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Does Progressive Finance Alter School Organizations and Raise Achievement? The Case of Los Angeles

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Abstract

State finance reforms have raised per-pupil spending and elevated the achievement of disadvantaged students over the past half-century. But we know little about how fresh funding may alter teacher staffing or the social and curricular organization of schools, mediating gains in learning. We find that US$1.1 billion in new yearly funding—arriving to Los Angeles high schools after California enacted a progressive weighted-pupil formula in 2013—led schools to rely more on novice and probationary teachers. Schools that enjoyed greater funding modestly reduced average class size and the count of teaching periods assigned to staff in five subsequent years. Yet, high-poverty schools receiving higher budget augmentations more often assigned novice teachers to English learners (ELs) and hosted declining shares of courses that qualified graduates for college admission. Mean achievement climbed overall, but EL and poor students fell further behind in schools receiving greater funding.

Keywords

school finance, educational equity, school organizations

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State policy makers have moved to equalize spending per pupil over the past half-century, making allocations to schools less dependent on the wealth or poverty of local communities. These reforms have driven significant gains in achievement among many students raised in low-income families during certain historical periods (e.g., Jackson et al., 2015; Johnson, 2019; Lafortune et al., 2018).

But we know little about *how* progressivity in funding alters patterns of *teacher staffing* or the *social organization* of schools—essential mediating processes that must operate proximal to student engagement and learning. When new dollars arrive for disadvantaged pupils, how do district or school leaders adjust staffing arrangements, alter the curriculum or course offerings, and modify the school organization in ways that drive pupil motivation and learning?

This theoretical challenge is complicated as states move to "weighted-pupil" finance strategies (WPF), where greater funding is awarded to districts or schools that serve larger shares of disadvantaged pupils, relative to allocations to schools serving middle-class peers. WPF strategies have attracted wide political appeal: permitting states to consolidate and deregulate categorical funding streams, while decentralizing fiscal control back to local school boards, and gaining support from pro-equity advocates (Augenblick et al., 1997; Bersin et al., 2008; Leppert & Routh, 1980; Odden & Picus, 2014).

Yet, evidence remains mixed on whether new dollars, purportedly focused on students from poor families, (a) are distributed by district officials to schools that serve greater shares of these pupils, (b) alter staffing patterns or the social organization of schools in discernible ways, and (c) lift student achievement. This article examines the case of the Los Angeles Unified School District (LAUSD), the nation's second largest, benefiting from US$1.1 billion in new yearly funded by the third year of implementation (2015–16), dollars generated by poor students via a weighted-pupil formula pressed by former California Gov. Jerry Brown (United Way, 2017).

This boost in spending—equaling nearly one fifth of LAUSD's operating budget—was in part allocated to high schools serving large shares of disadvantaged students (United Way, 2018). But another significant slice went to cover pension liabilities, rising health care costs, and purposes distant from classroom instruction. So, did this sharp gain in funding—rhetorically aimed at narrowing achievement gaps—empirically alter teacher staffing or the social organization of high schools? Can we detect gains, or shrinking disparities, in student learning over the initial 5 years of implementation, 2013–2018? These questions motivate our analysis.

Does Progressive Finance Alter School Organizations?

Affection for WPF reforms stems from the confluence of three developments. First, recognition has grown that, after setting demanding proficiency standards, it costs more to lift poor children over these hurdles. Children may be disadvantaged by family poverty, language, or unstable homes situations. Neighborhoods with concentrated poverty host especially denigrating conditions for the academic motivation and learning of many students (Bryk et al., 2010). "Because not all students come to school with the same individual, family, or neighborhood advantages, some need more resources than others to meet a given achievement standard," as argued by designers of California's rendition of weighted-pupil funding (Bersin et al., 2008, p. 5).

In addition, the accretion of centrally regulated categorical aid fell into disfavor by the 1990s in several states. California officials, for instance, were monitoring over 65 separate funding streams, most requiring bureaucratic oversight at state and district levels. One survey of principals detailed the inordinate amount of time required to submit multiple budgets and monitoring reports, trying to keep pace with disparate state regulations tied to so many funding streams (Fuller et al., 2007).

Former Gov. Arnold Schwarzenegger pushed through legislation in 2009 to consolidate many of the state's categorical aid programs, a move welcomed by local school boards and union leaders (placing now-discretionary dollars on the bargaining table). Yet, equity advocates in California feared that diminished accountability over dollars intended for poor students would yield regressive effects (Buik et al., 2017). The original argument for centrally guided categorical aid, going back to the Great Society, was that dollars aimed at poor children, if left unregulated, would quietly move to schools situated in politically stronger communities.

The consolidation of categorical aid into block grants mirrors a final shift that has gained momentum in recent decades: delegating greater authority to school principals over budgets and teacher hiring. Rising distrust of central bureaucracies (whether situated in state capitals or district offices), along with faith in school-level control, has been exploited by charter school advocates since the 1990s, along with earlier proponents of neighborhood control, pressed by many activists on the political Left (reviewed, Finn et al., 2016).

Uneven Effects on Schools and Students

Despite the political appeal of WPF reforms, detecting consistent effects inside schools remains an elusive exercise. Reform advocates often focus on moving dollars to schools that host sizable shares of disadvantaged children—a necessary first step—but then fail to examine subsequent staffing or organizational change inside schools. In addition, evidence is mixed on whether such reforms appreciably boost per-pupil allocations for schools with larger shares of disadvantaged children. When districts enjoy fiscal discretion, new dollars may flow to better-off communities or simply cover pension liabilities and fringe benefits, rather than allocated for classroom improvements for low-achieving children and youth.

One activist punctuates this question by asking whether California's rendition of weighted-pupil funding operates as a *dump truck* or a *backpack*. Does the state metaphorically arrive to local districts and dump new dollars on the loading dock, no questions asked? Or, do policy makers believe they are strapping funds on the backs of poor (weighted) students, so dollars flow directly to their schools?[1]

Hawaii's WPF reform did result in larger allocations to schools that served greater shares of disadvantaged students (Levin et al., 2013). But an ambitious weighted-pupil experiment in Prince George's County, Maryland, resulted in slight redistributions after the district moved to raise per-pupil spending across *all* schools. The district "unlocked" only certain school-level posts that otherwise remained centrally controlled. Overall progress toward equalizing spending per pupil among schools remained slight (Malen et al., 2015).

Districts in Oakland and San Francisco have employed WPF devices to progressively distribute dollars to schools, then decenter management out to principals. Yet, results in terms of altered teaching staffs or improved classroom quality remain mixed (Chambers et al., 2008). Miles and Roza (2006) found that specific elements of WPF structures in Cincinnati and Houston held consequences for between-school allocations: the share of district budgets to which pupil weights are applied, intricate elements of the allocation formula, and entrenched ways in which districts assign teaching posts and fungible dollars.[2]

Overall, California has moved from a centralized array of categorical programs to a highly decentralized finance regime, moving fiscal authority back to local school boards. Other states fall in between, including the extent to which local districts can adjust their own revenue streams independent of state finance. Local authorities in Ohio, for instance, can raise or lower local income taxes to help fund schools in addition to setting property tax rates. This diversification of local revenue streams appears to help stabilize school finance during economic downturns (Hall & Koumpias, 2018). So, financing structures remain works in progress, often adjusting or rebalancing between centralized and local sources of funding.

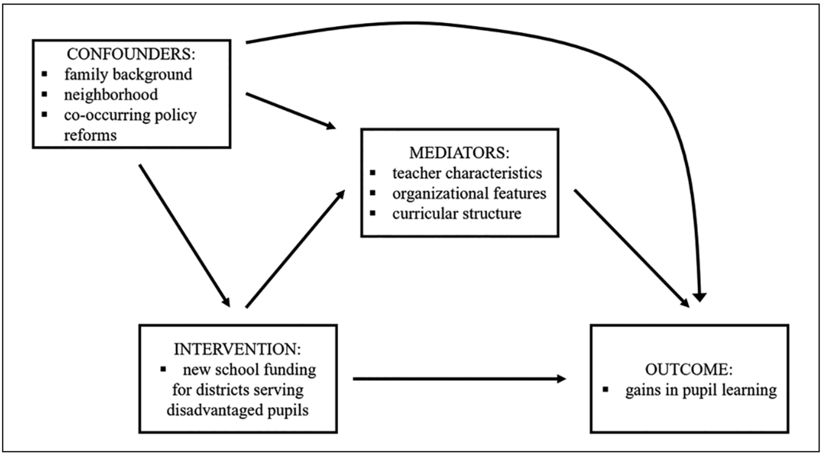

Figure 1. Causal logic for how achievement effects resulting from finance reforms may be mediated by change in teacher staffing, school and curricular organization.

Theory of Action—Do Finance Gains Alter the Social Organization of Schools?

We have arrived at the theoretical vagaries of how WPF schemes actually touch schools that host larger shares of disadvantaged students. Governors and legislators may reassert their faith in local school boards, while downplaying the unequal political influence of stakeholders inside districts, along with rising budget shares going for non-classroom commitments.[3] While local rationality is often postulated—boards will move dollars toward effective inputs and program models—California's finance reform does not require that districts provide evidence on what shifts in school practices are predictive of achievement. Nor is it clear that officials in Los Angeles acted from any consensus about how new dollars would somehow enrich staffing or improve the social organization of schools.

Figure 1 offers a conceptual model for how WPF strategies may affect teacher staffing or the social and curricular organization of schools. Local educators, for example, might hire more experienced teachers, lower class sizes, or bring on counselors to guide low-achieving students. Or, shifts in curricular organization may occur, say the balance between elective versus rigorous courses that help qualify graduates for admission to 4-year public universities. (These classes are known in California as *A to G courses*, those counted by the University of California for admission by high school graduates).[4]

Overall, it is difficult to see how rising spending could boost student achievement without somehow improving teacher staffing or the social and curricular organization of schools. Our study set out to identify such mediators, then test whether high schools in Los Angeles that enjoyed greater spending increases after California's finance reform displayed positive organizational changes, which in turn raised achievement or narrowed disparities in learning.

California's Progressive Finance Reform

Then-governor Jerry Brown swept aside scores of categorical aid programs in 2013 and replaced the state's revenue-limit regime (earlier established by Proposition 13 in 1978) with the WPF initiative, dubbed the Local Control Funding (LCF) Formula. Approved by the legislature just prior to the 2013–14 school year, it provided a *base grant* of equal dollars per pupil, while varying by grade level, in amounts set at about US$6,900 per K-6 student, US$7,200 for each middle-school and US$8,300 per high school pupil, and adjusted each year for inflation (California Office of the Legislative Analyst, 2013).

Supplemental grants then provide local districts an additional 20% for each student from a low-income family, designated English learner (EL), or pupils in foster care. *Concentration grants* further increase per-pupil distributions to districts by an amount equal to 50% of the base grant, kicking-in for the first disadvantaged student after the district reaches 55% of its total enrollment falling into one of the weighted-pupil categories.[5] Brown (2013) promised that, "We are bringing government closer to the people, to the classroom where real decisions are made, and directing the money where the need and the challenge is greatest."

Spending Gains for Los Angeles

California's resurging economy, following the Great Recession, along with a constitutionally required allocation for elementary and secondary schools were already driving education spending upward. The state set-aside for K-12 education equaled US$63.6 billion in 2016–17, about 88% flowing to local districts through the new LCF formula, the remaining 12% via surviving categorical programs (California Office of the Legislative Analyst, 2016).[6]

Districts with enrollments with less than 25% weighted students saw their per-pupil revenues rise just 5% over the subsequent 6 years, compared with a

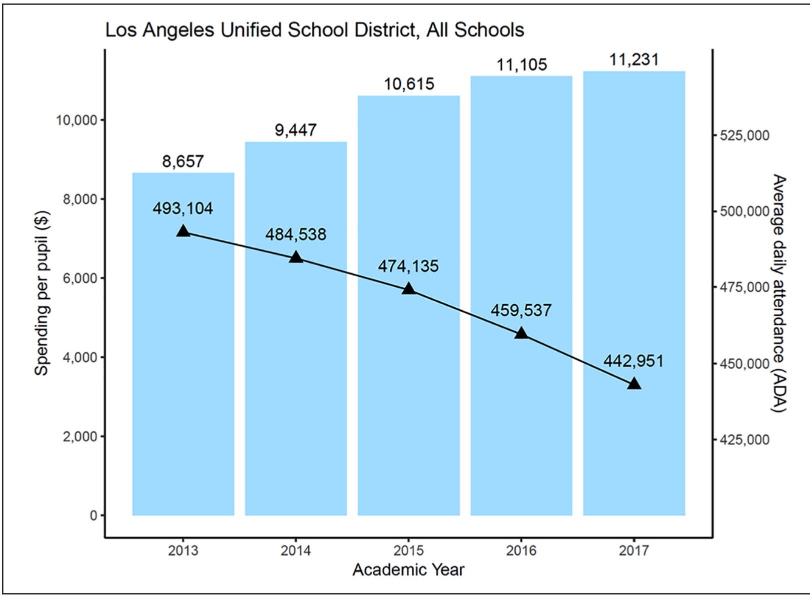

Figure 2. Spending per pupil rises in the Los Angeles Unified School District as average daily attendance declines, 2013–14 to 2017–18.
Note. Dollars are in constant 2016 dollars.

one-third gain in state dollars for districts in which 80% of all students falling in at least one of the disadvantaged-pupil categories (EdSource, 2016). By 2018–19, the state allocated US$23 billion more to public schools than just prior to the LCF reform, equaling a boost of nearly two fifths in yearly revenues to local school districts (California Office of the Legislative Analyst, 2019).

Gov. Brown's reform significantly enriched LAUSD's revenue picture as well (Figure 2). The district spent about US$9,400 per pupil in 2006–07, just prior to the recession. In the first year of the finance reform (2013–14), LAUSD spent US$8,657 per pupil, rising to US$11,231 4 years later. The district's budget increase generated by disadvantaged students via supplemental and concentration grants equaled US$1.1 billion yearly by 2015–16.

Note that funding gains climbed rapidly over the initial 3 years, then leveled-off as the state met its overall finance target. Meanwhile, enrollment continued to decline in LAUSD, as adult fertility rates fell and children continued to move to charter schools.

Do New Dollars Reach Intended Students?

California's finance reform required that each local district establish a baseline level of support provided to disadvantaged pupils (that is, prior to passage of LCF). Then, districts receiving supplemental or concentration grants were required to expand or improve services for weighted students "in proportion to" the amount of new dollars that they generated for their district (the so-called "proportionality requirement"). In response, LAUSD created a designated fund in 2014–15 for the Targeted Student Population (TSP), that is, the pupils weighted by the state for Local Control Funding.

Controversy soon arose in LAUSD over whether school officials were meeting the proportionality requirement. The district agreed to another US$151 for high-needs middle and high schools in 2017, stemming from successful legal action brought by the American Civil Liberties Union (ACLU).[7] Two analyses of spending growth had found that schools serving higher concentrations of poor students, ELs, and those in foster care had not received commensurate budget increases in Los Angeles during the initial years of implementation (Partnership for Los Angeles Schools, 2017; United Way, 2017).

District officials in Los Angeles at times argue that targeting new funds on weighted students (TSP) is not necessary, since four fifths fall under one of the disadvantaged categories. But wide variability in achievement persists across the district. About one third of all LAUSD students cleared the state's proficiency standard in Grade 4, falling to one-quarter of 11th-grade students in 2017. The share of white and Asian fourth-graders clearing this proficiency hurdle in English language arts (ELA) averaged 69% that year, compared with just 31% of Latino peers. Similar disparities remain for black students.[8]

Inequities in proficiency levels also map against the racially and economically segregated nature of Los Angeles, with poor families concentrated on the eastside, the Pico-Union district downtown, and South L.A., home to the Watts District. Economically better-off families, mostly White or Asian, populate schools on the west side, and the western reaches of the San Fernando Valley.

Research Questions and Analytic Strategy

Against this backdrop, we ask whether high schools benefiting more from (the exogenous portion of) funding increases displayed greater change in teacher qualities, and the curricular or social organization of schools, compared with schools receiving weaker budgets. We then estimate whether school-level budget gains predict higher levels of achievement or discernible narrow of gaps in achievement among racial groups of students. We also examine whether detected changes are conditioned by the socioeconomic conditions of differing schools. We specifically ask the following questions:

Research Question 1: As the district's budget climbed in the wake of new state funding, did high schools serving larger shares of disadvantaged students spend more per pupil during the initial 5 years of implementation, compared with schools hosting smaller shares of these pupils?
Research Question 2: Did high schools with stronger spending gains per pupil acquire a differing mix of teachers or display social-organizational changes, such as altering class size, teacher workload, wider access to college-prep courses, or more equal student access to experienced teachers?
Research Question 3: Did student achievement levels change, or gaps narrow, in high schools that enjoyed higher spending gains, compared with schools with less new funding during the initial 5 years of implementation?

Overall, we associate change in school-level spending with staffing and organizational alterations in each year among LAUSD's 108 comprehensive (noncharter) high schools, 2013–14 to 2017–18. We then estimate achievement effects, stemming from gains in school spending in the 4 years for which the state's new testing regime (Smarter Balanced) operated, beginning in 2014–15. Since "pre-treatment" budget data are not available for LAUSD, prior to the state finance reform, we estimate the exogenous portion of the spending for each school, then utilize the instrumented within-school increases in spending to estimate the effect on teacher staffing, organizational, and student achievement outcomes.

We also control for observed time-varying confounders such as student characteristics, along with school and year fixed effects, as detailed below. Our analytic strategy builds from recent work on estimating school finance effects (Jackson et al., 2015; Johnson & Tanner, 2018). We exclude elementary schools from the present analysis, given that earlier work shows almost no progressivity in how LAUSD distributed new dollars to these schools following passage of the LCF finance reform (Partnership for Los Angeles Schools, 2017; United Way, 2018).

We examine how descriptive trends in teacher staffing and features of school organizations may differ between schools in poor versus middle-class parts of L.A. Similarly, the achievement effects—raising mean performance or narrowing disparities—may unfold differently in historically impoverished versus materially better-off neighborhoods. We detail how mediators and pupil achievement move differently over the 5-year implementation period, following 2013–14, as we test for the effects stemming from school-level spending gains.

Method

Data—School Site Spending

Total school site spending. Our primary source of school-level financial data is the *school spending report*, maintained and shared by the LAUSD budget services and financial planning office in each of the 5 years following 2013 enactment of California's LCF finance reform. This report provides budgets and spending amounts by major program group for all staff positions and program dollars assigned to each school. This includes school-level resources that support all operations not limited to teacher salaries, fringes, and instruction-specific costs. School-level spending reports exclude all fund sources held by the central district, including capital funds, debt service, internal service funds, and resources held by the central office. On average, school site resources accounted for 88% of total expenditures for LAUSD's unrestricted budget.

Instructional spending. Within total school budgets, we examined changes and effects stemming from school-level instructional spending. Our composite of all instructional elements includes (a) teaching positions (e.g., certificated teachers, long-term substitutes, classroom aides), (b) specific instructional programs and services (e.g., special education instructional staff, tutors for EL pupils, and staff that support college-prep course implementation), and (c) all other support for instructional operations (e.g., supplies, books and materials, and extra resources to help reduce class size). Some educators have welcomed the return of elective courses following the demise of No Child Left Behind, while social-justice advocates in Los Angeles have pushed LAUSD to widen access to A-G and Advance Placement courses for disadvantaged students.[9]

Targeted Student Population (TSP) fund. Created in 2014–15, this designated fund aimed to meet the state proportionality requirement, that is, support for weighted (TSP) students in proportion to the new revenue these pupils generate for the district. This fund continues to support over 45 separate initiatives, from expanding A-G course offerings to expanding police security in schools. The Fund was the third largest contributor to instructional spending in 2017–2018, allocating US$541 million out to schools. It was created in direct response to the inflow of supplemental and concentration grants from the state and exogenous to any collateral policy change.

Data—Student Demographics and Outcome Measures

We combine the school-level spending data with three sets of school-level outcomes related to attributes of teachers employed, features of school and curricular organization, and pupil achievement on state tests. Data on these outcomes first come from the California Longitudinal Pupil Achievement Data System (CALPADS), providing annual data on teacher demographics, pupils nested in courses, staff assignments by course, and standardized test scores by pupil subgroup (California Department of Education, 2019). Excluding charter schools and nontraditional high schools, our analytic data set includes school-by-year panel data spanning 2013–14 to 2017–18, representing 540 school-by-year observations from the 108 traditional high schools.

Table 1 reports descriptive statistics for student characteristics and the outcome variables. We split results between the first quartile (Q1) of schools (n = 25) enrolling the lowest shares of disadvantaged (TSP) students, and the fourth quartile (Q4, n = 26), those schools enrolling the highest shares. The first panel shows means for school enrollment, racial composition of students, and the percentage of all students designated at TSP. Note that the lowest poverty quartile of schools enrolls pupils of which 71.6% are (TSP) disadvantaged, 58.7% Latino, and 15.3% black on average.

We also see in Table 1 that high-poverty schools rely more on novice, substitute, probationary (nontenured) teachers, and those hired from outside the district. Average class size for ELA courses is a bit smaller (24.4 pupils) in high-poverty schools, compared with low-poverty counterparts (25.7 pupils), but not for math courses. Teachers in high-poverty schools are assigned to more teaching periods per day on average.

The total number of course titles offered is larger in low-poverty schools, perhaps due to greater enrollment and resources necessary for hosting a differentiated curriculum. The percentage of ELA and math classes approved as meeting A-G standard (by the University of California admissions office) is somewhat lower in high-poverty schools (76.7% and 80.0%, respectively) than in low-poverty schools (80.8% and 83.7%).

Table 2 details the access of EL students to differing teachers and courses. We focus on ELs for two reasons. First, the state's course enrollment data center on this group among the three targeted groups: ELs, low-income students, and foster youth. Second, examining within-school teacher assignment to EL students is well aligned with our interest in assessing whether new

Table 1. Descriptive Statistics for Teacher Characteristics, Features of School Organization, and Curricular Structure by Low and High-Poverty High Schools (Q1 and Q4) in LAUSD, Pooled Data, 2013–14 to 2017–18.

		High schools		
		Overall	Mean by subgroup	
Category	Variables	*M*	Q1	Q4
Student characteristics	Enrollment	1107.6	1548.6	893.9
	The unduplicated pupil percentage of targeted student population (TSP)[a]	85.2	71.6	93.8
	% White	4.1	11.4	0.8
	% Hispanic or Latino	81.8	58.7	92.9
	% African American	8.1	15.3	4.4
	% Asian	2.2	4.7	0.9
Teacher staffing	% Teachers newly hired in the district	8.3	4.9	11.9
	% Novice teachers (<2 years of experience)	7.0	4.0	10.1
	% Teachers holding a master's degree or above	50.2	51.8	50.3
	Teacher employment status			
	% Tenured teachers	83.1	89.4	77.2
	% Long-term substitutes/ temporary employees	4.6	3.0	6.1
	% Probationary teachers	9.7	6.0	13.4
School organization and working conditions	Average class size (ELA)	24.1	25.7	24.4
	Average class size (Math)	25.6	26.8	26.2
	Average class periods assigned to teachers (ELA)	3.8	3.7	3.9
	Average class periods assigned to teachers (Math)	4.0	4.0	4.3
Curricular structure	Total number of courses offered in the school	59.4	74.8	50.6
	% Classes approved as A-G (ELA)	79.2	80.8	76.7
	% Classes approved as A-G (Math)	80.6	83.7	80.0
N	Number of schools	108	25	26
	Number of observations (school by year panel)	540	125	130

Note. LAUSD = Los Angeles Unified School District; ELA = English language arts; UPP = unduplicated pupil percentage.
[a]The unduplicated pupil percentage of free or reduced-price meal (FRPM) eligibility, English learner (EL), and foster youth data from the California Longitudinal Pupil Achievement Data System (CALPADS). Highest (lowest) poverty schools are those in the top (bottom) quartiles of school-level distributions of 5-year mean UPP counts, labeled as Q1 and Q4, respectively.

Table 2. Descriptive Statistics for Access of English Learners to Experienced Teachers and College-Preparatory (A-G) Classes, Pooled Data, 2013–14 to 2017–18.

Variable		Overall *M*	Mean by subgroup Q1	Q4
English learners' access to experienced teachers				
$\overline{\%EL_{Novice}} - \overline{\%EL_{Experienced}}$	ELA classes	4.4	4.4	3.5
	Math classes	9.2	8.0	16.7
$\overline{\%EL_{NonTenured}} - \overline{\%EL_{Tenured}}$	ELA classes	9.8	9.3	9.1
	Math classes	14.2	9.9	19.9
English learners' access to A-G classes				
$\overline{\%EL_{NonAG}} - \overline{\%EL_{AG}}$	ELA classes	36.2	30.1	43.4
	Math classes	18.8	16.0	23.8

Note. (1) $\overline{\%EL_{Novice}} - \overline{\%EL_{Experienced}}$: The average percentage of English learners (ELs) in classes taught by the novice teachers minus the average percentage of ELs in classes taught by the experienced teachers (more than 2 years of experience) within the school. (2) $\overline{\%EL_{NonTenured}} - \overline{\%EL_{Tenured}}$: The average percentage of ELs in classes taught by the nontenured teachers minus the average percentage of ELs in classes taught by the tenured teachers within the school. (3) $\overline{\%EL_{NonAG}} - \overline{\%EL_{AG}}$: The average percentage of ELs in classes not approved as A-G minus the average percentage of ELs in classes approved as A-G within the school. Highest (lowest) poverty schools are those in the top (bottom) quartiles of school-level distributions of 5-year mean UPP (2013–17) and are labeled as Q1 and Q4, respectively. ELA = English language arts; UPP = unduplicated pupil percentage.

school funding helps narrow achievement gaps, which are quite large, as shown in Table 3 and Figure 7.

So, we calculated a simple index that equals the mean percentage of ELs enrolled in classes taught by novice teachers (2 or fewer years of classroom experience), minus the mean percentage taught by experienced teachers (more than 2 years) within each school. This measure is generated from the *class-level* enrollment data, not the *student-level* data, which prevents us from replicating the exact same teacher-quality-gap measure used in Goldhaber et al. (2015).

In our study, a positive value of $\overline{\%EL_{Novice}} - \overline{\%EL_{Experienced}}$, for example, means that the classes taught by novice teachers are more likely to have higher shares of ELs compared with classes taught by experienced teachers. This class-level gap measure gives a snapshot of the extent to which ELs experience unequal access to experienced teachers within a school. Because this measure is based on within-school comparisons across classes, district-wide changes in the share of novice and experienced teachers do not affect its magnitude.

Table 3. Descriptive Statistics for Smarter Balanced State Assessment Results, Percentage Met or Exceeded Standard by Student Subgroup, 2014–15 to 2017–18.

		Overall	Mean by subgroup	
Subject	Variable	*M*	Q1	Q4
English language arts/literacy (ELA)	% Standard met or exceeded: Percent of students who has met or exceeded the achievement standard			
	(1) Fluent English proficient & English only	54.5	59.5	53.9
	(2) English learner	4.4	3.8	4.4
	Gap by EL status: (1) FEP–(2) EL	47.5	52.8	47.2
	(3) Not economically disadvantaged	51.9	62.6	37.4
	(4) Economically disadvantaged	49.0	55.1	47.2
	Gap by economic status: (3) Not disadvantaged–(4) disadvantaged	2.3	7.1	−6.4
Mathematics	% Standard met or exceeded: Percent of students who has met or exceeded the achievement standard			
	(1) Fluent English proficient & English only	20.2	27.9	17.4
	(2) English learner	2.2	3.2	1.5
	Gap by EL status: (1) FEP–(2) EL	17.2	24.9	15.1
	(3) Not economically disadvantaged	22.9	33.5	12.8
	(4) Economically disadvantaged	17.9	24.2	15.5
	Gap by economic status: (3) Not disadvantaged–(4) disadvantaged	3.7	9.1	−1.9

Note. Note that California did not conduct statewide testing in the first year after Local Control Funding was enacted, as California shifted to a new exam regimen. Highest (lowest) poverty schools are those in the top (bottom) quartiles of school-level distributions of 5-year mean unduplicated pupil percentage (2013–14 to 2017–18) and labeled as Q1 and Q4, respectively. EL = English learner; FEP = fluent-English-proficient.

We see in Table 2 that this gauge of ELs' unequal access to experienced or tenured teachers is much greater in math classes in high-poverty schools. These gaps are wider when focusing on access to A-G courses. The mean percentage of ELs enrolled in ELA classes not meeting A-G standards, minus the mean percentage of ELs enrolled in A-G, equals 43.4% in high-poverty, but 30.1% in low-poverty, schools. Similar disparities appear for math courses.

Turning to measures of student achievement, Table 3 reports the mean percentage of students meeting or exceeding state ELA and math standards, averaged over the 4 years for which comparable data are available. California shifted to the Smarter Balanced assessment in the second year of LCF implementation. For ELA, Row 1 shows that students designated as fluent-English-proficient (FEP) do better in low-poverty schools (59.5% meeting or exceeding standard), compared with peers attending high-poverty schools (53.9%). ELs do poorly on the state's ELA exam overall, not more than 5% meeting or exceeding standard.

Disparities between the two quartiles of schools are most stark in ELA when comparing *non*-economically disadvantaged students attending low-poverty schools (62.6% meeting or exceeding standard), versus peers attending high-poverty schools (just 37.4% meeting or exceeding). Similar results appear for pupil performance in math.

Estimation Strategy

A key concern in estimating the discrete effects of any finance reform is that variation in between-school spending may endogenously stem from a variety of confounding factors, including student background or collateral policy events. If disadvantaged students sort into lower quality schools and progressive finance programs award more dollars to schools with such pupils, analysts may attribute "effects" to the treatment, when in fact effects flow from prior unobserved pupil or family attributes. So, the methods challenge is to identify the source of variation in school spending that is induced, in our case, solely by the LCF finance reform.

A strong strategy for assessing the effects of LCF stems from the approaches developed by Johnson and Tanner (2018), which exploits two sources of exogeneity as drivers of school spending: the *timing* of reform events and the *funding formula* (allocating state dollars to districts or schools) that expresses the policy shift or discontinuity. Assuming the exact timing of the LCF reform is a random event, Johnson and Tanner identify exposed and unexposed birth cohorts, that is, experiencing the finance reform, using data on years during pre- and post-policy implementation.

In addition to the treatment-exposure measure, they construct a simulated instrumental variable (IV), defined as the LCF-intended amount of the supplemental and concentration grants (or "dosage") animated by the funding formula.[10] The LCF-induced changes in district-level per-pupil spending are assumed to be conditionally exogenous to changes in unobserved socio economic factors conditional on the level of high-need (weighted) students in each district.

Unfortunately, LAUSD officials did not create or release school-by-school spending reports prior to enactment of the 2013–14 finance reform. This absence of preintervention data prevents us from identifying the unexposed counterfactuals: exploiting the first source of exogeneity, timing of the reform event, is not a viable option for our analytic strategy. Thus, we rely mainly on the exogeneity of the policy event reflected in the funding formula when identifying the effect of variation in school spending on outcomes between schools and over time.

To examine the effect of LCF-induced funding increases on changes in our three sets of outcomes, based on the simulated IV approach, we estimate the following equations required for a two-stage least squares (2SLS) regression model:

$$\text{First stage}: \ln\left(PPE\right)_{st} = \alpha + \beta \cdot Dosage_{st} + \tilde{X}'_{st}\Gamma + \mu_s + \lambda_t + \epsilon_{st}.$$

$$\text{Second stage}: Y_{st} = \theta + \delta \cdot \ln\left(\widehat{PPE}\right)_{st} + \tilde{X}'_{st}\Pi + \rho_s + \tau_t + \upsilon_{st}.$$

where our endogenous treatment of interest, $\ln\left(PPE\right)_{st}$, is the natural log of per-pupil total school spending, instructional spending, or TSP Fund spending for high school s and for year t. $Dosage_{st}$ is the key variable in our design, containing the source of exogeneity, which indicates *the simulated instrumental variable* or *dosage*. $Dosage_{st}$ is the LCF-intended amount of supplemental and concentration grant dollars for high school s in year t, generated from the funding formula, $Dosage_{st} = \left\{0.20 \times Base_{st} \times UPP_{st}\right\} + \left\{0.50 \times Base_{st} \times \max\left[UPP_{st} - 0.55, 0\right]\right\}$ (see note 10 for details). $\tilde{X}_{st}$ is a matrix that includes mean-centered school-level time-varying confounders, such as logged student enrollment, percentage of TSP students, and pupil racial composition. School fixed effects μ_s, ρ_s and year fixed effects λ_t, τ_t are included in both equations to account for general underlying differences across schools and years, and to exploit only variation within school-by-year cells. ϵ_{st} and υ_{st} are random error terms.

The first-stage regression provides information on how the LCF policy altered the level of school spending. In the second-stage regression, we use only the portion of the school spending increase that can be explained by the LCF-intended funding generated by the formula. Thus, we are primarily interested in estimating the regression coefficient δ of the instrumented per-pupil school spending $\ln(\widehat{PPE})_{st}$. This represents the effect of LCF-induced increases in school spending per pupil on change in outcome Y_{st} after controlling for unobserved time-invariant school and year fixed effects, and the observed time-varying school-level factors.

This strategy depends on critical identification assumptions: (a) the simulated instrument $Dosage_{st}$ must be related to the potentially endogenous treatment variable $\ln(PPE)_{st}$ (nonzero effect of instrument), and (b) the simulated instrument $Dosage_{st}$ impacts the outcome Y_{st} only through the treatment $\ln(PPE)_{st}$, that is, there is no direct path from instrument to outcome, except through treatment (exclusion restriction). The validity of the first assumption can be empirically tested. Table 4 present the results of fitting the first-stage model. The results show that the simulated instrument $Dosage_{st}$ has a strong and statistically significant effect on the endogenous treatments—total school site spending, instructional spending, and TSP program spending—even after controlling for the school-level demographic variables included in the model. For example, a 1% increase in the LCF-intended amount of supplemental and concentration grants for high schools leads to a 0.67% increase in total school spending, 0.71% increase in instructional spending, and 1.24% increase in the TSP program spending.[11] Note that TSP spending shows the strongest relationship with $Dosage_{st}$.

For the second assumption, we evidence the credibility of our instrument $Dosage_{st}$, by explaining why there is not likely a third path that relates $Dosage_{st}$ directly to the outcomes Y_{st} . First of all, $Dosage_{st}$ reflects the exogeneity of the LCF formula imposed by district leaders' decisions. Earlier descriptive findings detail how LAUSD officials took into account the proportional representation of TSP students among high schools as they progressively allocated new LCF dollars (United Way, 2017). That is, they took into account the funding formula's emphasis on supplemental and concentration grants—the truly exogenous "shock" contained in the LCF reform—as they assigned differing amounts of new dollars to schools, based in part on relative shares of TSP students enrolled. Thus, the LCF-intended amount simulated by the funding formula is likely to be unrelated to other school-level changes that could affect our outcome measures during the same 5-year period.

One might argue a direct path operates between the LCF-intended amount, $Dosage_{st}$, to the school-level organizational changes, because $Dosage_{st}$ itself is a function of school-level enrollment and the overall level of school disadvantage. To address this threat to the validity of our instrument, we included

Table 4. Summary of Estimated Effects of the LCF-Intended Amount of Supplemental and Concentration Grant Dollars (*Dosage*$_{st}$) on the Per-Pupil Total School Site Spending, Instructional Spending, and TSP Fund Spending (Results of the First Stage Estimation of 2SLS-IV).

	Outcome variables (per-pupil, logged)		
Predictors	(1) Total school spending[a]	(2) Instructional spending[a]	(3) TSP program spending[a]
Simulated instrumental variable			
The LCF-intended amount of supplemental and concentration grant dollars (*Dosage*$_{st}$)[a]	0.67*** (0.24)	0.71*** (0.27)	1.24*** (0.52)
School-level time-varying covariates (X_{st})			
Enrollment[a]	0.66 (0.49)	−0.34*** (0.08)	0.12 (0.22)
The unduplicated pupil percentage of targeted student population (UPP_{st})	0.06* (0.04)	0.02** (0.01)	−0.02 (0.02)
% White	0.04 (0.11)	0.01 (0.01)	−0.07 (0.05)
% Hispanic or Latino	0.02 (0.08)	0.01 (0.01)	−0.05 (0.04)
% African American	0.01 (0.09)	0.00 (0.01)	−0.09* (0.04)
% Asian	0.13 (0.14)	0.01 (0.01)	0.04 (0.07)
School and year fixed effects	Yes	Yes	Yes
Number of schools	108	108	108
Number of observations (school by year panel)	540	540	432

Note. LCF = local control funding; TSP = targeted student population; 2SLS = two-stage least squares.
[a]Natural logs were taken for the outcome variables, $Dosage_{st}$, and enrollment.
$Dosage_{st}$ for school s in year t is generated from the funding formula, $Dosage_{st} = \{0.20 \times Base_{st} \times UPP_{st}\} + \{0.50 \times Base_{st} \times \max[UPP_{st} - 0.55, 0]\}$ where $Base_{st}$ is the *Base* grant that depends on enrollment and varies only by grade level and UPP_{st} (the unduplicated percentage of targeted student population): those eligible for free or reduced-price lunch, with limited English proficiency, or in foster care. Clustered standard errors based on schools are presented in parentheses.
*$p \leq .10$. **$p \leq .05$. ***$p \leq .01$.

$\tilde{X}_{st}$ in the first- and second-stage models, which include school-level time-varying covariates such as logged student enrollment, percentage of TSP students, and pupil racial composition. Their inclusion accounts for their potential direct impact on the school-level outcomes, thereby controlling for other processes that might have otherwise linked the $Dosage_{st}$ directly to the outcomes. Also, our inclusion of school and year fixed effects rules out additional potential sources of bias, such as time-invariant differences in school quality across schools or statewide changes due to economic cycles.

Given the two identifying assumptions, the coefficient δ should uncover the causal effect of LCF-induced school spending on teacher characteristics, school and curricular organization, and pupil achievement. In many situations, the impact of reform-induced school spending increases may differ according to the overall level of school disadvantage. To discern differences in the effect of LCF-induced school spending in high-need schools compared with low-need schools, an interaction term between $\ln(PPE)_{st}$ and school disadvantage level UPP_{st} was included and tested in the second-stage model. There are two endogenous predictors at the second stage, however, as the interaction between an endogenous predictor ($\ln(PPE)_{st}$) and an exogenous covariate (UPP_{st}) is itself potentially endogenous. To satisfy the rank condition (Wooldridge, 2002/2010), we fitted two first-stage models, one for each endogenous second-stage predictor: $\ln(PPE)_{st}$ and $\ln(PPE)_{st} \cdot UPP_{st}$. In each case, we regressed each endogenous predictor on the full complement of instruments and covariates: $Dosage_{st}$ and $Dosage_{st} \cdot UPP_{st}$, as implemented by Miller et al. (2018). Only the significant interaction terms were included in the final second-stage model.

Findings

Which Schools Received Greater Funding?

We first report on how funding increases allocated among L.A. high schools varied, based on their share of disadvantaged (weighted TSP) students enrolled, during the initial 5 years of implementation, 2013–14 to 2017–18. We also compare spending levels per pupil for total school-level spending, instructional spending, and spending from the district's TSP Fund.

We see in Figure 3 (Panel A) that total per-pupil spending began slightly higher for high-poverty schools (Q4) in 2013–14, the initial year of the state finance reform, compared with low-poverty schools (Q1). Total school-level spending then grew rapidly in high-poverty schools over the 5 years, from US$6,771 to US$8,398 per pupil, compared with a rise from US$6,044 in 2013–14 to US$7,708 in 2017–18 for low-poverty schools. These differences are consistent with the stated intent of the state's LCF finance reform, tracking to the state finance formula.

Spending trends look similar for instructional spending (Panel B), with two important exceptions. Growth in spending occurred during the initial 3

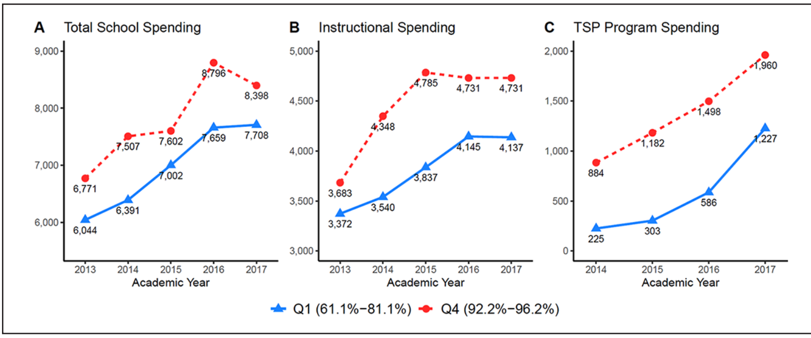

Figure 3. Average per-pupil spending for LAUSD high schools, 2013–14 to 2017–18.

Note. Total school spending based on school-site budgeted expenditures. This includes only operating expenditures for the general, day-to-day operation of high schools, and excludes expenditures for capital outlay, debt services, and other funds held at the district level. *Instructional spending* includes only categories of school-level spending directly related to instruction, such as teaching positions and instructional programs or services. *TSP program spending* is defined—from 2014–15 forward—as expenditures for programs to support the academic achievement of low-income, English learner, and foster-youth students as urged under the LCF reform. All dollars in constant 2016 dollars. LAUSD = Los Angeles Unified School District; TSP = targeted student population; LCF = local control funding.

years of implementation, then leveled-off in the final 2 years. This may reflect an initial surge in teacher hiring or staffing changes, followed by a steady state. Here too, spending per pupil grew more rapidly in the high-poverty schools, relative to low-poverty schools.

Allocations from the (post-reform) TSP Fund continued to climb, along with somewhat more progressive targeting on high-poverty schools (Panel C). By Year 5, spending from the TSP Fund equaled US$1,960 per pupil in high-poverty schools, compared with US$1,227 at low-poverty campuses. We again see that district leaders distributed this Fund's dollars according to the percentage of disadvantaged students attending schools.

Did Funding Gains Alter Teacher Staffing or School Organizations?

For each set of dependent outcomes—teacher staffing, school and curricular organization, and pupil achievement—we report descriptive trends over time and treatment effects that may have stemmed from the exogenous portion of the LCF reform as distributed among L.A. schools.

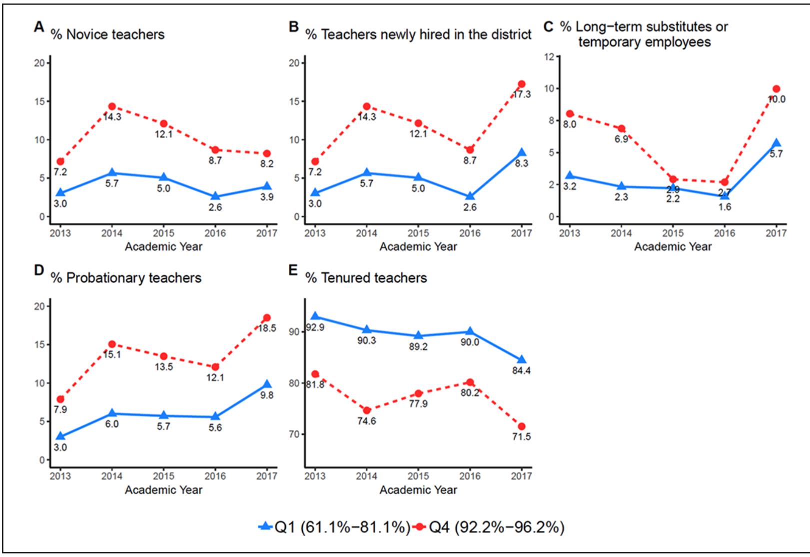

Figure 4. Change in teacher staffing for LAUSD high schools, 2013–14 to 2017–18.

Note. Highest (lowest) poverty schools are those in the top (bottom) quartiles of school-level distributions of 5-year mean TSP percentages (2013–14 to 2017–18), labeled as Q1 and Q4, respectively. LAUSD = Los Angeles Unified School District; TSP = targeted student population.

Teacher staffing. Figure 4 displays time trends for attributes of teaching-staff profiles across the district's high schools. We see that hiring of novice and probationary teachers surged in the opening 2 years of the reform, especially in high-poverty schools (Q4, Panels A and D). Then, after 2 years of settling, the uptick of inexperienced teachers occurred again in Year 5. In this final year of the time series, 18.5% of teachers held probationary (nontenured) status in high-poverty schools, compared with 9.8% in low-poverty schools. High-poverty schools also increased their reliance on long-term substitutes by Year 5.

Table 5 summarizes treatment effects on teacher staffing, estimated from the exogenous portion of the finance reform. Most action stems from instructional and TSP-Fund spending. Variation in the former spending category significantly predicts the percentage of teachers newly hired to the district (positive coefficient), novices (negative), and probationary teachers (positive). Given that natural logs were taken, a 10% difference in instructional spending is associated with a 7.1 percentage point difference in the share of staff made-up by probationary teachers. The same spending increment is

Table 5. Summary of Estimated Effects of Finance-Reform Induced Funding Increase on Teacher Staffing, Features of School Organization, and Curricular Structure.

Outcome variable	Model (1) Total school spending	Model (2) Instructional spending	Model (3) TSP program spending
% Teachers newly hired in the district	16.18 (11.89)	74.34** (34.11)	7.82** (3.53)
% Novice teachers (<2 years of experience)	−5.30* (2.32)	−22.22** (10.22)	−2.04** (0.85)
% Teachers holding a master's degree or above	8.84 (7.36)	42.05* (22.76)	5.68 (3.31)
Teacher employment status:			
% Tenured teachers	−17.51 (13.09)	−76.34** (38.44)	−7.54* (4.06)
% Long-term substitutes/ temporary employees	6.51 (5.58)	27.83 (19.30)	7.55*** (2.88)
% Probationary teachers	16.22 (18.89)	71.05** (33.60)	6.04* (3.18)
Average class size (ELA)	−1.55 (1.84)	−5.92*** (1.00)	−1.23 (1.97)
Average class size (Math)	0.15 (1.59)	−6.07*** (1.49)	−1.09** (0.50)
Average class periods assigned to teachers (ELA)	−0.24 (0.36)	−1.01 (1.61)	−0.13 (0.22)
Average class periods assigned to teachers (Math)	−0.33 (0.45)	−1.63** (0.78)	−0.20** (0.08)
Total number of courses offered in the school	7.31** (3.27)	42.94** (19.53)	3.07*** (0.66)
% Classes approved as A-G (ELA)	1.23 (14.41)	35.68* (21.45)	6.72** (3.36)
% Classes approved as A-G (ELA): Interaction effect with the UPP of disadvantaged students	−0.96 (13.53)	−0.50** (0.26)	−0.10*** (0.04)
% Classes approved as A-G (Math)	14.87 (11.69)	66.10* (34.58)	4.61*** (1.36)
School and year fixed effects	Yes	Yes	Yes
Time-varying covariates X_{st}	Yes	Yes	Yes
Number of schools	108	108	108
Number of observations (school by year panel)	540	540	432

Note. Time-varying covariates X_{st} include logged student enrollment, percentage of TSP students, percentages of white, Latino, African American, and Asian students. Clustered standard errors based on schools are presented in parentheses. TSP = targeted student population; ELA = English language arts; UPP = unduplicated pupil percentage.
*$p \leq .10$. **$p \leq .05$. ***$p \leq .01$.

associated with a 4.2 percentage point advantage in a school's ability to hire teachers with a master's degree.

Spending gains from the TSP Fund yielded similar effects, but at lower levels of magnitude. For example, a 10% advantage in Fund spending predicts 0.2% lower reliance on novice teachers. All estimation results control for school and year fixed effects and time-varying confounders listed at the foot of Table 5.

School and curricular organization. Figure 5 displays time trends for these organizational outcomes, possibly moved by school-level spending gains. We see that the count of course titles drifted upward, rising from about 73 to 79 in low-poverty schools (hosting larger enrollments on average), compared with an increase from 48 to 54 in high-poverty schools (Panel D). Rising budgets and the wane of *No Child* accountability pressure may have spurred schools to grow-out curricular diversity.

Average class size in math courses remained largely static in high-poverty schools at about 26 pupils per teacher over the 5 years, while declining by one child, 27 to 26 per teacher, in low-poverty schools (a similar pattern in ELA classes, Panel B). The mean count of teaching periods assigned to teachers declined slightly, from 4.1 to 3.9, but only in low-poverty schools.

Clear disparities in curricular structure appear when looking at the share of all courses that meet the A-G standard for ELA. This percentage declined from about 79% to 75% in high-poverty schools, while rising in low-poverty schools from 78% to 82% (Panels E and F). This pattern is more equitable for the rising share of A-G approved courses in math.

Table 5 shows how school funding gains—specific to instructional spending or from the TSP Fund—contributed significantly to lower class sizes in ELA and math, and in reducing the count of teaching periods assigned to instructional staff. A 10% difference in instructional spending between schools predicts 0.6 fewer pupils per math class. This budget increment predicts that about one in every six math teachers had one less course to teach each day on average.

In Table 5, we also see how variation in instructional spending gains predicts more course titles offered and higher shares of all courses meeting the A-G standard in math and ELA domains. Total spending and TSP Fund spending also predict a larger, more differentiated curriculum among schools. Note that we are reporting the significant interaction effect between instructional spending and the percentage of disadvantaged students on the percentage of A-G approved ELA classes among schools. A 10% increases in the LCF-induced instructional spending resulted in a 3.5 percentage point

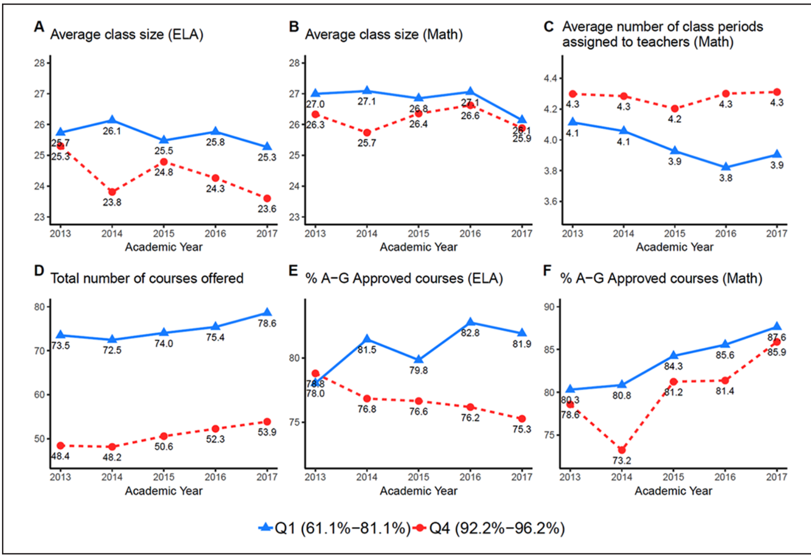

Figure 5. Change in school organizational features and curricular structure for LAUSD high schools, 2013–14 to 2017–18.
Note. Highest (lowest) poverty schools are those in the top (bottom) quartiles of school-level distributions of 5-year mean TSP percentages (2013–14 to 2017–18), labeled as Q1 and Q4, respectively. LAUSD = Los Angeles Unified School District; ELA = English language arts; TSP = targeted student population.

increase in A-G approved ELA classes when the TSP share of students equals zero (hypothetically the lowest poverty schools).

But the negative interaction effect implies, for example, that in a certain high poverty school with 90% of the TSP percentage level, the percent of A-G approved ELA classes would *decrease* by 9.3 percentage points per 10% increase in instructional spending (because $0.1 \times (35.68 - 0.50 \times 90) = -0.93$). From these estimation results, we can conclude that high and low-poverty schools responded differently to variable gains in instructional spending in structuring their curricular offerings.

Figure 6 details how growing counts of inexperienced teachers were often assigned to ELs, another key element of curricular structure. After subtracting the mean percentage of ELs in classes taught by probationary (nontenured) teachers from the share in classes taught by tenured teachers, we see a growing disparity for students in high-poverty schools (Panel B). This arithmetic difference rises from 14.9 to 27.3 in high-poverty schools, compared with remaining nearly flat over the period in low-poverty schools. The

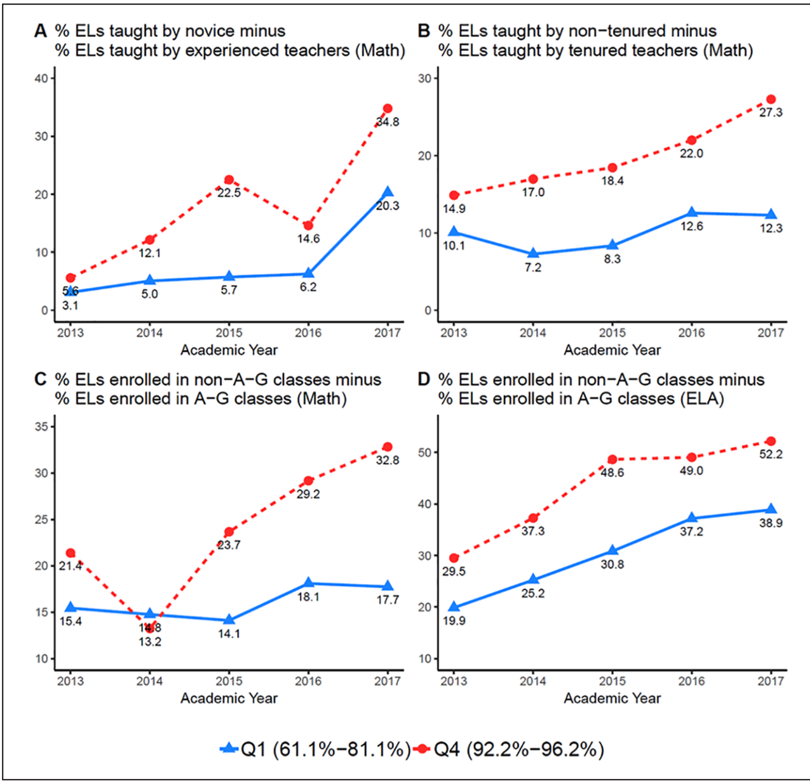

Figure 6. Change in disparity in access to experienced teachers and A-G classes for math and ELA, schools, 2013–14 to 2017–18.

Note. Highest (lowest) poverty schools are those in the top (bottom) quartiles of school-level distributions of 5-year mean TSP percentages (2013–14 to 2017–18), labeled as Q1 and Q4, respectively. ELA = English language arts; TSP = targeted student population; EL = English learners.

picture is better for ELs assigned to math courses, although the disparity persists between low- and high-poverty schools.

Panel C displays a similar inequity for the percentage of ELs gaining access to A-G math courses. This arithmetic gap rises to 32.8 for ELs attending high-poverty schools, relative to a disparity index of 17.7 for EL peers in low-poverty schools. ELs did gain greater access to A-G courses for ELA in high-poverty schools during the 5-year period, but the gap widened vis-à-vis peers in low-poverty schools (Panel D). Overall, high schools that enjoyed greater spending gains exacerbated disparities in ELs' access to experienced

Table 6. Summary of Estimated Effects of Finance-Reform Induced Funding Increase on Access of English Learners to Experienced Teachers and College-Preparatory (A-G) Classes.

Outcome variable	Model (1) Total school spending	Model (2) Instructional spending	Model (3) TSP program spending
English learners' access to experienced teachers			
$\overline{\%EL}_{Novice} - \overline{\%EL}_{Experienced}$ (ELA classes)	49.32 (65.32)	49.94 (110.30)	6.18 (7.01)
$\overline{\%EL}_{Novice} - \overline{\%EL}_{Experienced}$ (Math classes)	128.13 (180.65)	25.97** (12.90)	4.48 (5.27)
$\overline{\%EL}_{NonTenured} - \overline{\%EL}_{Tenured}$ (ELA classes)	22.79 (26.39)	55.26 (53.52)	3.18 (4.40)
$\overline{\%EL}_{NonTenured} - \overline{\%EL}_{Tenured}$ (Math classes)	18.36* (10.33)	37.66** (19.07)	5.35* (3.31)
English learners' access to A-G classes			
$\overline{\%EL}_{NonAG} - \overline{\%EL}_{AG}$ (ELA classes)	20.30** (10.10)	90.89*** (29.42)	10.13*** (2.44)
$\overline{\%EL}_{NonAG} - \overline{\%EL}_{AG}$ (Math classes)	8.57 (6.68)	44.42** (21.81)	4.06* 2.20
School and year fixed effects	Yes	Yes	Yes
Time-varying covariates X_{st}	Yes	Yes	Yes
Number of schools	96	96	96
Number of observations (school by year panel)	480	480	384

Note. (1) $\overline{\%EL}_{Novice} - \overline{\%EL}_{Experienced}$: The average percentage of English learners (ELs) in classes taught by the novice teachers minus the average percentage of ELs in classes taught by the experienced teachers (more than 2 years of experience) within the school. (2) $\overline{\%EL}_{NonTenured} - \overline{\%EL}_{Tenured}$: The average percentage of ELs in classes taught by the nontenured teachers minus the average percentage of ELs in classes taught by the tenured teachers within the school. (3) $\overline{\%EL}_{NonAG} - \overline{\%EL}_{AG}$: The average percentage of ELs in classes not approved as A-G minus the average percentage of ELs in classes approved as A-G within the school. Time-varying covariates X_{st} include logged student enrollment, percentage of TSP students, and percentages of white, Latino, African American, and Asian students. Clustered standard errors based on schools are presented in parentheses. TSP = targeted student population; ELA = English language arts; EL = English learners.
$^{*}p \leq .10$. $^{**}p \leq .05$. $^{***}p \leq .01$.

teachers and A-G courses, depending on whether they attended low- or high-poverty schools, as seen in Table 6. The arithmetic difference indicating the percentage of ELs in classes taught by novice minus the share in classes taught by experienced math teachers is 2.5 percentage points wider for each

10% increment in instructional spending, and 3.8 points wider for exposure to tenured versus probationary math teachers. We found no effect on ELs' access to experienced ELA teachers.

The regressive effect of instructional spending gains is worse when analyzing EL-student access to A-G courses. For each 10% increment in instructional spending, the disparity index meaning the share of ELs enrolled in non-A-G courses minus the share of ELs enrolling in A-G courses is 9.1 percentage points larger in ELA and 4.4 points larger in math classes. The robust return of elective courses not qualifying as college-prep, along with rising reliance on probationary teachers, appear to have further stratified ELs within the curricular structure, especially in high-poverty schools.

Did Funding Gains Raise Achievement or Narrow Disparities?

Student performance on state tests did rise overall during the 5-year period in Los Angeles, but patterns differ greatly by types of students and schools. Figure 7 (Panel A) shows that the percentage of pupils meeting or exceeding the state standard for ELA, split between ELs and peers who are fluent-English proficient (FEP). This share climbed for FEP pupils in low-poverty schools, for instance, from 53.8% to 60.2%, and from 46.8% to 52.4% in high-poverty schools. But ELs, already performing at low levels, drifted even lower.

Note in Panel B that economically disadvantaged pupils generally perform better when attending low-poverty schools, where the percentage at or exceeding standard in ELA rose from 50.8% to 54.5%. Economically disadvantaged students attending high-poverty schools saw their mean ELA performance move from 42.3% to 46.1% meeting or exceeding standard. We observe that the percentage of pupils, not economically disadvantaged, and who met or exceeded standard for ELA, climbed in both high- and low-poverty schools.

These patterns are similar when turning to math achievement (Panels C and D). Again, we see that gains are stronger for FEP and nondisadvantaged students, moving from 24.3% meeting or exceed standard for FEPs in 2014–15% to 28.6% in 2017–18. This compares to moving from 3.5% to 4.5% for ELs. A similar pattern appears in Panel D, except disadvantaged and nondisadvantaged students attending low-poverty schools perform better in math, compared with similar peers in high-poverty schools.

Table 7 reports how spending gains predict higher achievement levels, particularly for FEP and nondisadvantaged students. Again, effects are largest stemming from school-level instructional spending. The 10% hypothetical increment in spending predicts a 4.9 percentage point increase in the share

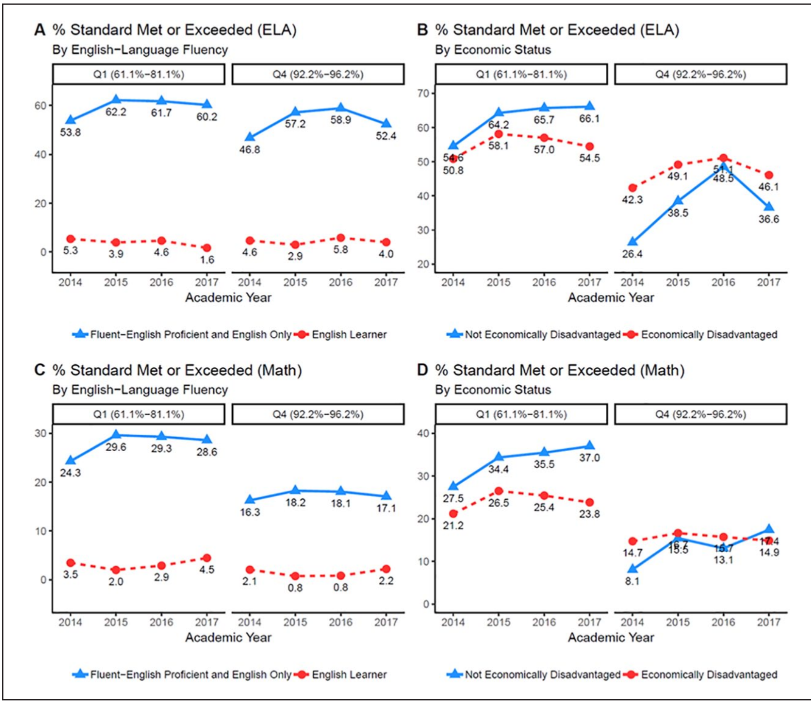

Figure 7. Change in smarter balanced state assessment results by student subgroup.

Note. Highest (lowest) poverty schools are those in the top (bottom) quartiles of school-level distributions of 5-year mean TSP percentages (2013–14 to 2017–18), labeled as Q1 and Q4, respectively. TSP = targeted student population; ELA = English language arts.

of FEP students at or exceeding standard in ELA, and a 2.4 point increase in math. Stronger spending from the TSP Fund does predict higher achievement for economically disadvantaged students in ELA and math, although at low magnitudes (0.4 and 0.2 percentage points, respectively, for a 10% increment in spending).

More worrisome, the gaps in achievement between EL and FEP students, and between economically disadvantaged and nondisadvantaged pupils, grew wider among high schools that received greater budget increases. This worsening inequity may stem, in part, from the fact that ELs were increasingly assigned to courses taught by inexperienced or probationary teachers. Additional research is required to see if low-performing black students or other subgroups also experienced this unequal sorting, especially as the

Table 7. Summary of Estimated Effects of Finance-Reform Induced Funding Increase on Smarter Balanced State Test Results, Percentage Met or Exceeded Standard by Student Subgroup, 2014–15 to2017–18.

	Model (1)	Model (2)	Model (3)
Outcome variable	Total school spending	Instructional spending	TSP program spending
% Standard met or exceeded on ELA assessment: Percent of students who has met or exceeded the achievement standard for ELA			
(1) Fluent English proficient & English only	9.42** (4.67)	48.85** (20.77)	5.11*** (1.97)
(2) English learner	−5.24 (5.27)	−15.19 (15.30)	−1.83 (1.74)
Gap by EL status: (1) FEP–(2) EL	5.82 (8.97)	63.62** (29.74)	3.01 (2.17)
(3) Not economically disadvantaged	49.62 (32.78)	86.44*** (28.72)	9.77*** (2.77)
(4) Economically disadvantaged	5.86* (3.14)	37.45** (18.73)	3.92** (1.83)
Gap by economic status: (3) Not disadvantaged–(4) disadvantaged	31.75 (23.25)	56.44** (22.27)	6.38*** (2.26)
% Standard met or exceeded on math assessment: Percent of students who has met or exceeded the achievement standard for Math			
(1) Fluent English proficient & English only	4.45* (2.42)	24.36** (11.02)	2.55** (1.05)
(2) English learner	−3.49 (2.75)	−8.18 (7.93)	−1.00 (0.96)
Gap by EL status: (1) FEP–(2) EL	4.39 (5.13)	14.56 (14.29)	1.78 (1.73)
(3) Not economically disadvantaged	31.41 (20.50)	53.89*** (20.21)	6.14*** (1.93)
(4) Economically disadvantaged	1.97 (1.64)	16.17 (9.99)	1.69* (1.00)
Gap by economic status: (3) Not disadvantaged–(4) disadvantaged	22.34 (16.44)	39.01** (18.07)	4.45** (1.84)
School and year fixed effects	Yes	Yes	Yes
Time-varying covariates X_{st}	Yes	Yes	Yes
Number of schools	96	96	96
Number of observations (school by year panel)	480	480	384

Note. Time-varying covariates X_{st} include logged student enrollment, percentage of TSP students, and percentages of white, Latino, African American, and Asian students. Clustered standard errors based on schools are presented in parentheses. TSP = targeted student population; ELA = English language arts; EL = English learner; FEP = fluent-English-proficient.
* $p \leq .10$. ** $p \leq .05$. *** $p \leq .01$.

curricular structure moved away from A-G college-prep courses. Schools benefiting from stronger funding gains naturally went into the labor market and found novice and probationary teachers, then assigned growing shares of EL students to their classes.

Discussion and Policy Implications

These findings offer positive and troubling results after assessing how California's ambitious finance reform unfolded among schools in Los Angeles. We do find that LAUSD leaders distributed greater resources to *high schools* that served larger concentrations of disadvantaged students during the initial 5 years of implementation, which set favorable conditions for improving teacher staffing and organizational features proximal to student learning. This progressive distributional strategy differed greatly from the district's funding of *elementary schools*, where new monies were spread evenly across campuses with little regard to varying levels of neighborhood wealth or poverty (Partnership for Los Angeles Schools, 2017; United Way, 2017).

LAUSD's strategy for high schools did pay off in some respects. Mean class size fell slightly, as did the count of teaching periods assigned to instructional staff, reflecting modest gains in working conditions. In addition, some may argue that broadening-out the curriculum and reviving (non-college-prep) electives will prove motivating for students. Additional research may eventually tie these and other organizational changes to rising learning curves. Schools that enjoyed stronger funding gains were somehow able to raise mean proficiency levels in math and English language arts. This bottom-line finding for Los Angeles high schools is consistent with California-wide results at the secondary level, stemming from the LCF finance reform (Johnson, 2019).

That said, our findings demonstrate that new funding may inadvertently operate to stratify disadvantaged students within schools and widen disparities in achievement. First, schools able to spend more, beginning in 2013–14, understandably led to a hiring surge, raising the share of teaching staff with little experience (novice and probationary teachers), along with pulling-in new instructors from outside the district. We do not assume that these newcomers were less effective than seasoned incumbents. But the novice and probationary teachers were unevenly assigned to EL students, not fluent English speakers, and this may have contributed to widening disparities in achievement over the 5-year period.

Second, the broadening of curricular offerings was perhaps predictable, as *No Child* and state accountability pressures waned as the new funding infusions arrived to L.A. schools. California stopped statewide testing in the first year of LCF implementation, as the education department transitioned to

Smarter Balanced assessments. But as the count of course titles grew, the share deemed college-prep by university authorities shrunk in corresponding fashion, particularly for ELA classes in high-poverty schools. Then, we find that EL students shifted proportionally away from A-G courses and into the non-college-prep electives. We do not yet know whether this contributed to mean achievement; but it is unlikely the drift away from college-prep courses for EL students would *reduce* disparities in achievement within or between high schools.

Third, we found that ELs and economically disadvantaged students performed better when attending low-poverty, rather than high-poverty, high schools. The past half-century of research on racially integrated schools points to similarly positive peer effects when poor kids attend schools with higher shares of middle-class peers (review, Reardon & Owens, 2014). Our finding is similar: Los Angeles pupils from poor or non-English speaking families outperformed very similar peers when attending schools with more nondisadvantaged or middle-class classmates. At the same time, this *between-school* inequity is rarely discussed publicly among LAUSD leaders, nor taken into account as they distribute new state funding.

On one hand, it is encouraging that L.A. district officials focused new dollars on the most challenged high schools, effectively altering staffing patterns and consequential elements of school organizations. Urban school districts like Los Angeles face rising health care costs and pension liabilities, obligations that divert new funding from classrooms, even before district officials decide on distributions among schools. Yet, district leaders have been able to apply the progressive spirit of the state reform as they distribute greater budget increases to high schools that hosted the proportionally largest populations of disadvantaged students. So, the fact that we heard a spending echo, observing discernible organizational change inside L.A. high schools, remains a promising finding.

At the same time, district leaders tended to scatter new initiatives among many separate programs. The TSP Fund alone continues to assign nearly a half-billion dollars to over 45 different spending items each year, from adding special education tutors to campus police officers, expanding the count of A-G courses to hiring restorative-justice counselors to reduce discipline problems.

What district chiefs did not anticipate was how schools would come to rely more on novice teachers and long-term substitutes, then expand the count of non-college-prep courses. And these forces within schools likely contributed to widening achievement gaps. Overall, the infusion of new dollars spurred action by a variety of civic activists and bureaucratic enclaves to boost funding for their favored programs, all the while ignoring the actions of principals, who quietly altered the curricular or social organization of their schools.

Our study holds two limitations, pointing to the urgency of additional research. We earlier mentioned how formal mediational models could advance our understanding of the mechanisms set in motion when new funding arrives to schools. The challenge is to uncover which mediators prove proximal to student motivation and learning. School finance studies typically separate the distributional flow of dollars to schools from in-depth study of organizational change inside (e.g., Bryk et al., 2010). But we know little empirically about the interplay between new resources moving into schools and how campus leaders convert dollars and staff positions into organizational change.

In addition, the lack of pretreatment budget data at the school level for LAUSD required that we employ an instrumental-variables approach, which constrains our ability to advance strong causal inferences. Importantly, our results for Los Angeles resemble staffing and organizational effects estimated among California's districts with the inclusion of pretreatment trend data (Johnson & Tanner, 2018; Lee & Fuller, 2017). The new federal requirement that districts must report school-level spending numbers could inform future research, as finance reforms and policy shocks continue to mark the education policy landscape.

Overall, these findings accent the importance of theorizing not only *whether* district leaders fairly distribute new revenues among schools, but also *how* new monies alter the staffing or social organization of campuses. The past generation of finance reforms in many states served to close wide disparities in per-pupil spending *among districts*, independent of a community's wealth. Longitudinal studies show how this shift has lifted the achievement of disadvantaged students, as reviewed above. But gaps in learning *among* and *within* schools in the same district have narrowed episodically and modestly over the past half-century.

Many states, like California, now allocate more for each disadvantaged student served, compared with lower base grants for pupils from middle-class and affluent families. The worry is that the political legitimacy of such progressive reforms will wane if new dollars fail to reach or lift intended students. If decentralized finance strategies prove unable to narrow disparities in learning, we may see the pendulum swing back to centralized, highly regulated interventions. After all, categorical aid shaped in Washington D.C. or state capitals emerged in the Great Society out of concern that affluent communities or labor unions would pull dollars away from politically weak families and their children, or divert new funding from classrooms.

Leaders of urban districts that benefit from weighted-pupil financing might articulate a clear logic of what staffing and social-organizational strategies they intend to set in motion. Then, track whether and how new resources accomplish these improvements inside schools. Without any theory of school-level change and evidence of narrower achievement gaps, political support for progressive finance may well fade.

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Notes

1. Thanks go to Bill Lucia of the EdVoice organization in Sacramento for this vivid analogy.
2. Between-school distributions in New York City under Mayor Michael J. Bloomberg became weighted toward disadvantaged students; yet more experienced teachers were disproportionately assigned (under seniority rules) to schools serving fewer poor students (Rubenstein et al., 2007).

3. Jerry Brown, a Democrat, consistently protected the discretion of local school boards. Vetoing a bill that would have required middle schools to begin classes later in the morning, Brown called it a "one-size-fits-all approach," opposed by teachers and school boards. "These are the types of decisions best handled in the local community" (Gutierrez & McBride, 2018).
4. A variety of social-justice groups began in 2005 advocating for widening the availability of A-G course in high school serving disadvantaged students, including the Community Coalition and Inner City Struggle. UCLA's John Rogers (2015) has documented this largely successful movement over the years.
5. The state counts weighted students just once, so-called "unduplicated pupils," when they fall into more than one category of disadvantage.
6. Statewide spending rebounded to just above pre-recession levels by 2016–2017 after adjusting for inflation, reaching US$10,657 per pupil (California Department of Education, 2016). This level still places California in the bottom third of all states nationwide. The bulk of LCF funding is tied to the nonweighted base grant, equaling US$45.3 billion in the same year, compared with US$5.7 and US$3.3 billion in supplemental and concentration grants, respectively.
7. LAUSD attorneys did not admit to any underspending on schools that served larger concentrations of disadvantaged pupils, despite two earlier state rulings to that effect. L.A. district officials overestimated what they had earlier spent on weighted pupils by as much as US$450 million per year, according to the ruling by the California Department of Education (2016). This allowed the district to allocate fewer new dollars for services that benefited the weighted students, relative to the level required if they had accurately reported their pre-LCF baseline level of support—until LAUSD compromised with the ACLU, allocating an additional US$151 million in the fifth year of implementing the state's WPF reform.
8. Assessment results for LAUSD students can be found at: https://caaspp.cde.ca.gov/sb2017/search.
9. Scholars tend to find that limited access to college-prep courses represents a form of curricular tracking that diminishes odds of college entry (review by Kanno & Kangas, 2014).
10. The official funding formula for district d is given by $Fund_d = Base_d + \{0.20 \times Base_d \times UPP_d\} + \{0.50 \times Base_d \times \max[UPP_d - 0.55, 0]\}$, where $Base_d$ is the *Base* grant that depends on enrollment and varies by grade level and UPP_d (the unduplicated percentage of disadvantaged students): those eligible for free or reduced-price meals, with limited English proficiency, or in foster care. The *supplemental* grant is 20% of $Base_d$ multiplied by the share of disadvantaged students. The *concentration* grant further raises an amount equal to 50% of $Base_d$ for each additional poor student enrolled after UPP_d surpasses 55% of the district's total enrollment.

    When generating the $Dosage_{st}$ in our estimation model, we first simulated the school-level base grant based on target base rates per average daily attendance (ADA) in four grade spans: K-3 (US$6,845), 4–6 (US$6,947), 7–8 (US$7,154), and 9–12 (US$8,289). Then we reflected adjustments to the K-3 and high school base rates included in the funding formula. The K-3 adjustment increases the K-3 base rates by 10.4% and the high school adjustment increases the grades 9–12 base rate by 2.6%. After the base grant is simulated for each school using ADA by grade span, we generated the supplemental and concentration grants according to the funding formula using the simulated base grant and UPP_{St} at the school level.

11. Because natural logs were taken for the outcome variables and $Dosage_{st}$, the regression coefficients of the logged simulated IV can be interpreted as the elasticity of outcomes with respect to $Dosage_{st}$, which is the percentage change in outcomes when $Dosage_{st}$ increases by 1%.

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