The Economics of Advanced Academics

An Economist's Perspective on How we Serve our Gifted Students

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What Defines a “Gifted Student”?

“Students, children, or youth who give evidence of high achievement capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who need services and activities not ordinarily provided by the school in order to fully develop those capabilities.”

US Elementary and Secondary Education Act

Gifted Students in Europe and the US

- Estimates for the share of students who are gifted range widely.
  - In Europe between 2% and 15% are considered gifted. (European Commission, 2023)
  - In the United States 6.6% are enrolled in Gifted & Talented (GATE) programs. (US Department of Education, 2023)
    - Wide variation across states – from 0.4% in Vermont to 18.5% in Maryland.

How Schools Tend to Serve Gifted Students

- Accommodations in the regular classroom (e.g. special projects, advanced coursework)
- Assignment to special classes via
  - Part-time pull-out: time removed from regular class environment into a gifted class environment
  - Full-time self-contained: entire school day in a gifted class environment
- Accelerated courses (e.g. taking math at a higher grade level) or grade advancement

National Association for Gifted Children

How Schools Tend to Serve Gifted Students

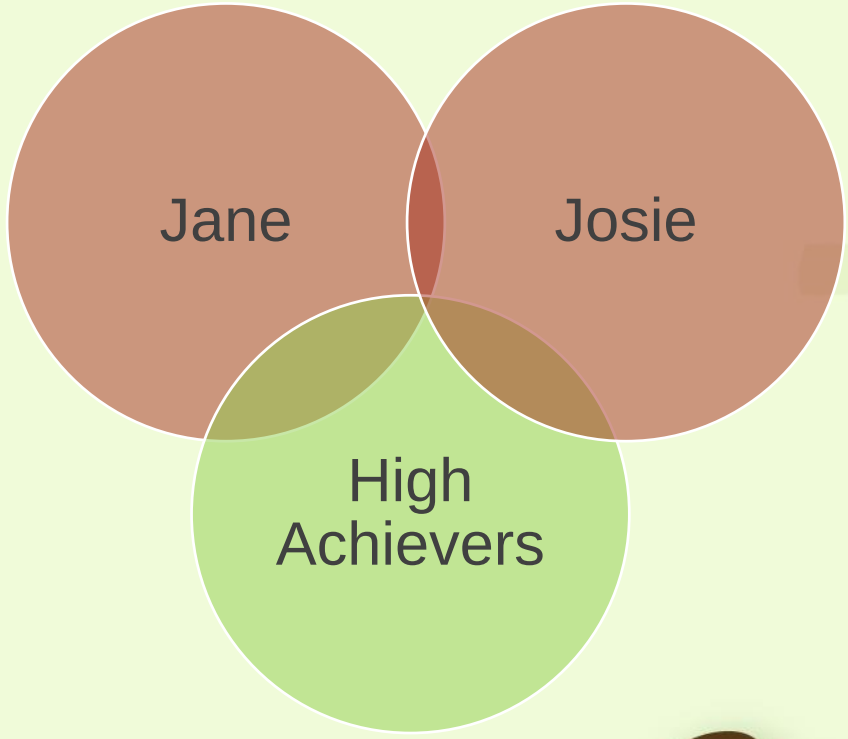
- In upper grades (e.g. middle and high school, though sometimes elementary) may have separate schools
  - Advanced academic magnets
  - Dual enrollment with local colleges

Understanding the Economics Behind GT Interventions

- Peer Effects
- Targeted Instruction
- Curricular Enhancements

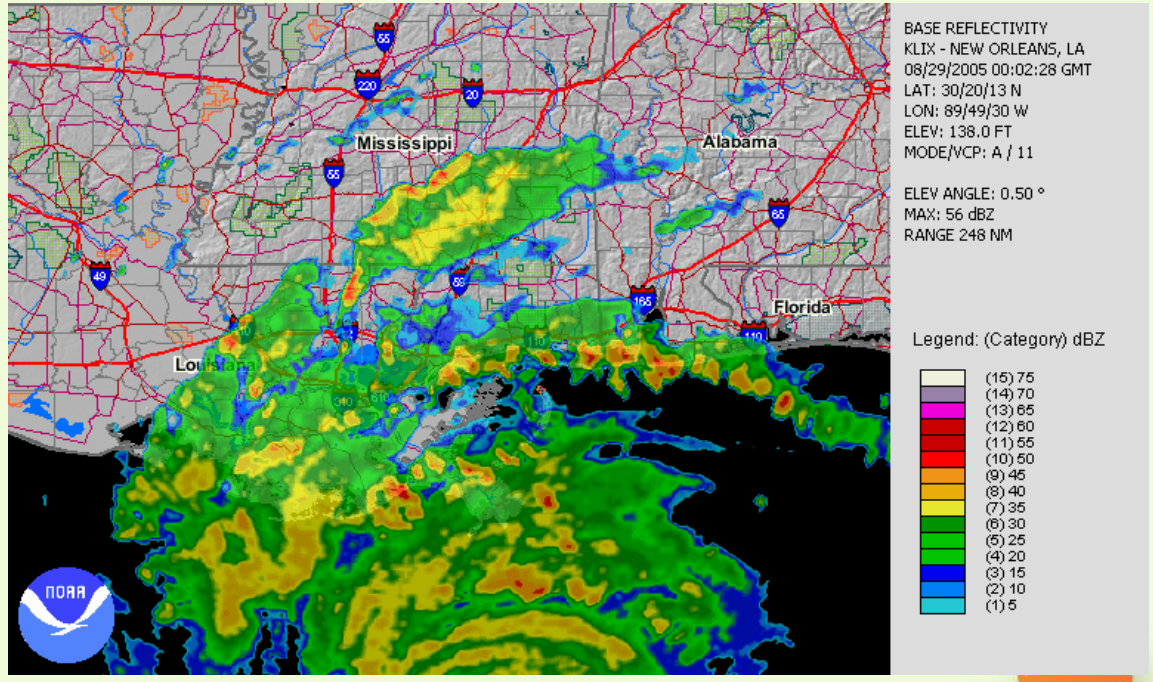
Peer Effects

- Students are influenced by other students.
- Good evidence achievement peer effects in K-12 education are sizable.
- Example – Imberman, Kugler, Sacerdote (2012).
  - Tricky problem – students tend to choose their own peers.
  - For example, Jane and Josie are friends, but perhaps they are friends because they are both high achievers.
  - Any peer effect we find, may simply be a function of their existing abilities.



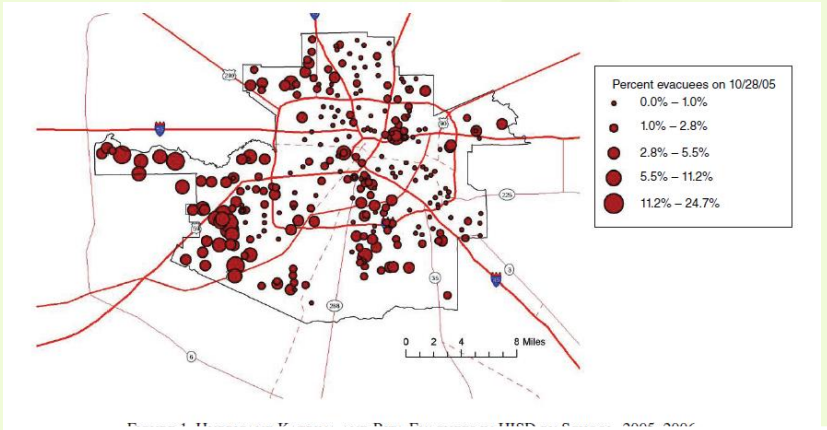
Hurricanes as a Natural Experiment in Peer Effects

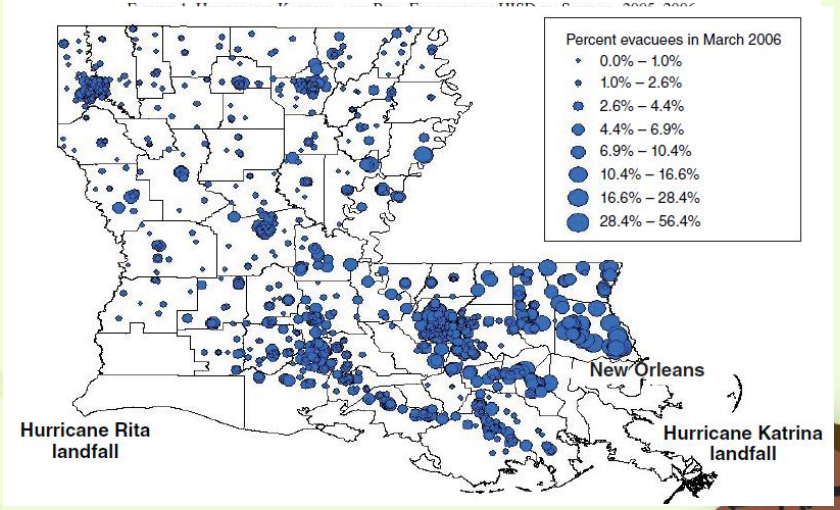
- Economists like to use “natural experiments” to tease out causal impacts of things like peer effects.
- *Natural experiment – something that happens in the “real world” that approximates an experimental design*
- Imberman, Kugler and Sacerdote (2012) use evacuations of students from New Orleans to other school districts after Hurricane Katrina in 2004.



Hurricanes as a Natural Experiment in Peer Effects

- Students from New Orleans evacuated then enrolled in schools throughout Louisiana and Houston, Texas.
- Opportunity to look at how students already in these schools were affected.
- Found peer-effects were there, though modestly sized, and that higher achieving peers increased one's own achievement.
- Though don't look specifically at GT, highlights that peer effects can be a particularly important component of the GT environment (more on this later).





Understanding the Economics Behind GT Interventions

- Peer Effects
- Targeted Instruction
- Curricular Enhancements

Targeted Instruction

- Theory that teachers target the median student in the classroom.
- This could lead gifted classrooms and schools to benefit students by shifting the “center of gravity” of instruction.
- Hard to separate this from peer effects but combined suggest tracking may be beneficial for gifted students.

An Experiment in Tracking

- Duflo, Dupas, and Kremer (2011) do an experiment in Kenya that tracks students in a school into two classrooms by baseline achievement.

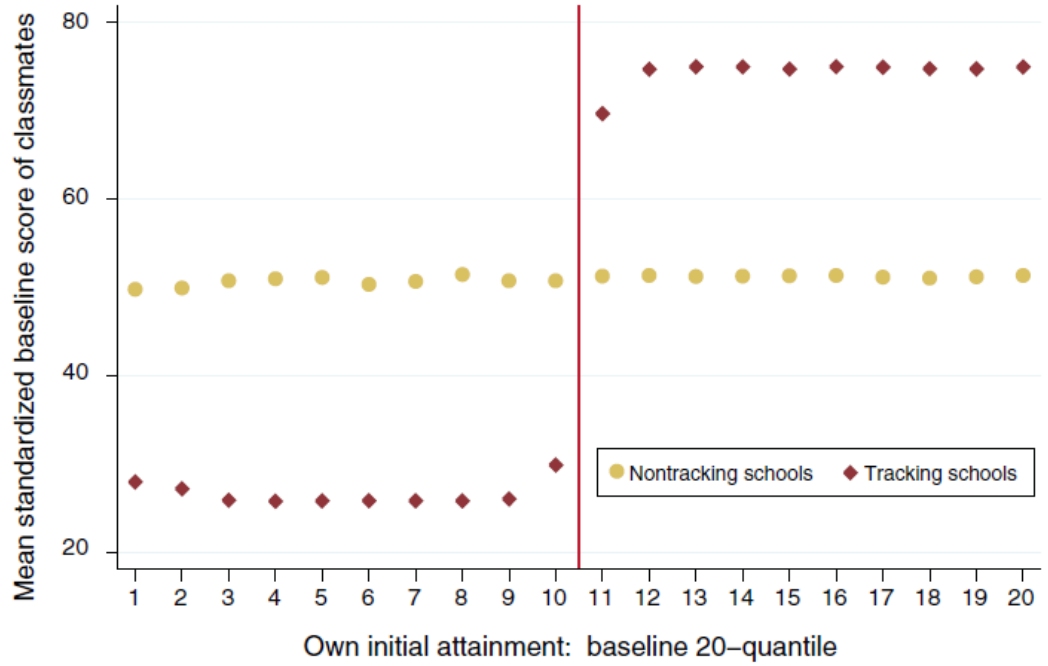


FIGURE 2. EXPERIMENTAL VARIATION IN PEER COMPETITION

An Experiment in Tracking

- They find consistently higher scores across all ability levels in tracked classrooms – both the low and high achieving students.

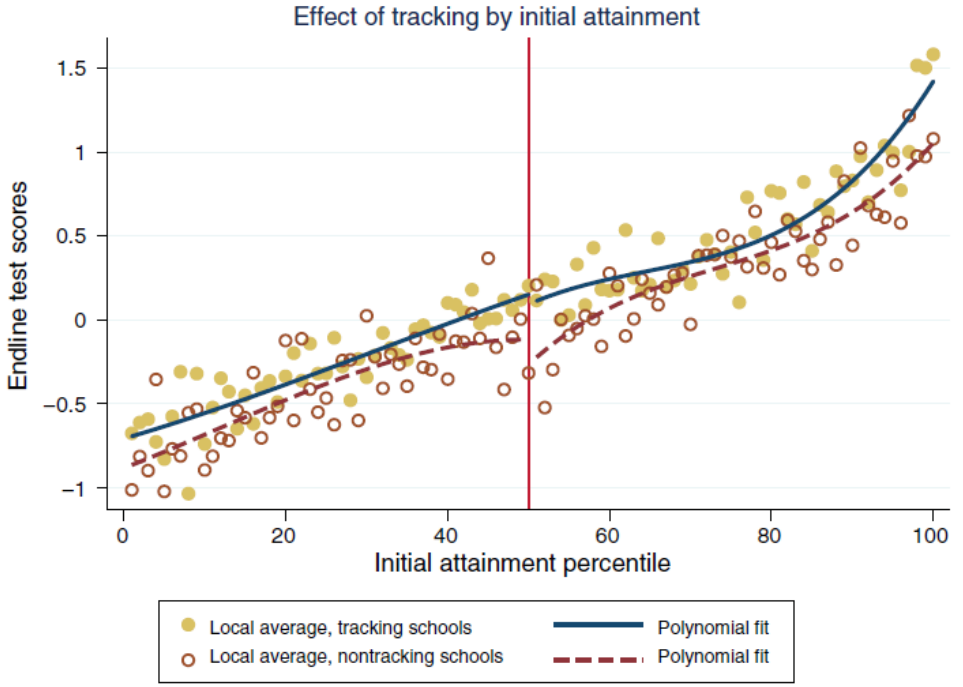


FIGURE 3. LOCAL POLYNOMIAL FITS OF ENDLINE SCORE BY INITIAL ATTAINMENT

Understanding the Economics Behind GT Interventions

- Peer Effects
- Targeted Instruction
- Curricular Enhancements

Things Done Differently in Gifted/Advanced Classes

- Adjustments to curriculum for GT and advanced classes may have impacts.
  - Condensing and streamlining to do less review of previously learned materials.
  - Accelerated learning by advancing a portion or all of a grade level.
  - More project-based learning.
  - Specially trained and certified teachers.

National Association for Gifted Children
https://nagc.org/page/knowledge-center

How To Assess the Impacts of Advanced Academics?

"Whereas the priorities of edcuators depended on their responsibilities, the striking commonality in their responses was that practitioners and policymakers – at all levels – wanted to know the answer to ***questions of cause and effect****. They wanted to know* ***if A caused B****."*

From "Methods Matter" by Richard Murnane and John Willett, discussing a survey conducted by the US Institute for Education Sciences in 2002. Emphasis in original.

The Fundamental Problem of Causal Inference as it Pertains to Advanced Students

- Let's take two students John and Sarah.
- Both John and Sarah have the same 1st grade test scores and are being considered for a GT class in 2nd grade.
- But only Sarah gets in the class. Why?
  - Maybe she did better in interviews, or her grades are better. Or perhaps the teachers saw something more in her.

The Fundamental Problem of Causal Inference as it Pertains to Advanced Students

- This is a problem if trying to find the effect of the gifted class.
- It means there are *unobserved* factors that affect entry in the class.
- Those factors may also contribute to future success regardless of what classes Sarah and John are in.
- Thus, can we attribute better outcomes to the gifted class? No.

The Ideal – Do an Experiment

- What if we could just randomly put some students in advanced classes and others in regular classes?
- Then which class you are in is not related to these other factors and any impacts you find are due solely to being in the advanced class.
- Great, but it's really hard to do such an experiment. It's unlikely you'll find some school willing to let you do it.

Natural Experiments in Advanced Academics

"If you can't do an experiment, go out and find one."

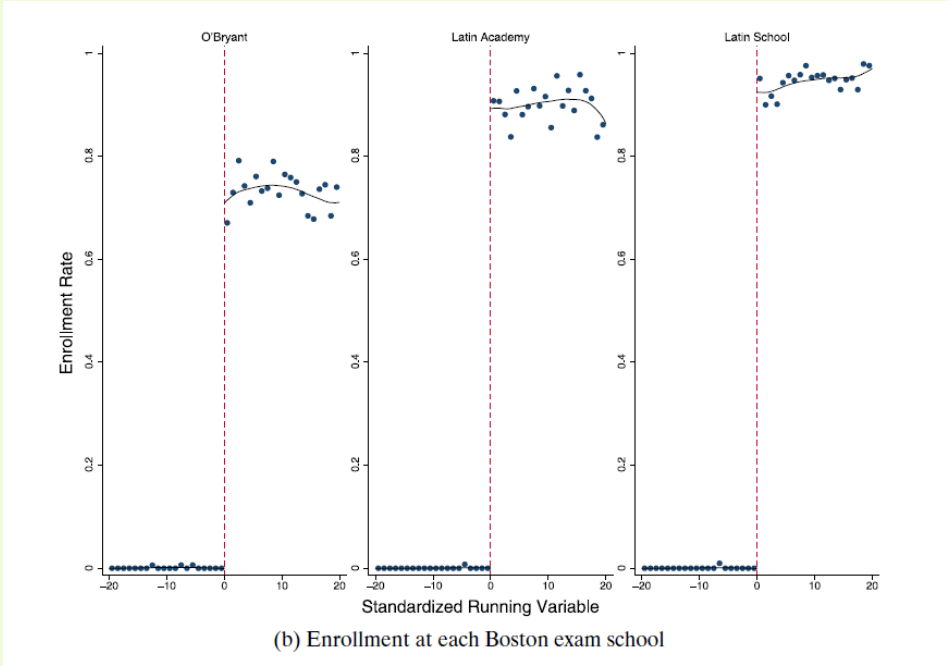
Scott Imberman, March 4, 2025.

Natural Experiments in Advanced Academics

- There are certain real world situations that replicate an experiment.
- One that's commonly occurs in analyzing advanced academics and other education policies is admission via a threshold.
- Often there's some metric – either a test, grades, or combination of factors – that is used to determine entry (at least partially).

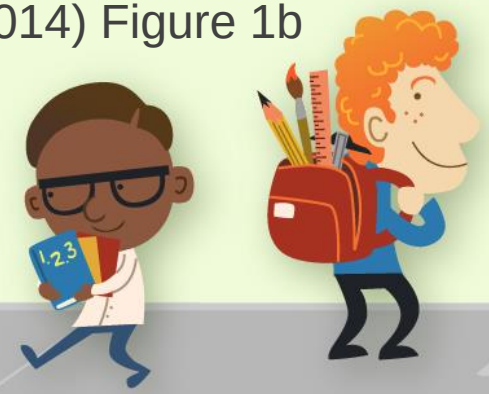
Specialized High School Admissions

- Abdulkadiroglu, Angrist, and Pathak (2014) look at effects of NYC and Boston specialized high schools for gifted students.
- The key assumption – students who just barely exceed the threshold (in this case an exam score) are virtually identical on all factors than someone who barely doesn't, other than the school they attend.



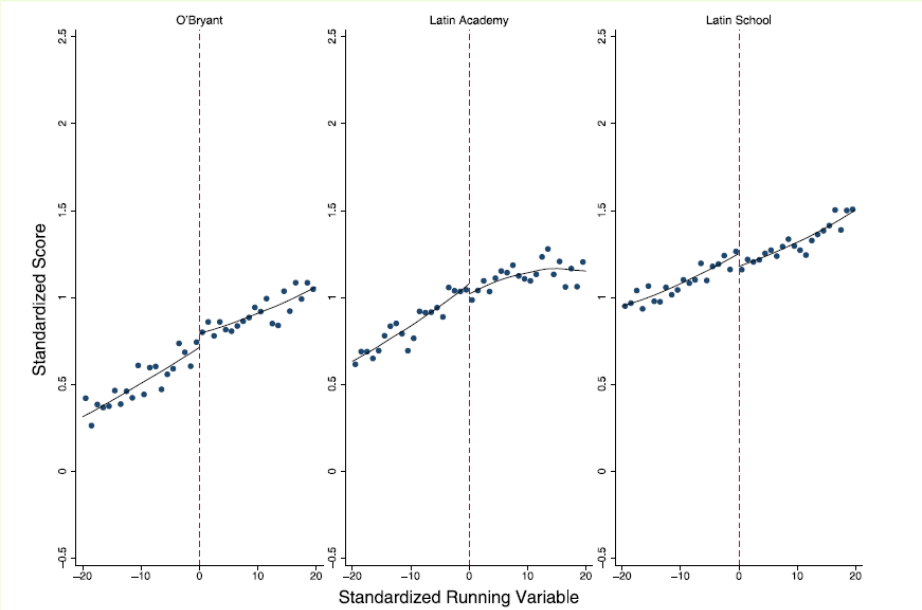
(b) Enrollment at each Boston exam school

Abdukadiroglu, Angrist, Pathak (2014) Figure 1b



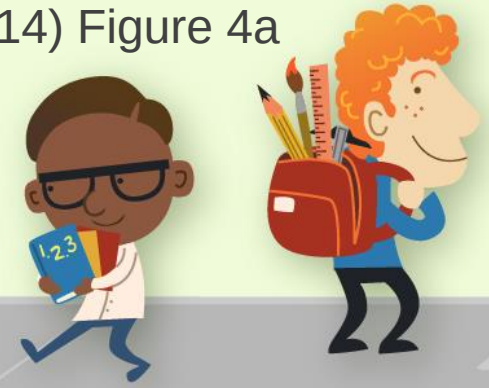
Specialized High School Admissions

- If everything else about them is the same, then if students who barely cross the threshold see gains in performance, we can attribute it to the advanced high school enrollment.
- Bottom line for Abdulkadiroglu et. al. – find no impact on test scores in Boston or NYC …



(a) 10th grade math at Boston exam schools for 7th and 9th grade applicants

Abdulkadiroglu, Angrist, Pathak (2014) Figure 4a



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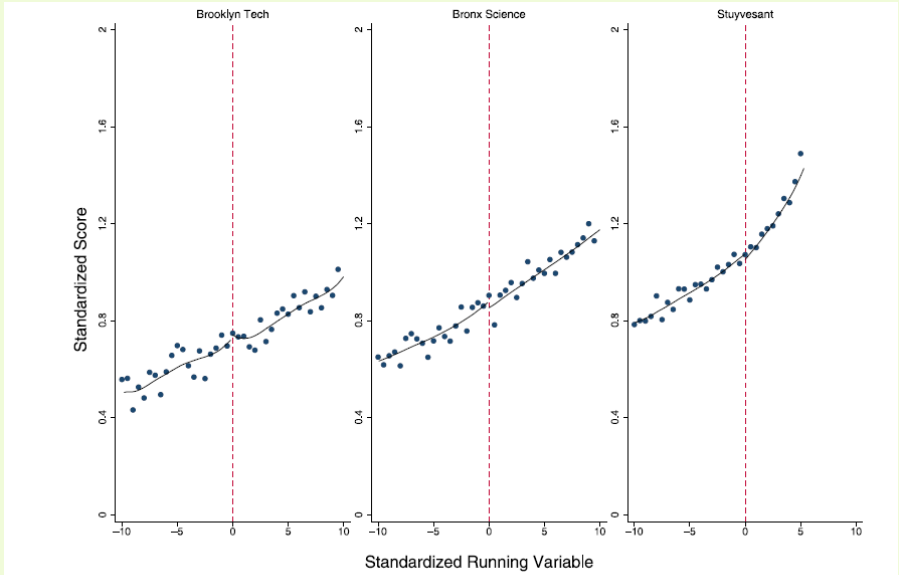
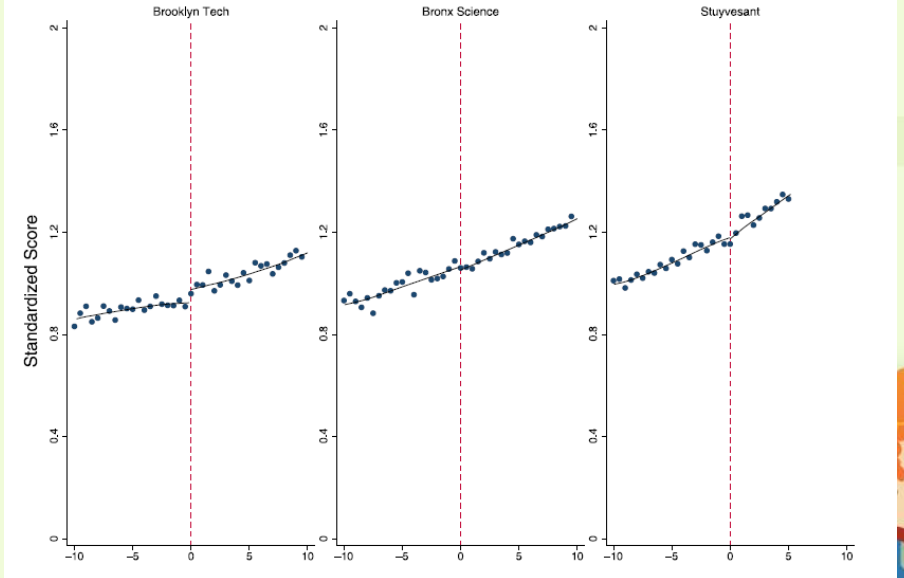


(a) Regents Advanced Math at NYC exam schools

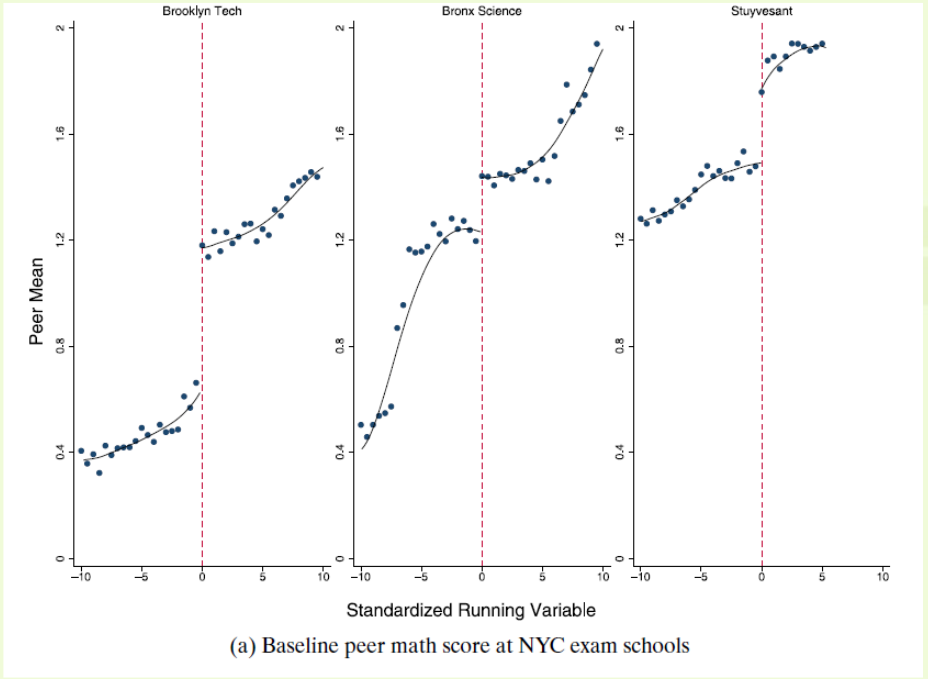


(b) Regents English at NYC exam schools

Abdukadiroglu, Angrist, Pathak (2014) Figures 7a,b

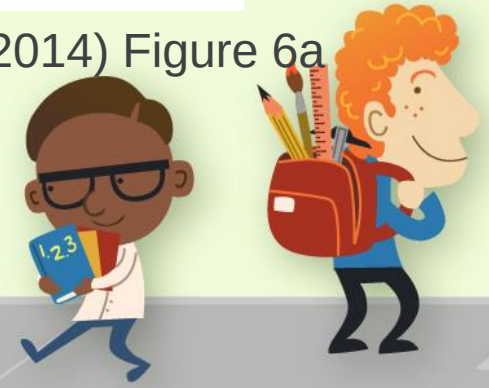
Specialized High School Admissions

- If everything else about them is the same, then if students who barely cross the threshold see gains in performance, we can attribute it to the advanced high school enrollment.
- Bottom line for Abdulkadiroglu et. al. – find no impact on test score. in Boston or NYC…
- despite large increases in peer quality.



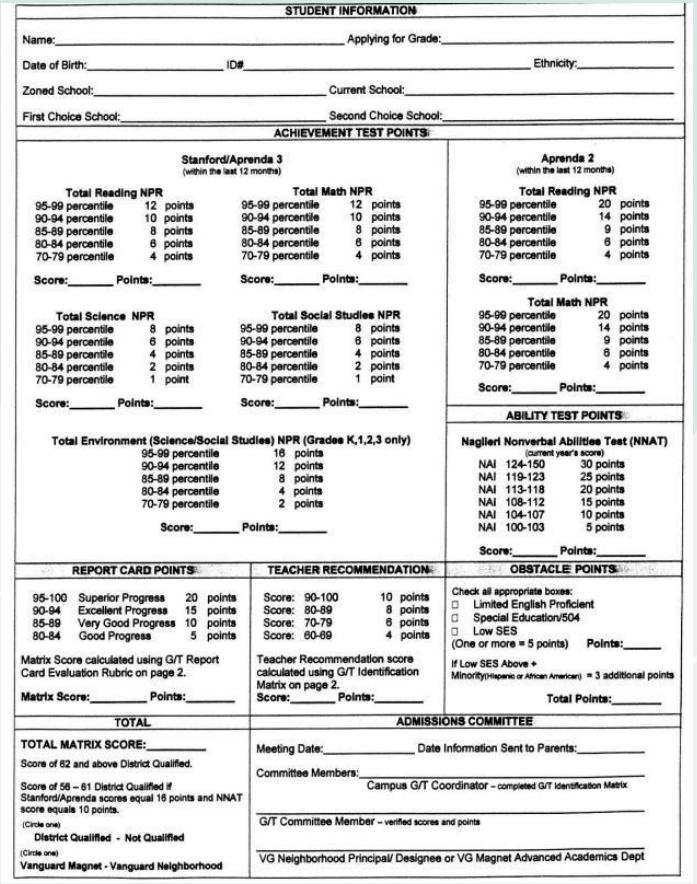
(a) Baseline peer math score at NYC exam schools

Abdukadiroglu, Angrist, Pathak (2014) Figure 6a



What About Younger Grade Levels?

- Bui, Craig and Imberman (2014) look at middle school students in a gifted and talented program in a large school district in the southwest US.
- Same idea here for getting a causal effect – use the admissions threshold.
- Admissions use a mix of factors so need to combine them into a single index.



STUDENT INFORMATION

Name:_____ Applying for Grade:_____

Date of Birth:_____ ID#_____ Ethnicity:_____

Zoned School:_____ Current School:_____

First Choice School:_____ Second Choice School:_____

ACHIEVEMENT TEST POINTS

Stanford/Aprenda 3 (within the last 12 months)

Total Reading NPR		Total Math NPR	
95-99 percentile	12 points	95-99 percentile	12 points
90-94 percentile	10 points	90-94 percentile	10 points
85-89 percentile	8 points	85-89 percentile	8 points
80-84 percentile	6 points	80-84 percentile	6 points
70-79 percentile	4 points	70-79 percentile	4 points
Score:_____ Points:_____		Score:_____ Points:_____	

Total Science NPR		Total Social Studies NPR	
95-99 percentile	8 points	95-99 percentile	8 points
90-94 percentile	6 points	90-94 percentile	6 points
85-89 percentile	4 points	85-89 percentile	4 points
80-84 percentile	2 points	80-84 percentile	2 points
70-79 percentile	1 point	70-79 percentile	1 point
Score:_____ Points:_____		Score:_____ Points:_____	

Total Environment (Science/Social Studies) NPR (Grades K,1,2,3 only)

95-99 percentile	16 points
90-94 percentile	12 points
85-89 percentile	8 points
80-84 percentile	4 points
70-79 percentile	2 points

Score:_____ Points:_____

Aprenda 2 (within the last 12 months)

Total Reading NPR	
95-99 percentile	20 points
90-94 percentile	14 points
85-89 percentile	9 points
80-84 percentile	6 points
70-79 percentile	4 points
Score:_____ Points:_____	

Total Math NPR	
95-99 percentile	20 points
90-94 percentile	14 points
85-89 percentile	9 points
80-84 percentile	6 points
70-79 percentile	4 points
Score:_____ Points:_____	

ABILITY TEST POINTS

Naglieri Nonverbal Abilities Test (NNAT) (current year's score)

NAI 124-150	30 points
NAI 119-123	25 points
NAI 113-118	20 points
NAI 108-112	15 points
NAI 104-107	10 points
NAI 100-103	5 points

Score:_____ Points:_____

REPORT CARD POINTS

95-100	Superior Progress	20 points
90-94	Excellent Progress	15 points
85-89	Very Good Progress	10 points
80-84	Good Progress	5 points

Matrix Score calculated using G/T Report Card Evaluation Rubric on page 2.

Matrix Score:_____ Points:_____

TEACHER RECOMMENDATION

Score: 90-100	10 points
Score: 80-89	8 points
Score: 70-79	6 points
Score: 60-69	4 points

Teacher Recommendation score calculated using G/T Identification Matrix on page 2.

Score:_____ Points:_____

OBSTACLE POINTS

Check all appropriate boxes:

- ☐ Limited English Proficient
- ☐ Special Education/504
- ☐ Low SES

(One or more = 5 points) Points:_____

If Low SES Above + Minority(Hispanic or African American) = 3 additional points

Total Points:_____

TOTAL

TOTAL MATRIX SCORE:_____

Score of 62 and above District Qualified.

Score of 56 – 61 District Qualified if Stanford/Aprenda scores equal 16 points and NNAT score equals 10 points.

(Circle one) District Qualified - Not Qualified

(Circle one) Vanguard Magnet - Vanguard Neighborhood

ADMISSIONS COMMITTEE

Meeting Date:_____ Date Information Sent to Parents:_____

Committee Members:_____

Campus G/T Coordinator – completed G/T Identification Matrix

G/T Committee Member – verified scores and points

VG Neighborhood Principal/ Designee or VG Magnet Advanced Academics Dept

Bui, Craig, Imberman (2014) Figure 1

What About Lower Grades?

- Bui, Craig and Imberman (2014) look at middle school students in a gifted and talented program in a large school district in the southwest US.
- Same idea here for getting a causal effect – use the admissions threshold.
- Admissions use a mix of factors so need to combine them into a single index.
- Crossing the threshold increases likelihood of being placed in the gifted program of 50 percentage points.

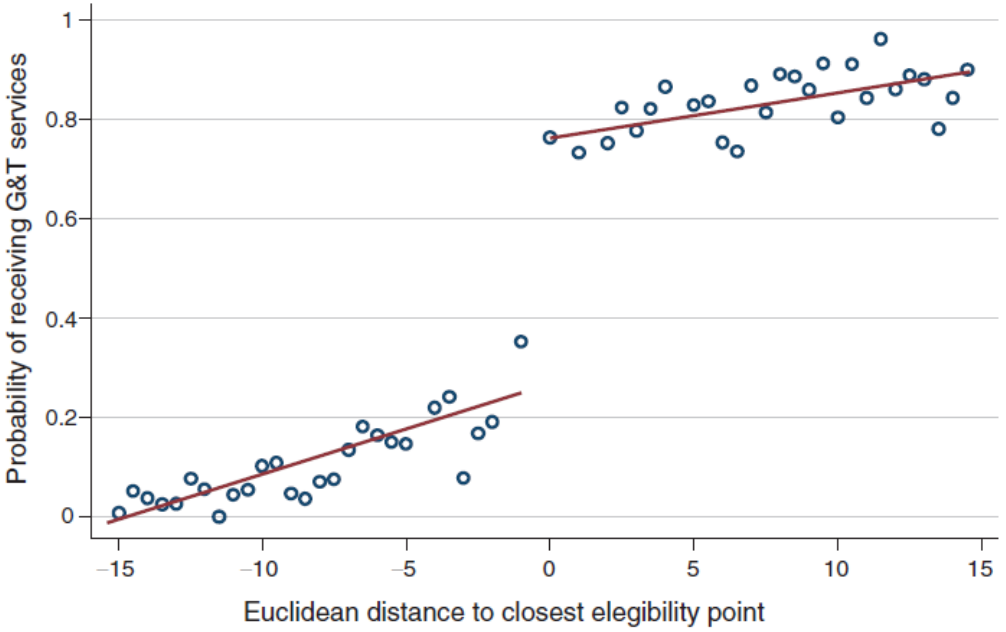


FIGURE 4. GIFTED STATUS IN SEVENTH GRADE BY DISTANCE TO BOUNDARY BASED ON FIFTH GRADE MATRIX POINTS

What About Lower Grades?

- Bui, Craig and Imberman (2014) look at middle school students in a gifted and talented program in a large school district in the southwest US.
- Same idea here for getting a causal effect – use the admissions threshold.
- Admissions use a mix of factors so need to combine them into a single index.
- Crossing the threshold increases likelihood of being placed in the gifted program of 50 percentage points.
- But just like Abdulkadiroglu et. al. (2014) no impact on test scores.

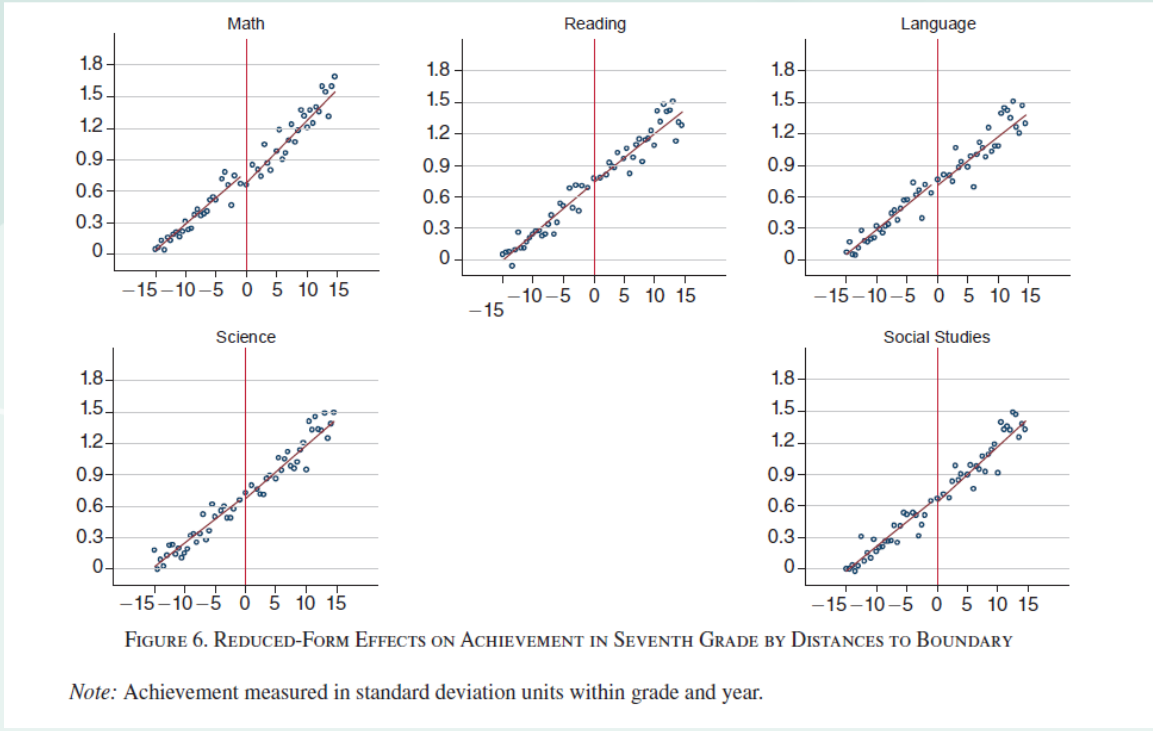


FIGURE 6. REDUCED-FORM EFFECTS ON ACHIEVEMENT IN SEVENTH GRADE BY DISTANCES TO BOUNDARY

Note: Achievement measured in standard deviation units within grade and year.

More Lower Grades GT

- Card and Giuliano (2016) look at another large US school district and elementary school students.
- Similar to Bui et. al. (2014) they see a large increase in enrollment in GT from passing the threshold…

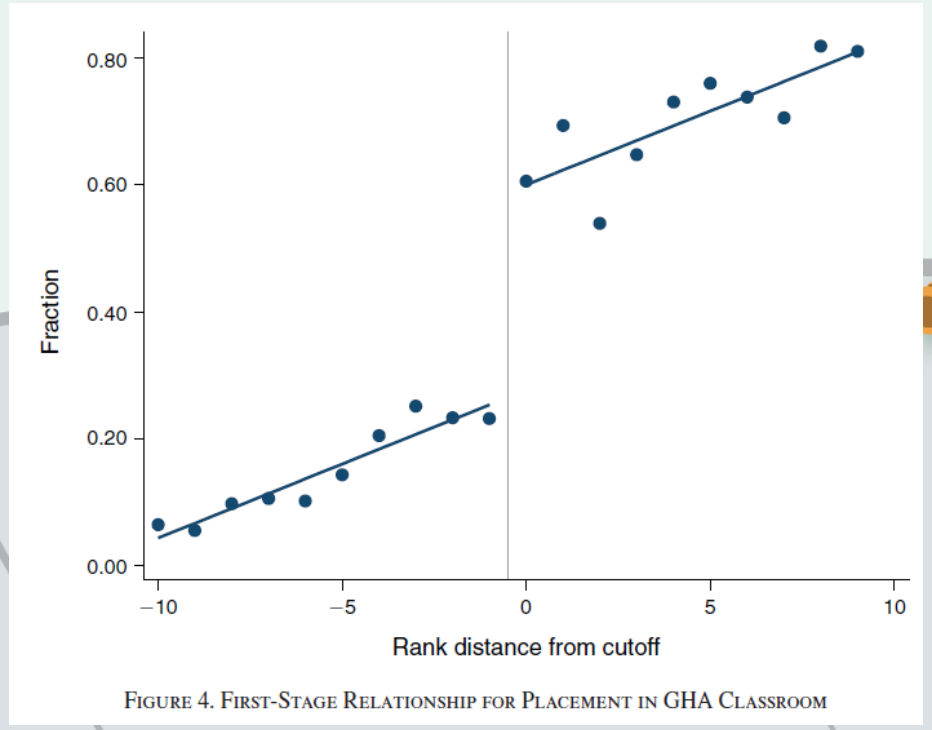
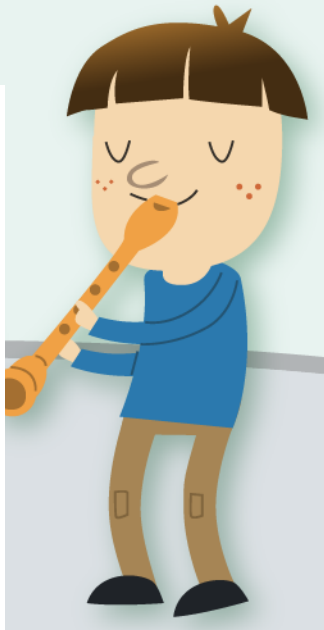


FIGURE 4. FIRST-STAGE RELATIONSHIP FOR PLACEMENT IN GHA CLASSROOM



More Lower Grades GT

- Card and Giuliano (2016) look at another large US school district and elementary school students.
- Similar to Bui et. al. (2014) they see a large increase in enrollment in GT from passing the threshold…
- … but they find increases in achievement concentrated amongst Black and Hispanic students.

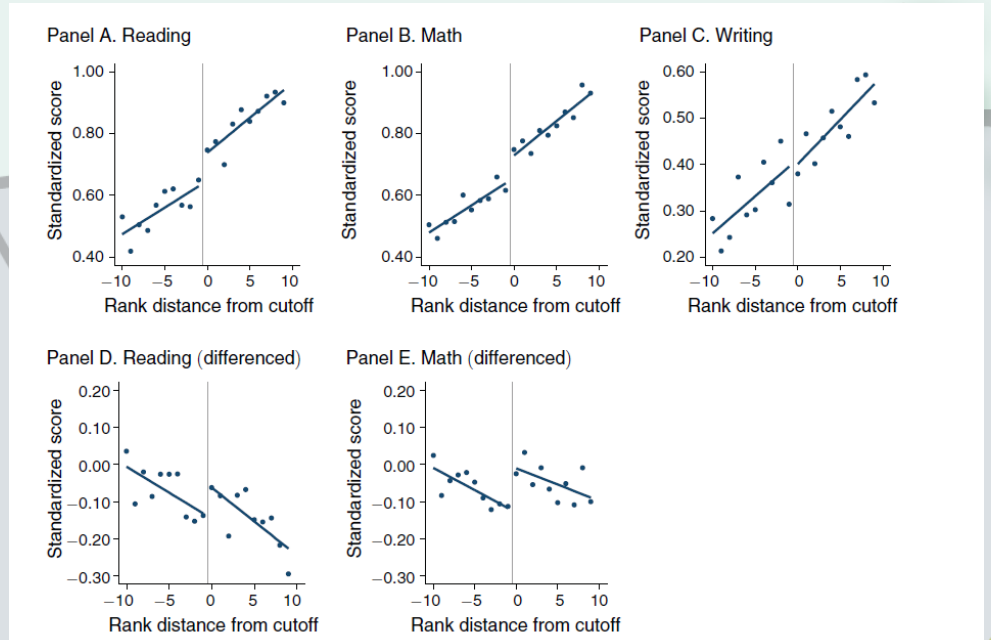


FIGURE 5. FOURTH-GRADE STANDARDIZED TEST SCORES

Reconciling Different Results

- Why might the Card et. al. work differ from what Abdulkadiroglu et. al. and Bui et al. show?
  - Simplest explanation is different contexts – the GT programs may differ and student populations may just respond differently.
  - But there are other issues. One problem is the nature of this method – you only see impacts for people near the threshold… so if the thresholds are different, the impacts may be different.
  - This also shows a limitation – these studies don't tell us much about what happens to students way above the thresholds.
  - Further, maybe impacts are more likely to show up in later-life outcomes rather than test scores.

Long Term Effects of GT

- One issue with the prior studies is that they are mostly short-term.
- What about long-run effects?
- Fryer and Dobbie (2014) also look at NYC advanced high schools and find no impact on college enrollment, graduation, or quality, like what Abdulkadiroglu et. al. see for short-term effects.
- But maybe high school interventions just happen too late to really alter a student's path.

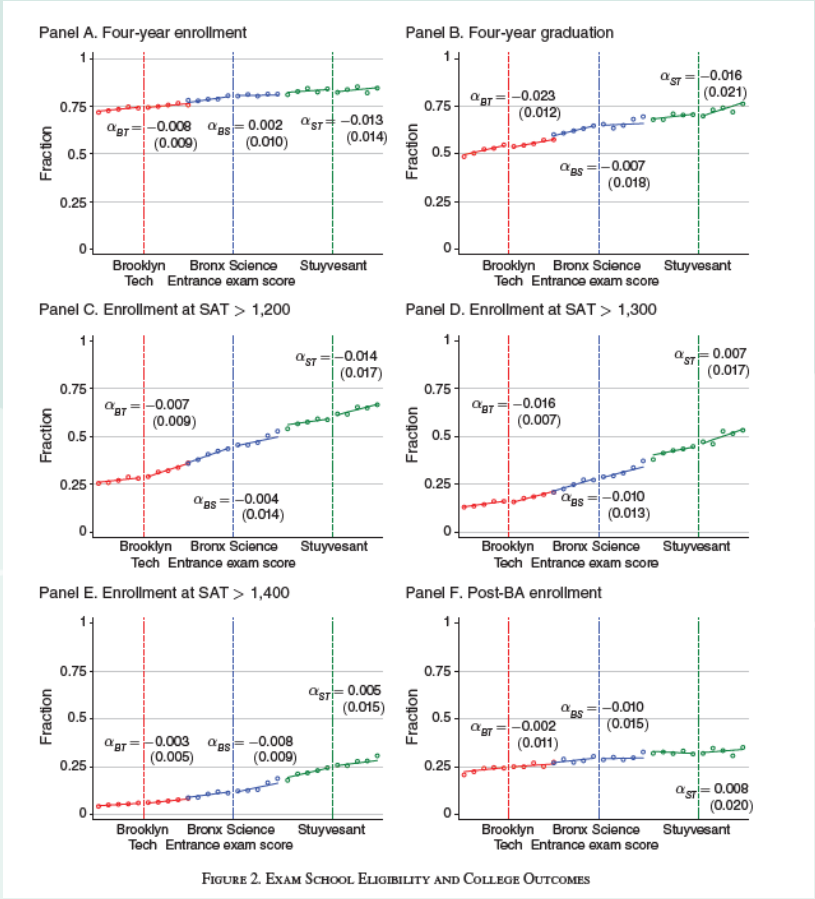
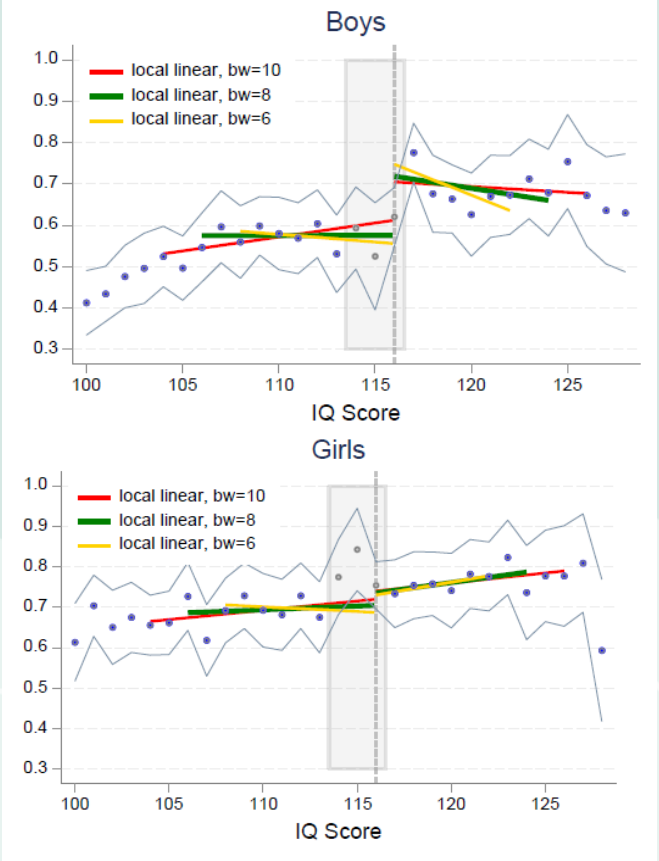


FIGURE 2. EXAM SCHOOL ELIGIBILITY AND COLLEGE OUTCOMES

Long Term Effects of GT

- Card, Giuliano and Chyn (2024) show that a middle school GT program improved HS graduation and college enrollment for boys but not girls.



Card, Giuliano, Chyn (2024) Figure 4a

Relationships Between On-Time Graduation and College Enrollment

Long Term Effects of GT

- Card, Giuliano and Chyn (2024) show that a middle school GT program improved HS graduation and college enrollment for boys but not girls.
- Cohodes (2020) shows that Boston's upper elementary GT program increased high school graduation and college enrollment.
  - Like in Card and Giuliano (2016) these effects are concentrated in racial minorities.

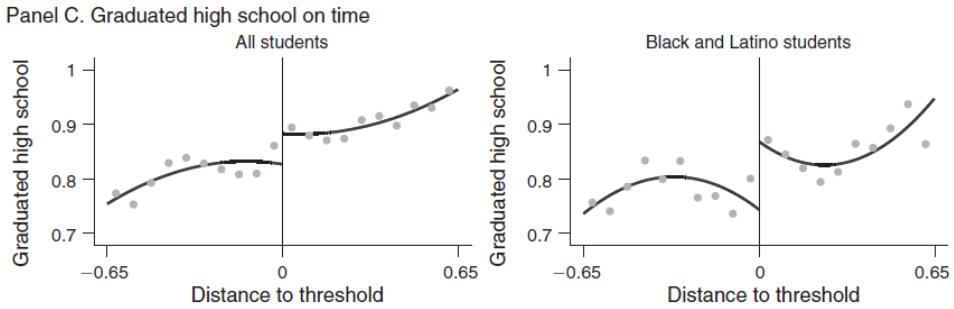


FIGURE 3. HIGH SCHOOL OUTCOMES BY DISTANCE TO ELIGIBILITY THRESHOLD

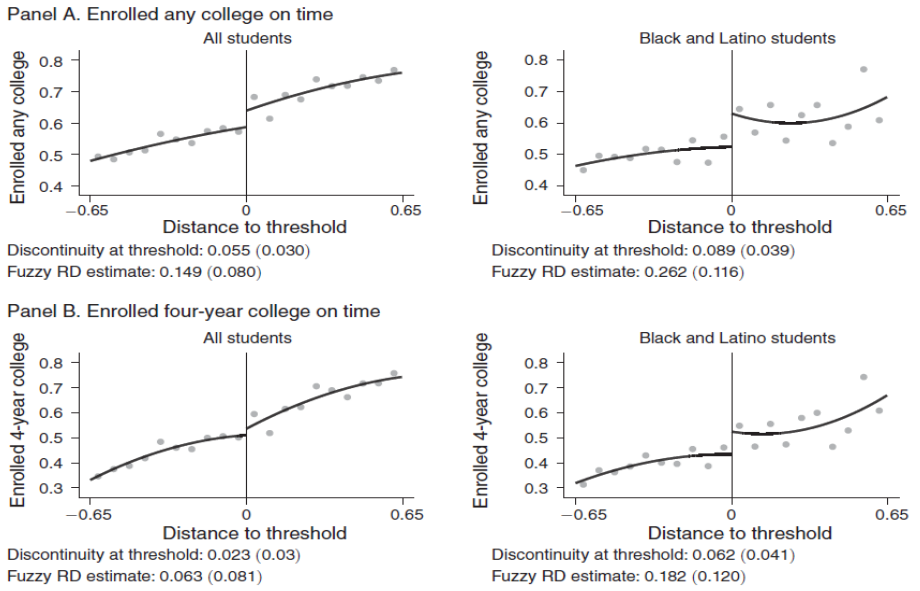


FIGURE 4. COLLEGE ENROLLMENT OUTCOMES BY DISTANCE TO ELIGIBILITY THRESHOLD

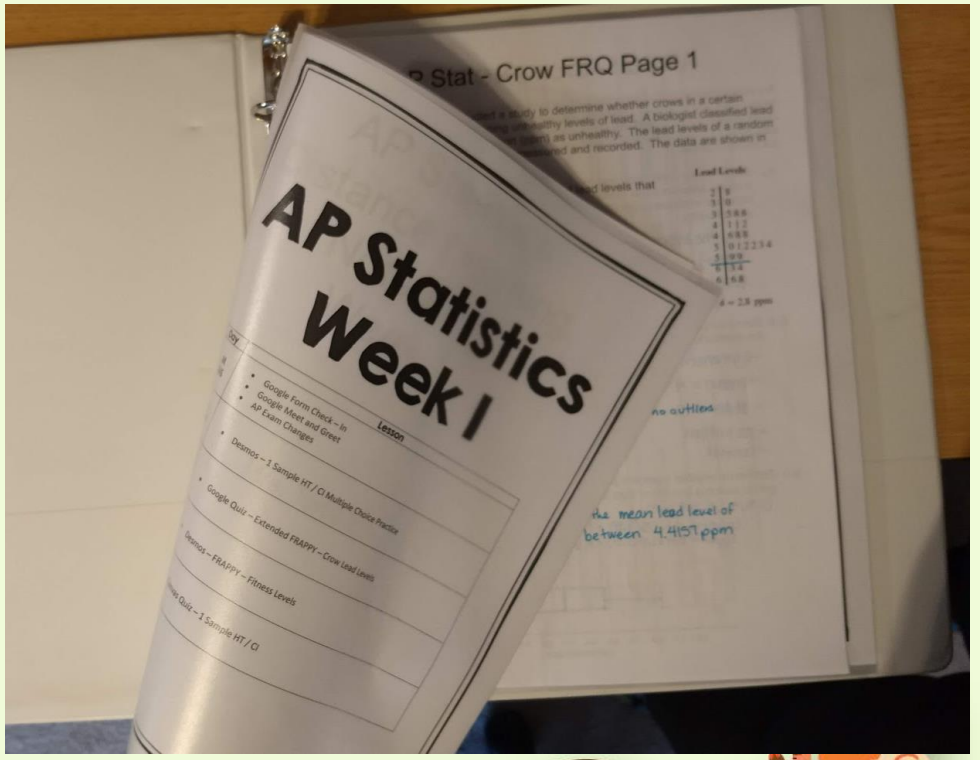
Overall Assessment of Impacts of GT and Advanced High Schools

- Short-term impacts are mixed and better for minority groups.
- Long-run impacts are much more promising, particularly for programs below the high school level.

A Brief Word About Advanced College Prep

- A number of studies have looked at impacts of AP/IB courses.
  - Jackson (2010) shows that an incentive program for students and teachers to take and pass AP exams leads to higher college entrance exam scores and college enrollment rates.
  - Arce-Trigatti (2018) shows that a requirement mandating offering of AP courses in school increased high school graduation rates and achievement.
  - Conger et al (2021) showed increased science skills in an experiment that randomly chose schools to be provided supports to establish AP science courses…

  but the courses reduced students' confidence in their ability to do college science and increased stress.



Expanding Access to Advanced Education

“The investments we make today in disadvantaged young children promote social mobility, create opportunity, and foster a vibrant, healthy, and inclusive society and economy.”

James J. Heckman, Economics Nobel Laureate

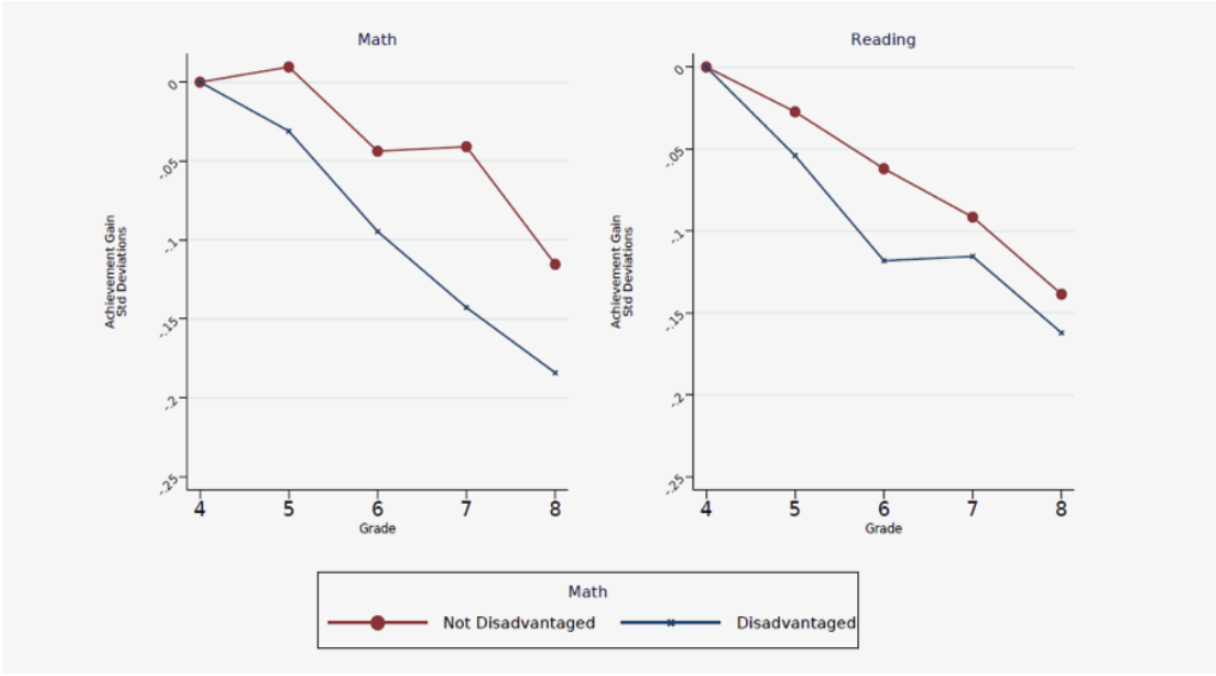
Issues of Access

- In general, there have long been concerns that access to advanced academic programs is more limited for low SES students.
  - The programs are costly and thus lower resourced schools are less inclined to provide them.
  - Screening mechanisms may be subject to both statistical (e.g. lower SES students tend to perform relatively poorly on exams) and taste-based (e.g. some teachers may perceive racial minority students as less intelligent) discrimination.

Socio-Economic Differences in GT Access in Ohio

- In a study I did for the Thomas Fordham Institute (“Ohio’s Lost Einsteins: The inequitable outcomes of early high achievers”, 2021), I show that high achieving students in the US state of Ohio who were economically disadvantaged saw lower achievement gains than non-disadvantaged high achievers.

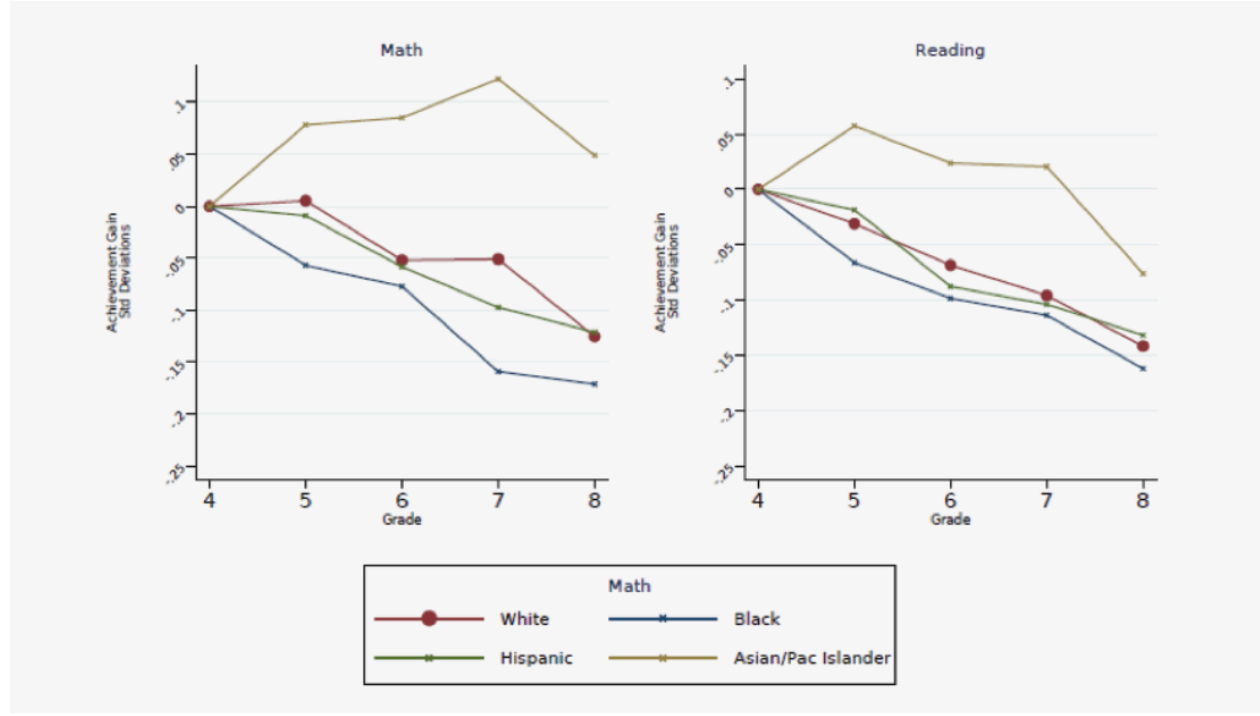
Figure 2: Cumulative achievement gains for high achievers relative to fourth grade, by economic disadvantage



Socio-Economic Differences in GT Access in Ohio

- And a similar story emerges when looking by race.

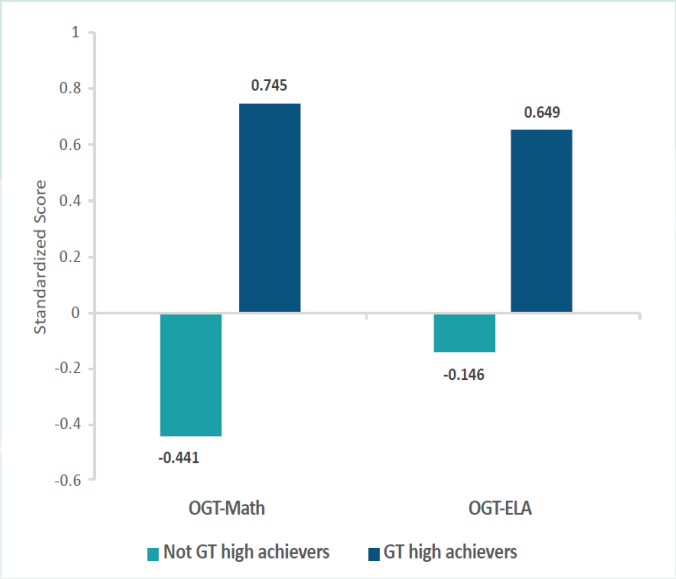
Figure 4: Cumulative achievement gains for high achievers relative to fourth grade, by race



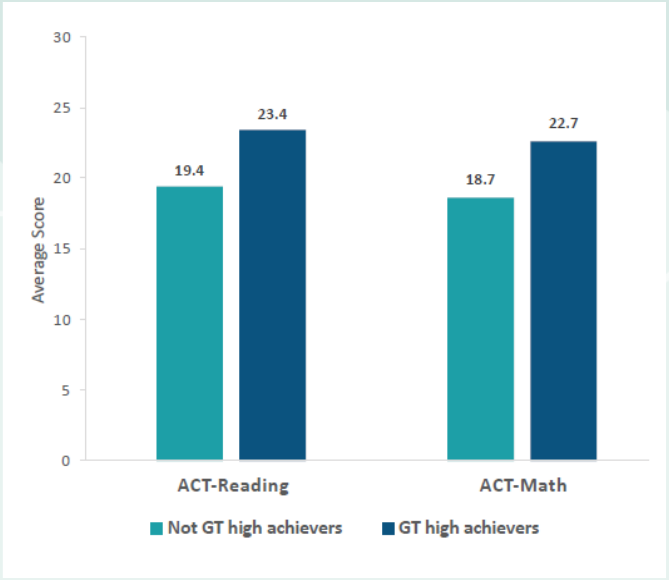
Socio-Economic Differences in GT Access in Ohio

- The study also shows that the relationship between access to a GT program and long-run outcomes for high achievers is very strong for Black students.

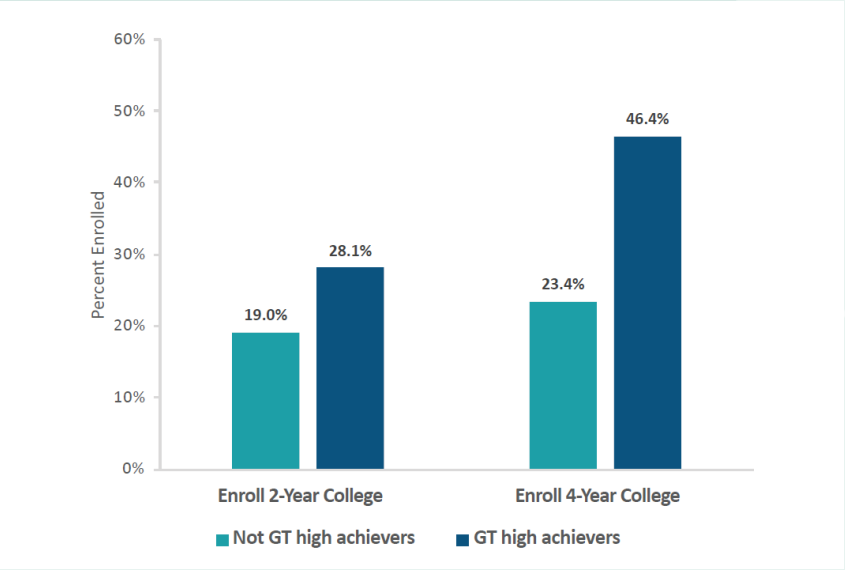
HS Achievement



College Entrance Exams



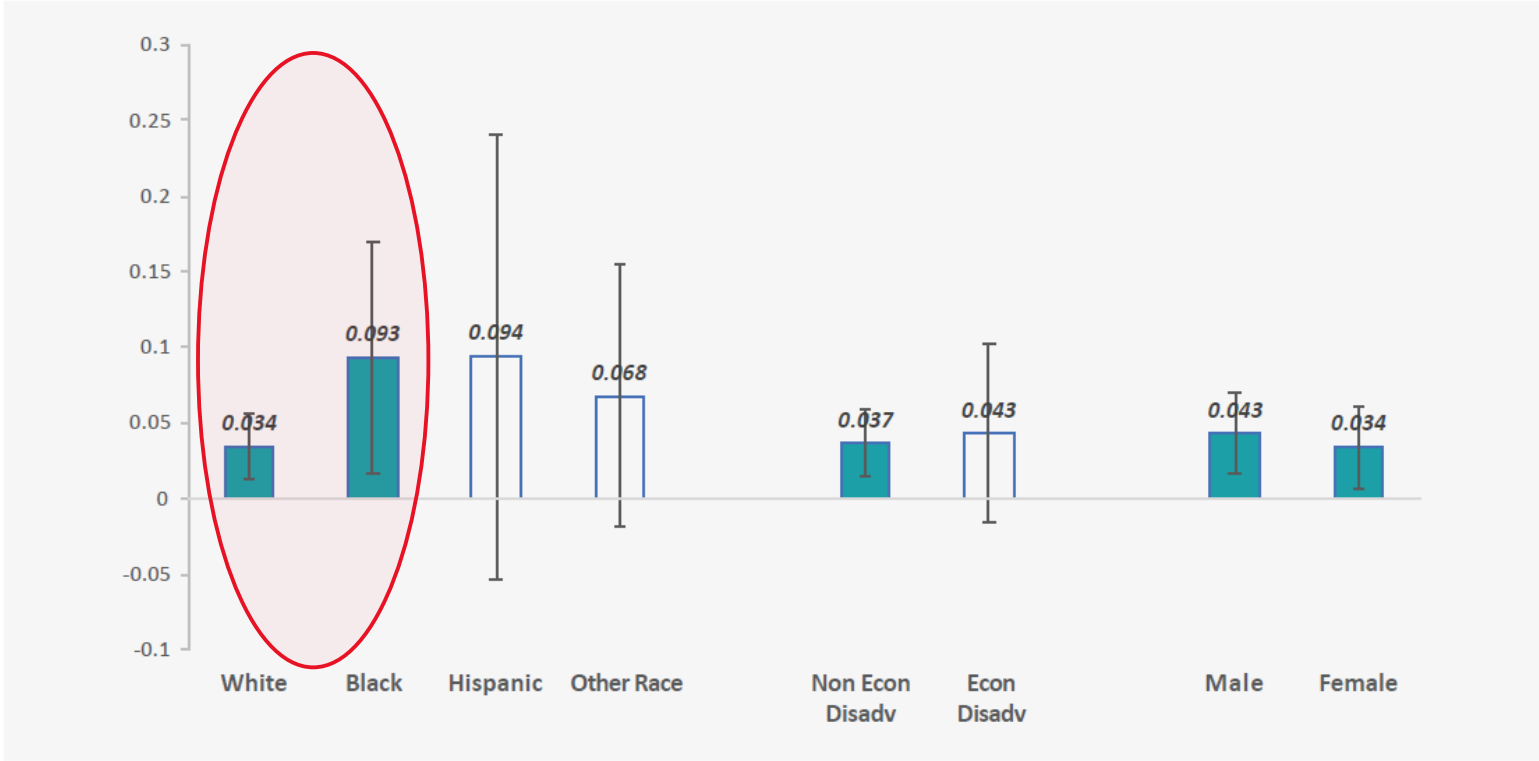
College Enrollment



Socio-Economic Differences in GT Access in Ohio

- While those are not causal, the study is able to provide some credibly causal estimates that impacts of GT identification on K-8 math scores are larger for Black students

Impact Estimates of GT identification on Achievement (Standard Deviations)



How Do We Increase Access?

- So what can be done to increase access for minorities and low-income students?
- Besides the obvious of providing more funds for GT programs in schools with high minority and/or disadvantaged populations…
- can also expand universal screening – making sure that every student is screened for GT services using objective metrics.

How Do We Increase Access?

- Card and Giuliano (2016) look at the impacts of universal screening from the brief implementation of a program in a large urban school district in the US.
- The program had a huge impact on the share of students enrolled in GT programs.
- But did it help improve equity of access to these programs?

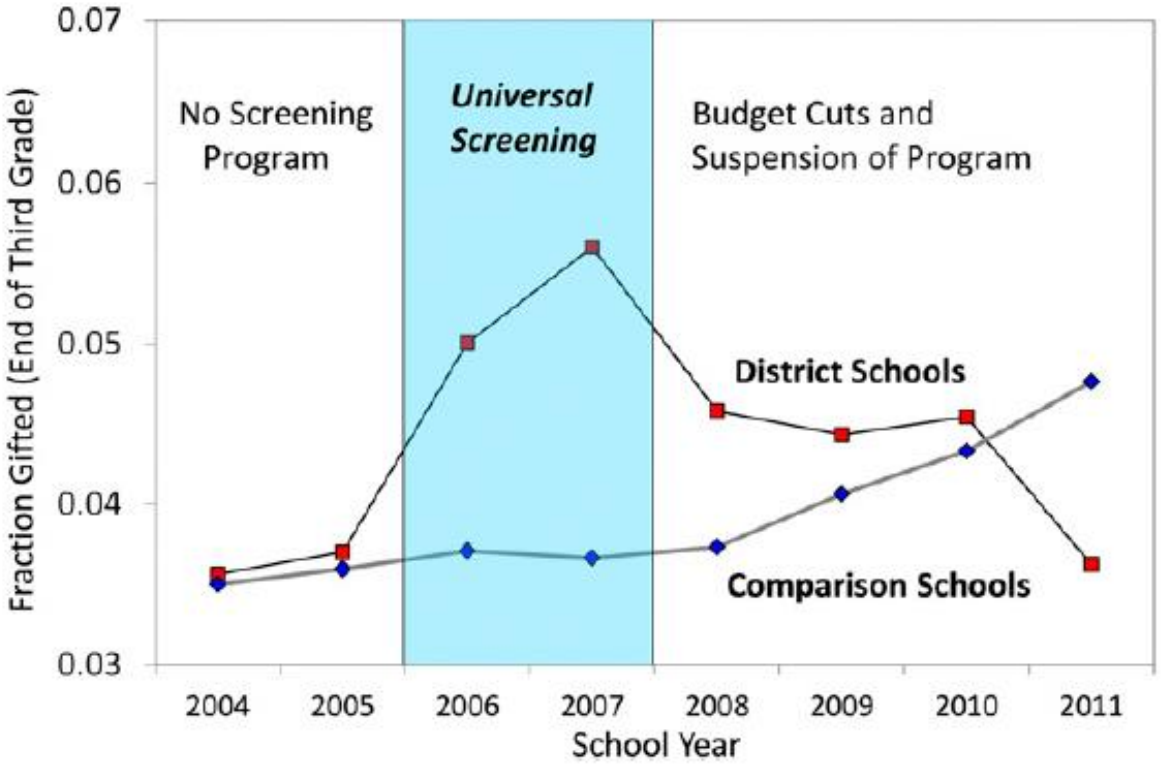


Fig. 1. Fraction gifted by end of third grade, District schools vs. matched comparison schools. (See *SI Materials and Methods* for details.)

How Do We Increase Access?

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- The program had a huge impact on the share of students enrolled in GT programs.
- But did it help improve equity of access to these programs?
  - In short, yes. The impacts on Black (2.4 pp) and Hispanic (4.2 pp) students were significantly larger than for White (1.5pp) students after adjusting for time trends.

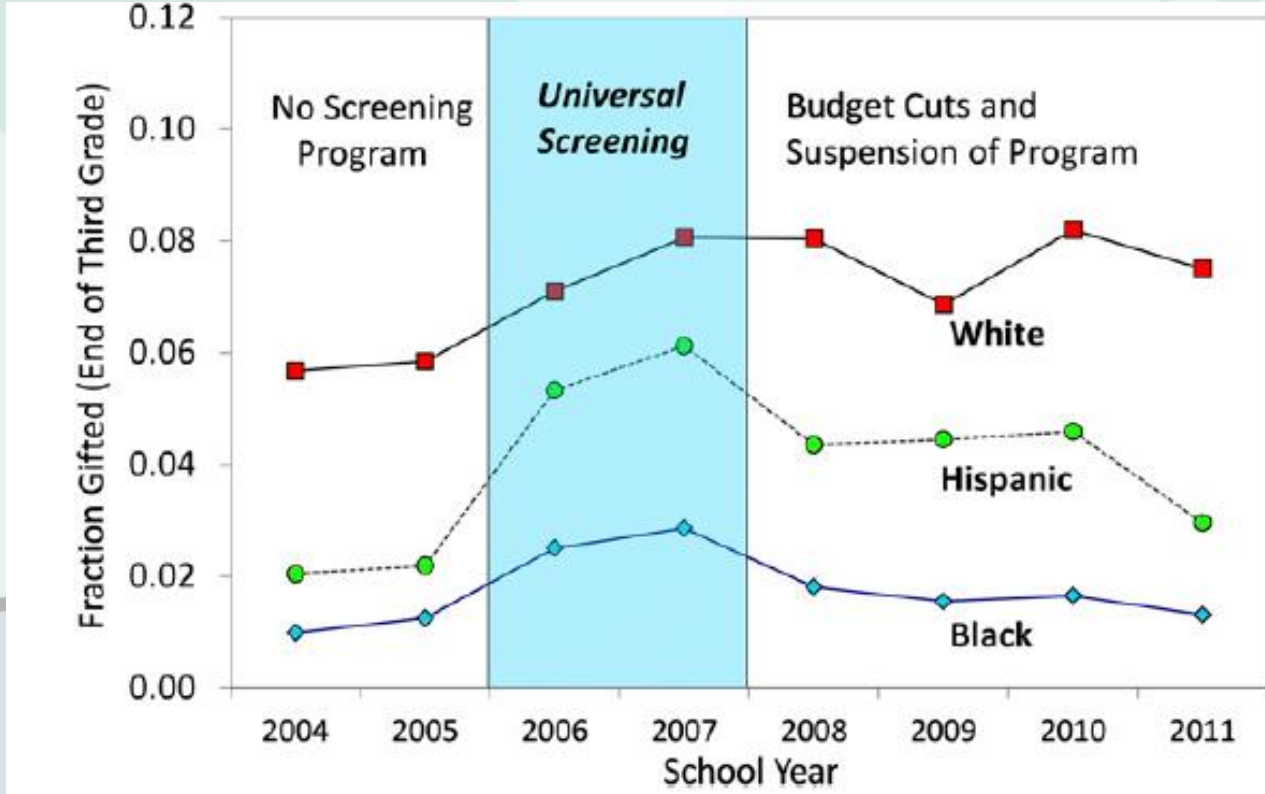

Fig. 3. District trends in fraction gifted by end of third grade.

Limitations of Universal Screening

- So it seems universal screening can improve minority access to GT programs.
- But it is not a panacea – expanding access without expanding funding could lead to degradation in services.

So What Does it All Mean in the End?

- At the end of this exploration, we can come to a few conclusions.

1. The impacts of GT and other advanced academic programs are mixed but largely appear to at least not be a net negative for students who participate.

   But for every action there is an opposite reaction – more support for GT programs without the requisite increases in funding could lead to negative consequences elsewhere in the education system.

2. Ensuring access to people from all walks of life is important. Universal screening can help but may not be enough.

Thank you!

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