Test-Optional Admissions

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Test-Optional Admissions Trend

The Washington Post

A shake-up in elite admissions: U-Chicago drops SAT/ACT testing requirement

By Nick Anderson

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The University of Chicago will no longer require ACT or SAT scores from U.S. students, sending a jolt through elite institutions of higher education as it becomes the first top-10 research university to join the test-optional movement.

> "Debate over admission testing has intensified in recent years . . .
>
> studies have found a strong link between scores and economic background . . .
>
> Schools that drop testing requirements often say they are doing so in the name of wider access"

- By 2019, 33% of colleges did not require test scores (among 900+ Common App)
- Pandemic  $\longrightarrow$ In 2021-22 season, 95%
- Most colleges have stayed test optional

  at least for near term; some permanently

Our Questions

1. **Why would a college benefit from test optional?**
   - Suppose tests are informative, but advantage some students

     UC 2020 STTF: "Test scores are predictive [of success in college] for all demographic groups and disciplines, even after controlling for HSGPA..."
   - Why not require scores, but put low weight or adjust for demographics?

     → Zero weight unlikely optimal
   - Paper formalizes a simple impossibility result

     → Under broad conditions, no benefit from test optional
   - Our story: **Social Pressure**

     College faces costs for decisions "society" does not agree with, given available info

     → Not observing test scores can induce lower disagreement cost

     Tradeoff: Not observing scores also means worse information

Our Questions

Given social pressure mechanism:

2. **What does a test-optional eqm look like?**
   - How might college compare students who do and don't submit test scores?
   - Which students submit?
   - How do admissions outcomes differ from test mandatory?
     $\rightarrow$ Which students benefit or harmed?

3. **When do colleges prefer to go test optional?**
   - Depends on how flexibly college can treat non-submitters
   - Extended example of affirmative-action ban triggering test optional/blind

Example

An Example

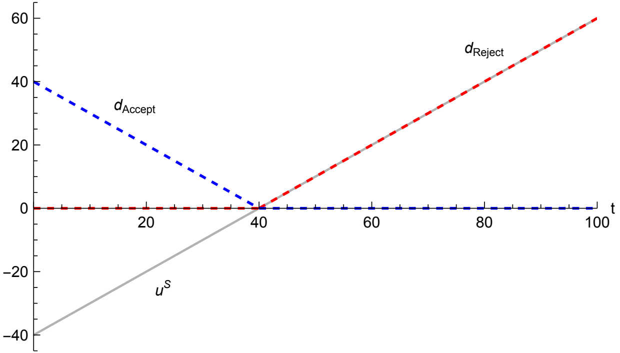
Consider a student at some given observables (GPA, extra-curriculars, . . .).

- Test score $t \sim U[0, 100]$
- Society gets $u^s(t) = t - 40$ from acceptance

  Normalize rejection payoff to $u^s = 0$

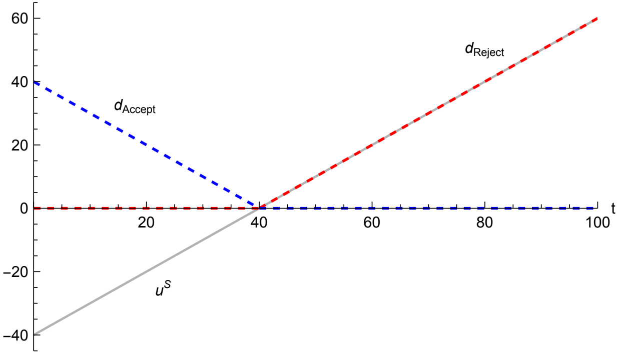
  $\implies$ Society's test-score bar is 40
- College decides whether to admit student
- Social pressure on College when decision conflicts with Society's pref, given avail info
- Disagreement cost $d \propto$ magnitude of Society's (expected) utility loss from decision

An Example



- If $\mathbb{E}[u^s(t)] > 0$, rejecting has cost $d = \mathbb{E}[u^s(t)] = \mathbb{E}[t] - 40$
- If $\mathbb{E}[u^s(t)] < 0$, accepting has cost $d = -\mathbb{E}[u^s(t)] = 40 - \mathbb{E}[t]$

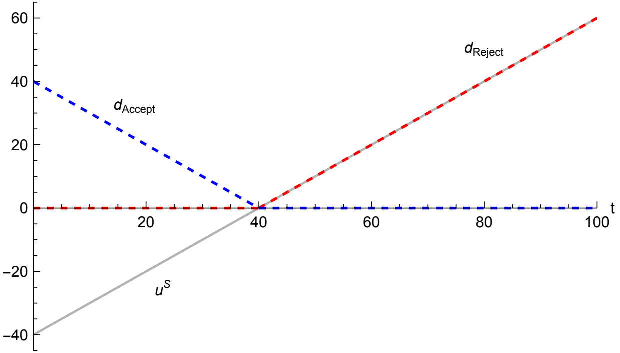
An Example



Disagreement cost of Accepting regardless of test score ("Fencing Champion"):

- Test mandatory: $\int_0^{40} \frac{40-t}{100} \mathrm{d}t > 0 \; (= 8)$
- Test blind: 0
  - $\because$ Society's expected utility under prior is $50 - 40 = 10 > 0$

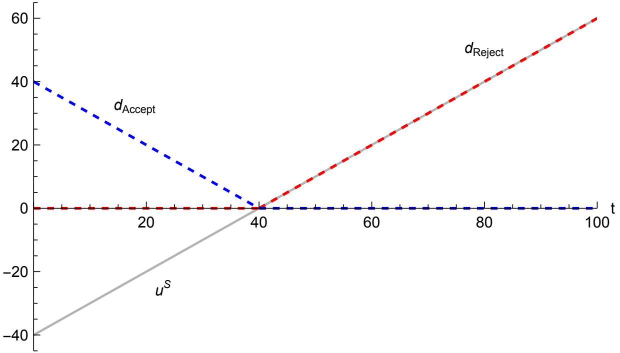
An Example



Disagreement cost of Rejecting regardless of test score ("New Jerseyian"):

- Test mandatory: $\int_{40}^{100} \frac{40-t}{100} \mathrm{d}t = 18$
- Test blind: 10
  $\because$ Society's expected utility under prior is $50 - 40 = 10 > 0$

An Example



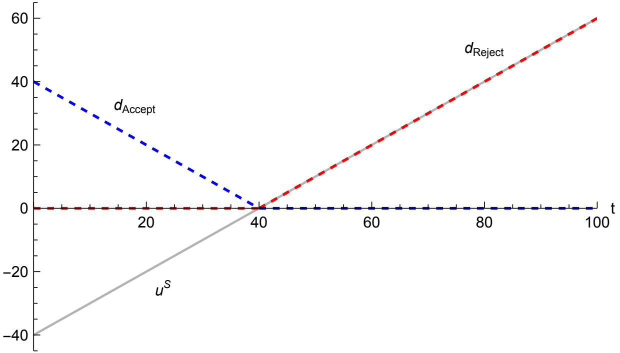
If College wants same decision regardless of score, then better to not observe scores

Why? Society is **Bayesian**, but judges College based on avail info

Disagreement cost is **convex** $\implies$ benefit of pooling

$\rightsquigarrow$ Bayesian Persuasion logic (Kamenica-Gentzkow '11)

An Example



Now suppose College wants to admit NJ applicants with scores above 70

$\rightarrow$ Cares about score, but more selective than society

Under Test Mandatory or Test Blind, cannot achieve that without disagreement cost

But can using a Test-Optional policy:

$\rightarrow$ Admit score-submitters with scores above 70

$\rightarrow$ Reject non-submitters (or accept them with tiny prob)

Beyond the Example

More generally, college cannot achieve its first best

$\rightarrow$ Tradeoff between better decisions and more disagreement

Must also account for different student groups

We embed these considerations in a richer model of test-optional admissions

Model

Model

- **Student** applying to a college

  Observables $x \sim F_x$ in $\mathcal{X}$

  Test score $t \sim F_{t|x}$ in $\mathbb{R}$

  (technical: each $F_{t|x}$ either continuous, or discrete with no accumulation points)

- **College** decides $A =$ Accept or Reject

  Utility $u^c(x,t) = v^c(x) + w^c(x)t$ of accepting student

  Normalize rejection utility to 0

- **Society** utility from acceptance $u^s(x,t) = v^s(x) + w^s(x)t$ (rejection utility 0)

- College also pays **disagreement cost**, with Bayesian Society inferring $t^s = \mathbb{E}[t|\text{Info}]$:

$$d(x,t^s,A) = \begin{cases} \max\{u^s(x,t^s),0\} & \text{if } A = \text{Reject} \\ \max\{-u^s(x,t^s),0\} & \text{if } A = \text{Accept} \end{cases}$$

- College's full payoff $U^c(x,t,t^s,A) = u^c(x,t) - \delta d(x,t^s,A)$, where $\delta > 0$

Model

No asymmetric information between College and Society

- Observables x: Always observed
- Test score t:

  Test-mandatory regime: observed

  Test-optional regime: student *chooses* whether to submit

Colleges commits to an Admissions policy

- Imputation rule $\tau : \mathcal{X} \to [-\infty, +\infty]$

  College to treat non-submitters as if $t = \tau(x)$

- Acceptance rule $\alpha : \mathcal{X} \times [-\infty, +\infty] \to [0, 1]$

  Probability of admitting student with (x, t) — imputed or submitted t

  Require monotonicity: $\alpha(x, \cdot) \uparrow$

Study both **flexible** and **restricted/exogenous imputation**

More on Imputation

Flexible imputation + monotonic acceptance rule cannot be improved on

> Dartmouth: "Our admission committee will review each candidacy without second-guessing the omission or presence of a testing element."

Suggestive of commitment to non-Bayesian decisions/imputation

> USC: "Applicants will not be penalized or put at a disadvantage if they choose not to submit SAT or ACT scores."

Possible (restricted) imputation rules

- No Adverse Inference: $\tau(x) = \mathbb{E}[t|x]$
- Control for only certain dimensions (e.g., GPA but not race):

  $\tau(x_1, ..., x_N) = \mathbb{E}[t|x_2, x_7]$

Model

How do students decide whether to submit?

- Our assumption: Student with (x, t) submits if $t > \tau(x)$, doesn't submit if $t \leq \tau(x)$

  Optimal $\because$ Acceptance prob $\uparrow$ in imputed/submitted score

- Assumes knowledge of τ and best response

  $\rightarrow$ In practice, admittedly not "in equilibrium" (yet?)

Model: Wrapping Up

College chooses test-regime and admissions policy (τ, α) to maximize

$$U^c(x,t,t^s,A) = u^c(x,t) - \delta d(x,t,t^s,A), \text{ where}$$

$$t^s = \begin{cases} t & \text{if } t > \tau(x) \\ \mathbb{E}[t|x, t \leq \tau(x)] & \text{if } t \leq \tau(x) \end{cases}$$

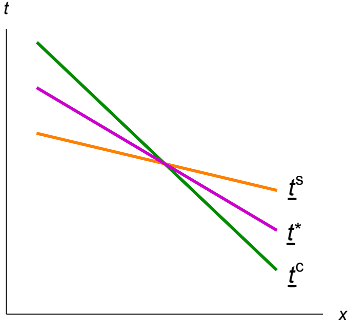
$$d(x,t^s,A) = \begin{cases} \max\{u^s(x,t^s),0\} & \text{if } A = \text{Reject} \\ \max\{-u^s(x,t^s),0\} & \text{if } A = \text{Accept} \end{cases}$$

- If $t^s = t$, maximizing U^c is equivalent to maximizing ex post utility

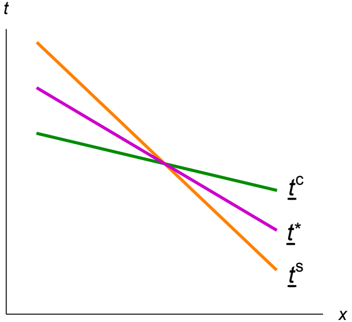
$$u^*(x,t) = \frac{1}{1+\delta} u^c(x,t) + \frac{\delta}{1+\delta} u^s(x,t).$$

- Test score bars $\underline{t}^i(x)$ defined by $u^i(x, \underline{t}^i(x)) = 0$; ex post bar $\underline{t}^*(x)$

$$x \in \mathbb{R}, \quad u^i(x,t) = a^i + x + w^i \times t$$



(a) College weights test less: $w^c < w^s$



(b) College weights test more: $w^c > w^s$

- College is more selective than Society at some x, lower at others
- Ex post bar always in-between

Analysis

Test Mandatory

Proposition

Under test mandatory, College accepts type (x, t) if $u^*(x, t) > 0$, and rejects otherwise.

Simply use the ex post bar!

When social-pressure intensity $\delta \uparrow$, college becomes more selective iff $\underline{t}^c(x) < \underline{t}^s(x)$

$\implies$ student with such x harmed; other x benefits

Test-Optional with Flexible Imputation

Remark

Test optional with flexible imputation **always** improves (weakly) on test mandatory.

- College always has option of setting $\tau(x)$ very low,
  and then replicating test-mandatory outcome & payoff
- When and how can college do strictly better?

  We will see that:

  $\rightarrow$ For x at which college less selective: college might do strictly better

  $\rightarrow$ For x at which college more selective than society: college does strictly better
- Note: Always optimal to set $\tau(x)$ s.t. any submitted $t > \tau(x)$ is accepted

  $\rightarrow$ What $\tau(x)$ is optimal?

  $\rightarrow$ How to treat non-submitters?

Flexible Imputation, College Less Selective

Proposition

Consider flexible imputation and x s.t. College is less selective: $\underline{t}^c(x) < \underline{t}^*(x) < \underline{t}^s(x)$.

Optimal for College to either

- Set $\tau(x) = \infty$ and accept everyone; or
- Set $\tau(x) = \underline{t}^*(x)$; accept iff submit score $t > \underline{t}^*(x)$ (so reject non-submitters)

Proof sketch:

If accepting non-submitters, must accept everyone, set $\tau(x) = \infty$

If rejecting non-submitters, set $\tau(x) = \underline{t}^*(x)$

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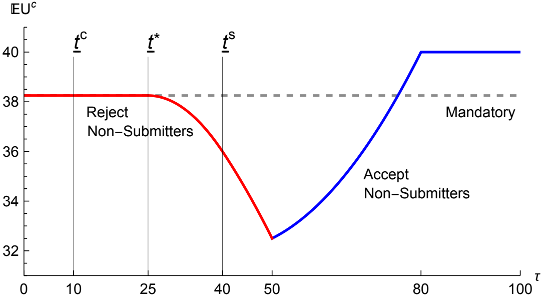
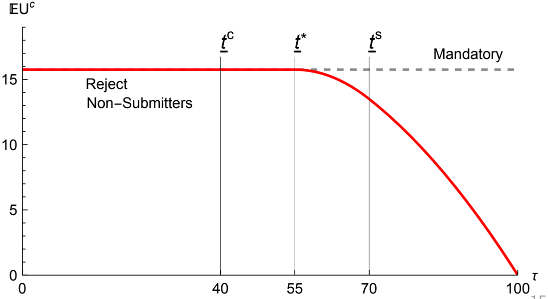
<u>Case 1</u>:



<u>Case 2</u>:



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In latter case, replicating test mandatory

Student welfare:

Under test mandatory, accepted if $t > \underline{t}^*$

Accept (weakly) more students under test optional

$\therefore$ at observables where College is less selective, students are (weakly) better off

Flexible Imputation, College More Selective

Proposition

Consider flexible imputation and x s.t. College is more selective: $\underline{t}^s(x) < \underline{t}^*(x) < \underline{t}^c(x)$.

Optimal for College to

- choose $\tau(x) \in [\underline{t}^*(x), \underline{t}^c(x)]$; and
- accept iff submit score $t > \tau(x)$ (so reject non-submitters)

Logic is a little more involved

But recall example:

Fix $x =$ "from New Jersey"; $t \sim U[0, 100]$

$u^s(t) = t - 40$; $u^c(t) = t - 70$; $\delta = 1$

$$\implies \underline{t}^s = 40,\ \underline{t}^c = 70,\ \underline{t}^* = 40$$

$\tau = 70$ and reject non-submitters yields college's first best (no disagreement cost)

Flexible Imputation, College More Selective

Proposition

Consider flexible imputation and x s.t. College is more selective: $\underline{t}^s(x) < \underline{t}^*(x) < \underline{t}^c(x)$.

Optimal for College to

- choose $\tau(x) \in [\underline{t}^*(x), \underline{t}^c(x)]$; and
- accept iff submit score $t > \tau(x)$ (so reject non-submitters)

College strictly better off than under mandatory, even if $\tau(x) = \underline{t}^*(x)$
(so long as $F_{t|x}$ has wide-enough support)

Student welfare:

Under test mandatory, accepted if $t > \underline{t}^*$

Accept (weakly) less students under test optional

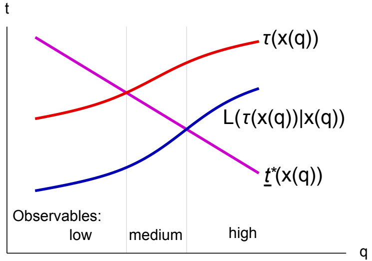
$\therefore$ at observables where College is more selective, students are (weakly) worse off

Restricted Imputation

In general, at any given x, college may be hurt by test optional under restricted imputation

Anything systematic about which students benefit or are harmed?

- Students with "Low" observables: same as test mandatory
  $\tau(x)$ below $\underline{t}^*$, and reject non-submitters
- "Intermediate" observables: harmed under test optional
  $\tau(x)$ above $\underline{t}^*$, and reject non-submitters
- "High" observables: benefit from test optional
  $\tau(x)$ above $\underline{t}^*$, and accept non-submitters



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  $\tau(x)$ above $\underline{t}^*$, and reject non-submitters
- "High" observables: benefit from test optional
  $\tau(x)$ above $\underline{t}^*$, and accept non-submitters

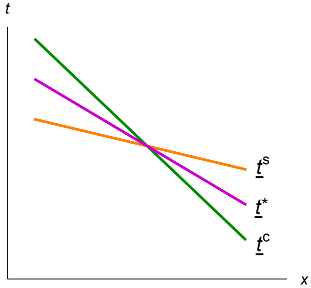
Formalization of Low/Medium/High observables:

- Assume $u^c(x,t) = v^c(x) + t$ and $u^s(x,t) = v^s(x) + t$.
- Take a parametrized path of observables $x(q)$ over $q \in [0,1]$, with
  1. $v^c(x(q))$ and $v^c(x(q))$ increasing in q
  2. $t|x(q)$ distribution MLRP-increasing in q
  3. $\tau(x(q))$ increasing in q (implied by no adverse inference)

Which Students Benefit from Test optional?

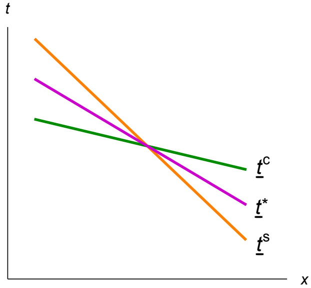
Depends on how test scores are imputed

- With flexible imputation:
  Students where College is less selective than Society
- With restricted imputation:
  Students with "good" observables



College puts less weight on tests

$\rightarrow$ same direction



more weight on tests

$\rightarrow$ opposite directions

When Does a College Benefit from Test Optional?

- Flexible imputation: Always
- Restricted imputation: Ambiguous

  At any given x, can help or hurt

  Need to take expectation over x's

Extended example in paper: (elaborate)

With restricted imputation, Ban on Affirmative Action can push College from test mandatory $\rightarrow$ test blind

$\because$ if lower score indicates College's favored group, AA ban causes College to put less weight on scores than Society

Related to, but somewhat distinct from, avoiding lawsuits alleging illegal behavior

AA ban can backfire on Society

$\because$ Society does not want group membership used, but it does want test scores

Related Literature

Garg, Li, Monachou (2021)

Chan & Eyster (2003)

Liang, Lu, Mu (2022)

Conclusion

- Model of Test-Optional vs Test-Mandatory college admissions
  - Avoiding info can reduce social pressure $\rightsquigarrow$ à la info design
  - How does college evaluate non-submitters? Imputation $\tau(x)$
  - How do students decide whether to submit? If $t > \tau(x)$
- Which students benefit from test optional?
  - Flexible imputation: students that College prefers relative to Society
  - No-adverse inference: students with good non-test observables
- Banning AA can trigger permanent ignoring of test scores
  - In the past, relevant to Univ California system
  - Following June's US Supreme Court decision, potentially relevant widely

Thank you!

Appendix

Puzzle: Framework

College's payoff $u^C(a, h, x, z)$ of admitting **student** with
ability a, holistic fit h, non-test observables x, private type z

Student observes x, z; College observes x, h (if student applies)

Student payoff from admission normalized to 1

Timeline:

- College publicly chooses admission rule: a mapping
- Student learns x and z
- Student chooses test-prep effort e at cost $c(e|x, z)$
- Test score $t \sim F(\cdot|a, e, x, z)$ realized $\rightarrow$ signal of a
- Student decides whether to apply, at cost $\varphi(x, z)$

If student applies:

- Under test optional, student chooses whether to submit score
- Student can send a cheap-talk message m
- College makes admission decision based on x, h, and submitted info (t, m)

Puzzle: Impossibility Result

Proposition

College cannot benefit (strictly) from being test optional.

Intuition: Not having info cannot help, if you can use it freely and can commit

- Any test-optional eqm outcome can be replicated under test mandatory

  $\rightarrow$ college can simply ignore test scores from
  those students who would not have submitted under test optional

- In general, college might do even better under test mandatory

Not a Puzzle?

What can break the impossibility result?

- **Direct cost of taking the test or submitting the score**

  Perhaps students with high costs *can't* apply if mandatory (Garg, Li, Monachou '21)

  Not so compelling outside pandemics

  SAT takes 3 hours; costs $60, fee waivers for low-income students

  Pre-Covid, 25 U.S. states required ACT or SAT for HS graduation

- **Non-equilibrium / behavioral factors**

  Perhaps students simply like applying to test-optional colleges

- **External constraints on the college**

  Perhaps college is forced to make admissions decisions in a particular way
  → If test scores submitted, *must* put a lot of weight on them

  College faces **social pressure** on its decisions

Affirmative Action Ban

- College and Society agree on tests t and observable dimension x_1
- Disagree about binary observable $x_0 \in \{r, g\}$
  $\rightarrow$ College prefers g over r; Society indifferent
- Binary test $t \in \{0, 1\}$, with different average score by x_0 group
  - Race:
    Blacks, Hispanics have lower avg SAT scores than Whites, Asians
    College may have stronger desire for diversity than Society (California)
  - Legacy, Donor families:
    Privileged backgrounds $\implies$ higher scores
    College cares about legacies & donations, Society doesn't
- College chooses test mandatory or test blind (=optional with $\tau(x) \geq 1$)

Affirmative Action Ban

College wants to give bonus to group g over group r (back)

AA allowed: College can condition admissions on $x_0 \in \{g, t\}$

AA banned: Make x_0 unobservable / unusable

$\rightarrow$ Now test score becomes signal of x_0

Results

1. AA allowed: College prefers test mandatory
2. AA banned, group g has **lower** test scores (race):
   College may prefer test blind
   More likely if test disparity $\uparrow$, social pressure $\uparrow$, College preference for $g \uparrow$
3. AA banned, group g has **higher** test scores (donors, legacies):
   College prefers test mandatory
4. Banning AA can backfire for Society
   Fixing test regime, Society prefers AA ban
   Fixing AA regime, Society prefers mandatory