Using Student-Level Opportunity to Examine Achievement and Inequality

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Berkeley Evaluation and Assessment Research Seminar

October 21st, 2025

Dissertation and ongoing research focus:

1. Explore educational inequality through the lens of opportunity.
2. Improve methods for identifying high-needs students.

Goals:

1. Include *every* students.
2. Incorporate multiple group memberships simultaneously.
3. Avoid reinforcing stereotypes.
4. Embrace complexity, emphasize simplicity: "*Simplexity*" (Jenkins-Stark, AUSD)
5. Individual-level measures of opportunity.
6. Model and explain the within-group heterogeneity of opportunity and achievement.
7. Identify students for support (or acceleration).

Data

Student-level data:

- Two school districts: 2015–2019
- Demographic profiles
- Smarter Balanced Assessment (SBA) English Language Arts (ELA) and math scores

State and school-level data:

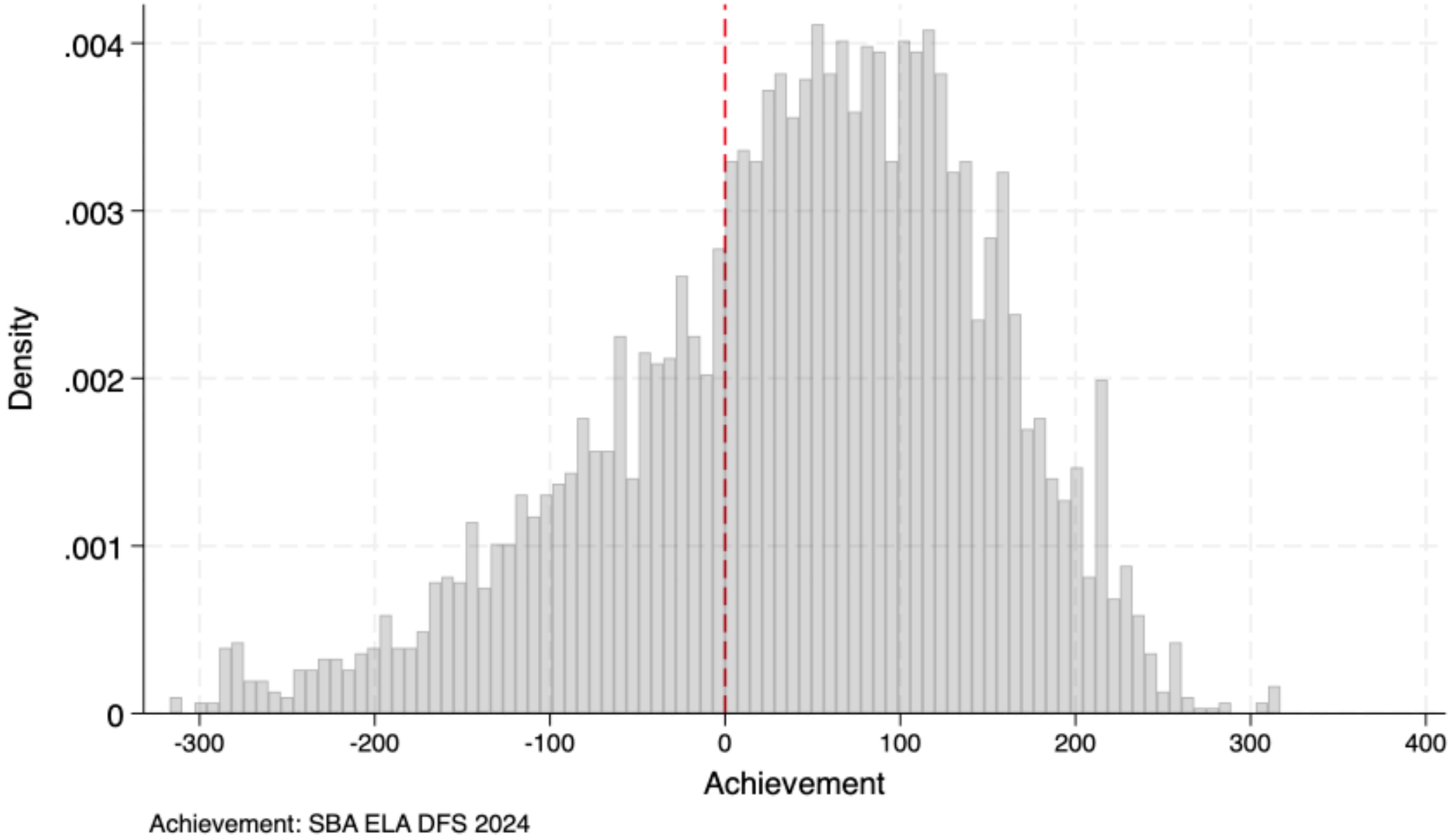
- Enrollment and SBA scores 2015–2024

Achievement measures:

- SBA scores converted to Distance From Standard (DFS; Smarter Balanced Assessment Consortium, 2018)
- Grade point averages (GPA)
- A-G grade point average
- SAT scores

Achievement and Inequality

Achievement Inequality



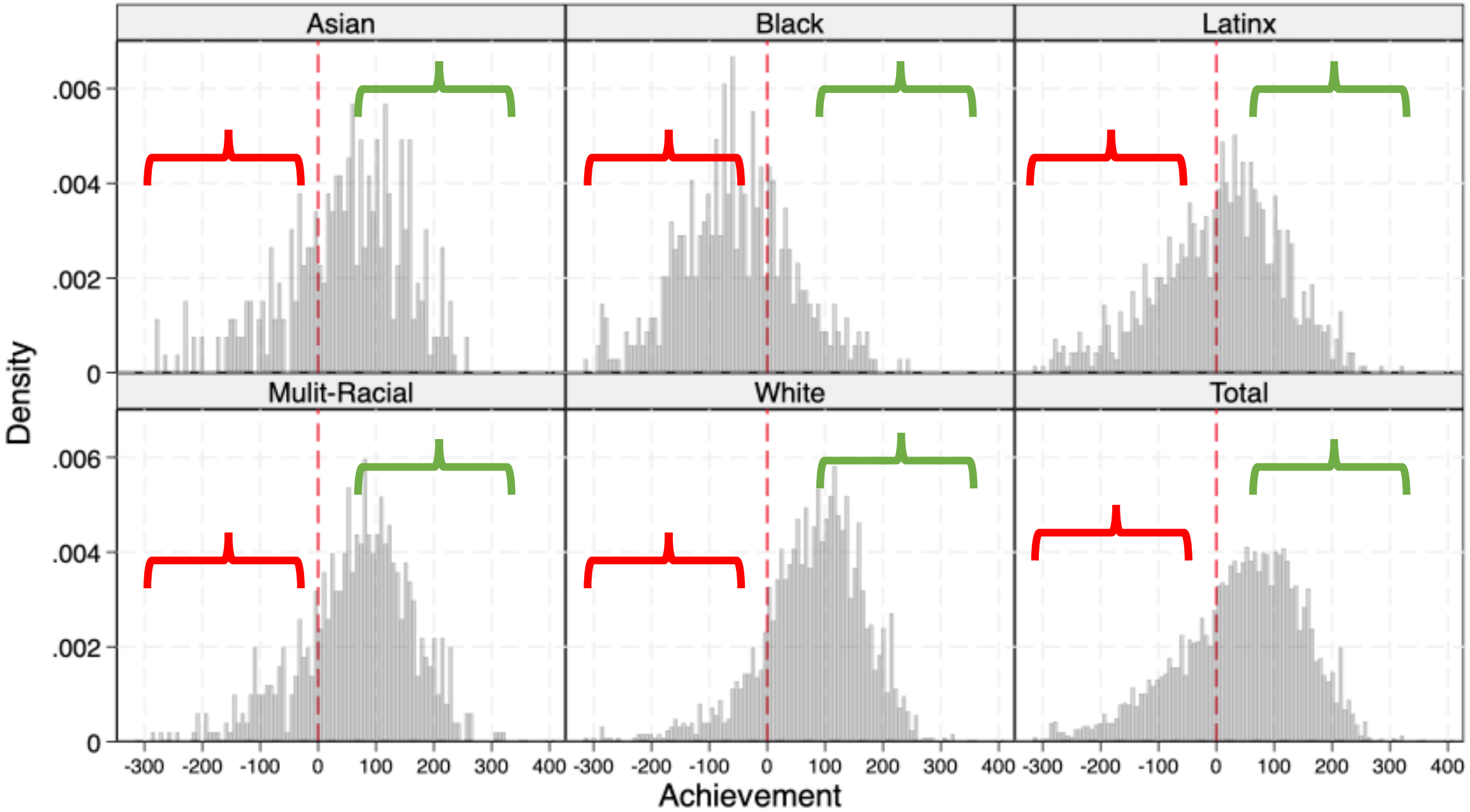
Inequality: Achievement-Gap Framework

Measure: Group averages or rates of proficiency.

Pros:

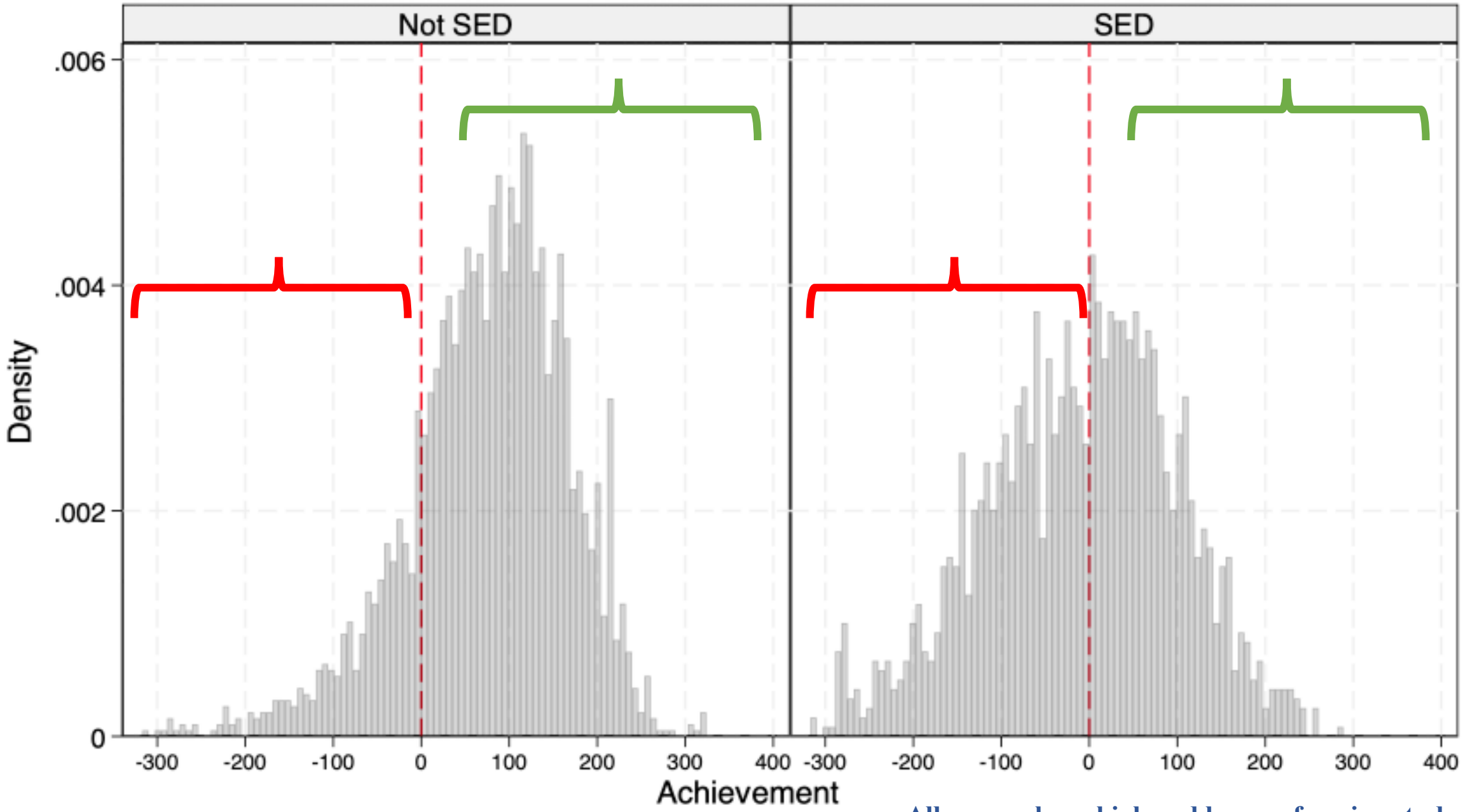
- Draws attention to systemic and structural inequalities.
- Simplicity.

Ethnic-racial and socioeconomic achievement gaps are the most common, but not the only group-based inequalities.



Achievement: SBA ELA DFS 2024

All groups have high and low performing students.



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- Simplicity.

Cons:

- Deficit perspective (Harper, 2015; Milner, 2012).
- Reinforces stereotypes (Quinn, 2022; Steele & Aronson, 1995).
- Low predictive validity (Bowers & Zhou, 2019).
- Groups with small numbers are often omitted (Hafoka et al., 2020) .
- Ignores students' multiple identities (Gutiérrez, 2008) .
- Ignores within-group heterogeneity of achievement (Lopez et al., 2018; Reardon & Galindo, 2009).
- Positions White or middle class as the norm or reference group (Milner, 2012)..

Milner: Focus more on opportunity gaps and less on achievement gaps (2011).

What helps explain achievement inequality?

- Achievement is a function of opportunity and effort.
  - $A = f(\text{Opportunity, Effort, error})$
- Education production function (Bowles, 1970):
  - $A = f(\text{Family/Community/School factors, Effort, error})$
    - Family, community, and school factors represent opportunity.
    - Family, community, and school factors are beyond the control of the student.
    - If opportunity is defined by these factors, it is beyond the control of the student.
    - Effort is within the control of the student.

- **Acceptable inequality:** Similar opportunity, different effort.
- **Unacceptable inequality:** Same effort, different opportunity.
- How much of achievement is due to effort?
- How much of achievement is attributable to opportunity?

Defining Opportunity

Defining opportunity

- Cambridge (n.d.): *"A situation or occasion in which it is possible to do something you want to do."*
- Oxford (n.d.): *"A set of circumstances that make it possible to do something."*
- Imply an element of choice and maintain the burden on the student to act on the opportunity.
- Very broad. Just about anything can be considered an opportunity.

How have researchers defined and measured opportunity?

- **Number** of books in the house (Leseman & De Jong, 1998).
- Access to a **rigorous** curriculum (Guiton & Oakes, 1995).
- **Attending** preschool (Gorey, 2001).
- Being taught by **highly-quality** teachers (Darling-Hammond, 2000).
- Having **highly-educated parents** (Alon, 2007).
- Teacher **cultural competence** (Carter, 2013).
- **Adequate** and **sufficient** school funding (Brick, 2005; Coleman, 1968; Ladd, 2008).
- Access to **safe** housing, **affordable** healthcare, and **good** schools (Milner, 2012).
- The universe of potential opportunity variables is unlimited.

- Many of these definitions would be difficult to measure at scale due to issues of privacy or political opposition.
- If we cannot consistently define opportunity, policies designed to reduced educational inequality will continue to rely solely on measures of achievement.

A Conceptual Framework for Defining Opportunity

Criteria:

- Focus on systemic opportunity and not opportunity due to random or discrete events.
- Use educationally salient variables.
  - Variables for which data are already collected.
  - Variables included in school accountability policies.
  - Solid evidence linking group membership with achievement.
  - Importance in classroom and school composition.
- A subset of the universe of opportunity variables.

A common definition → A common method of measurement.

Advantage Framework

- Advantage (n.d.): "*Conditions giving a greater chance at success.*"
  - Circumstances a person is born into.
  - Outside the student's control.
  - Systematic advantages.
- A subset of six opportunity variables:
  - Race/ethnicity, disability status, English language status, and socioeconomic status (No Child Left Behind, 2001; Every Student Succeeds Act, 2015).
  - Parent educational level:
    - Contribution to achievement via social capital (Schlee et al., 2009).
    - A secondary indicator of socioeconomic status (Harwell & LeBeau, 2010).
  - Gender:
    - Historical role in determining access to education and the impacts of stereotypes reinforced in the curricula (Bailey et al., 2016; Horton, 2020; Monkman, 2021).

Opportunity Rubric/Construct Map using the Advantage Framework

Opportunity (via Advantage)	English Language Status	Gender	Parent Educational Level	Race & Ethnicity	Socioeconomic Status	Special Education Status	Achievement
Increasing Opportunity / Increasing Advantage							Increasing Achievement
	Initial Fluent Bilingual (56; 29)		**Graduate Degree** (58; 33)	**Asian** (62; 50)			
				Filipino (45; 10)	**Not Disadvantaged** (35; 4)		
	Redesignated English Fluent (20; -20)	**Female** (-1; -52) / **Male** (-24; -46)	**College Degree** (22; -11)	**White** (22; -10)		**Students Not in Special Education** (0; -37)	
				Multi-Racial (21; -13)			
	English Only (0.0; -78)		**Some College** (-21 ; -61)	**Nat. Hawaiian** (-32; -71)	**Disadvantaged** (-41; -80)		
			High School Grad. (-48; -88)	**Hispanic/Lat.** (-39; -80)		**Students in Special Education** (-103; -136)	
	English Learner (-108; -133)		**Not a High School Graduate** (-66; -88)	**Nat. Am. Alaskan Nat.** (-48; -86)			
				Black (-58; -104)			

Achievement numbers in parentheses are the average post-COVID (2022–2024) Smarter Balanced Assessment English Language Arts and Math DFS Scores by subgroup (ELA; Math).

Measuring Opportunity

Measuring Educational Inequality

Ferreria & Gignoux (2013):

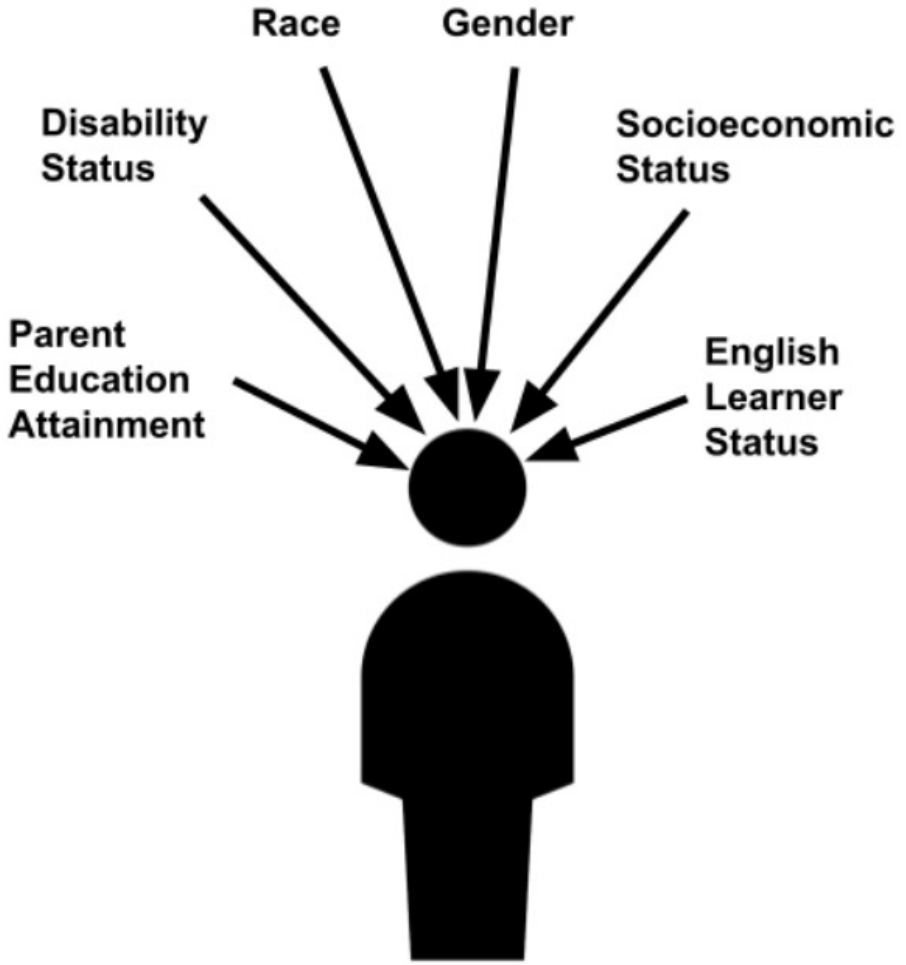
- Examined 2006 PISA reading, math, and science performance among 57 countries.
- Concerned about selection bias in the samples from each country.
- How can you compare achievement when circumstances are so different?
- Proposed two measures for educational inequality:
  - Variance for achievement inequality.
  - Variance explained by pre-determined circumstances for opportunity inequality.

Measuring the inequality of opportunity:

- Regressed PISA scores on 10 student characteristics.
  - Accounted for up to 35% of the inequality of achievement.
  - Ideally, students' backgrounds would have no association with achievement.
  - Interpreted the variation in achievement explained by students' backgrounds (R^2) as a measure of the inequality of opportunity.
- The unexplained portion of the variance (i.e., residual variance) represents a combination of effort, omitted variables, and measurement error.

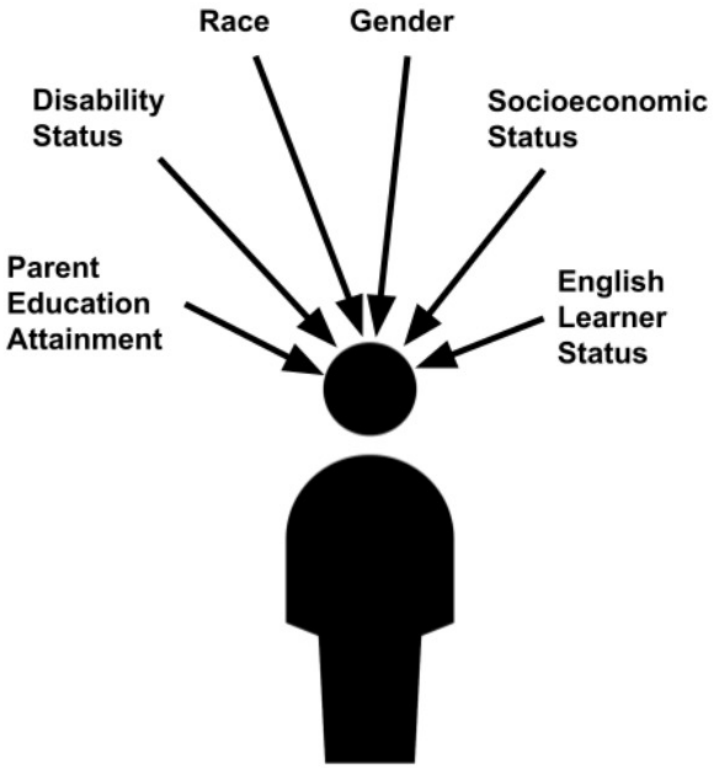
Why a Student-Level Measure of Opportunity?

- Achievement is measured at the student level.
- The consequences of higher or lower achievement (e.g., intervention, acceleration, college acceptance, etc.) are experienced at the student level.
- The six sources of opportunity intersect and act collectively at the individual level.
- Advantage Framework: 2,000+ different combinations.

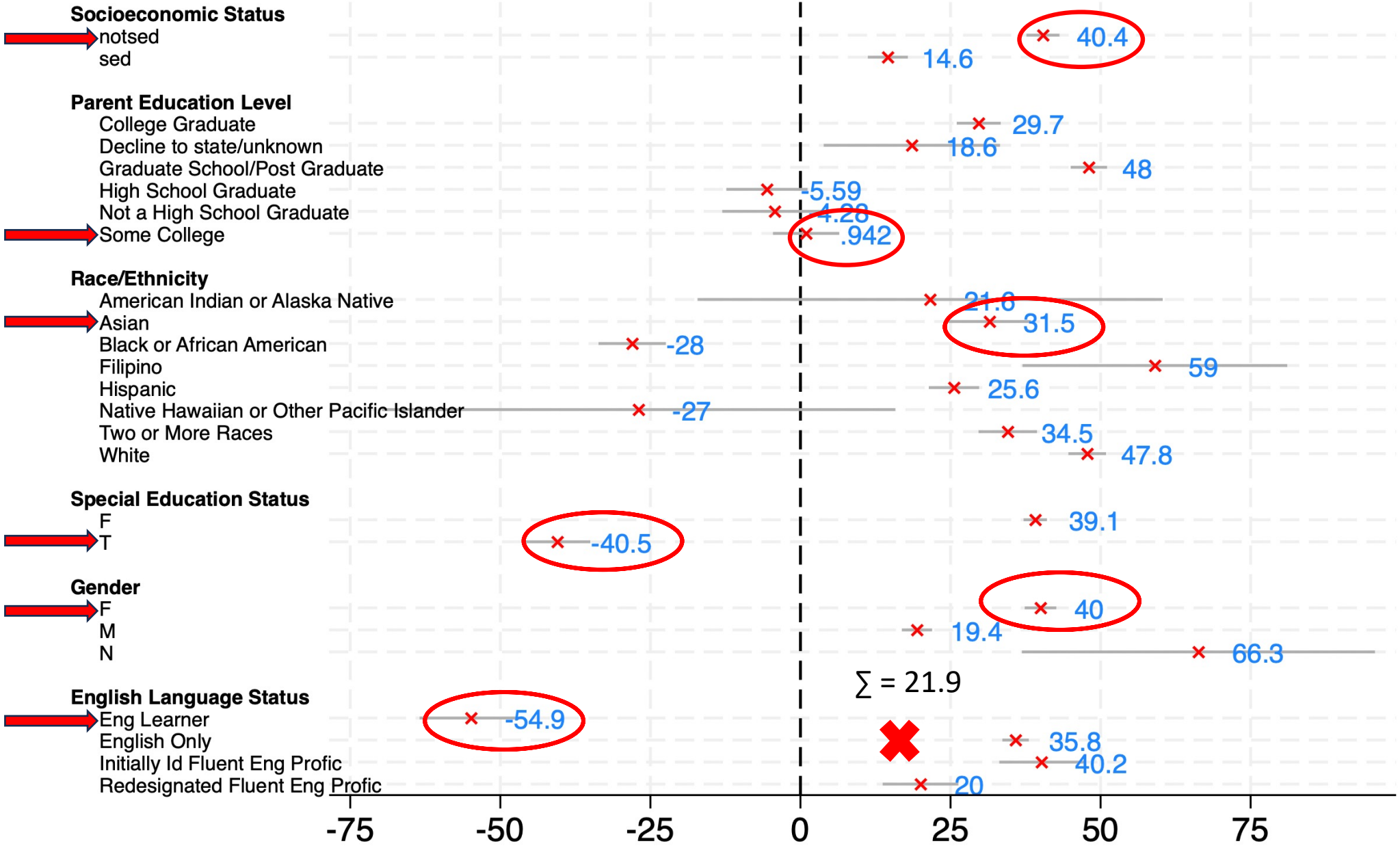


Estimating Student-Level Opportunity

- Regressed achievement on the subgroups for the six opportunity variables (~25 dummy variables).
- Estimated the marginal mean coefficients for each of the ~25 subgroup variables.
- Sumed the six coefficients relevant to each student's demographic profile (= $\hat{y}$).
- The R^2 value is derived from the differences between students' actual achievement scores and the scores predicted ($\hat{y}$) by their background characteristics.
- $\hat{y}$ reflects the level of achievement predicted solely by a student's backgrounds (i.e., circumstances beyond their control), independent of effort.



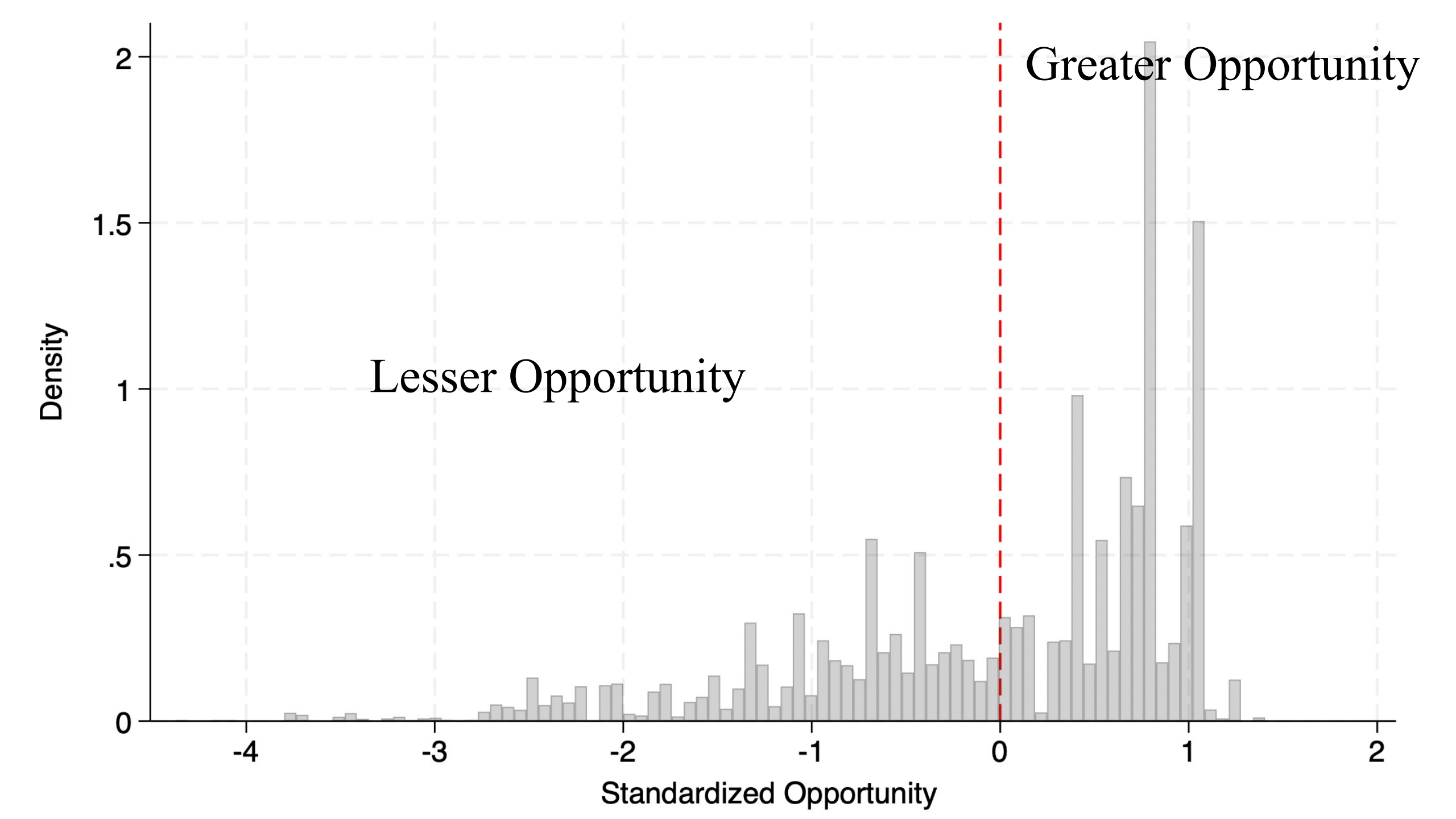
Marginal Regression Coefficients for Advantage Variable Subgroups

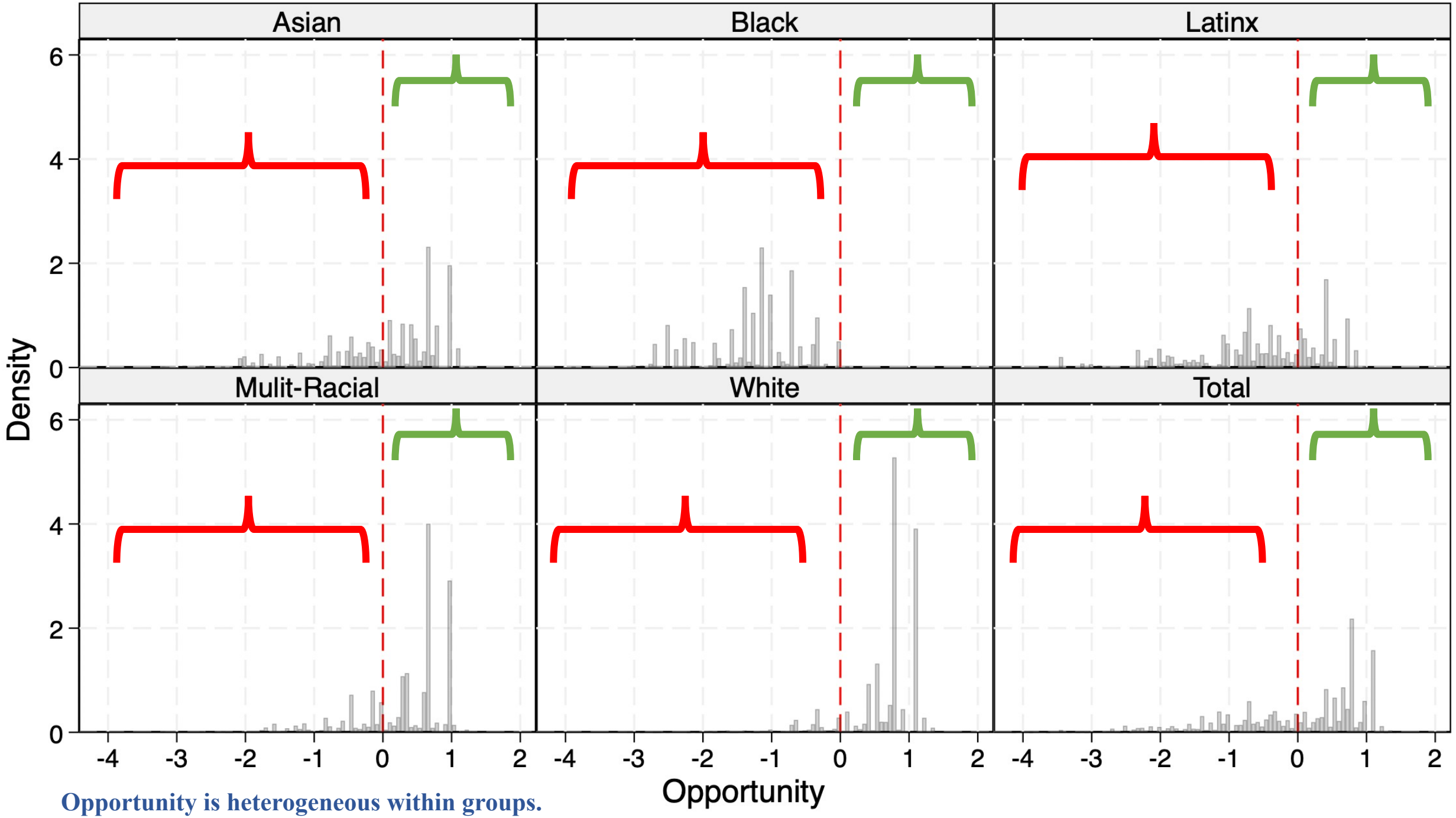


A variable-centered approach yields six vastly different ways of portraying this example profile. Actual ŷ is 21.9.

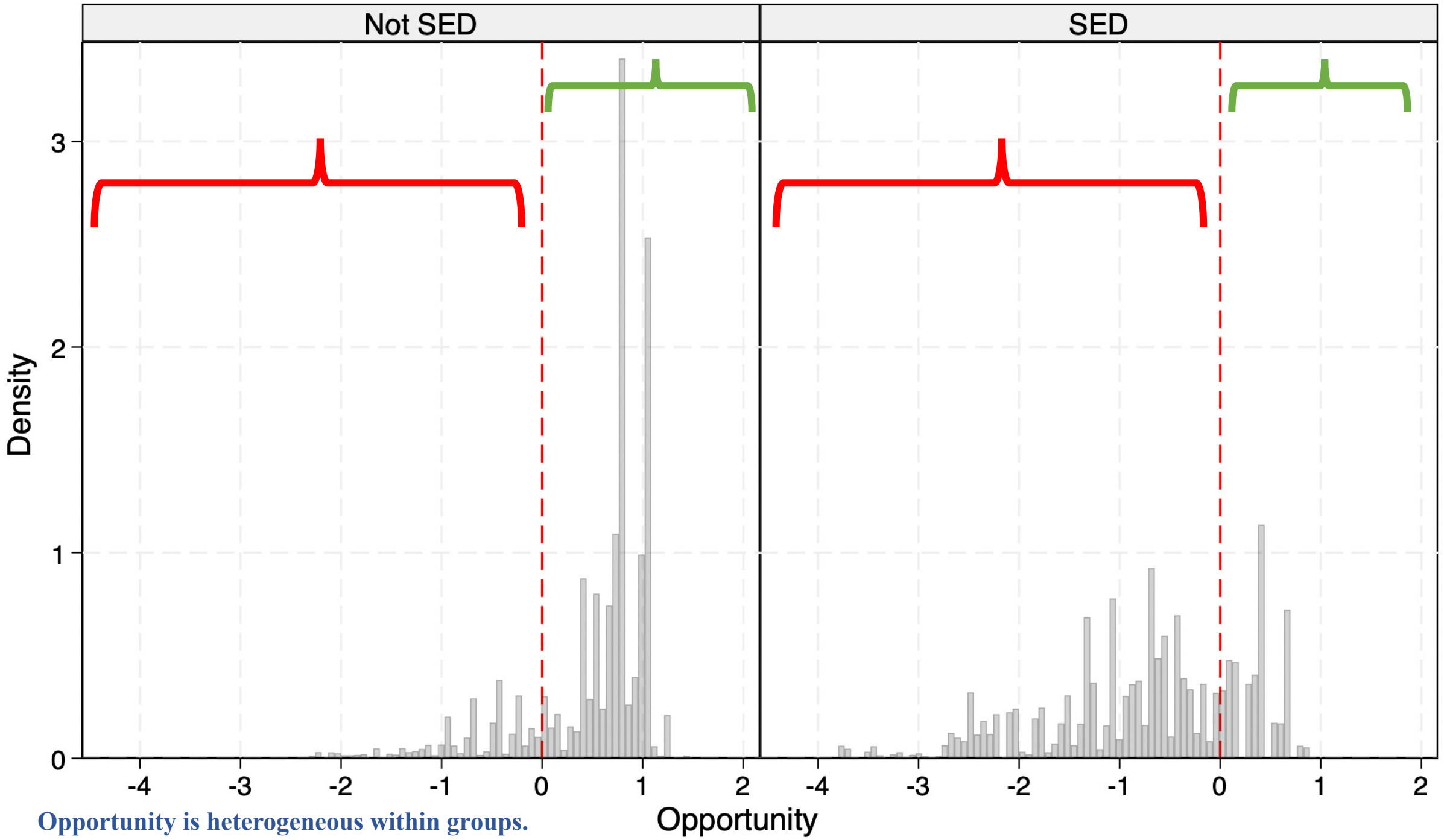
Student-Level Opportunity

- The sum of the six marginal mean coefficients determined by each student's demographic profile is their measure of opportunity.
- This is equivalent to $\hat{y}$.
- Opportunity was standardized to facilitate comparisons across samples.
- Standardizing makes zero meaningful in terms of inequality.


Greater Opportunity
Lesser Opportunity
Density
2
1.5
1
.5
0
-4
-3
-2
-1
0
1
2
Standardized Opportunity



Opportunity is heterogeneous within groups.



Opportunity is heterogeneous within groups.

Goals Met:

1. Include *every* students.
2. Incorporate multiple group memberships simultaneously.
3. Avoid reinforcing stereotypes.
4. Embrace complexity, emphasize simplicity: "*Simplexity*" (Jenkins-Stark, AUSD)
5. **Individual-level measures of opportunity.**
6. Model and explain the within-group heterogeneity of opportunity and achievement.
7. Identify students for support (or acceleration).

Why not just use ŷ?

- You can. But you will be tossing away potentially useful information.
- Going through the steps of examining the marginal mean coefficients provides several benefits:
  1. Documents each subgroups contribution to opportunity. Useful for school accountability goals or program evaluation.
  2. Opportunities available to a subgroup can vary over time and across school districts.
  3. Inequality is by definition contextual.
     1. **Example**: Redesignated Fluent English Proficient (RFEP)
        1. District 1: RFEP was the **fourth largest** contributor to opportunity (***b* = 49.9**) and the mean opportunity for RFEP students was **above** the district average (***M* = 0.35 *SD***).
        2. District 2: RFEP was the **sixth smallest** contributor to opportunity (***b* = 20.0**) and the mean opportunity for RFEP students was well **below** the district average (***M* = -0.47 *SD***).
     2. Without a measure of opportunity, comparing the achievement of RFEP students between those districts could lead to flawed inferences and poor policy/decision making.

Effective policies and practices can show measurable increases in opportunity over time.

	Year 1	Year 2	Year 3
Parent Educational Level			
College Grad	26.6	41.3	48.4
Graduate Degree	54.7	59.5	69.7
HS Graduate	-7.8	-5.7	14.8
Not HS Grad	-16.4	-9.7	13.3
Some Coll..	-6.1	8.7	14.1
Race/Ethnicity			
AmInd	-30.3	-28.5	-4.4
Asian	48.5	49.9	63.8
Black	-25.8	-12.7	-8.5
Filipino	59.5	68.1	99.6
Hispanic	25.9	32.3	44.3
NatHI or PI	-82.9	-28.4	-48
Multi-Rac~l	41.8	55.2	66.3
White	50.8	56.8	66.2

	Year 1	Year 2	Year 3
Special Education Status			
Not SWD	44.3	53.2	63.6
SWD	-31.4	-28.6	-19.6
Gender			
Female	43.8	51.5	63.9
Male	24.2	33.2	41.3
Non-Binary	50.7	41.2	105.4
English Language Status			
English L..	-81.5	-74.1	-48.1
English O..	37.9	45.3	56.3
IFEP	50.6	60	67.1
RFEP	23.9	42.7	54.5
Socioeconomic Status			
Not SED	43.4	51.9	62.9
SED	19.2	27.0	36.5

Opportunity: Highly Correlated

Opportunity estimated using four years of SBA ELA and four years of SBA math.

	1	2	3	4	5	6	7	8
1. Opp ELA Year-1	1.000							
2. Opp ELA Year-2	0.996	1.000						
3. Opp ELA Year-3	0.994	0.998	1.000					
4. Opp ELA Year-4	0.992	0.997	0.998	1.000				
5. Opp Math Year-1	0.961	0.966	0.962	0.965	1.000			
6. Opp Math Year-2	0.970	0.975	0.971	0.974	0.998	1.000		
7. Opp Math Year-3	0.964	0.971	0.969	0.971	0.997	0.996	1.000	
8. Opp Math Year-4	0.963	0.974	0.973	0.977	0.992	0.994	0.996	1.000

What can you do with opportunity?

A parsimonious model for examining achievement.

Identify students for support programs or intervention:

- Greater predictive accuracy and specificity.
- Identifying high-needs students within focal groups.

Descriptive variable:

- Average opportunity by classroom, school, program, caseload, teacher, etc.
- Context for classroom observations.
- Context for student-level meetings.

Analysis:

- Examine the inequality of opportunity over time.
- Efficacy of programs/interventions.
- Provides a single comprehensive predictor/independent variable.

Using the Advantage Framework to the Examine Inequality of Opportunity

District-Level Inequality of Opportunity (Ferreria & Gignoux, 2013):

Regressed SBA ELA on:	District 1 Adjusted R^2	District 2 Adjusted R^2
English Language Status	.148	.131
Gender	.026	.016
Special Education Status	.162	.168
Socioeconomic Status	.101	.226
Parent Educational Level	.118	.262
Race/Ethnicity	.087	.233
Opportunity (Advantage Framework)	**.391**	**.462**

Variable-centered approaches to inequality may understate its magnitude.

Additional Validity

Outcomes regressed on Year–1 Opportunity:	District 1 Adjusted R^2	District 2 Adjusted R^2
SBA ELA Year 4	0.391	0.462
SBA Math Year 4	0.322	0.398
Cumulative GPA	0.284	0.321
University of California A-G GPA		0.361
SAT	0.263	

Within-Group Inequality of Opportunity:

Regressed SBA ELA on opportunity for the subgroup:	**District 1** Adjusted R^2	**District 2** Adjusted R^2
Ethnic-Racial Groups		
Asian	.435	.436
Black	.330	.277
Hispanic/Latinx	.299	.374
White	.290	.173
Socioeconomic Status		
Disadvantaged	.373	.382
Not Disadvantaged	.295	.209

Opportunity explains the heterogeneity of achievement within groups shown in slide #7.

Goals Met:

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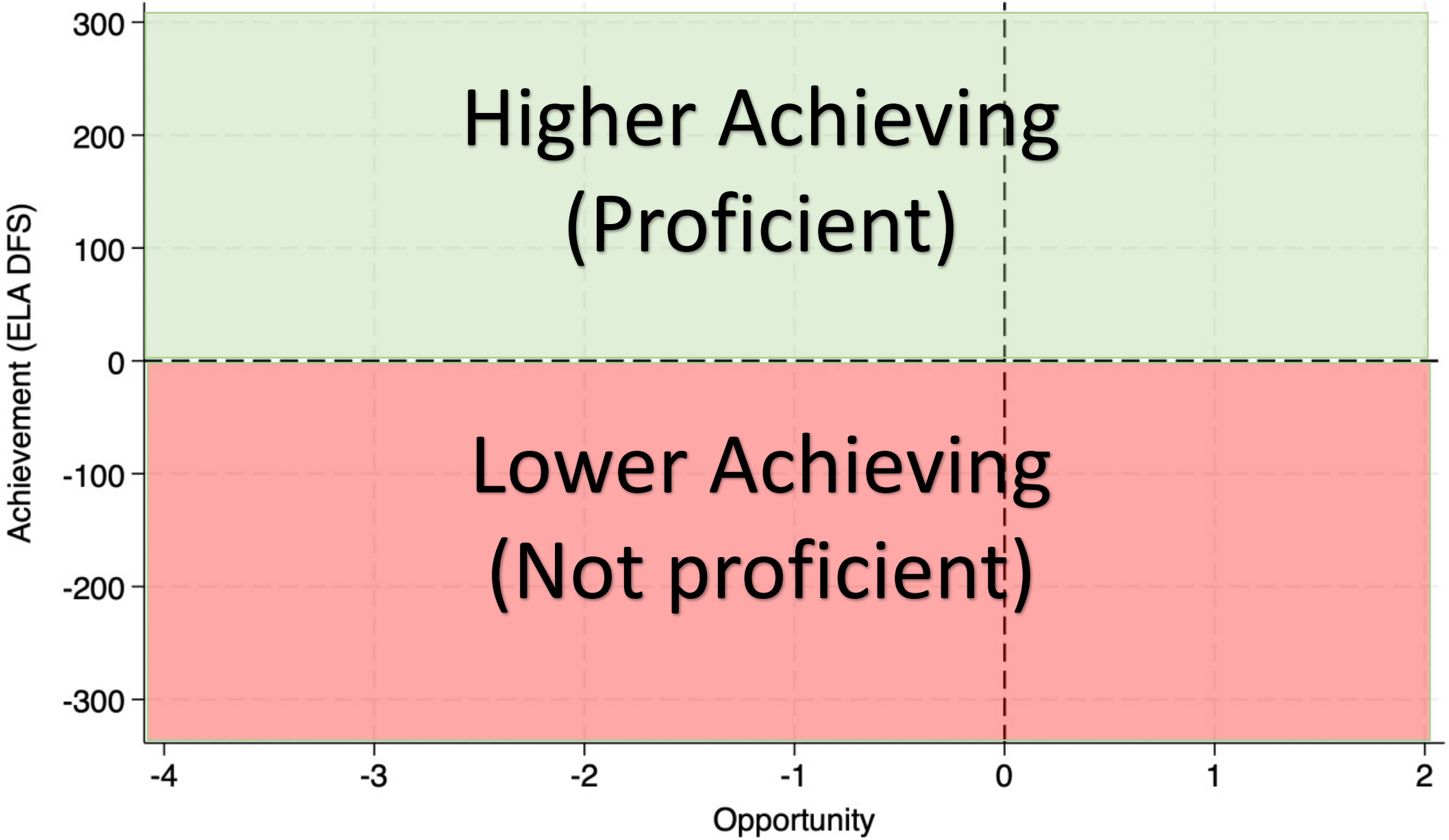
Using Opportunity to Examine Achievement and Identify High-Needs Students

Is high-needs status a function of achievement or of opportunity?

Identifying High-Needs Students:



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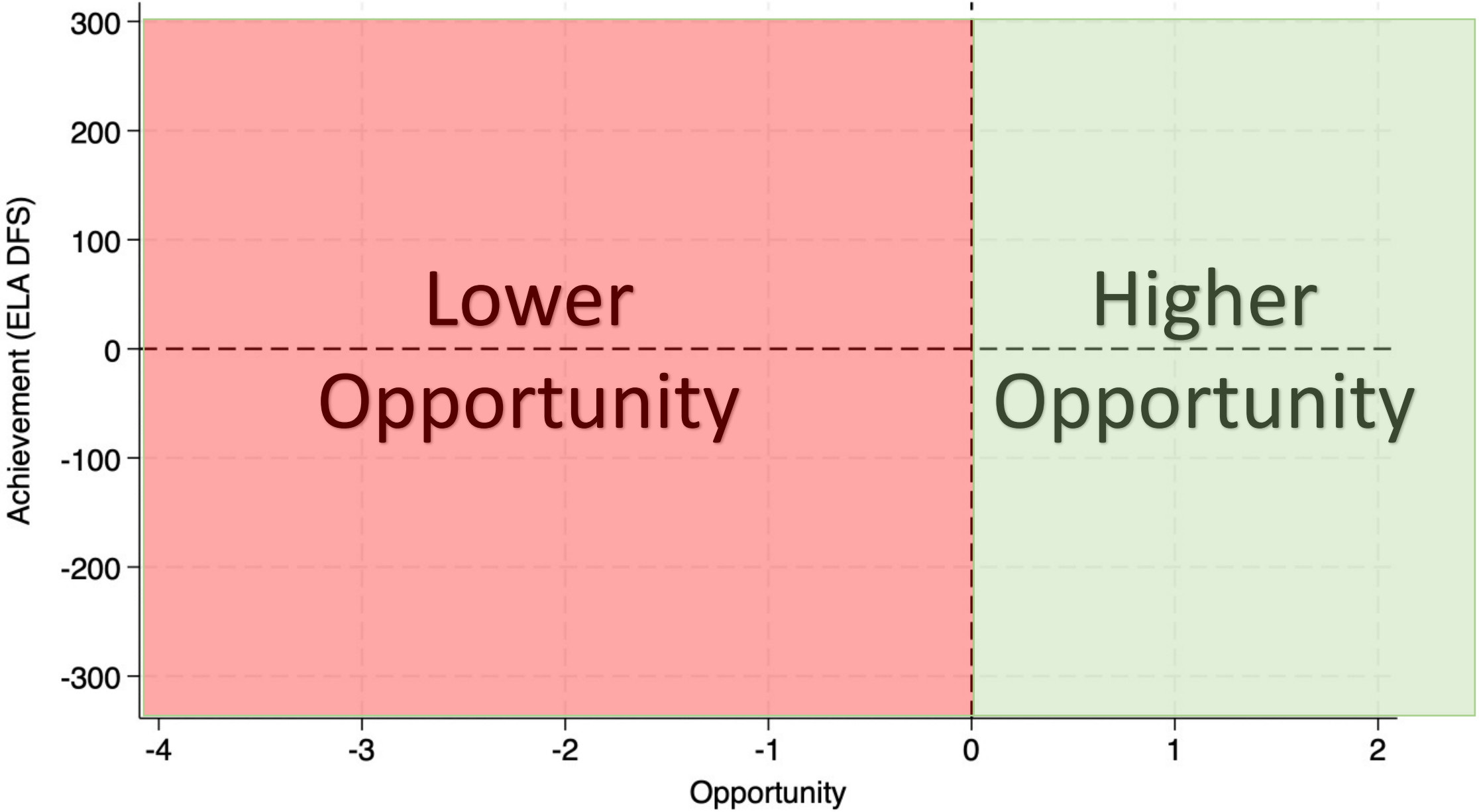
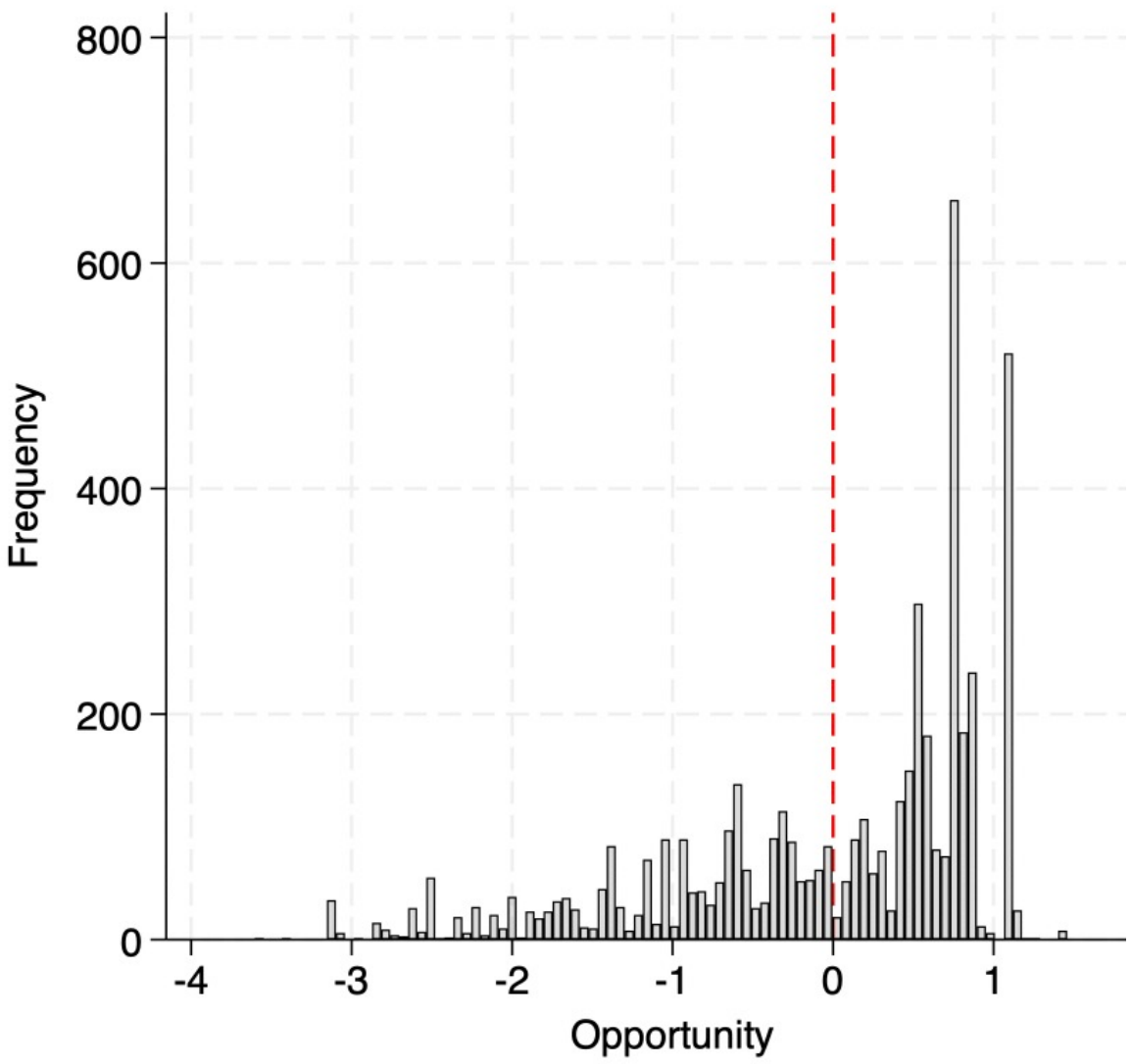
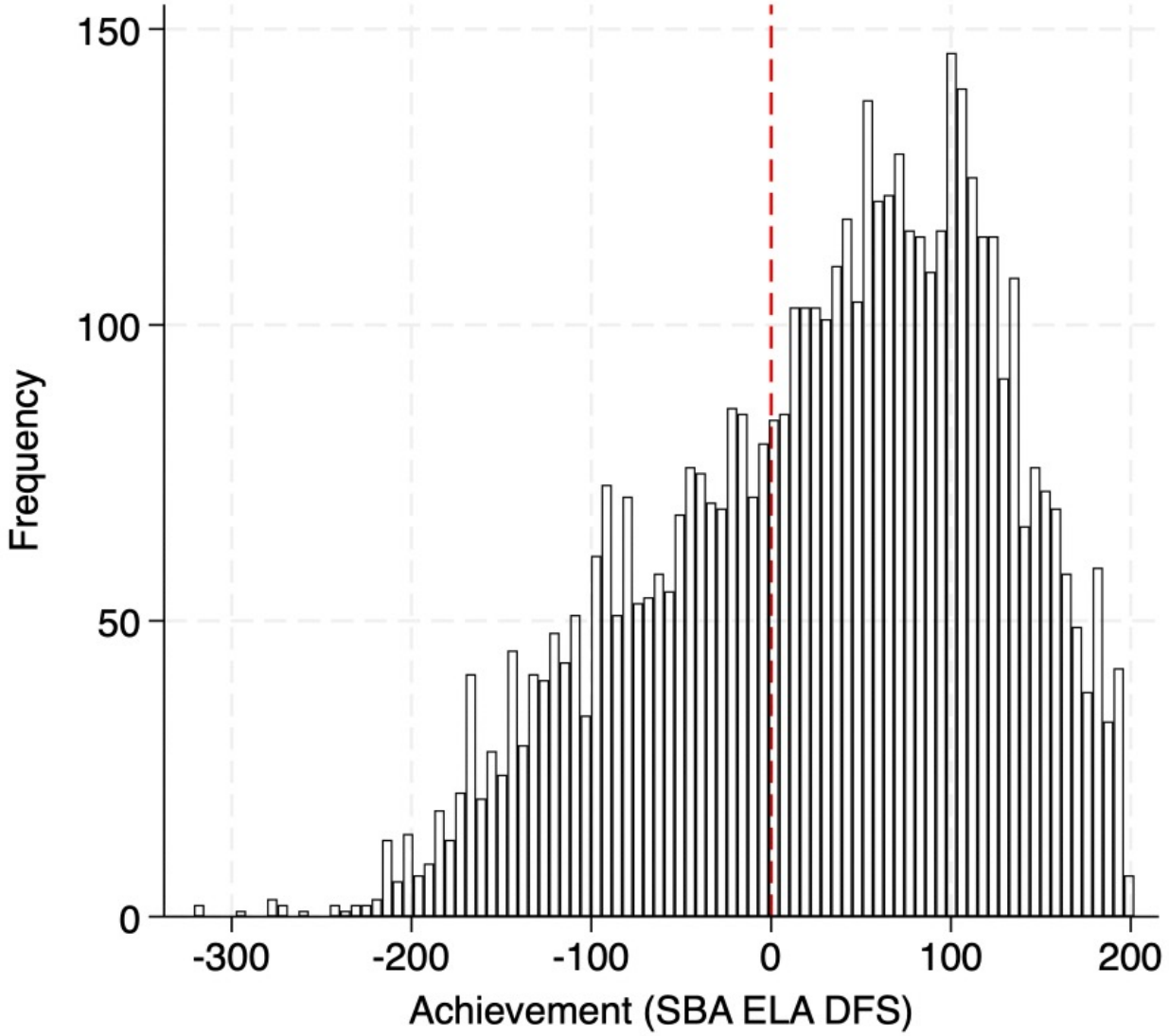
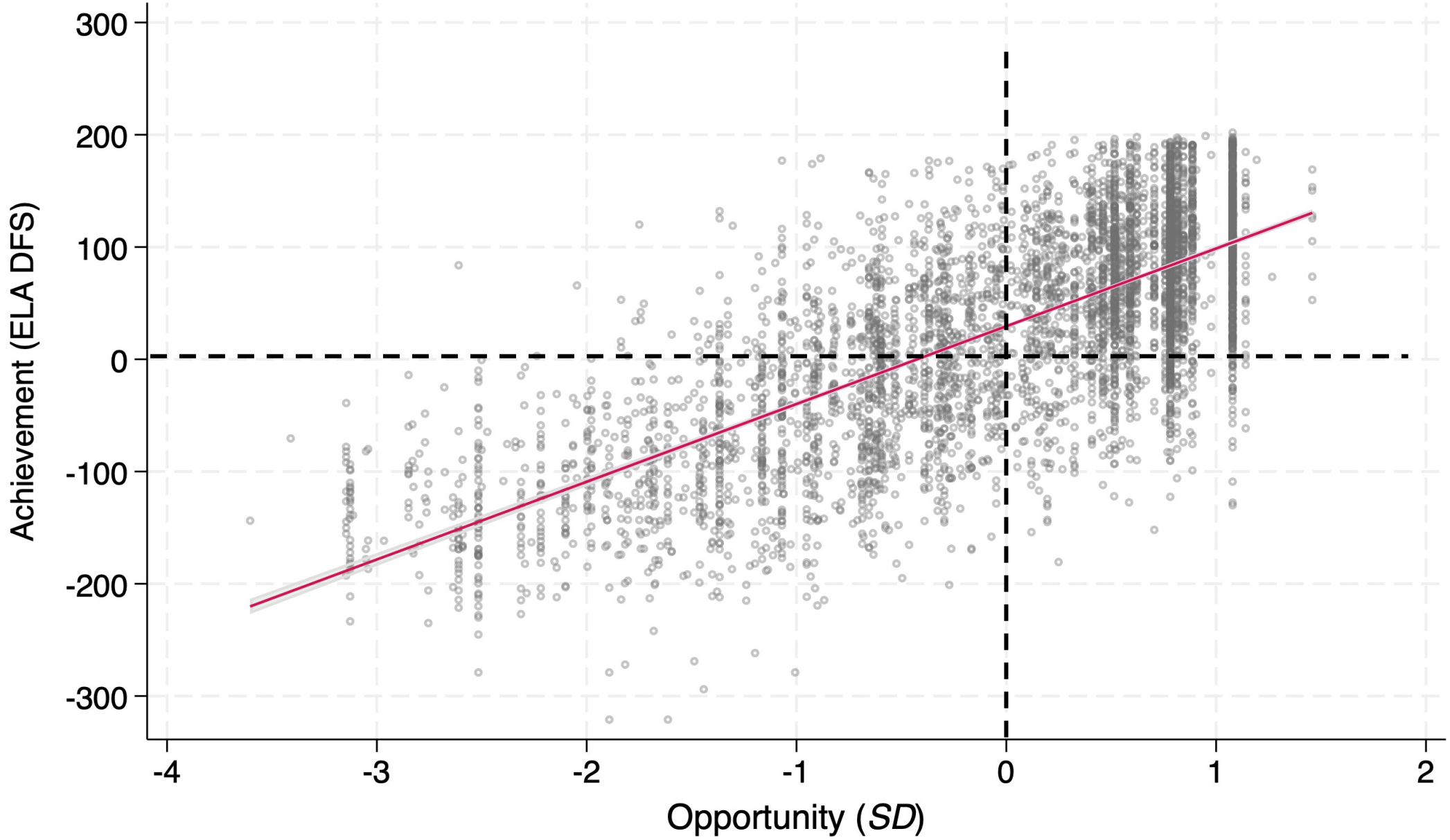


Opportunity & Achievement

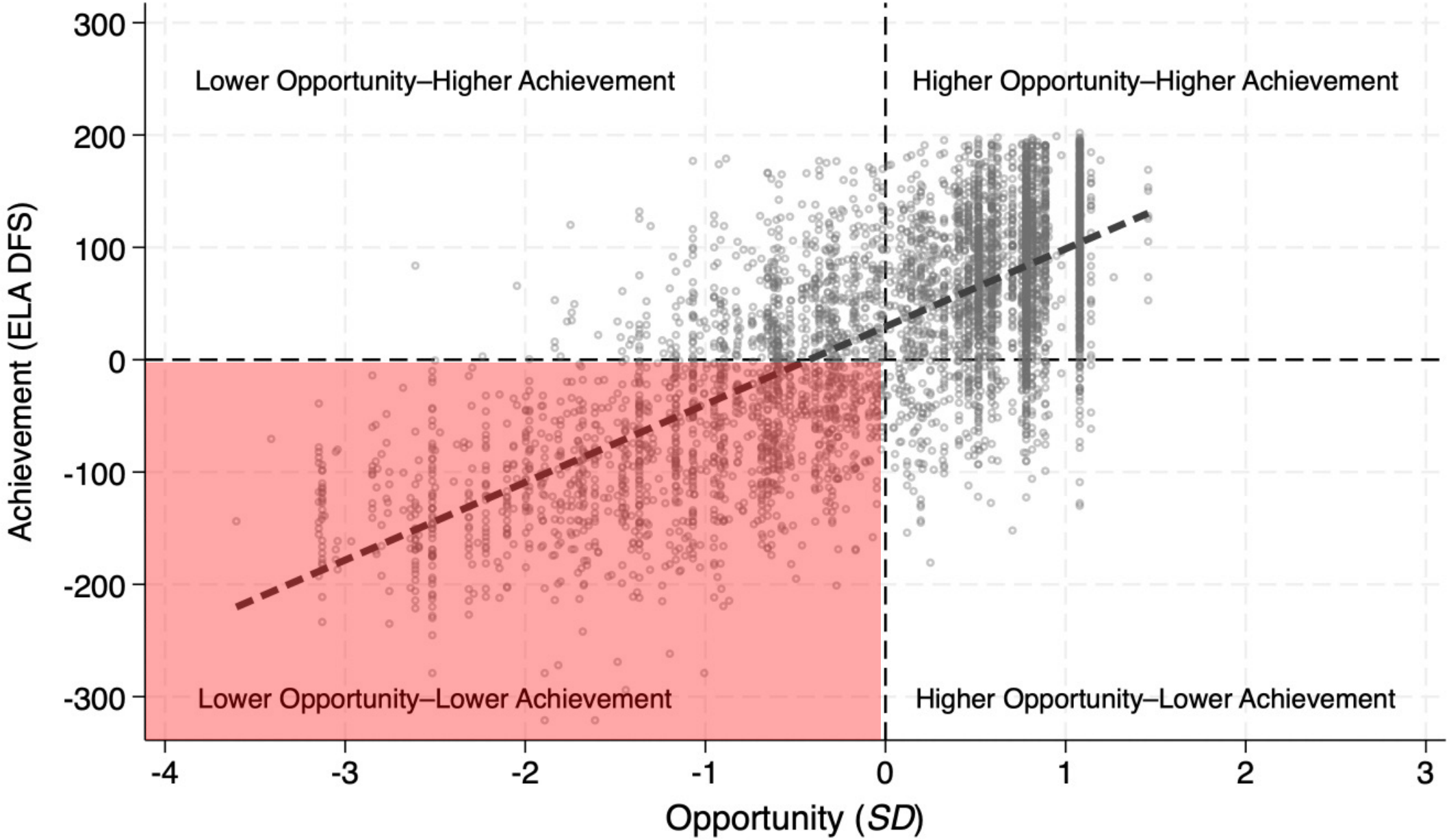




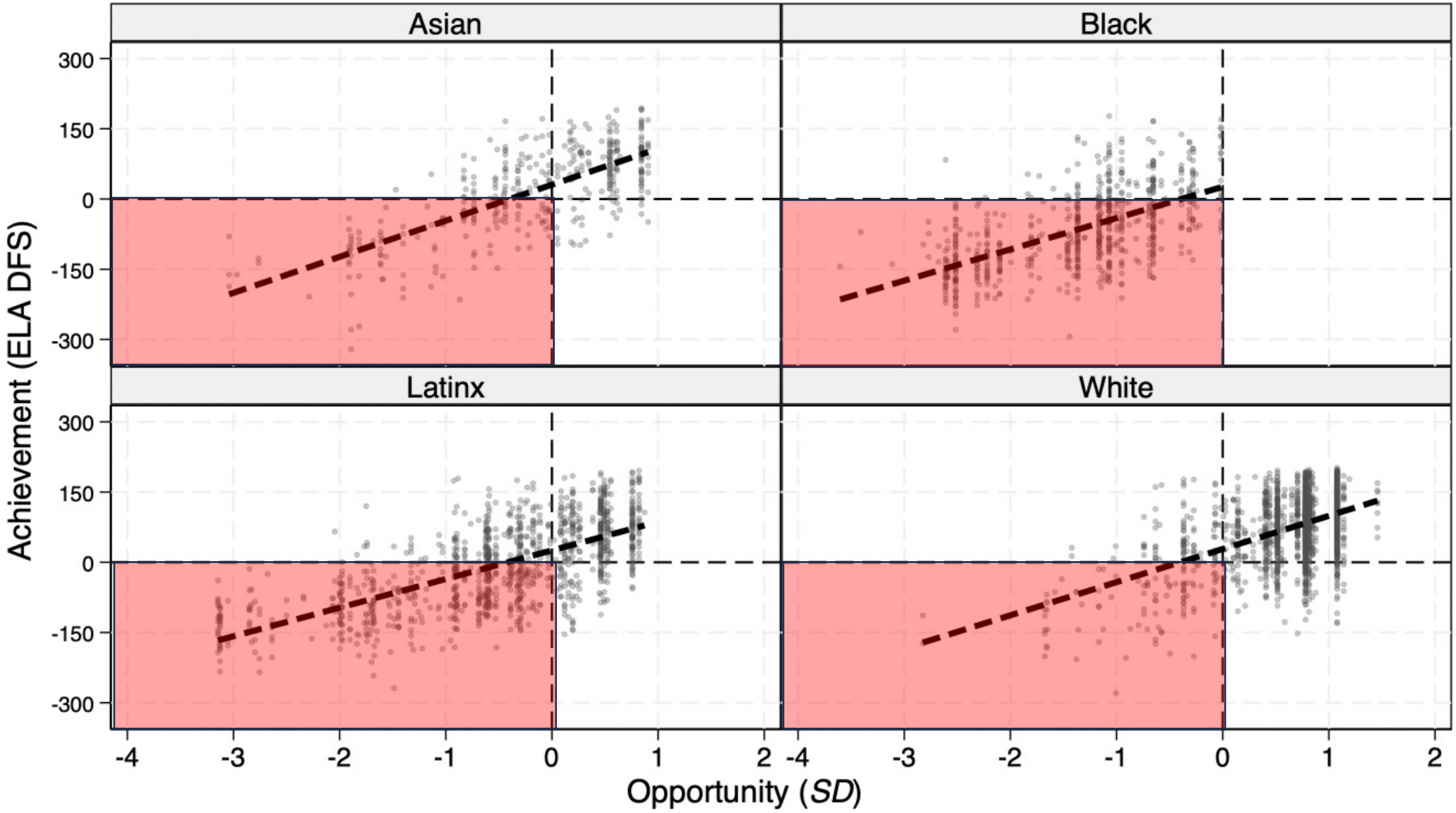
Relationship between Opportunity & Achievement



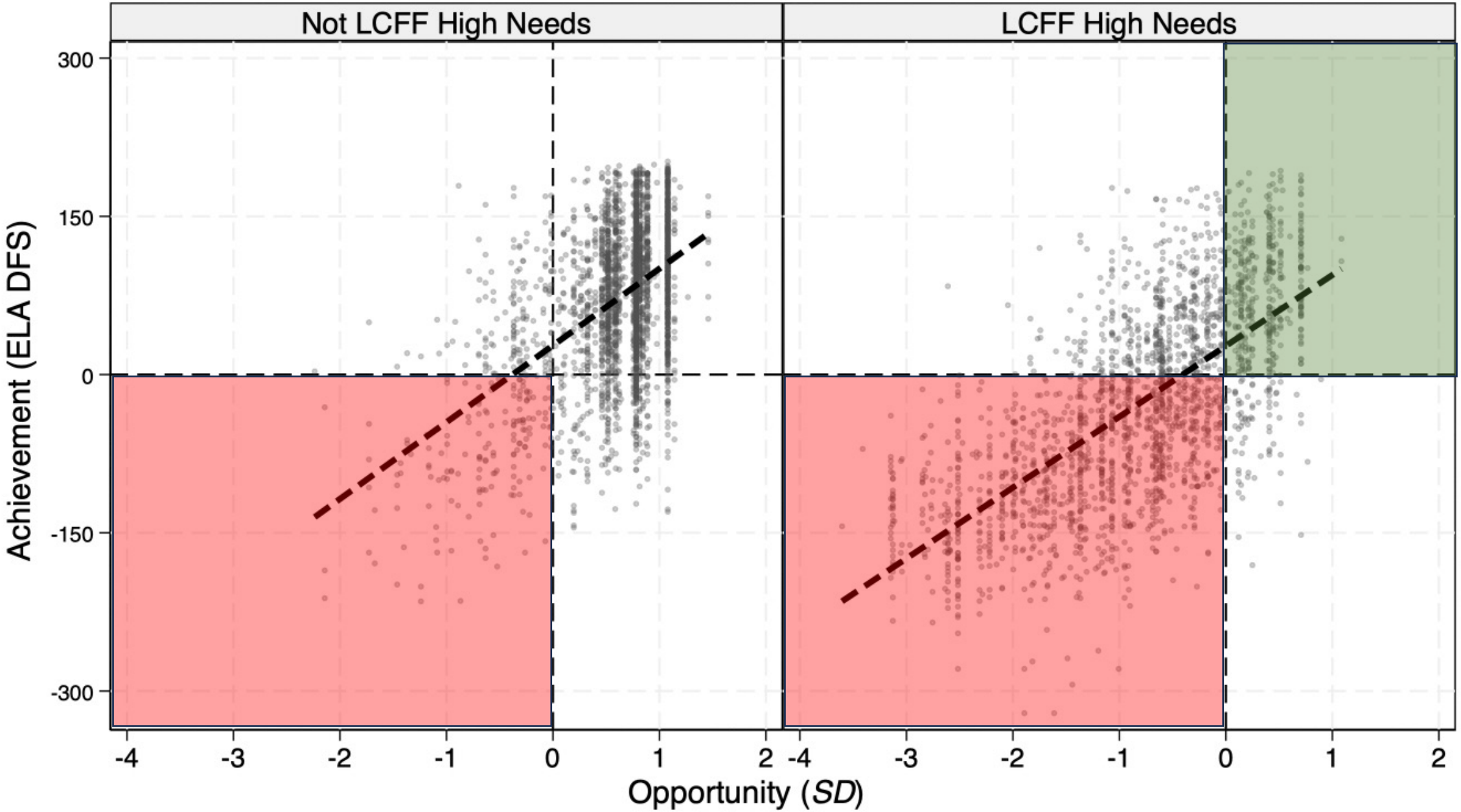
Identifying High-Needs Students:



Relationship is consistent within subgroups



California's Local Control Funding Formula: High-Needs Students



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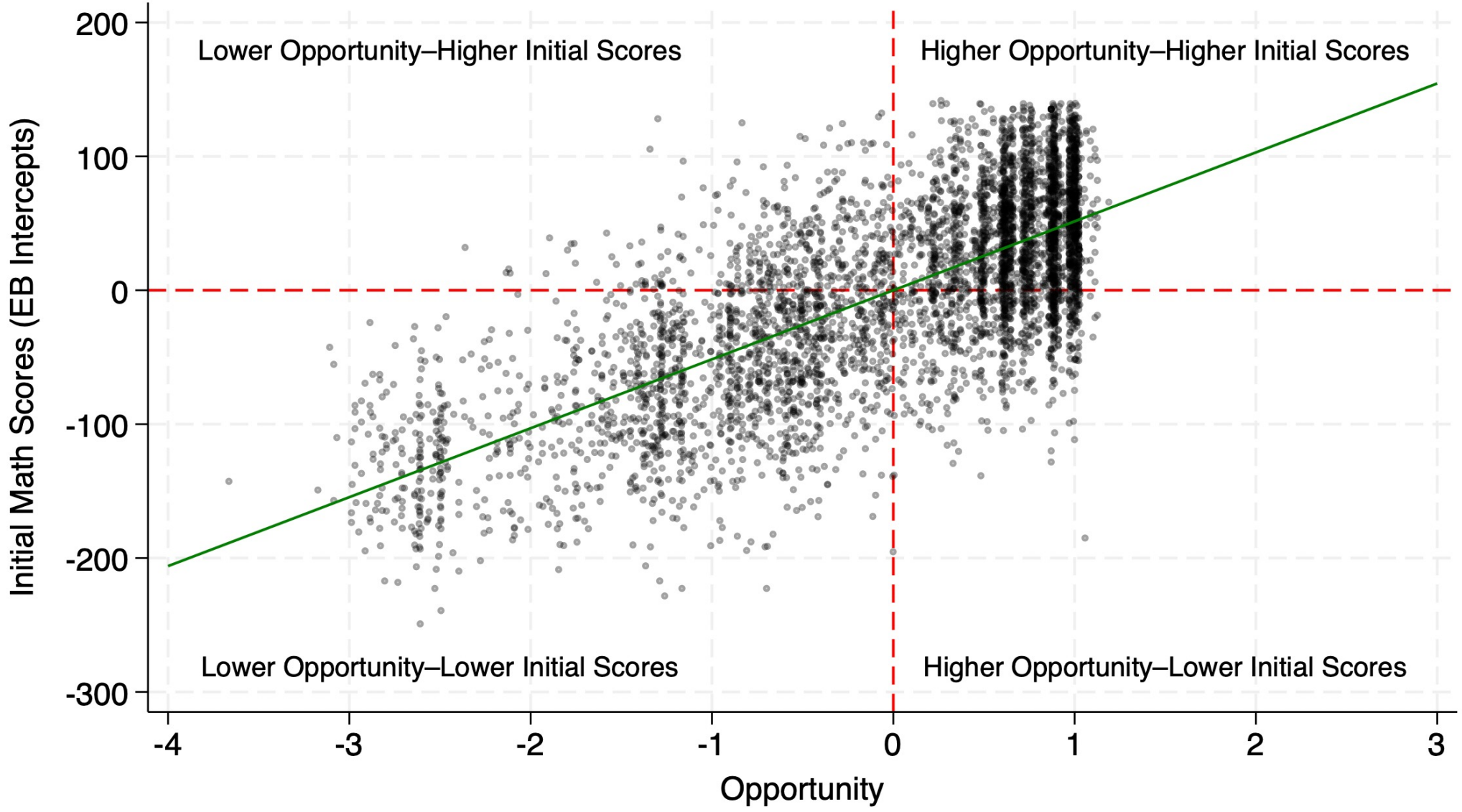
Using Opportunity to Examine Student Growth

Longitudinal: Initial ELA Scores

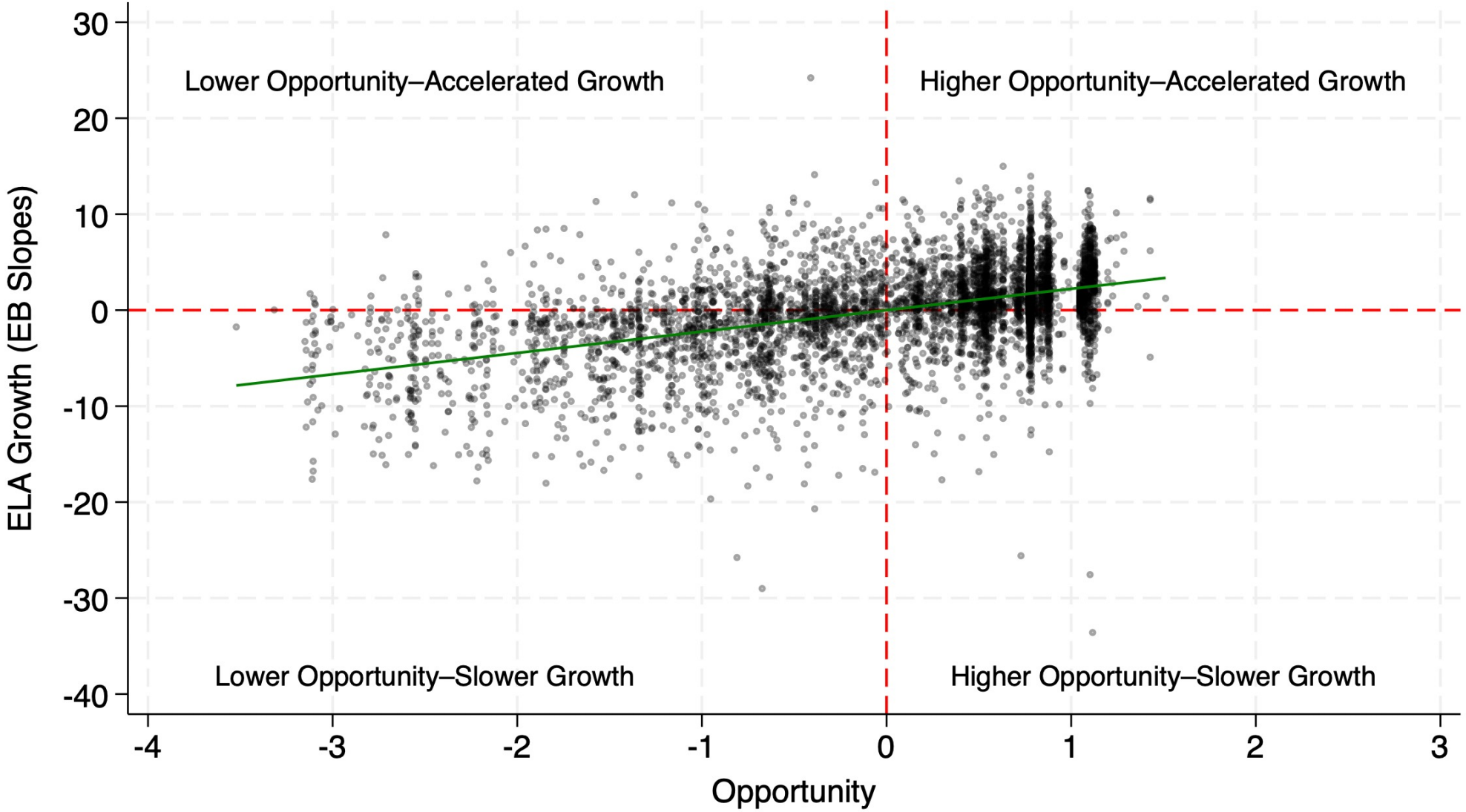
Adj. R^2 = .53

Longitudinal: Initial Math Scores



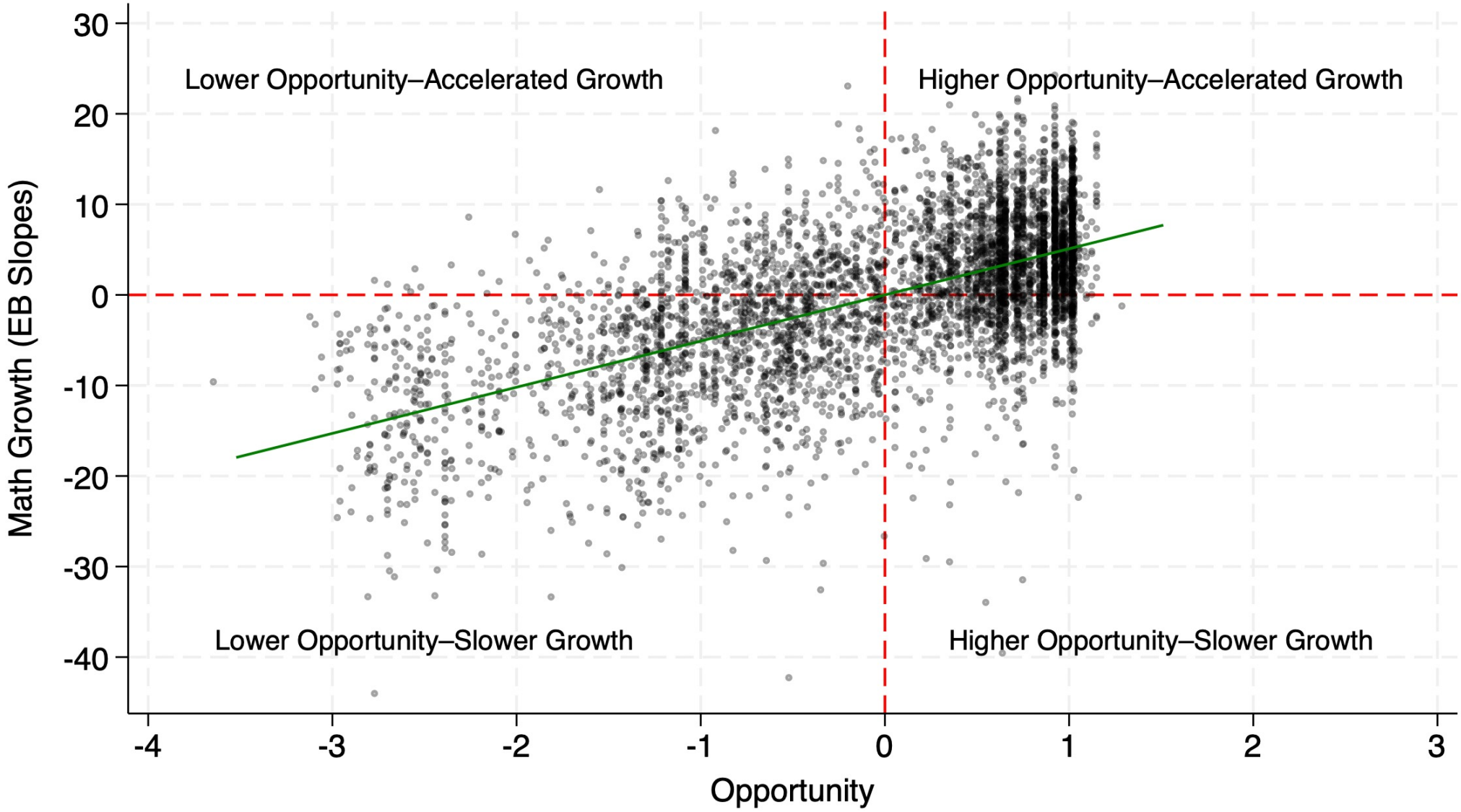
Adj. R^2 = .51

Longitudinal: ELA Growth



Adj. R^2 = .22

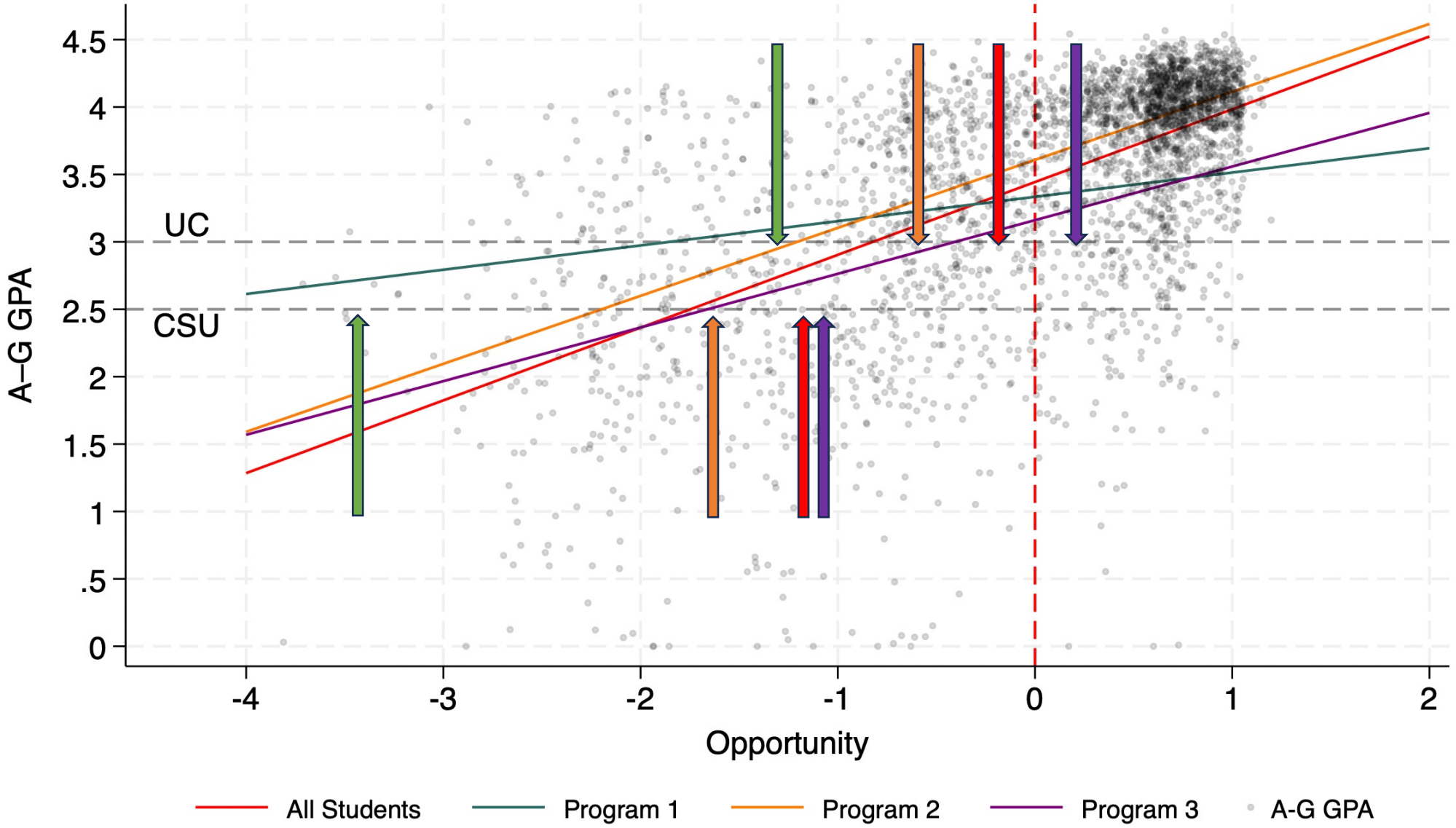
Longitudinal: Math Growth



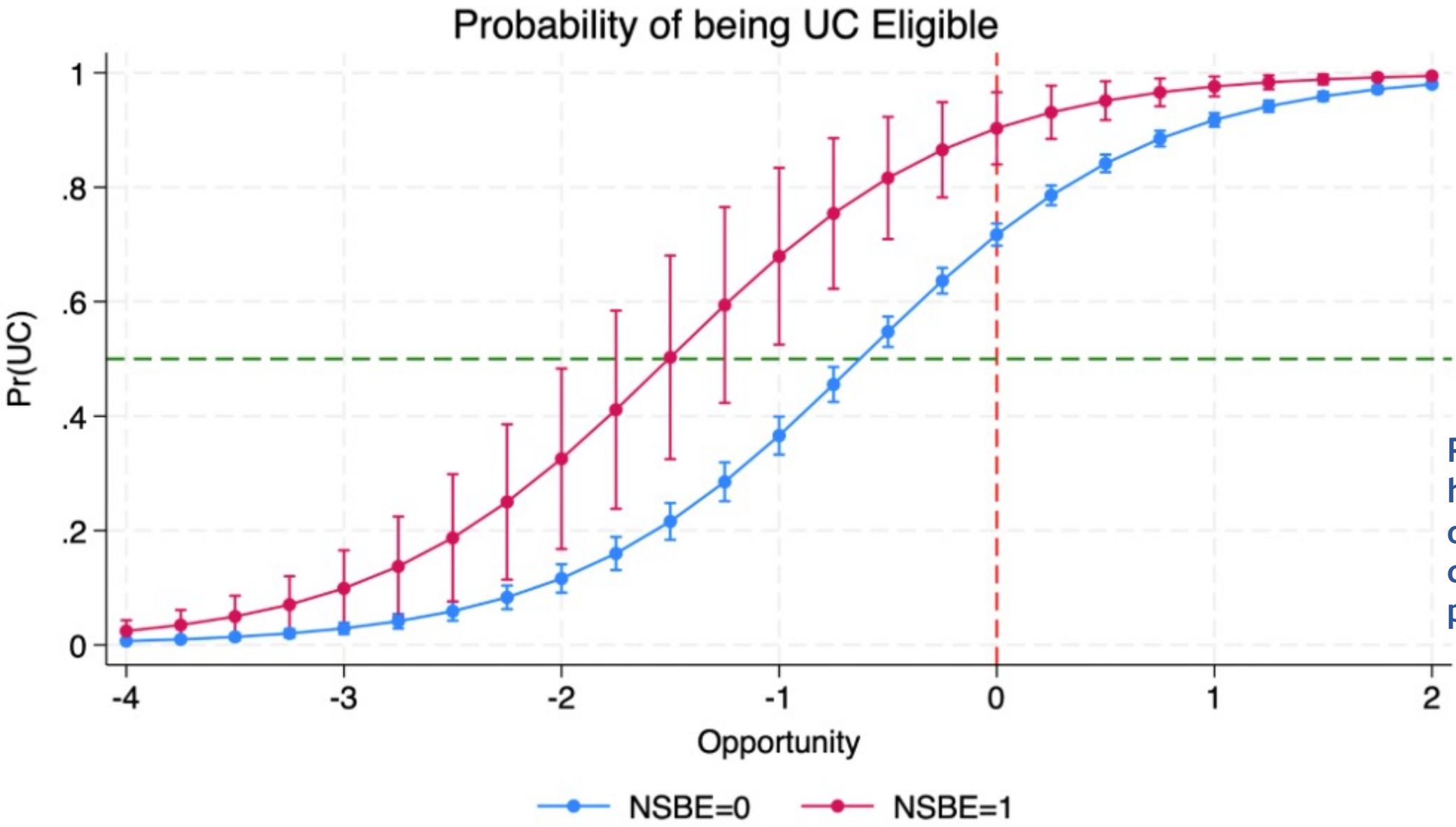
Adj. R^2 = .36

Using Opportunity to Examine Programs/Interventions

Using Opportunity to Examine Programs/Interventions



Programs 1 and 2 improve post-secondary access for lower-opportunity students.



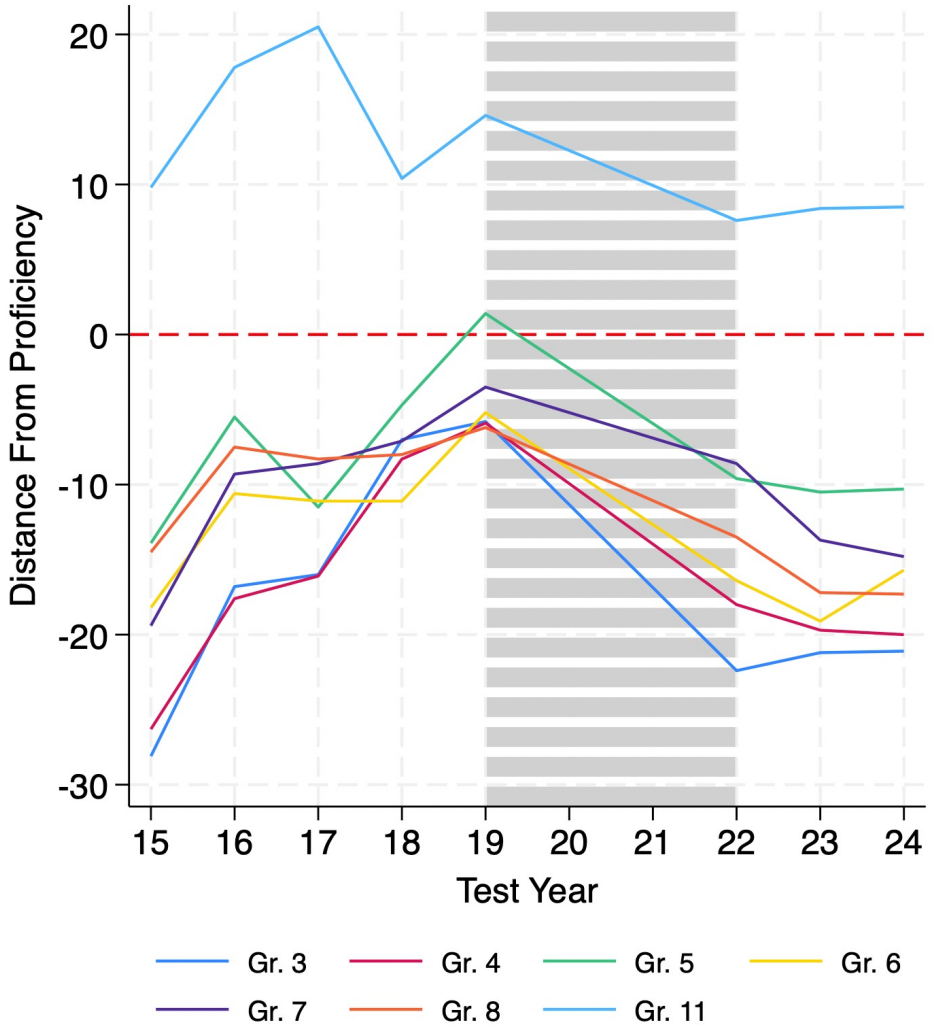
Program shows higher probability of UC eligibility compared to non-participants.

Using Opportunity as a School-Level Characteristic

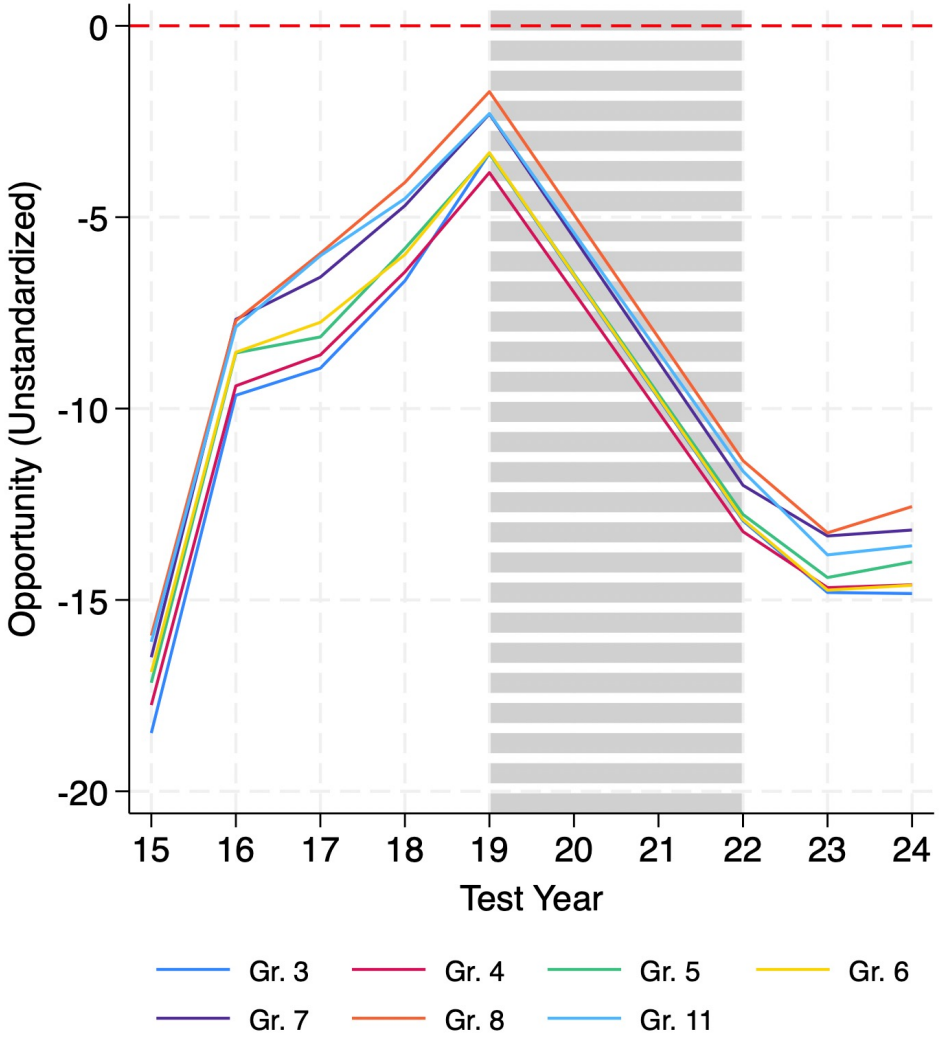
Data: All California public schools from 2015 to 2024.

Using Opportunity to Explore the Impact of State-Level Policy

Grade-Level Mean Achievement

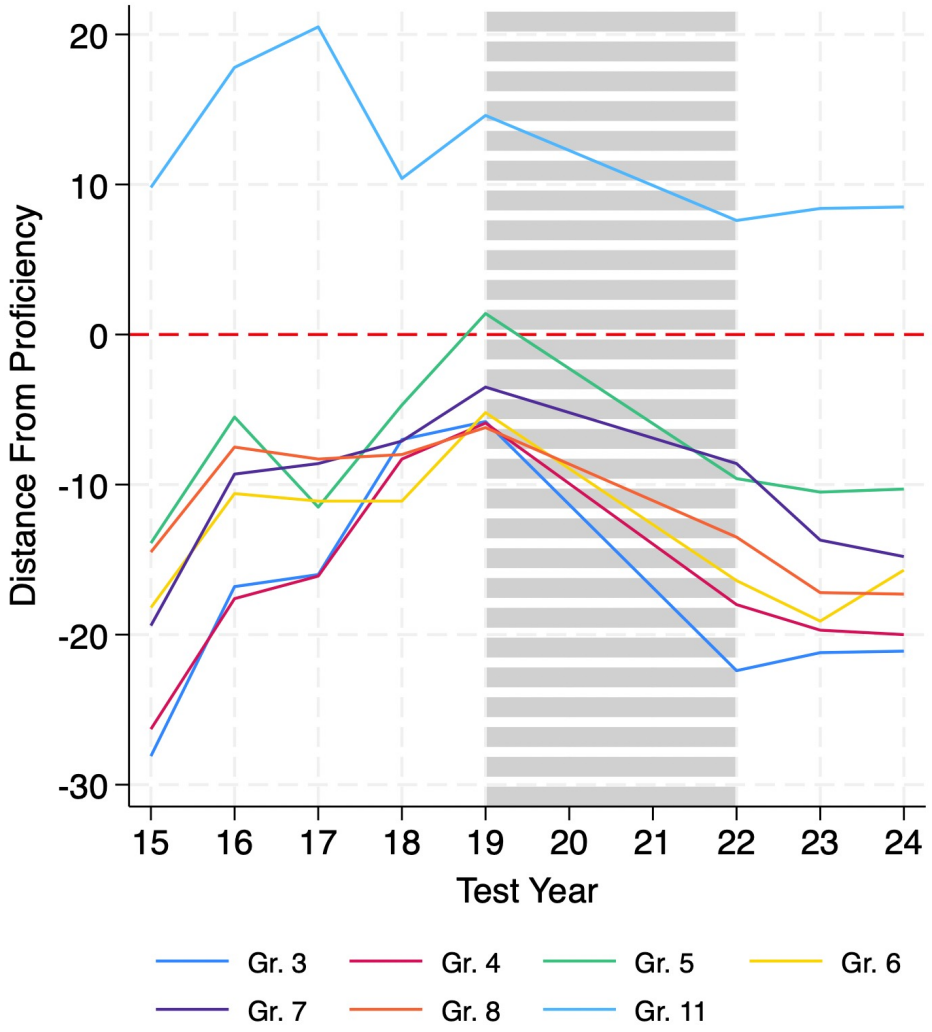


Grade-Level Mean Opportunity

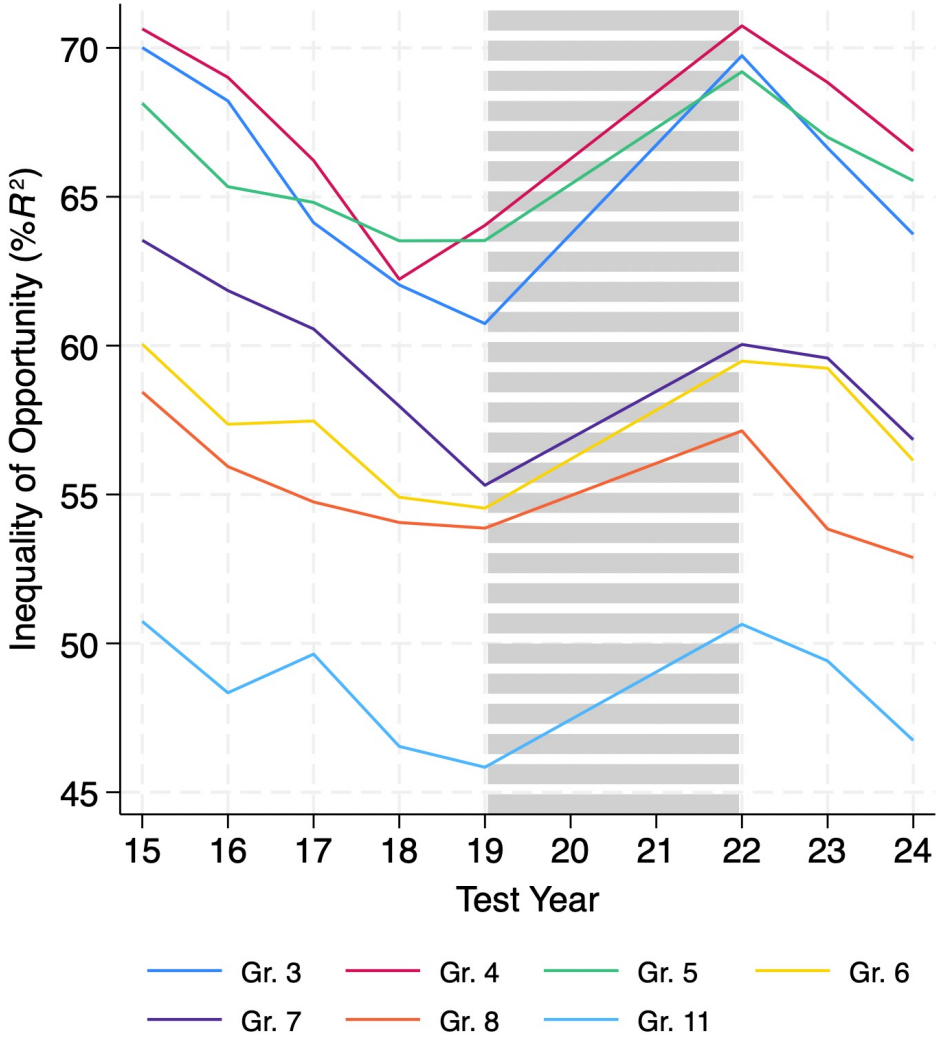


Using Opportunity to Explore the Impact of State-Level Policy

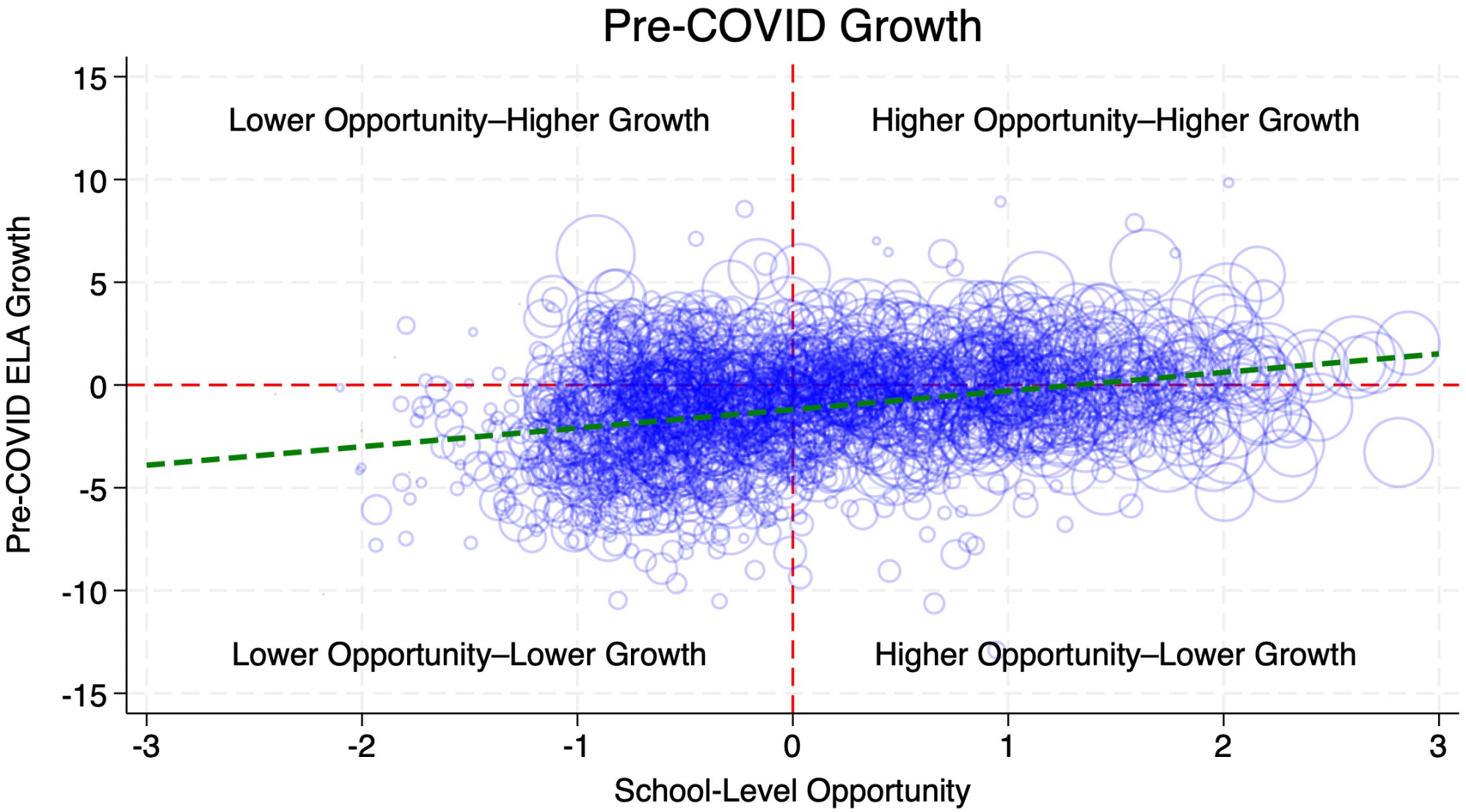
Grade-Level Mean Achievement



Inequality of Opportunity

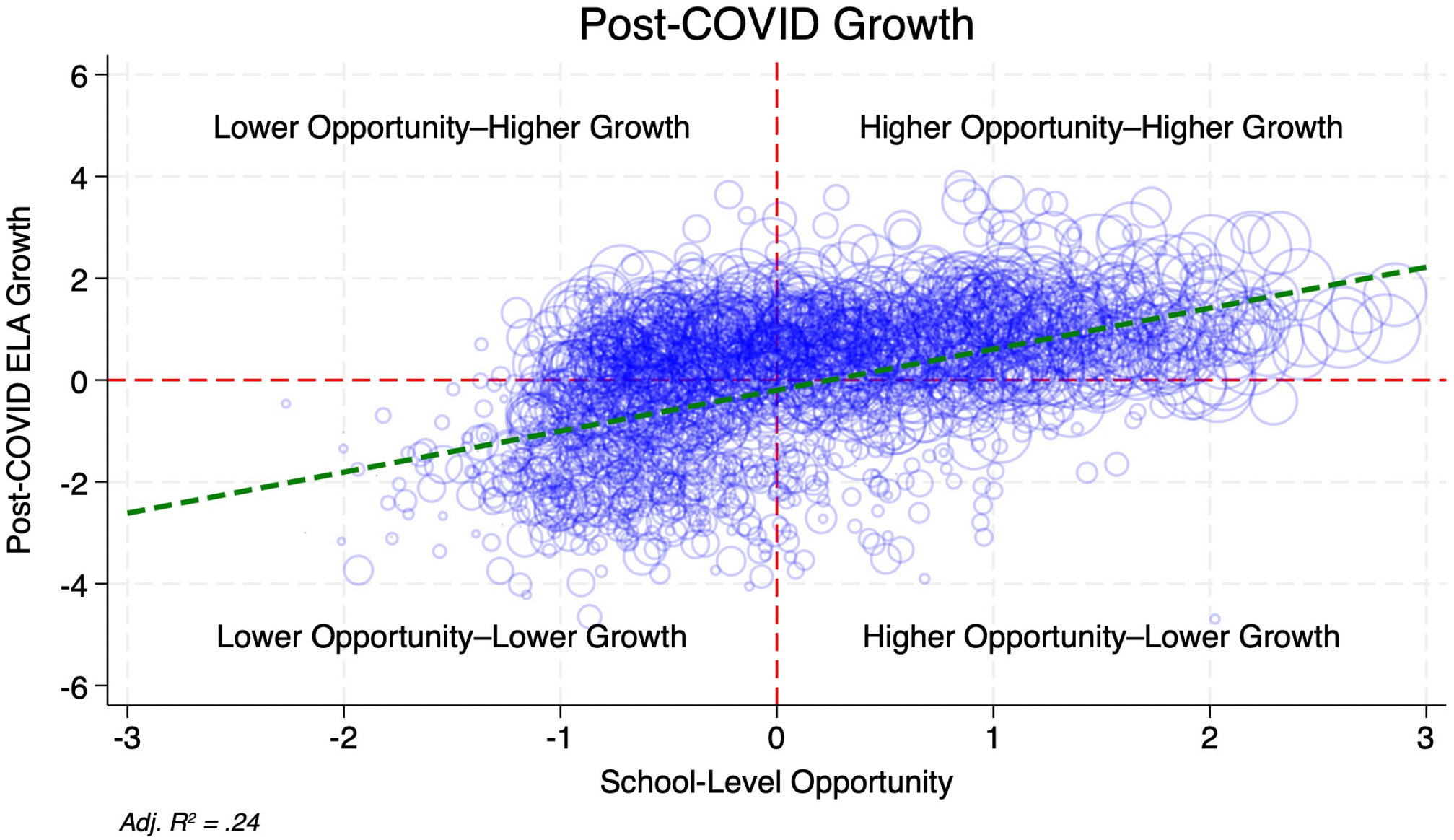


CA: School-Level Growth Pre-COVID



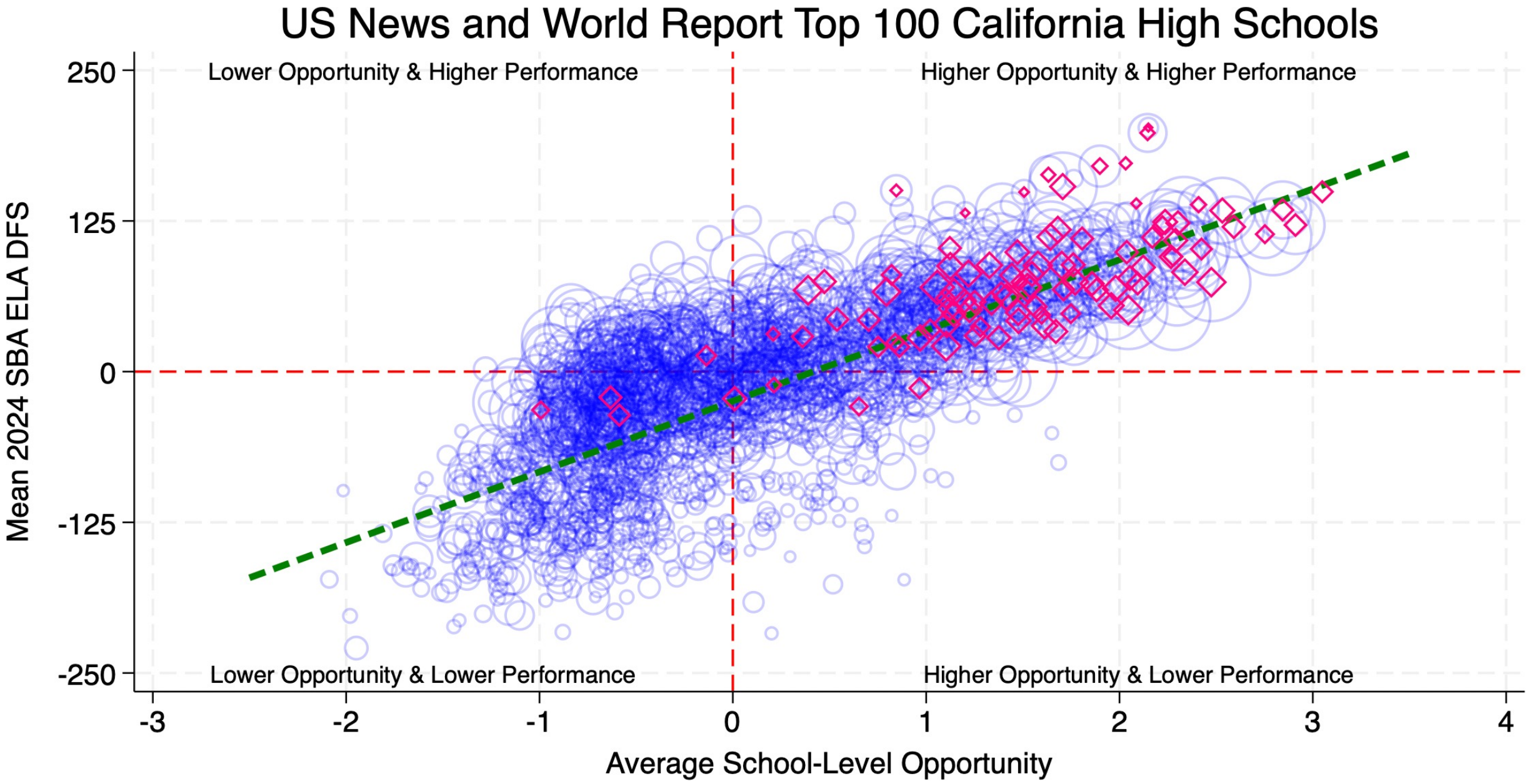
Adj. R^2 = .09

CA: School-Level Growth Post-COVID



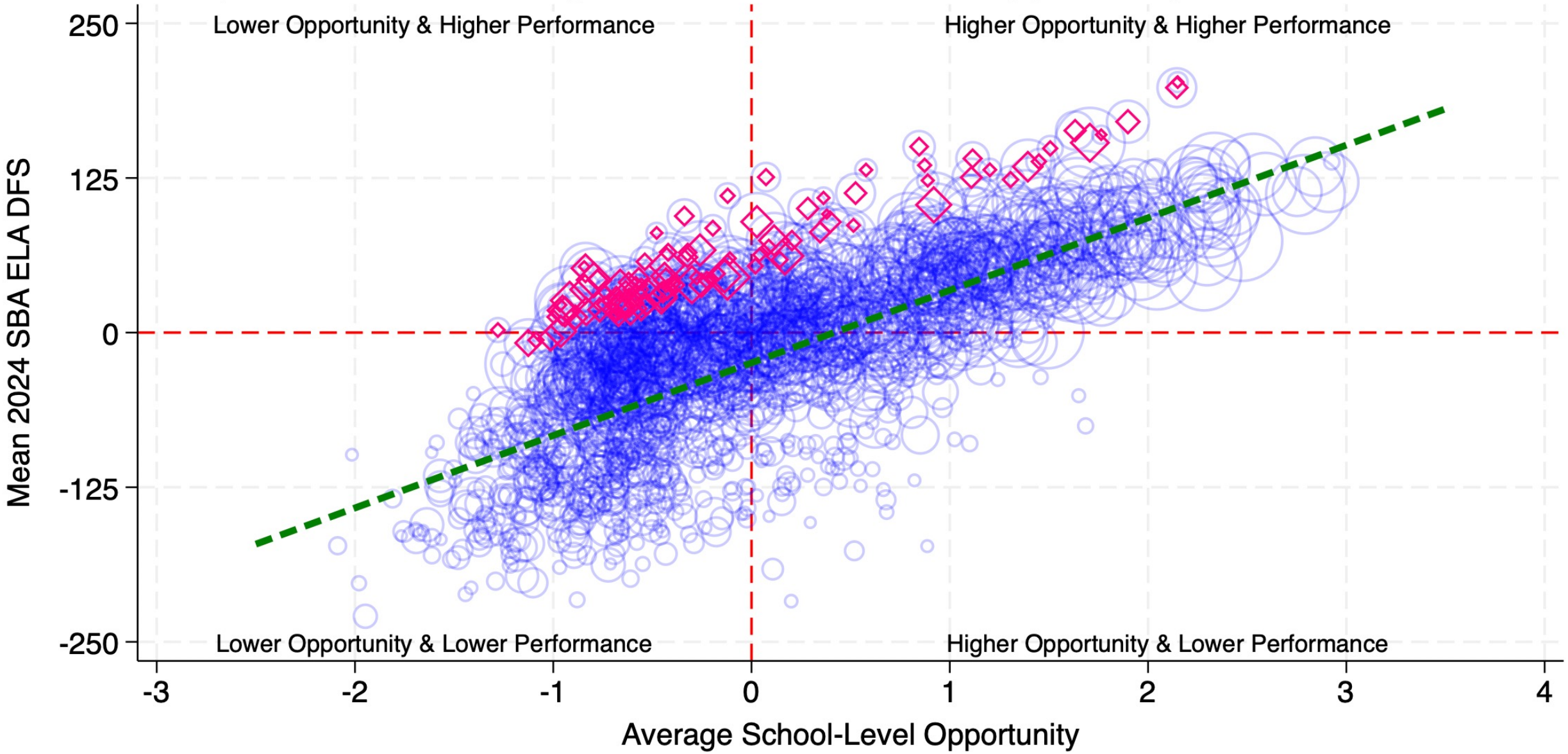
Students' background characteristics explain a greater portion of the variance in achievement during the post-COVID recovery years.

Using Opportunity to Identify High-Performing Schools



All but five of the US News top 100 schools are high-opportunity schools.

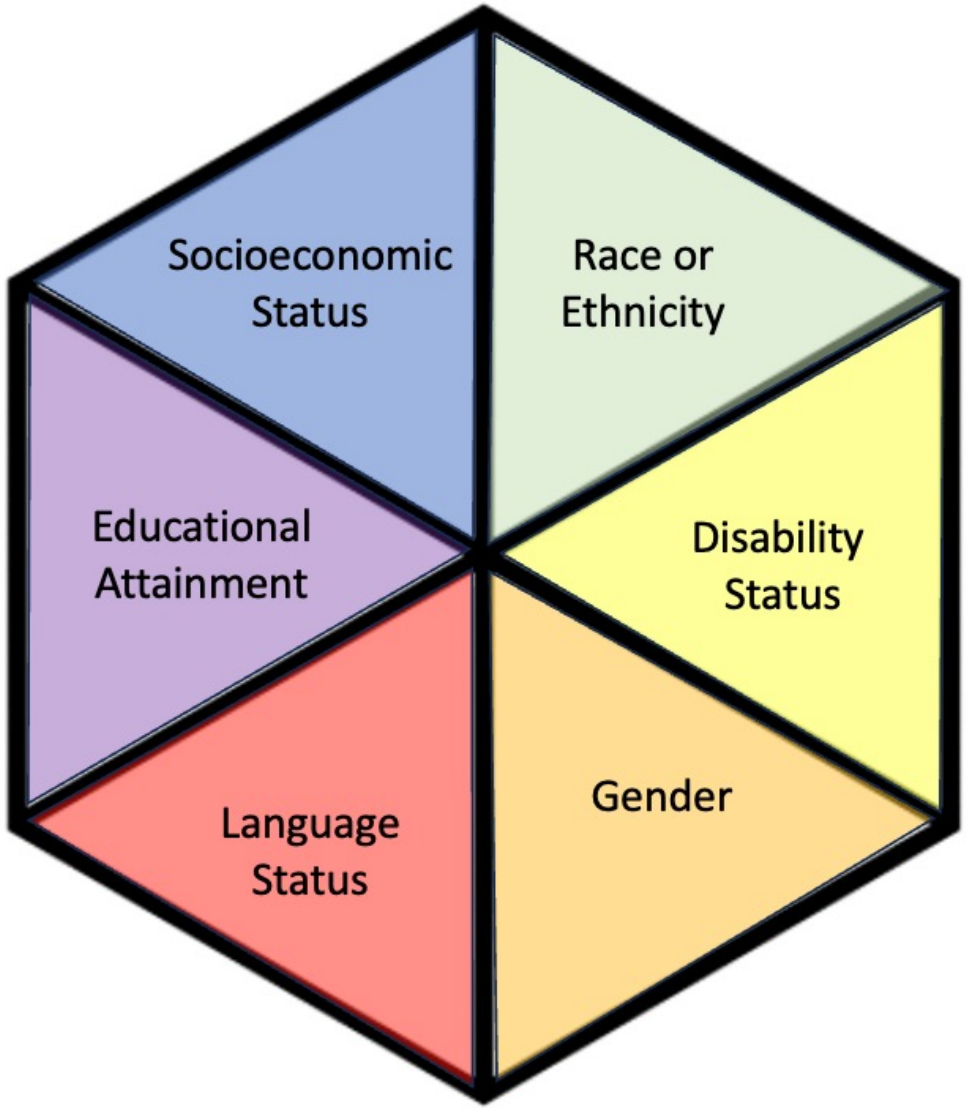
Top 100 California High Schools Based on Opportunity and Achievement



Here, the top 100 schools are those with the 100 largest positive residuals and include many lower opportunity schools. Eight schools appear on both lists.

An Inclusive Framework for Addressing Inequality

- The gap frameworks prime people to think of themselves, and others, solely as members of specific groups.
- Members of more advantaged groups are less likely to support equity-centered policies if they perceive it will diminish their social position (Schmitt et al., 2003).
- Polices designed to address educational inequality require **broad public support** and political will.
- The Advantage framework provides multiple entry points for individuals to examine aspects of themselves, and others, in terms of greater or lesser advantage.
- The framework creates opportunities to find common ground.



Thank you!

Special thanks to the faculty, staff, and classmates
at the Berkeley School of Education.

Advisor Dr. Frank Worrell
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Thank you!

Questions and comments?

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