Title:

The economic advantage: social context, state policy, and the test scores of poor and non-poor students

Justification:

Students from affluent families tend to perform better on standardized tests – arguably critical gate keepers of educational opportunity – than their poor peers (e.g., Reardon, 2011; Sirin, 2005). The factors that lead to this economic advantage are multifaceted: students from affluent family backgrounds not only have access to more educational resources within their homes and neighborhoods (e.g., preschool programs and after school activities) that are predictive of academic success, but may also have more advocacy from parents to alter their school conditions (e.g., parent fundraising, contributions to schools, asking for their children to be placed in specific classes or with specific teachers). This symposium brings together four papers that provide a more comprehensive picture of the educational advantage, measured using test score gaps, that affluent students have over their less affluent peers during elementary and middle school. All four papers use population-based data and exploit variation (among U.S. states, counties, and school districts) in order to identify a series of local and state characteristics – from structural factors like residential segregation to the prevalence of parent fundraising – that exacerbate or reduce this advantage.

The objectives of this symposium are to: (1) map the between-state and between- and within-district variation in the educational opportunities of poor and non-poor students; and, (2) explore the influences of socioeconomic status, segregation, school funding, and state policy on the average test scores of poor and non-poor students. The first paper analyzes variation among states in the relationship between school districts' average socioeconomic status and their average test scores (the SES-achievement gradient). The second paper estimates the average test scores, and growth in those scores over grades, of poor and non-poor students within U.S. school districts and counties. Both of these papers explore how social context, e.g., economic segregation, and school factors, e.g., per pupil expenditures, can explain the variation in their respective measures of inequality among states, counties, or districts. The third paper explores whether the introduction of common core aligned tests predicts recent shifts in the relationship between SES and achievement, as well as shifts in the test score gaps between poor and non-poor students. The final paper explores how parent-teacher associations exacerbate educational inequality through providing more resources to advantaged students within already affluent school districts.

Together, these four papers provide new information about the extent of the educational inequalities between poor and non-poor students and how they vary across the U.S. They then generate consistent, population-based hypotheses about how contextual and policy factors

operate at multiple levels – through family fundraising, neighborhood conditions, and state policy – to reproduce inequality.

Title:

State Contexts and SES Achievement Gradients

Authors and Affiliations:

Heewon Jang, Stanford University

Background and Purpose

Socioeconomic achievement gaps have long been one of the central topics of discussion in educational research. Previous literature has focused on a variety of possible mechanisms through which children's socioeconomic background – including their individual characteristics, neighborhood contexts, and school system characteristics – can influence their academic and educational success (Coleman et al., 1966; Reardon, Kalogrides, & Shores, 2017). State educational and social policies may play an important role in shaping these associations through affecting school district and community characteristics, resources, and patterns of residential and school segregation. However, not much is known about the role of state context and policy and how they affect the relationship between socioeconomic status (SES) and achievement.

In this paper, I examine how state characteristics explain the between-state variation in the association between school district SES and test scores. I seek to answer two main research questions. (1) Do the characteristics of the state education systems, including their policy and larger social context, explain the variation in the socioeconomic achievement gradients among states? (2) Does the relationship between state characteristics and the socioeconomic achievement gradient change across grades?

Data and Analytic Approach

This study uses district average test score from the Stanford Education Data Archive (SEDA) from 2009-2015 to examine state-level SES-achievement gradients and the growth of these gradients from grade 3 to 8 in math and ELA (English Language Art). In addition to test score data, I use two main sets of state characteristics: factors related to state education policies and factors describing state-level socioeconomic inequality. For education policies, I use measures of funding fairness and the distribution of access to pre-school programs taken from Chingos and Blagg (2017) and the ACS PUMS (American Community Survey Public Use Microdata sample). As measures of socioeconomic inequality, I use between-district income segregation, the association between district racial composition and district SES, and state level income inequality, which I create from the Common Core of Data (CCD) and the ACS data.

I fit precision-weighted hierarchical linear models to estimate the within-state associations between average district test scores and school district SES at grade 3 and their growth rate from grade 3 to 8, while controlling for the change of test scores over the years and subjects. In this framework, I then add the factors described above to explain the variation in the grade 3 SES-achievement gradient, and the rate of change in the gradient from grade 3 to 8.

Results

My preliminary results show that there is a substantial amount of variance in the SES-achievement gradient (Figure 1.1) as well as in the growth of the SES-achievement gradient across the states (Figure 1.2). The gradient is positive for all the states with an average of 0.22,

implying that districts with higher SES tend to show higher average test scores without exception. The degree to which district SES relates to average test score considerably varies across states. For instance, California has the steepest gradient at 0.31, which is almost three times higher than Tennessee at 0.12. The SES-achievement gradient grows steeper in most states from grade 3 to 8, but there are a few states where gradient narrows or is stable (Figure 1.2).

I find that between-district income segregation is positively associated with both the SES-achievement gradient at grade 3 and its growth through grade 8 (Table 1.1). A 1SD increase in the average between-district segregation is predicted to increase the SES-achievement gradient by 0.03, approximately 10% of the average gradient. A 1SD increase in between-district income segregation is associated with increase in the growth of the SES achievement gradients by 0.003, approximately 40% of the average growth of the gradient.

Conclusion

The findings of the study suggest that between-district economic segregation plays an important role in shaping socioeconomic disparities in educational opportunity, even though it is not clear whether segregation is a cause or a correlate of achievement gaps. It is particularly interesting in that between-district segregation not only widens the range of district SES but also changes the degree to which district SES affects educational outcomes. This can be interpreted in line with Mayer (2000)'s argument that there is a semilogarithmic effect of wealth and poverty on children's education: the same amount of dollar would matter more in poor communities. In other words, between-district income segregation appears to disproportionately disadvantage children in poor neighborhoods.

Title:

Achievement Gaps Between Poor and Non-Poor Students in U.S. School Districts

Authors and Affiliations:

Sean Reardon, Stanford University
Erin Fahle, St. John's University
Heewon Jang, Stanford University
Elise Dizon-Ross, Stanford University

Background and Purpose

Students' family socioeconomic status and neighborhood socioeconomic conditions impact their educational opportunities and outcomes. Relative to children from wealthier families, children from poorer families have fewer educational resources at home (e.g., Kaushal et al. 2011), attend lower quality schools (e.g., Rothstein, 2013), and more often live in concentrated poverty with few neighborhood resources (e.g., Reardon, Fox & Townsend, 2015; Sharkey & Faber, 2014). These differences in educational opportunities manifest as test score gaps within and between schools and districts (Reardon, 2011; Sirin, 2005). But, little is known about what, if any, community characteristics contribute to the educational success of poor students or reduce the inequality between poor and non-poor students living within them.

In this paper, we analyze how the average scores of poor and non-poor students, and test score gap between them, are a function of the local context. We have two guiding questions. First, what factors contribute to the educational success of both poor and non-poor students? Second, what factors contribute to inequality between poor and non-poor students within communities? Our study is uniquely able to answer these questions because we can analyze: (1) the heterogeneity in the income-achievement relationship across places (at multiple aggregations); and, (2) the changes in the income-achievement relationship as cohorts progress through school.

Data

We use test score data from the ED*Facts* Data Initiative provided to our team by the National Center for Education Statistics to estimate achievement gaps between economically disadvantaged (poor) and non-disadvantaged (non-poor) students. Economic disadvantage (ECD) is most often defined as whether or not a student receives free or reduced lunch, although some states have opted for more inclusive definitions. Using this data, we estimate standardized mean test scores for both poor and non-poor students in 9,607 districts and 1,369 counties. We have estimates in math and reading in grades three through eight from the 2008-09 through 2015-16 school years. We also construct district- and county-level measures of SES, income inequality, residential income segregation, school income segregation, and school features using data from the American Community Survey and Common Core of Data.

Notably, the years of our data sample overlap with the roll out of the Community Eligibility Provision (U.S. Department of Education, 2015; Neuberger et al., 2015), which as a by-product allows participating schools to modify how they report students by ECD status and their test scores. Therefore, in our analyses, we remove district-year or county-year cases where schools participated in the CEP program in that year.

Analysis

We model the estimated district or county means as a function of subject, grade, and year, as well as our covariates, using precision-weighted hierarchical linear models of two forms. In all cases we state-mean center the estimates and covariates (akin to including state fixed effects) in order to reduce any bias that results from the different definitions of ECD used across states. Our first model produces Empirical Bayes estimates of the average test scores by ECD status, and shows how the average achievement and the growth in achievement of each group relates to each contextual factor. The second model directly estimates the gap between poor and non-poor students and tests whether the contextual factors are related to the size of the gap and the growth in the gap over grades.

Findings

We focus here on the results for school districts, as the findings are largely consistent for counties. We find that there are almost no U.S. school districts where poor students outperform non-poor students (Figure 2.1). The average gap between non-poor and poor students is approximately half of a standard deviation. Translating this into approximate grade levels indicates that poor students in the average U.S. school district are performing nearly one and a half grade levels behind their non-poor peers. However, there is substantial between-district variation in the achievement of each group and in the gap between them.

Our model results show three patterns with respect to the covariates we explore (Table 2.1). First, socioeconomic status and income inequality are positively associated with achievement for both poor and non-poor students. However, the benefit to non-poor students is much larger than that for poor students, leading to larger average test score gaps in high-SES districts and those with high income inequality relative to poorer and less unequal places. Importantly, the poor students living in more affluent and more unequal communities may be less poor than poor students living in less affluent and less unequal communities, complicating the interpretation of this result. Second, residential and school segregation are positively related to the average test scores of non-poor students, but negatively related to those of poor students; this means that achievement gaps are larger, all else equal in more segregated districts. Finally, school features – such as funding and charter enrollment disparities – are less strongly associated with average test scores of poor and non-poor students.

Conclusions

Overall, our results suggest that economic achievement gaps vary widely among school districts, and tend to be larger in more affluent districts and in districts with high income inequality and/or high segregation. Although poor students have better academic outcomes in high-SES communities than low-SES communities, they do not appear to benefit as much from such contexts as do non-poor students. Moreover, we show that segregation systematically

hurts poor students and benefits non-poor students. However, we also find that overall test scores (of poor and non-poor students combined) are higher in communities with more income inequality and more segregation than in less unequal and more integrated districts. This suggests that public policy decisions may require balancing equity goals (reducing achievement gaps) with efficiency goals (improving overall achievement).

Title:

A Decade of Growth in Academic Achievement Gaps: Common Core, Segregation, or Other Factors?

Authors and Affiliations:

Rebecca Hinze-Pifer, University of Illinois – Urbana Champaign

Background

American children of the 21st century face a world of rising income inequality, increased residential income segregation, and other social forces likely to exacerbate academic achievement gaps between the children of the rich and the children of the poor. Simultaneously, the education system has undergone a broad education standardization movement (the Common Core State Standards) and a six-fold expansion in the share of students attending charter schools – both reforms with lofty intentions to reduce socioeconomic achievement gaps.

This paper documents an increase in the association between family socioeconomic status and student academic achievement over the last decade. At all levels – nationally, between states, between districts in the same state, and within districts – we see evidence these gaps are widening. We explore multiple hypotheses regarding the cause of this widening inequality.

Research Questions

1) How has the academic achievement gap between the children of high-income families and the children of low-income families changed in recent years?
2) At what levels of the education system are changes in the family income-achievement gradient occurring? Are changes arising from differences between states, between districts within states, within districts, or across multiple levels of the system?
3) At each level, do changes arise from changes in aggregate performance among high SES students, low SES students, or both?
4) To what extent are changes in the family income-achievement gradient consistent with plausible causes, including:
    a) Changes in education policy and practice arising from the Common Core State Standards movement?
    b) Shifts in charter school participation?
    c) Changes in residential segregation by income?
    d) Changes in the adult labor market (e.g. returns to skill)?

Data and Research Methods

The data for this study are drawn from the Stanford Education Data Archive (SEDA), which includes district-level data on every state accountability test taken in grades 3—8 in the U.S. between 2009 and 2016. These data are originally drawn from state reporting on student performance to the U.S. Department of Education under the EDFacts Initiative (U.S. Department of Education, 2017) and translated to a common scale as described in Reardon, Kalogrides and Ho (2017). The linking process relies on the longitudinal stability and state-level sampling used by the national NAEP exam, which is given in grades 4 and 8 in odd years. In addition, we examine national, state, and trial urban district (TUDA) subgroup scores on the NAEP exam (2003—2017).

These data are supplemented by a time invariant measure of district socioeconomic status constructed from the US Census Bureau American Community Survey (ACS) and provided for use with the covariates file from SEDA. Unlike other measures, this covariate is constructed strictly based on ACS respondents who report they have children attending the local public school. In order to address the last three research questions, we have compiled extensive data on state-level implementations of the Common Core state standards and charter school participation, and are currently compiling measures of residential segregation, adult employment, returns to skill, and other salient dimensions of the adult labor market.

We measure the relationship between family socioeconomic status and educational achievement in different ways across the multiple levels of the American education system:

1) Nationally, between states, and at the state level, it is measured as the gap in NAEP scores by student eligibility for free/reduced price lunch.
2) Between districts within states, it is measured as the association between district mean performance and district socioeconomic status on state standardized tests, estimated by OLS regression of district average test scores on district socioeconomic status. As a supplemental measure, we also examine the between-district proportion of test score variance in each state-year (the intraclass correlation, or ICC), constructed as described in Fahle and Reardon, 2017); which measures between-district dispersion independent of district or student socioeconomic status.
3) Within districts, it is measured as the achievement gap between economically disadvantaged and non- economically disadvantaged students on state standardized tests.

Table 3.1 provides descriptive statistics for these measures. The first three research questions are addressed through examination of longitudinal trends, including specifications accounting for state or district, grade, and subject fixed effects. In addition to considering the association between various explanatory variables and our measures of achievement inequality, the ultimate analysis will exploit policy-induced shocks to charter participation to address the final research question.

Results and Discussion

As shown in Figures 3.1 and 3.2, the gap between lunch-eligible and lunch-ineligible students on the national NAEP exam has widened in both math and reading (ELA) since 2005, for both 4th and 8th grades. Within states, the dispersion of scores between districts on 3rd – 8th grade accountability tests (ICC) has increased in both math and ELA (Figure 3.3). In separate analyses, we find the large jumps in 2015 arise from the shift to Common Core-aligned accountability tests in many states that year. After accounting for changes in the accountability test, a small significant upward trend in ICC remains in math.

Within states, the association between district SES and performance increased roughly half a standard deviation, with a larger increase in math than in ELA (Figure 3.4). This pattern is relatively unchanged after accounting for changes to standardized tests. The gap between economically disadvantaged and non-economically disadvantaged students within school districts also rose consequentially, by 19% of a standard deviation in math and 8% of a standard deviation in ELA (Figure 3.5). Finally, Figure 6 shows an exacerbation of an existing pattern where the largest gaps exist in the most affluent districts.

These upward trends largely arise before Common Core-related instructional changes would have reached the classroom, and persist after accounting for changes to the accountability tests used by states. In preliminary analyses they do not seem related to several other Common Core-related factors. The final paper will include analyses of the potential roles of charter schools, residential segregation, and income inequality.

Title:

PTOs, Supplemental Resources, and Achievement Gaps in U.S. Public School Districts

Authors and Affiliations:

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James Carter, III, University of North Carolina at Chapel Hill

Background

Parent-teacher associations, parent-teacher organizations (PTOs), booster clubs, and school foundations are enduring pathways for parents to collectively invest tax-exempt dollars into U.S. public schools. Called "Dream Hoarders" (Reeves, 2017), the growing capacity for parent fundraising in the nation's most affluent communities creates disparities that parallel growing wealth inequality across the nation: in North Carolina alone, a single PTO is responsible for 3 percent of total PTO revenue generated among elementary schools in a given year. Supplemental funds from these organizations materialize as student enrichment activities, new curricula, school renovations, and additional instructors. The unequal distribution of these resources goes largely unchecked as PTOs maintain their reputation as innocuous, social clubs; however, a handful of recent scholars draw attention to their role in reproducing class-based and racial inequalities, calling for a closer examination of the role they play in maintaining or exacerbating academic achievement gaps (Murray, Domina, Renzulli, & Boylan, 2018; Posey-Maddox, 2014).

Research Questions

Two sets of analyses guide our inquiry into the relationship between PTO resources and educational inequality:

1. How do district demographics, resources, organizational, and neighborhood characteristics associate with levels of PTO resources? We expect PTO resources to accrue disproportionately in middle-class, white communities (Murray et al. 2018; Nelson & Gazley, 2014), but also in districts where state and local contributions to education are low and socioeconomic diversity is high.
2. To what extent do poor and non-poor, black and white, white and Hispanic, and white and Asian students benefit equally from attending schools in districts with high PTO revenues? The resources PTOs generate can often be used at the discretion of parents unlike many of the more categorically proscribed funds in public schools suggesting that their benefits might disproportionately accrue to relatively advantaged students whose families are able to contribute (Posey-Maddox, 2014).

Data Collection and Analysis

To answer these research questions, we built an unprecedented nationwide panel of PTO resources, district characteristics, and broader community contexts matched to standardized test scores and test score achievement gaps from the Stanford Education Data Archive (SEDA) over the period 2009-2015. To measure supplemental resources, we extracted PTOs and similar school-supporting organizations from the Urban Institute's National Center for Charitable Statistics' (NCCS). NCCS maintains financial data on all U.S. nonprofit organizations that report annual revenues to the Internal Revenue Service (IRS). We matched PTOs to their associated

elementary and middle schools by using probabilistic matching techniques that allowed us to link common records across datasets using address and name identifiers. This process resulted in a panel of schools and charitable organizations matched to demographic, membership, and staffing estimates from the National Center for Education Statistics (NCES). Annual revenues from PTOs at the school level were aggregated to the district level and divided by total enrollment to create a per-pupil measure of supplemental district resources.

We subsequently paired these data with the SEDA to incorporate measures of district-level math and English/language arts (ELA) achievement gains and gaps in achievement gains between racial/ethnic and socioeconomic status groups in grades 3-8. The SEDA also includes measures of resources, segregation, per-pupil expenditures from state and local sources, and district demographic characteristics in addition to the NCES' Education Demographic and Geographic Estimates (EDGE), populated with variables from the American Communities Survey and Decennial Census contiguous with school district boundaries. These data provide a rich description of the wider community context including measures of single-parent household rates and income and educational inequality between parents of different racial/ethnic groups. We also rely on an SES composite score that combines multiple measures of district poverty. See Table 4.1 for district characteristics at various levels of PTO resources and Table 4.2 for achievement gains and gaps in achievement gains over incremental changes in supplemental PTO revenues.

We will use ordinary least squares (OLS) regression over data pooled across years and grades to investigate the district level correlates of PTO resources using the following model:

$$PTOrev_d = \alpha + \beta_1 X_d + \sum State_d + \varepsilon$$

where $PTOrev_d$ is a per-pupil measure of PTO revenues aggregated to the district level and X_d is a vector of district level characteristics. We include state fixed effects to control for unobservable variation between states.

We will also use random- and fixed-effects models to estimate how PTO resources drive test scores and test score gaps, leveraging the panel nature of our data by using the following model:

$$Ach_{dgt} = \alpha + \beta_1 PTOrev_{dt} + \beta_2 PTOrev_{d(t-1)} + \beta_3 X_{dt} + \sum State_d + \sum District_d + \sum Year_t + \mu_d + \varepsilon_{dt}$$

where Ach_{dgt} represents year-to-year achievement gains and gaps among socioeconomic and racial subgroups predicted by $PTOrev_{dt}$, a time-varying measure of per-pupil PTO revenues aggregated to the district level. Running this separately for math and ELA, we will control for time-varying district characteristics, X_{dt}, the prior year's PTO revenues, $PTOrev_{d(t-1)}$, and include state, district, and year fixed-effects, to estimate the independent contribution of an additional year of PTO funding to academic achievement.

Results

Table 1 reveals interesting descriptive relationships between district characteristics and PTO resources. As expected, supplemental resources to districts increase with rising income in the community, and with greater proportions of individuals that hold a bachelor's degree or higher. We also see these resources decline as the rate of single parenthood increases. Consistent with this trend, high PTO revenues are associated with increases in the proportion of white students and decreases in the proportions of black and Hispanic students. We see similar trends in terms of achievement. High PTO revenues are associated with the largest achievement gaps between black and white, and white and Hispanic students, yet the achievement gap narrows between white and Asian students with increasing PTO revenues.

Conclusion

We examine the extent to which PTO funding matters for student test scores, and how disparities in access to high-revenue PTOs correlate with subsequent racial/ethnic achievement gaps. We find evidence that supports a social reproduction hypothesis: that PTOs and their resources accrue in advantaged communities and disproportionately benefit relatively advantaged students. Our findings will contribute to ongoing debates about the role of resources in schools, particularly when they are controlled almost exclusively by parents.

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Tables and Figures

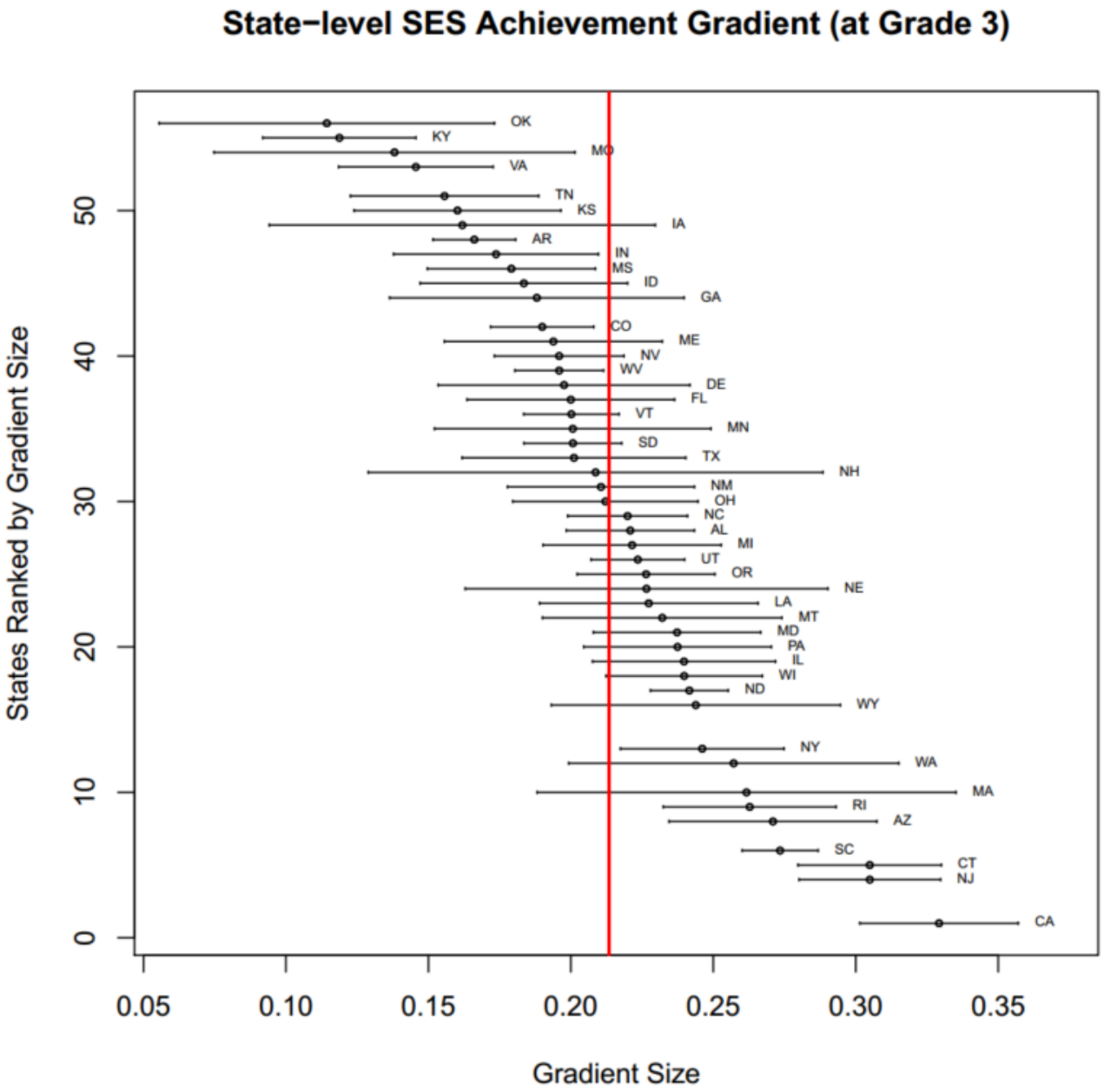


Figure 1.1. Distribution of SES Achievement Gradients at Grade 3

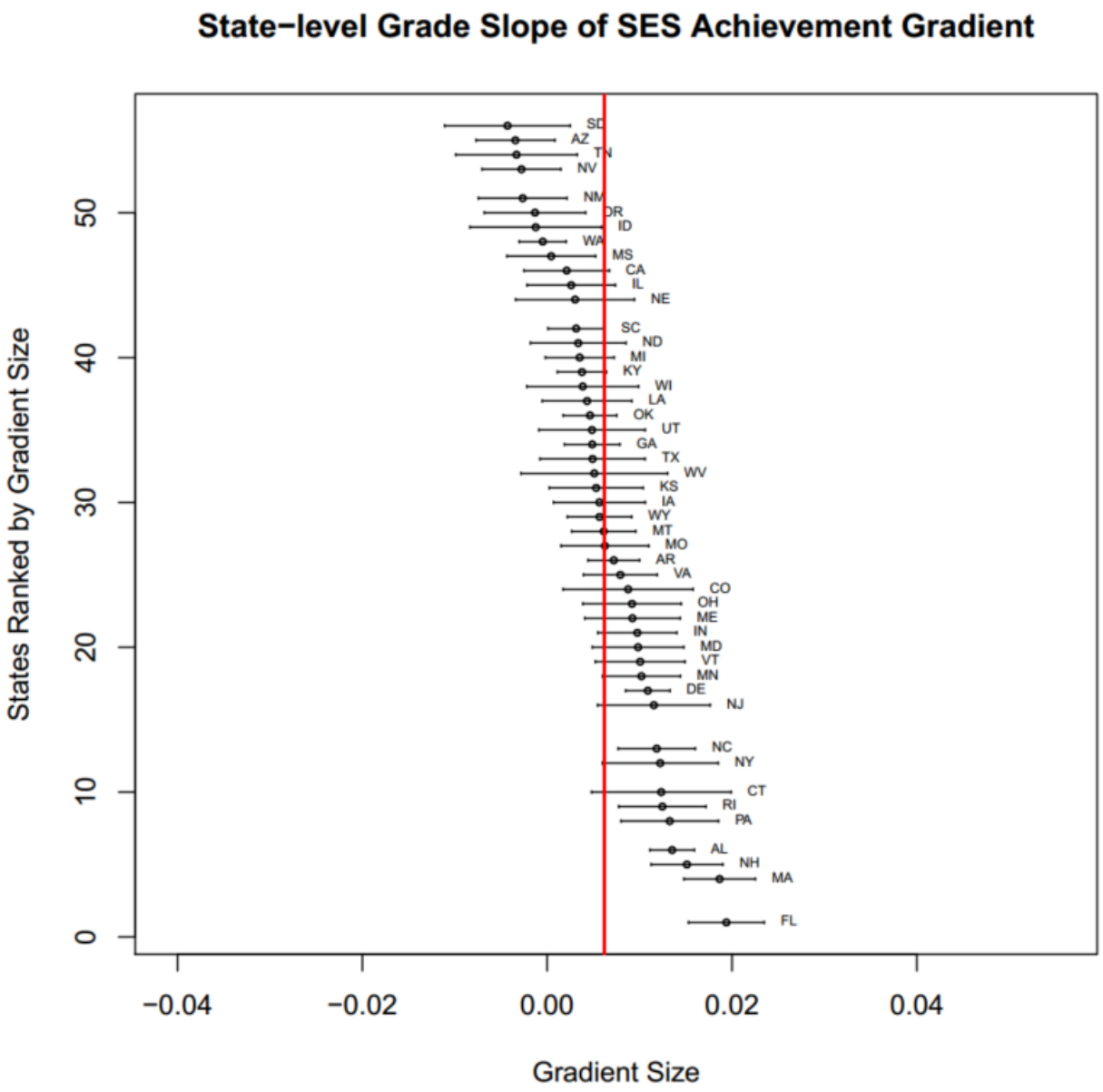


Figure 1.2. Distribution of SES Achievement Gradient Growth over the Grades 3-8

Table 1.1. Multivariate Model Results

	B	S.E.	
Intercept			
Intercept	0.1042	0.0191	***
PreK Enrollment Ratio	-0.0197	0.0317	
Funding Ratio	0.2877	0.7109	
Income Segregation (H)	0.7480	0.4364	+
Race-SES Association	-0.4598	0.2670	+
Gini Coefficient	-0.3009	1.0647	
SES Slope	0.2168	0.0073	***
PreK Enrollment Ratio	-0.0037	0.0128	
Funding Ratio	-0.2165	0.2711	
Income Segregation (H)	0.5415	0.1778	**
Race-SES Association	0.3742	0.1106	***
Gini Coefficient	-0.0192	0.4407	
Math			
Intercept	-0.0126	0.0013	***
SES Slope	0.0008	0.0013	
Year			
Intercept	0.0085	0.0003	***
SES Slope	0.0028	0.0003	***
Grade			
Intercept	-0.0201	0.0025	***
PreK Enrollment Ratio	-0.0056	0.0042	
Funding Ratio	-0.0166	0.0933	
Income Segregation (H)	-0.0179	0.0576	
Race-SES Association	0.0535	0.0352	
Gini Coefficient	-0.0817	0.1407	
SES Slope	0.0073	0.0010	***
PreK Enrollment Ratio	-0.0128	0.0380	
Funding Ratio	-0.0014	0.0020	
Income Segregation (H)	0.0518	0.0254	*
Race-SES Association	-0.0118	0.0159	
Gini Coefficient	0.0238	0.0633	
Number of Observations	801401		
Number of Districts	11279		
Number of States	48		
SD of SES achievement Gradient at Grade 3	0.0401		
SD of Gradient Growth through Grade 8	0.0054		

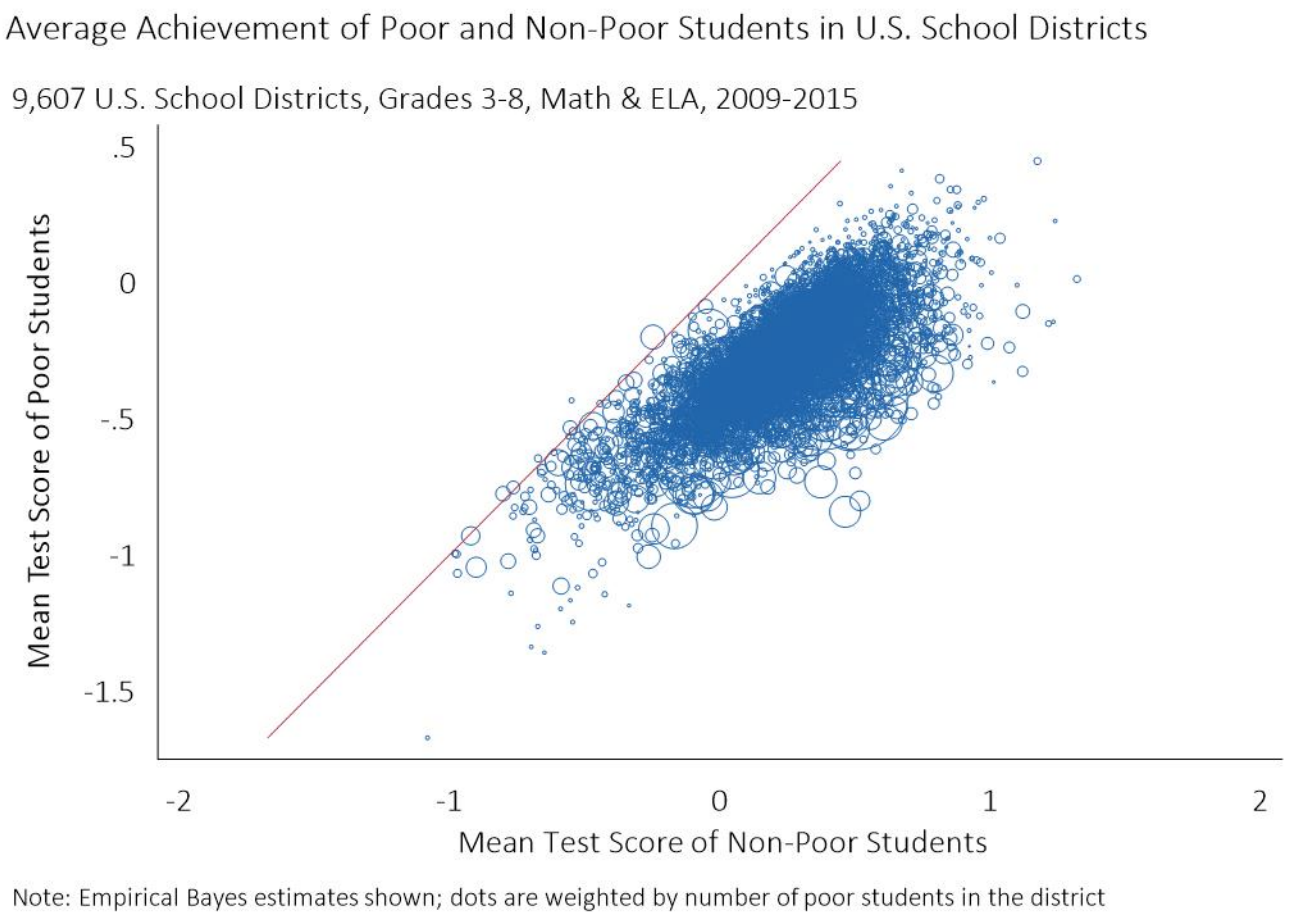


Figure 2.1. Empirical Bayes Estimates of the Average Achievement of Poor and Non-Poor Students in U.S. School Districts

Table 2.1. Multivariate Model Results Predicting the District Average Achievement and Growth by ECD Status

Variable	NonECD Mean	NonECD Grade Slope	ECD Mean	ECD Grade Slope
Intercept	0.2320 ***	-0.0031 ***	-0.2577 ***	-0.0062 ***
	(0.0019)	(0.0005)	(0.0016)	(0.0005)
Socioeconomic Status (Composite)	0.1662 ***	0.0105 ***	0.0875 ***	0.0122 ***
	(0.0031)	(0.0009)	(0.0025)	(0.0009)
90/10 Income Ratio	0.0119 ***	0.0007 ***	0.0019 ***	0.0007 ***
	(0.0006)	(0.0002)	(0.0005)	(0.0002)
Residential Segregation (H)	0.5775 ***	-0.0347	-0.4055 ***	-0.0685 **
	(0.0791)	(0.0214)	(0.0695)	(0.0227)
School Segregation (H)	0.7739 ***	0.0484 **	-0.1706 **	0.0204
	(0.0596)	(0.0159)	(0.0522)	(0.0168)
Per Pupil Revenue	0.0018 *	0.0001	-0.0027 ***	0.0004
	(0.0009)	(0.0002)	(0.0007)	(0.0003)
Percent of Students in Charter	-0.1881 ***	0.0271 **	-0.0573 +	0.0200 +
	(0.0372)	(0.0103)	(0.0324)	(0.0107)
Difference Charter Enrollment Rates (Not Free	-0.0686	0.0107	-0.0157	-0.0166
Lunch - Free Lunch)	(0.0518)	(0.0140)	(0.0449)	(0.0145)
Student-Teacher Ratio	-0.0001	0.0000	0.0000	0.0000
	(0.0002)	(0.0000)	(0.0001)	(0.0000)
Urban	0.0581 ***	-0.0010	-0.0080	-0.0029
	(0.0083)	(0.0022)	(0.0073)	(0.0023)
Rural	-0.0729 ***	0.0004	-0.0669 ***	0.0002
	(0.0057)	(0.0016)	(0.0050)	(0.0016)
Town	-0.0097	0.0021	-0.0624 ***	-0.0004
	(0.0060)	(0.0016)	(0.0053)	(0.0017)
Percent Black	-0.3813 ***	-0.0190 ***	-0.3247 ***	-0.0041
	(0.0159)	(0.0043)	(0.0132)	(0.0043)
Percent Hispanic	-0.2342 ***	-0.0010	-0.2463 ***	0.0152 ***
	(0.0137)	(0.0038)	(0.0114)	(0.0038)
Percent Other	-0.0273	0.0168 *	-0.2832 ***	0.0210 ***
	(0.0246)	(0.0068)	(0.0184)	(0.0063)
SD of Random Effect	0.2394	0.0428	0.1917	0.0457
R^2 (Relative to a Null Model)	51%	5%	39%	4%

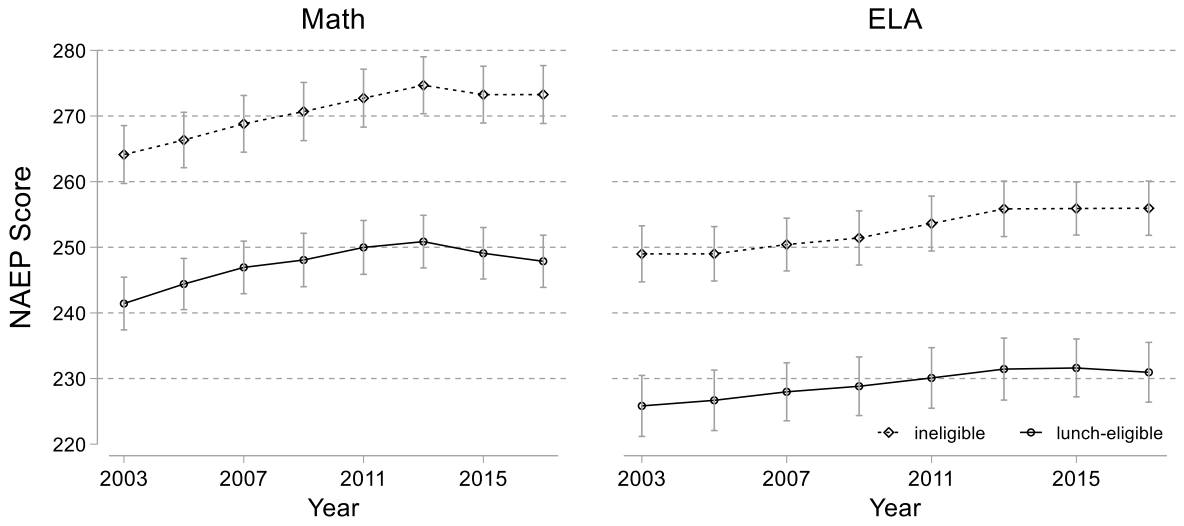
Note: Each model includes 9,607 districts, having 1,041,610 observations in total.

Table 3.1. Description of Inequality Measures

	Mean	S.D.	Sample size	Years	Grades
State NAEP scores					
Math - Lunch ineligible	270	22	816	2003 – 2017,	4, 8
Math - Lunch eligible	247	20	816	alternate	
Reading (ELA) - Lunch	253	21	816	years	
ineligible	229	23	816		
Reading (ELA) - Lunch					
eligible					
Stata SES-Achievement Slope					
Math	0.249	0.072	2,093	2009 – 2017	3 – 8
ELA	0.254	0.065	2,177		
State Intraclass Correlation					
(ICC)	0.101	0.049	2,117	2009 – 2017	3 – 8
Math	0.087	0.045	2,196		
ELA					
Within-District SES Gap					
Math	0.511	0.257	294,453	2009 – 2017	3 – 8
ELA	0.529	0.257	310,038		

Note: Sample size is the number of state-year-grade observations for NAEP, ICC, and SES-achievement slope and the number of district-year-grade observations for the within-district SES gap. The within-district SES gap is calculated from the difference between the district subgroup scores for economically disadvantaged and non-economically disadvantaged students.

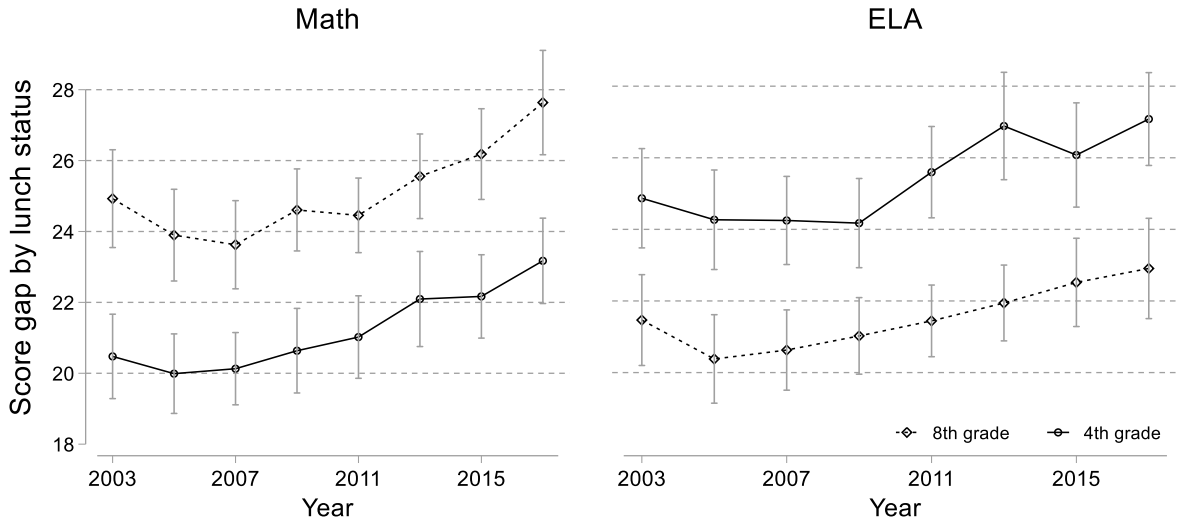
Figure 1. Trend in NAEP scores by lunch eligibility



Errors clustered by state. Error bars show robust 95% confidence intervals.
Models include state-grade fixed effects.

Figure 3.1. Trend in NAEP Scores by Lunch Eligibility

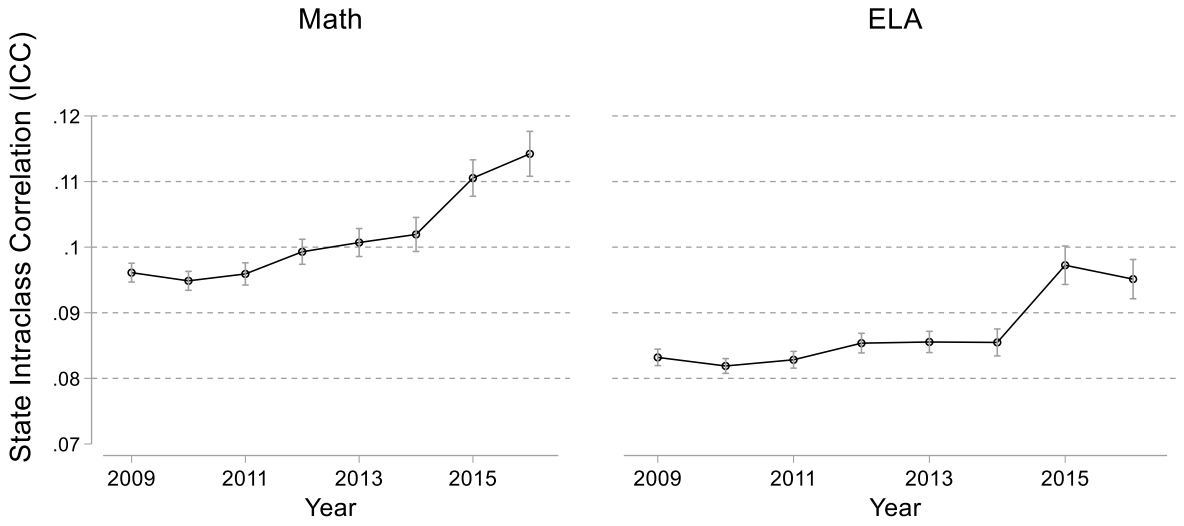
Figure 2. Trend in NAEP lunch eligibility gap by grade



Errors clustered by state. Error bars show robust 95% confidence intervals.
Models include state fixed effects.

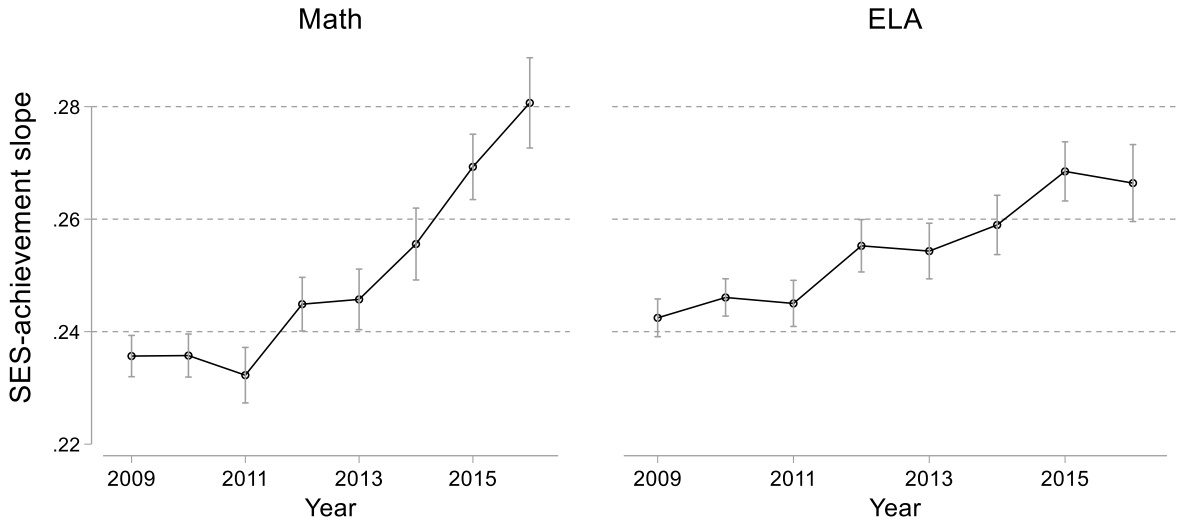
Figure 3.2. Trend in NAEP Lunch Eligibility Gap by Grade

Figure 3. Trend in state ICC



Error bars show robust 95% confidence intervals. Models include state-grade fixed effects.
DC & HI do not contribute to estimates.

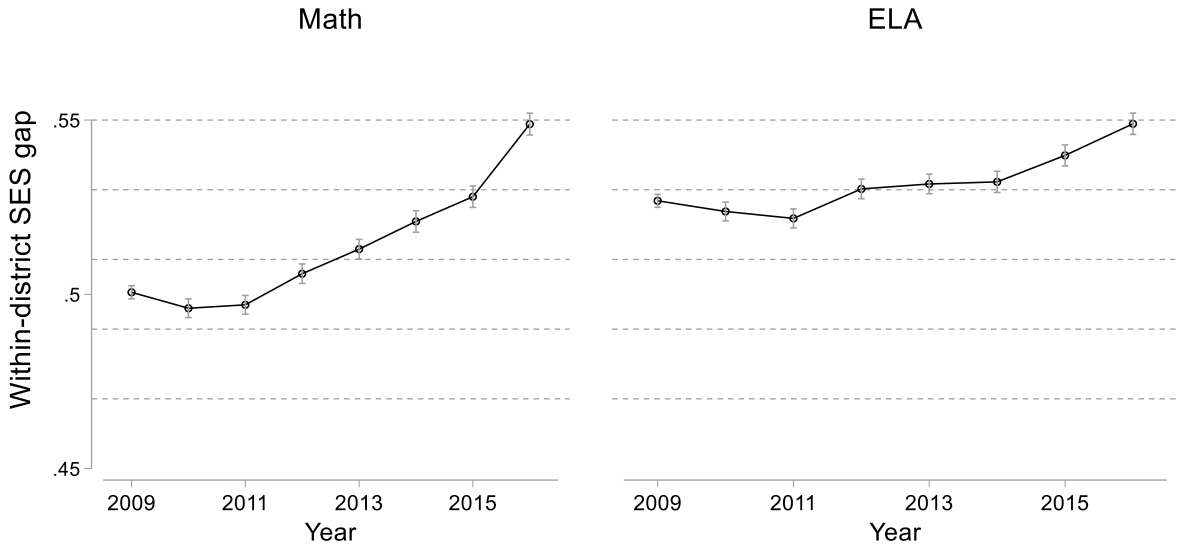
Figure 3.3. Trend in State ICC



Error bars show robust 95% confidence intervals. Models include state-grade fixed effects.
DC & HI do not contribute to estimates.

Figure 3.4. Trend in State SES-Achievement Slope

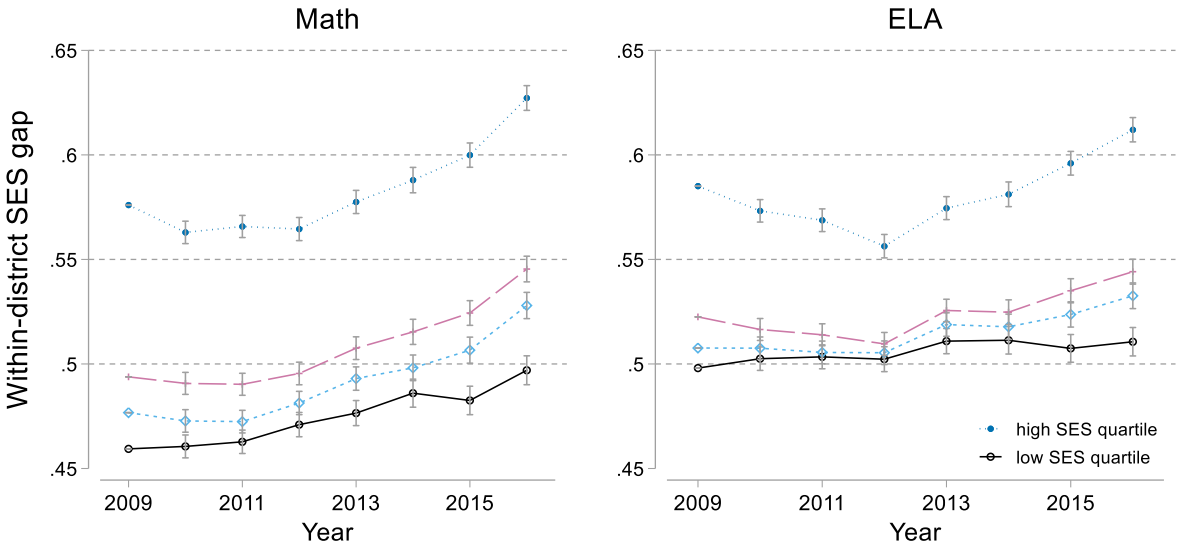
Figure 5. Trend in within-district SES gap



Error bars show robust 95% confidence intervals. Models include state-grade fixed effects.

Figure 3.5. Trend in Within-District SES Gap

Figure 6. Trend in within-district SES gap, by district SES quartile



Error bars show robust 95% confidence intervals. Models include state-grade fixed effects.

Table 3.6. Trend in Within-District SES Gap, by District SES Quartile

Table 4.1. Characteristics of U.S. Public School Districts and Supplemental Resources from PTOs, 2009-2015

		Supplementary Revenues per pupil				
	Overall	<$50	$50-$150	$150-$250	$250-$400	>$400
Number of Districts	7571	2196	3299	1051	548	477
Urban	8.82%	12.48%	8.95%	5.42%	4.57%	3.38%
Rural	41.51%	32.79%	39.50%	46.15%	56.31%	68.57%
Suburban	28.85%	12.67%	31.49%	29.31%	24.13%	17.09%
Town	20.82%	28.37%	20.05%	19.12%	14.99%	10.97%
Region 1: Northeast	22.67%	24.72%	23.04%	21.49%	18.97%	17.08%
Region 2: Midwest	39.65%	34.36%	39.08%	46.49%	48.08%	43.96%
Region 3: South	23.15%	27.53%	24.91%	18.07%	13.60%	12.07%
Region 4: West	14.53%	13.39%	12.97%	13.96%	19.35%	26.88%
Median income ($)	65,141.00	59,952.79	65,409.36	69,564.54	71,861.44	71,525.25
SES composite	0.164	-0.037	0.188	0.320	0.417	0.347
Unemployment rt.	4.66%	4.84%	4.64%	4.54%	4.38%	4.56%
Percent with bachelor's degree	25.83%	23.85%	26.15%	27.85%	27.58%	26.38%
Single Mom rt.	22.62%	24.85%	22.66%	20.87%	18.96%	19.24%
Socioeconomic diversity	0.356	0.367	0.357	0.349	0.340	0.337
District percent FRL	37.83%	41.58%	37.35%	33.41%	34.58%	37.36%
District percent black	8.96%	11.53%	9.25%	6.19%	5.97%	4.73%
District percent white	71.80%	67.33%	71.96%	77.61%	75.02%	74.81%
District percent Hispanic	14.94%	17.36%	14.64%	12.00%	12.90%	14.64%
Percent of public school students in charters	1.60%	2.29%	1.44%	0.87%	1.41%	1.32%
Pupil-teacher ratio	16.13	16.17	16.21	15.92	16.74	15.05
Revenue Per Pupil ($)	12,803.30	12,430.32	12,674.02	13,006.19	13,651.13	14,067.09

Table 4.2. Achievement Scores, Gaps, and Supplemental Resources in U.S. Public School District, 2009-2015

		Supplemental Revenues per pupil				
	Overall	<$50	$50-$150	$150-$250	$250-$400	>$400
Achievement Gains Gaps						
White - Black	1.76	1.64	1.80	1.92	1.93	1.93
White - Hispanic	1.35	1.24	1.37	1.49	1.63	1.50
White - Asian	-0.61	-0.47	-0.62	-0.72	-0.81	-0.89
Achievement Gains Trend						
White - Black	0.04	0.03	0.04	0.03	0.04	0.07
White - Hispanic	-0.02	-0.01	-0.02	-0.03	-0.01	-0.03
White - Asian	-0.12	-0.13	-0.12	-0.10	-0.09	-0.10