 0-20 to Top 0.1, while the y-axis shows the percentage of high school fixed effect on admission. The graph shows a generally decreasing trend from lower to higher percentiles, with a notable increase for the top percentile, indicating a significant effect.
High School Effects on Ivy-Plus Admissions, by High School Type

- Disadvantaged Public (e.g., Forest Hills HS): 8.0%
- Advantaged Public (e.g., Scarsdale HS): 5.2%
- Religious Private (e.g., Fordham Prep School): 8.2%
- Non-Religious Private (e.g., Horace Mann School): 10.4%

Mean Ivy-Plus Admission Rate = 7.2%
High School Effects on Non-Academic Rating, by High School Type

Overall Fraction of Applicants with High Non-Academic Rating = 25.1%

- Disadvantaged Public (e.g., Forest Hills HS): 23.1%
- Advantaged Public (e.g., Scarsdale HS): 22.4%
- Religious Private (e.g., Fordham Prep School): 24.3%
- Non-Religious Private (e.g., Horace Mann School): 30.7%
Ratings vs. High School Fixed Effects on Admissions, Controlling for SAT Score
Share of Ivy-Plus Applicants with High Ratings vs. (Shrunken) High School FE on Admissions

![Graph showing the relationship between high school fixed effects and admission rates for non-academic and academic ratings.](image-url)
Effect of Non-Academic Ratings Preferences

- Application: 34 (20.1%)
- Recruited Athletes: 27 (16.2%)
- Legacy Preference: 52 (31%)
- Non-Academic Cred.: 35 (20/9%)
- Matriculation: 20 (11.9%)
- Attendance: 168 (Extra students from top 1%)

Total attributable to admissions: 114 (68.1%)
Question 2

Does Admission to an Ivy-Plus College Have a Causal Effect on Students’ Post-College Outcomes?
Identifying the Causal Effects of Attending Highly Selective Colleges

- Goal: identify causal effects of Ivy-plus attendance relative to average state flagship university (elastic outside option for highly qualified students)

- Use two research designs to estimate this causal effect

  1. Isolating idiosyncratic variation in admissions among marginal students (new method introduced here)

  2. Isolating idiosyncratic variation in matriculation among admitted students (replicating Mountjoy and Hickman 2022, building on Dale and Krueger 2002)

- Start with admissions design, motivated by preceding evidence on importance of admissions margin
Empirical Model of College Admissions

Consider a student $i$ who applies to colleges $j \in \{A, B, \ldots\}$, each of which assesses student quality as

$$Z_{ij} = \gamma_{1j}X_{1i} + \gamma_{2j}X_{2i} + \epsilon_{ij}$$

where

- $X_{1i}$ is a vector of observable characteristics, potentially correlated w/ outcomes
- $X_{2i}$ is a scalar unobservable characteristic, potentially correlated w/ outcomes
- $\gamma_{1j}$ and $\gamma_{2j}$ are college-specific weights
- $\epsilon_{ij}$ is a college-specific unobservable $Corr(\epsilon_{ij}, \epsilon_{ij'}) = 0$, uncorrelated w/ outcomes

College $j$ admits student $i$ iff $Z_{ij} > C_j$

- Let $P_{ij}$ and $D_{ij}$ denote if student $i$ is admitted to and attends college $j$, respectively
Empirical Model of Post-College Outcomes

- Post-college outcome (e.g., earnings) for student $i$ is

$$ Y_i = \sum_{j \in J_i} D_{ij} \phi_j + \beta_1 X_{1i} + \beta_2 X_{2i} + \epsilon_i^Y $$

where $\phi_j$ is the causal effect of college $j$ on outcomes (normalized to 0 for mean state flagship, $j = O$) and $\text{Corr}(\epsilon_{ij}, \epsilon_i^Y) = 0$ by definition

- Goal: estimate $\phi_{Ivy}$
Selection Bias in Estimating College Fixed Effects

- Observational value-added estimator for $\phi_{IVY^+}$:

$$\hat{\phi}_{IVY^+, ols} = E[Y_i|X_{1i}, D_{iA} = 1] - E[Y_i|X_{1i}, D_{iO} = 1]$$

- Problem: $\hat{\phi}_{IVY^+, ols} \neq \phi_{IVY^+}$ due to bias created by colleges selecting on $X_{2i}$

- Need to isolate variation in admissions/attendance that arises from factors orthogonal to potential outcomes $Y_i(Dij)$
First approach: isolate variation in admissions due to idiosyncratic factors $\epsilon_{ij}$ unrelated to post-college outcomes

- Ex: availability of slots in orchestra or variation in essay ratings across readers

How to isolate such variation?

- Start by focusing on students placed on admissions \textit{waitlist}

  - Similar to logic of regression discontinuity, but no exogenous running variable local to cutoff here, so cannot directly implement RD design
Research Design #1: Isolating idiosyncratic Variation in Admissions

- Obvious concern: admissions from waitlist may still be driven by variation in $X_{2i}$

- Key idea: exploit fact that we observe multiple independent evaluations of same student to test whether we are isolating idiosyncratic variation $\epsilon_{ij}$

- Test if admissions decisions and ratings at other Ivy-plus colleges are related to admissions decision from waitlist at a given college
  - Intuition: if waitlist admissions are based on idiosyncratic factors at a given college, decisions made at college $B$ should not be related to admissions decision at $A$
Two-Rater Test for Idiosyncratic Selection

- **Assumption 1**: Correlated Admissions Criteria

  \[ \gamma_{2A} \cdot \gamma_{2B} > 0 \]

- Requires that colleges place same-signed (but not identical) weights on applicant characteristics \( X_{2i} \) that matter for potential outcomes
Two-Rater Test for Idiosyncratic Selection

- Test statistic for selection bias:

\[ T = E[P_{iB}|W_{iA} = 1, P_{iA} = 1] - E[P_{iB}|W_{iA} = 1, P_{iA} = 0] \]

- Under Assumption 1, \( T = 0 \) implies that residual variation in \( P_{iA} \) among waitlist students is driven purely by idiosyncratic variation \( \epsilon_{ij} \)

- Hence comparison of outcomes for students admitted vs. rejected from waitlist (adjusting for attendance rate) identifies causal effect of interest:

\[ \hat{\phi}_{A,W} = \frac{E[Y_i|W_{iA} = 1, P_{iA} = 1] - E[Y_i|W_{iA} = 1, P_{iA} = 0]}{E[D_i|W_{iA} = 1, P_{iA} = 1] - E[D_i|W_{iA} = 1, P_{iA} = 0]} = \phi_A \]
Correlated Admissions Assumption Underlying Two-Rater Test

- To understand assumption, consider two cases where it fails:
  
  1. College A practices holistic admissions while college B uses a test-score cutoff ($\gamma_{2A} > 0, \gamma_{2B} = 0$)
  
  2. College A seeks students interested only in math with 0 weight on arts, college B does the reverse ($\gamma_{2A} \cdot \gamma_{2B} = 0$)

- We believe that similarity of admissions processes makes this condition likely to hold in our application

  - Empirically, ratings at one Ivy-plus college strongly predict admissions at other Ivy-plus colleges outside waitlist pool
  
  - Further validate assumption using standard balance tests with observables and using additional variation in outside options after presenting baseline results
Two-Rater Test for Idiosyncratic Selection

Admissions Rate at Other Ivy-Plus College

- Admissions Rate with No Controls
- Admissions Rate with Controls
- Admissions Rate Dropping Legacies, Athletes, Top 1%

- Admit
- Waitlist Admit
- Waitlist Reject
- Reject
Treatment Effects of Ivy-Plus College Attendance
Comparing Waitlist Admits vs. Rejects

Predicted Outcomes
- Placebo Predicted Top 1%
- Placebo % Attending Graduate School

Demographics
- % Female
- % Underrepresented Minority
- % First-Gen College Student

Academic Credentials
- Test Score
- High School GPA

High School Quality and College Applications
- Predicted Top 1% based on HS Fixed Effect
- Number of Scoresends

Parent Income and Legacy Status
- Parent Income Percentile 90-95
- Parent Income Percentile 95-99
- Parent Income in Top 1%
- % Legacy

Difference as % of Non-Admit SD
Balance Test

- Multiple-rater test shows no significant difference in admissions at other colleges
  - Quantitatively, upper bound of 95% CI is 2.0pp
  - Admissions at other school predicts +2pp in top 1%
  - Can rule out bias of +0.04pp from this estimate

- Waitlist admits and rejects also balanced on placebo outcomes
  - Some imbalance on covariates, particularly from legacy students and top 1% who may use connections to get off waitlist
  - Drop these students below, results unchanged. This is because characteristics like legacy not positively correlated with outcomes (more on this below).
Treatment Effects of Ivy-Plus College Admission for Waitlisted Applicants
Earnings in Top 1% at Age 33

Diff = 5.0 (2.4)
Diff = 4.0 (2.4)
Diff = 5.7 (2.9)
Outcomes at age 33 observed for relatively few cohorts in our sample, limiting precision and capacity to examine heterogeneity

- Can gain precision by studying earlier ages, but earnings change rapidly especially for Ivy-plus graduates in their late twenties…
Treatment Effects of Ivy-Plus College Admission for Waitlisted Applicants, by Age
Earnings in Top 1% at Age 33
Increasing Precision Using Predictions Based on Initial Firm

- To increase precision, predict age 33 earnings using employer at age 25

  - Use historical data from universe of tax records to calculate fraction in top 1% at age 33 by age 25 firm (or graduate school, for those not employed)
Treatment Effects of Ivy-Plus College Admission for Waitlisted Applicants
Predicted Earnings in Top 1%

<table>
<thead>
<tr>
<th>Condition</th>
<th>Diff</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Means</td>
<td>2.5</td>
<td>0.6</td>
</tr>
<tr>
<td>With Controls</td>
<td>2.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Drop Legacies, Athletes, Top 1%</td>
<td>2.4</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Predicted Probability of Earning in Top 1% at 33 Based on Employer at Age 25
Distribution of Outside Options
Colleges Attended by Ivy-Plus Applicants Rejected from Waitlist

<table>
<thead>
<tr>
<th>Type of College Attended</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivy-Plus</td>
<td>5.1</td>
</tr>
<tr>
<td>Other Selective Private</td>
<td>2.4</td>
</tr>
<tr>
<td>Highly Selective Public Flagships</td>
<td>1.3</td>
</tr>
<tr>
<td>Other Private (e.g. Boston University)</td>
<td>0.6</td>
</tr>
<tr>
<td>Other Public SUNY - Stony Brook</td>
<td>-1.9</td>
</tr>
<tr>
<td>Missing</td>
<td></td>
</tr>
</tbody>
</table>
Next, estimate heterogeneity in treatment effects by outside option

- Define student subgroups $g$ to identify differences in mean outside options by home state, parent income, race, and school applied (estimates from waitlist rejects)

- Estimate quality of outside options for each group as mean observational VA of college that non-waitlisted students rejected from Ivy-plus colleges attend

Key assumption: no essential heterogeneity in treatment effect of attending Ivy-plus college across groups

- Implies heterogeneity in effects across groups driven purely by differences in outside options (as in Bleemer 2022)
Heterogeneity in Waitlist Admission Effects by Strength of Outside Options

Implied Mean Observational Value-Added of Outside Options

\[ \beta = -0.87 \ (0.24) \]

Causal effect of attending Ivy-Plus vs. avg. state flagship on Top 1% rate: 4.58 pp. (1.20)

\[ \text{Actual Outcome} \quad \text{Placebo Outcome} \]

Average Ivy-Plus in College-Specific Sample

Average Flagship Public

Waitlist Design Treatment Effect on Predicted Top 1%
Treatment Effects of Ivy-Plus College Admission for Waitlisted Applicants

Predicted Mean Income Rank

<table>
<thead>
<tr>
<th></th>
<th>Waitlist Reject</th>
<th>Waitlist Admit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Means</td>
<td>Diff = 0.6 (0.4)</td>
<td></td>
</tr>
<tr>
<td>With Controls</td>
<td>Diff = 0.8 (0.4)</td>
<td></td>
</tr>
<tr>
<td>Drop Legacies, Athletes, Top 1%</td>
<td>Diff = 0.4 (0.5)</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- Orange: Waitlist Reject
- Teal: Waitlist Admit
Non-Monetary Outcomes

- Does attending an Ivy-plus college have an impact on non-monetary outcomes as well?
- Begin by examining impacts on attending an elite (top 10) graduate program
Treatment Effects of Ivy-Plus College Admission for Waitlisted Applicants
Non-Monetary Outcomes

% Students in the Elite Position

In Elite Grad School

Diff = 3.2 (1.6)
Expanding Non-Monetary Outcomes

- To obtain more general measures of non-monetary success, define a revealed preference measure of working at a prestigious firm
  - Calculate ratio of Ivy-plus to flagship public attendees at each firm using historical data (leaving out own observation)
  - Define firms that rank highest on this ratio as “elite” firms, counting firms up to the number required to account for 25% of Ivy-plus employment
  - Then regress this ratio on predicted top 1% share and rank firms on the residual to obtain a measure of “prestigious” firms
  - Significant overlap between this list and publicly available lists of 10 most prestigious hospitals, research institutions, etc. (e.g., Mass General Hospital, Mayo Clinic, Johns Hopkins)
Treatment Effects of Ivy-Plus College Admission for Waitlisted Applicants
Non-Monetary Outcomes

- **Attend Elite Grad School**:
  - Waitlist Reject: 10%
  - Waitlist Admit: 13.2%
  - Diff = 3.2 (1.6)

- **In Elite Firm**:
  - Waitlist Reject: 20%
  - Waitlist Admit: 29.1%
  - Diff = 9.1 (2.2)

- **In Prestigious Firm**:
  - Waitlist Reject: 20%
  - Waitlist Admit: 27.4%
  - Diff = 7.4 (2.2)
Summary of Magnitudes: Causal Effect of Attending Ivy-Plus vs. Average State Flagship

**Causal Effect**

**Selection**

- Mean Income Rank
  - Means for Ivy-Plus (Gain = 2%)
  - Implied Means for Ivy-Plus Students Had They Attended State Flagships
  - Means for Flagship Public

- Percentage Achieving Outcome
  - Earnings in Top 1%
    - Gain = 60%
  - Attend Elite Grad School
    - Gain = 89%
  - Work at Elite Firm
    - Gain = 254%
  - Work at Prestigious Firm
    - Gain = 205%
Research Design #2: Variation in Matriculation Conditional on Admission

- Compare students who choose different colleges conditional on being admitted to the same set of colleges
  - Relies on different identification assumption: idiosyncratic student preferences conditional on choice set [Mountjoy and Hickman 2022, Assumption 1]

- Implement this design in our data for Ivy-plus and state flagship public colleges

- Then reconcile our findings with previous papers that use this design [Dale and Krueger 2002, 2014, Mountjoy and Hickman 2022]
Causal Effects of Ivy-Plus Attendance: Matriculation Design
Flagship Public and Ivy-Plus Schools, Predicted Top 1%

\[ \beta = 0.68 \pm 0.16 \]

4.08 pp
(0.65)

[Graph showing the relationship between traditional observational value-added estimate (FE controlling for SAT score and demographics) and college fixed effect with admission set controls.]

- Highly Selective Flagship Public Schools
- Ivy-Plus Mean
Causal Effects of Ivy-Plus Attendance: Matriculation Design
Texas, California, Elite Public, and Ivy-Plus Schools, Predicted Top 1%

\[ \beta = 0.60 \pm 0.06 \]

Traditional Observational Value-Added Estimate (FE Controlling for SAT score and Demographics):

- **Texas Schools**
- **CSUs**
- **Highly Selective Flagship Public Schools**
- **Other UC Schools**
- **Ivy-Plus Schools**
Causal Effects of Ivy-Plus Attendance: Matriculation Design
Texas, California, Elite Public, and Ivy-Plus Schools, Predicted Mean Income Rank

\[ \beta = 0.46 (0.06) \]

Traditional Observational Value-Added Estimate (FE Controlling for SAT score and Demographics)

- Texas Schools
- CSUs
- Highly Selective Flagship Public Schools
- Ivy-Plus Schools
- Other UC Schools
Treatment Effects of Ivy-Plus College Attendance
Comparing All Methods

- Predicted Top 1%:
  - Rescaled Waitlist Design: 4.7
  - Matriculation Design: 4.2
  - Observational VA Estimate: 5.4

- Predicted Mean Income Rank:
  - Rescaled Waitlist Design: 1.2
  - Matriculation Design: 1.4
  - Observational VA Estimate: 1.7

- Attend Elite Grad School:
  - Rescaled Waitlist Design: 5.5
  - Matriculation Design: 2.8
  - Observational VA Estimate: 8.9

- Work at Prestigious Firm:
  - Rescaled Waitlist Design: 16.4
  - Matriculation Design: 13.0
  - Observational VA Estimate: 22.4
Reconciliation with Dale and Krueger

- Why do our conclusions differ from Dale and Krueger (2002, 2014) who find that attending a more selective college has small/zero impact on earnings?

  1. We find a large effect of Ivy-Plus attendance solely on top-tail outcomes; Dale and Krueger focus on mean impacts on log earnings

  2. Dale and Krueger proxy for college quality using average SAT scores; we directly estimate colleges’ effects on outcomes

     • Earnings outcomes are not highly correlated with mean SAT scores within subset of highly selective colleges [Chetty et al. 2020]
Causal Effects of Ivy-Plus Attendance: Matriculation Design

Heterogeneity by Parent Income
Outcome-Based Tests of Admissions Preferences
Outcome-Based Tests of Admissions Preferences

- Are the factors that lead to high-income admissions advantage (legacy, athlete status, high non-acad ratings) associated with better post-college outcomes?
  
- More broadly, is there a tradeoff between admitting more students from middle class families and class “quality”?

- Helpful for evaluating whether admissions preferences that favor students from high-income families are “merited” from an outcome-based perspective

- And critical for understanding whether diversifying student body would translate to greater diversity among society’s leaders

- In this section, answer this question by examining how outcomes vary with admissions preferences
Post-College Outcomes by Application Credentials Among Ivy-Plus Matriculants

Predicted Top 1%

<table>
<thead>
<tr>
<th></th>
<th>Predicted Earnings in Top 1% Based on Age 25 Employer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legacy</td>
<td>-0.2</td>
</tr>
<tr>
<td>Athlete</td>
<td>+0.7</td>
</tr>
<tr>
<td>High Non-Academic Rating</td>
<td>-0.2</td>
</tr>
<tr>
<td>High Academic Rating</td>
<td>+3.9</td>
</tr>
</tbody>
</table>

Baseline = 11.6%
Post-College Outcomes by Application Credentials Among Ivy-Plus Matriculants

Non-Monetary Outcomes

Attending Elite Graduate School

<table>
<thead>
<tr>
<th>Legacy</th>
<th>Athlete</th>
<th>High Non-Academic Rating</th>
<th>High Academic Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.8</td>
<td>-5.4</td>
<td><strong>+0.5</strong></td>
<td><strong>+8.2</strong></td>
</tr>
</tbody>
</table>

Baseline = 7.5%

Working at Prestigious Firm

<table>
<thead>
<tr>
<th>Legacy</th>
<th>Athlete</th>
<th>High Non-Academic Rating</th>
<th>High Academic Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>+1.0</strong></td>
<td><strong>+9.9</strong></td>
</tr>
</tbody>
</table>

Baseline = 33.3%
Impact of Admissions Changes on Students’ Post-College Outcomes

- Adjust for selection when conditioning on matriculants by returning to applicant sample and using our causal effect estimates

- Identify potential outcomes of marginal rejected students (from waitlist) had they attended an Ivy-plus college by adding in our VA estimates
Post-College Outcomes Among Ivy-Plus Applicants

Predicted Top 1% by Non-Academic Rating

Admits and Waitlisted Students

Low Non-Academic Rating

High Non-Academic Rating
Post-College Outcomes Among Ivy-Plus Applicants

Predicted Top 1% by Non-Academic Rating

Predicted Probability of Earning in Top 1% at 33 Based on Employer at Age 25

- Admits and Waitlisted Students
- Value-Added of College Attended

Low Non-Academic Rating
High Non-Academic Rating
Predicted Probability of Earning in Top 1% at 33 Based on Employer at Age 25

Admits and Waitlisted Students
- Low Non-Academic Rating: 10.4
- High Non-Academic Rating: 11.0

Value-Added of College Attended
- Low Non-Academic Rating: 10.4
- High Non-Academic Rating: 11.2

Controlling for VA of College Attended
- Low Non-Academic Rating: 10.4
- High Non-Academic Rating: 10.2
Post-College Outcomes by Application Credentials Among Ivy-Plus Applicants

Predicted Top 1%

Predicted Earnings in Top 1% Based on Age 25 Employer

- Legacy: -1.1%
- Athlete: +0.1%
- High Non-Academic Rating: -0.2%
- High Academic Rating: +3.6%

Baseline = 11.4%
Post-College Outcomes by Application Credentials Among Ivy-Plus Applicants

Non-Monetary Outcomes

Attending Elite Graduate School

<table>
<thead>
<tr>
<th>Legacy</th>
<th>Athlete</th>
<th>High Non-Academic Rating</th>
<th>High Academic Rating</th>
<th>Baseline = 8.4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.7</td>
<td>-2.2</td>
<td>-7.1</td>
<td>0.0</td>
<td></td>
</tr>
</tbody>
</table>

Working at Prestigious Firm

<table>
<thead>
<tr>
<th>Legacy</th>
<th>Athlete</th>
<th>High Non-Academic Rating</th>
<th>High Academic Rating</th>
<th>Baseline = 22.4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.7</td>
<td>-0.2</td>
<td>-7.0</td>
<td>0.8</td>
<td></td>
</tr>
</tbody>
</table>
Fraction who Reach Top 1% by SAT Score, Controlling for Parent Income and College

![Bar chart showing the fraction of students reaching the top 1% by SAT score, controlling for parent income, value-added of college attended, race, and gender. The chart compares predicted top 1% probability across different test score quartiles.]

- **Bottom Quartile** (≤1390) (≤33) Predicted Top 1% Probability: 9.93
- **Second Quartile** (1460 - 1510) (33 - 34) Predicted Top 1% Probability: 11.30
- **Third Quartile** (1520 - 1560) (34 - 35) Predicted Top 1% Probability: 13.15
- **Top Quartile** (≥1570) (≥35) Predicted Top 1% Probability: 13.68

The chart also shows the effect of controlling for parent income, value-added of college attended, race, gender, and HS GPA.
Fraction who Reach Top 1% by SAT/ACT Score vs. High School GPA
Ivy-Plus Students

Note: figures are binned scatter plots controlling for parent income, race, gender, legacy status, recruited athlete status, and HS GPA (left panel) or SAT score (right panel).
How do these findings fit with prior evidence that children from high-income families have significantly higher levels of earnings among Ivy-plus attendees? [Chetty et al. 2020, Zimmerman 2022]
Share of Ivy-Plus Matriculants in Top 1% by Parental Income

Parent Income Percentile

Income/Earnings Distribution at Age 33

Total Individual Income

W-2 Wage Earnings
Share of Ivy-Plus Matriculants in Various Sectors by Parental Income

Business vs. Social Impact

- **Finance/Consulting/Tech**
- **Non-Profit/Public**
Share of Ivy-Plus Matriculants in Elite Positions by Parental Income

Percentage in Elite Position

Attending Elite Grad School
Working at Prestigious Firm

Parent Income Percentile

0-20, 20-40, 40-60, 60-70, 70-80, 80-90, 90-95, 95-96, 96-97, 97-98, 98-99, 99-99.9, Top 0.1
Counterfactuals: Impacts of Changes in Admissions Practices
Diversifying Society’s Leaders?

- Conclude by returning to our motivating question: can Ivy-plus colleges diversify society’s leaders by changing their admissions practices?

- Predict impacts of feasible changes in admissions practices on socioeconomic diversity of class and post-college outcomes
  - Colleges could fill newly opened slots in many ways; here, assume they keep the distribution of SAT, race, and gender unchanged
Assumptions

- Policy counterfactuals rely on two key additional assumptions:

  1. No behavioral responses in application or matriculation rates (unlikely to hold exactly, but plausible that behavioral responses are small relative to mechanical effects)

  2. Causal effects of colleges unaffected by changes in composition of student body

- Precise numerical predictions should be interpreted with caution; analysis gives a sense of order of magnitude of potential impacts
Predicted Impacts of Changes in Admissions Practices

Socioeconomic Composition of Student Body

Policy Counterfactual

- Actual Class: 58%
- Remove Legacy Preference: 61%
- + Equalize Athlete Shares by Income: 63%
- + Contextualize Non-Acad Cred: 67%
- Need-Affirmative Preferences for Students with High Academic Rating: 67%

+145 extra students from bottom 95%
Impact of Admissions Changes on Students’ Post-College Outcomes

- Would these increases in diversity of student body translate to analogous increases in diversity of society’s leaders?

- Predict post-college outcomes of newly admitted students to answer this question, based on potential outcomes adjusted for college VA as above
Predicted Impacts of Changes in Admissions Practices

Socioeconomic Composition of Student Body

Policy Counterfactual

- **Actual Class**: 58% from bottom 95%
- **Remove Legacy Preference**: 61% from bottom 95%
- **Equalize Athlete Shares by Income**: 63% from bottom 95%
- **Contextualize Non-Acad Cred**: 67% from bottom 95%
- **Need-Affirmative Preferences for Students with High Academic Rating**: 67% from bottom 95%

**Additional**: +145 extra students from bottom 95%

% Working at Prestigious Firm

- **Actual Class**: 33%
- **Remove Legacy Preference**: 33%
- **Equalize Athlete Shares by Income**: 33%
- **Contextualize Non-Acad Cred**: 35%
- **Need-Affirmative Preferences for Students with High Academic Rating**: 36%
Conclusion: Diversifying Society’s Leaders

- Changes in admissions practices at Ivy-plus colleges could increase socioeconomic diversity of the student body, holding fixed pre-college academic credentials.

- These changes would not reduce and may even increase Ivy-plus graduates’ probabilities of reaching the upper tail of society.

→ A handful of colleges could diversify socioeconomic backgrounds of society’s leaders significantly by changing their admissions practices.
Trends in Socioeconomic Diversity at Ivy-Plus Colleges, Entering Classes of 1998-2018
Ratio of Attendance Rates for Students from Middle Class (P70-80) vs. Top 1%
Attendance Rates at Selective Public Flagship Universities, Controlling for Race

![Graph showing relative attendance rates by parent income percentile for Ivy-Plus, Flagship Public, and Other Selective Private institutions.](image-url)
Admission Rates at Selective Public Flagship Universities, Controlling for Race
Attendance Rates at Selective Public Flagship Universities

Reweighting on Test Score
Attendance Rates by Parental Income and College, Controlling for Test Score

In-State Attendance at Selective Public Flagships

![Graph showing attendance rates by parental income and college, controlling for test score.](image-url)
Attendance Rates by Parental Income and College, Controlling for Test Score
Out-of-State Attendance at Selective Public Flagships

The graph shows the relative attendance rate by parental income percentile for different colleges, controlling for test score. The x-axis represents the parent income percentile, and the y-axis shows the relative attendance rate.

- 5.9x - Georgia
- 4.2x - Michigan
- 3.6x - UT Austin
- 3.4x - Virginia
- 2.3x - Florida
- 2.2x - UCLA
- 2.0x - UNC Chapel Hill
- 1.4x - Ohio State
- 1.2x - Berkeley
Attendance Rates by Parental Income and College

Attendance Rates to Selective Private Colleges

Graph showing the relative attendance rate of students from different income percentiles to various selective private colleges. The x-axis represents the parent income percentile, while the y-axis shows the relative attendance rate. Each line represents a different college, with labels indicating the multiplier for each college, such as 4.0x for USC, 3.0x for Vanderbilt, etc.
Attendance Rates Conditional on Application by Parental Income and College

Conditional Attendance to Ivy-Plus Colleges

![Graph showing the relationship between parental income and college attendance rates for Ivy-Plus institutions.](image-url)
Attendance Rates Conditional on Application by Parental Income and College
Conditional Attendance to Selective Private Colleges
Attendance Rates Conditional on Application by Parental Income and College
Conditional Attendance to Selective Public Colleges
Attendance Rates Conditional on Application by Parental Income and College

In-State Conditional Attendance to Selective Public Colleges

- 1.2x - Michigan
- 1.1x - Ohio State
- 1.1x - Virginia
- 1.0x - UT Austin
- 1.0x - UNC Chapel Hill
- 1.0x - Georgia
- 0.9x - Florida
- 0.7x - Berkeley
- 0.7x - UCLA
Attendance Rates Conditional on Application by Parental Income and College
Out-of-State Conditional Attendance to Selective Public Colleges
Application Rates by Parental Income and College, Controlling for Test Score
Application to Ivy-Plus Colleges
Application Rates at Selective Colleges by Parental Income, Controlling for Test Score
Application Rates by Parental Income and College, Controlling for Test Score

Application to Selective Public Flagships
Application Rates at Selective Public Flagship Colleges

![Graph showing application rates]

- **In-State**
- **Out-of-State**
Application Rates by Parental Income and College, Controlling for Test Score
In-State Application to Selective Public Flagships

![Graph showing application rates by parental income percentile and college, with annotations for specific institutions and their relative application rates.]
Application Rates by Parental Income and College, Controlling for Test Score
Out-of-State Application to Selective Public Flagships
Application Rates by Parental Income and College, Controlling for Test Score
Application to Selective Private Colleges
Admissions Office Ratings vs. Test Scores, by Parental Income

![Graph showing the relationship between student test scores and admissions office ratings for different parental income groups.](image)

- **Y-axis:** Share Given High Non-Academic Rating
- **X-axis:** Student's Test Score
- **Legend:**
  - Teal dots: Parent Income in Bottom 90%
  - Orange dots: Parent Income in Top 1%
Teacher and Guidance Counselor Ratings by High School Fixed Effect on Ivy-Plus Admissions

Share with High Teacher Rating

Share with High Guidance Counselor Rating
Treatment Effects of Ivy-Plus College Admission for Waitlisted Applicants
Attending Elite Graduate School

- **Raw Means**: Diff = 3.2 (1.6)
- **With Controls**: Diff = 3.2 (1.6)
- **Drop Legacies, Athletes, Top 1%**: Diff = 4.6 (2.0)

![Bar chart showing treatment effects](chart.png)
Treatment Effects of Ivy-Plus College Admission for Waitlisted Applicants Working at Elite Firm

<table>
<thead>
<tr>
<th>Condition</th>
<th>Working at an Elite Firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Means</td>
<td>Waitlist Reject 26%</td>
</tr>
<tr>
<td></td>
<td>Waitlist Admit 35.8%</td>
</tr>
<tr>
<td>Diff = 9.8 (2.2)</td>
<td></td>
</tr>
<tr>
<td>With Controls</td>
<td>Waitlist Reject 23.7%</td>
</tr>
<tr>
<td></td>
<td>Waitlist Admit 32.8%</td>
</tr>
<tr>
<td>Diff = 9.1 (2.2)</td>
<td></td>
</tr>
<tr>
<td>Drop Legacies, Athletes, Top 1%</td>
<td>Waitlist Reject 22%</td>
</tr>
<tr>
<td></td>
<td>Waitlist Admit 32.4%</td>
</tr>
<tr>
<td>Diff = 9.4 (2.6)</td>
<td></td>
</tr>
</tbody>
</table>
Treatment Effects of Ivy-Plus College Admission for Waitlisted Applicants
Working at Prestigious Firm

- Raw Means: Diff = 8.4 (2.1)
- With Controls: Diff = 7.4 (2.2)
- Drop Legacies, Athletes, Top 1%: Diff = 9.1 (2.6)
Quantiles of Income Distribution at Age 33
Ivy-Plus vs. Highly Selective Public Flagship Students

- 99th Percentile, Ivy-Plus: $1,902,000
- 95th Percentile, Ivy-Plus: $586,700

Income Percentile vs. Quantile of Income at Age 33 ($)

- Ivy-Plus Students
- Highly Selective Flagship Students
- Highly Selective Flagship Students, Reweighted on Test Score, Race, Gender, and Parent Income
Fraction Attending Elite Grad School by SAT Score, Controlling for Parent Income and College

Test Score
- Bottom Quartile (≤1390) (≤33)
- Second Quartile (1460 - 1510) (33 - 34)
- Third Quartile (1520 - 1560) (34 - 35)
- Top Quartile (≥1570) (≥35)
Fraction Working at a Prestigious Firm by SAT Score, Controlling for Parent Income and College

Test Score

- Bottom Quartile (≤1390) (≤33)
- Second Quartile (1460 - 1510) (33 - 34)
- Third Quartile (1520 - 1560) (34 - 35)
- Top Quartile (≥1570) (≥35)
Attending Elite Grad School: Matriculation Design

\[ \beta = 0.43 (0.05) \]

\[ 2.81 \text{ pp} (0.82) \]
Working at an Elite Firm: Matriculation Design

$\beta = 0.47 (0.02)$

Traditional Observational Value-Added Estimate (FE Controlling for SAT score and Demographics)

- Texas Schools
- CSUs
- Other UC Schools
- Highly Selective Flagship Public Schools
- Ivy-Plus Schools

13.91 pp (0.82)
Working at a Prestigious Firm: Matriculation Design

\[ \beta = 0.51 (0.03) \]

Traditional Observational Value-Added Estimate (FE Controlling for SAT score and Demographics)

- **Texas Schools**
- **CSUs**
- **Other UC Schools**
- **Highly Selective Flagship Public Schools**
- **Ivy-Plus Schools**

13.02 pp (0.85)