



California's Weighted Student Formula: Does it Help Money Matter More?

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This is the third paper in a three-part series analyzing early impacts of California's 2013 adoption of the watershed Local Control Funding Formula. The state's move effectively shifted control over spending decisions from the state legislature to local school districts and eliminated a slew of state-imposed spending rules that many local districts saw as impediments to doing the most with their dollars. At the heart of California's initiative is a weighted student funding model, designed to allocate funds on the basis of students and student needs and to let districts (WSF) and schools drive decisions about how to use their funds. California has undertaken one of the nation's largest WSF overhauls to date. As such, its experience is of national interest as more states move toward—or consider moving toward—weighted student funding.

PAPER ONE ASKS: “What did districts spend their new money on under a more flexible spending system?”

PAPER TWO ASKS: “How did districts distribute their state allocations across schools?”

THIS PAPER ASKS: “To what extent is California's initiative associated with an improved relationship between spending and student outcomes?”

California's LCFF was supposed to make money matter more

In 2013, California replaced its more prescriptive education finance formula with a weighted student formula (WSF) called the Local Control Funding Formula (LCFF). Under LCFF, the state granted districts both:

- a] Substantial new total dollars¹ (designed to be more equitable with greater increases for districts with more low-income students) and
- b] Greater flexibility in using those dollars (having stripped long-standing spending constraints on districts, thereby effectively shifting control to the local level).

1. From FY13 to FY16, statewide district revenues grew by 36%. Even after accounting for a mandatory hike in district payments to the state pension system over the same period, revenues still increased by 32%.

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As California's Weighted Student Funding law enters Year 5 of implementation, and a growing number of other states consider following suit, this paper provides an early investigation of whether we are seeing an improved relationship between spending and outcomes in the early years of LCFF.²

Why explore a change in the relationship between money and outcomes?

Given that one of WSF's main policy aims is to promote a more productive use of dollars, it makes sense to investigate the relationship between dollars and student outcomes. Specifically, in this paper, we ask: **Did the relationship between dollars and outcomes improve with LCFF?**

Notice that this is different than asking: "Are outcomes improving generally in California?" Or: "Does money matter in public education?" Those questions are also important and have been researched more fully elsewhere. Regarding student outcomes in California, early evidence from other research shows student test scores on the new state assessments are improving, although the achievement gaps persist. (These improvements occurred in tandem with the rollout of a new state-wide testing system for public school students. Thus, more time is needed to confirm upward trends).³

On the "does money matter" question, for decades, studies have tended to surface little if any positive correlation between spending and outcomes—even after accounting for student demographics. Some felt the research design in such studies was flawed as it focused on the effects of funding changes over the short-term rather than over the long haul. And correlation, of course, does not prove causation.⁴ Other researchers celebrated even a weak relationship between spending and student outcomes, but acknowledged that closing achievement gaps would essentially require a gigantic influx of new funds.⁵

In a noteworthy study, LaFortune, Rothstein and Persico (2016) found that when states substantially increase funding for the poorest districts, there is a measurable positive impact on test scores and a narrowing of the achievement gap.⁶ While this finding is promising, subsequent research also acknowledges that boosting spending in only the high-poverty districts is an insufficient means to close statewide achievement gaps given that low- and higher-income students are intermixed (albeit in different concentrations) across nearly all districts.⁷

2. A more thorough description of WSF and California's Local Control Funding Formula (LCFF) can be found in Paper One of this series.

3. See for instance PPIC's *K-12 Education* (2017). Available at

4. Research on the effects of short term funding has also produced limited results as demonstrated in studies of School Improvement Grants (SIGs). ADD CITE OR 2 ON SPECIFIC STUDIES HERE.

5. Insert loeb reference to a trillion dollars

6. Kirabo Jackson, Rucker Johnson, and Claudia Persico. "The Effects of School Spending on Education and Economic Outcomes: Evidence from School Finance Reforms." *The Quarterly Journal of Economics* (2016), pp. 157-218

7. Julien LaFortune, Jesse Rothstein, and Diane Whitmore Schanzenbach, "School Finance Reform and the Distribution of Student Achievement," National Bureau of Economic Research, Working Paper 22011, February 2016.

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Amid the research to date and the ongoing debates⁸ over the effect of money on outcomes is a near-uniform call for school-finance systems to help make money matter *more*. Essentially, that is a call to improve schooling's return on investment. Some point out that more money alone is "insufficient." Some advocate for policies that ensure funding is "allocated toward the most productive uses." Some underscore that "how the money is spent is equally important."⁹ All these ideas form an important part of what California's LCFF model purported to do: It was a strategy to make money matter more.

This study launches what we hope will be a new wave of much-needed research on education productivity. Our limited analysis investigates the relationship between spending and outcomes for the years immediately preceding LCFF and compares the results to the relationship computed for the years after LCFF. We acknowledge that this is a very preliminary glimpse at changing productivity in California districts. And we acknowledge that the research has some significant data limitations with myriad factors not controlled for in the analysis. All of this means our limited, first-look findings must be interpreted as tentative, with a healthy dose of caution on the side.

That said, our early findings suggest a more positive relationship between funding and student outcomes after LCFF than before LCFF. **In other words, money appeared to matter more in the wake of LCFF.**

California changes assessments at the same time it changes finance formula, confounding researchers

To investigate the change in relationship between spending and outcomes, this paper analyzes publicly available district-level financial and standardized test data (using students' mean scale scores) from roughly 600 California school systems.¹⁰ It is important to note that at the same time California started implementing its watershed funding formula in 2013, the state also changed its standardized student testing system. The final year of California Standardized Testing and Reporting (STAR) system testing was 2013. California schools then took a one-year testing "break" in 2014. Starting in 2015, schools administered the new California Assessment of Student Performance and Progress (CAASPP) Smarter Balanced tests.¹¹ Because of this change, researchers don't have apples-to-apples student test results to use in any pre- and post-LCFF analyses of effects.

8. See for instance a debate between Hanushek and Jackson, Johnson, and Persico available at: <http://educationnext.org/boosting-education-attainment-adult-earnings-school-spending>, <http://educationnext.org/money-matters-after-all>, <http://educationnext.org/not-right-ballpark>

9. See Hanushek (2017); Jackson et. al. (2016); and a quote from Jennifer Alexander in Carey (2016) https://www.nytimes.com/2016/12/12/nyregion/it-turns-out-spending-more-probably-does-improve-education.html?_r=0

10. Analysis included all California districts except for those with missing data; those excluded from analysis represent approximately 40% of the state's more than 900 districts.

11. California is by far the most populous state to adopt SBAC, aligned with the Common Core State Standards. Other states using SBAC include Connecticut, Delaware, Hawaii, Idaho, Michigan, Montana, Nevada, New Hampshire, North Dakota, Oregon, South Dakota, Vermont, Washington State, and West Virginia.

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For this analysis, we look at the relationship between spending and outcomes *within* districts over one-year intervals to see if the relationship has changed, which we can do even when the assessment changes. We also look at the relationship between spending and outcomes across districts year-by-year, controlling for other variables, and compare effects before and after LCFF. We use district general fund expenditures per pupil and analyze the relationship for each of the years for which state assessment data (of some type) were available: 2009 through 2013; and 2015 and 2016.

To be sure, the state's change in assessment (and the "break" year) still complicates matters. Later in this paper (see p.6), we discuss the myriad caveats associated with our early broad-strokes findings.

Measured relationship between funding and student achievement goes from negative to positive

To measure the relationship between funding and student achievement, we compare ordinary least squares (OLS) regressions of students' mean scale scores (MSS) in both mathematics and English (verbal) exams on total per-pupil expenditures (PPE) controlling for the percent of English learners and students who are low-income enough to qualify for a federal free or reduced-price school meals subsidy.

The regression formula is:

$$\ln(MSS)_i = \beta_0 + \beta_1 \ln(PPE)_i + \beta_2(\% ELL) + \beta_3(\% Free/Reduced Lunch)_i + \epsilon_i$$

We run the regression at the district level to measure how differences in student mean scale scores across districts can be accounted for by differences in per-pupil general fund expenditures across districts. We run this regression for each year from 2009 to 2013 and 2015 to 2016 (reflecting the break in state testing). The coefficient on funding per-student is compared before and after LCFF implementation to see if there is any noticeable difference in the relationship between the level of public school funding in any given district and student performance. We recognize that a deeper investigation might include additional relevant variables, like race, previous test scores, parents' career, etc. But we assume some of those other factors may have a consistent effect over the period studied.

Table 1 below gives the coefficient values and standard errors (in parentheses) for each regression of mean scale score on the explanatory variables. The regression analysis results reveal a highly statistically significant relationship between per-pupil expenditures and mean scale scores across all years, except for math mean scale scores in 2011 (the reason for this lack of significance is unclear).

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Table 1: Regression results show correlation between district per-pupil spending and student achievement turns positive after LCFF implementation.

Year	Math			Verbal		
	In(PPE)	Percent English Learner	Percent Subsidized Lunch	In(PPE)	Percent English Learner	Percent Subsidized Lunch
2009	-0.0267** (0.0101)	0.0003 (0.0001)	-0.0018*** (0.0001)	-0.0315*** (0.0066)	-0.0001 (0.0001)	-0.0016*** (0.0001)
2010	-0.0276*** (0.0106)	0.0004** (0.0002)	-0.0019** (0.0001)	-0.0358*** (0.0066)	0.00004 (0.0001)	-0.0017*** (0.0001)
2011	-0.0194 (0.0117)	0.0007*** (0.0002)	-0.0020*** (0.0001)	-0.0285*** (0.0073)	0.0003* (0.0001)	-0.0019*** (0.0001)
2012	-0.0419*** (0.0104)	0.0007*** (0.0002)	-0.0021*** (0.0001)	-0.0391*** (0.0066)	0.0002* (0.0001)	-0.0019*** (0.0001)
2013	-0.0430*** (0.0105)	0.0007*** (0.0002)	-0.0021*** (0.0001)	-0.0261*** (0.0061)	0.0002 (0.0001)	-0.0018*** (0.0001)
2015	0.0123*** (0.0024)	-0.0001* (0.00003)	-0.0005*** (0.00003)	0.0174*** (0.0029)	-0.0002*** (0.00004)	-0.0005*** (0.00003)
2016	0.0105*** (0.0025)	-0.00004 (0.00004)	-0.0005*** (0.00003)	0.0126*** (0.0028)	-0.0001** (0.00004)	-0.0005*** (0.00003)

Significance Codes: *** = 0, ** = 0.001, * = 0.01

Encouragingly, the direction of the relationship between spending and outcomes increases meaningfully after LCFF—shifting from negative to positive during the transition from the old funding system to the new weighted student funding model. For each year before LCFF (2009 to 2013), the relationship between spending and outcomes was negative—meaning that relatively higher spending in any given district was correlated with relatively lower student scores in that district. This trend appears to be reversed for each year with available test scores after LCFF (2015 to 2016), meaning higher levels of student funding were associated with higher test scores. For each year, the findings are considered highly significant (except, inexplicably, for math MSS in 2011, as noted earlier).

Caution must be exercised in interpreting these findings. The negative association between per-pupil spending and outcomes should not be interpreted as causal—meaning that greater levels of spending were causing lower test scores. Rather, within the limits of what’s measured and controlled for here, the measured association was negative in any given year prior to LCFF. That said, the move to a positive association suggests that despite any other factors affecting spending and outcomes, the relationship between

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the two became more positive in the years following LCFF. The level of funding compared across districts appeared to matter more *after* the policy change: In other words, money appeared to matter more.

Improved relationship also exists when examining only socioeconomically disadvantaged students

The same change in the relationship between per-pupil expenditures and outcomes can be observed when limiting the analysis to socioeconomically disadvantaged students, defined by the State Board of Education as “a student neither of whose parents have received a high school diploma” or “a student who is eligible for the free or reduced-price lunch program.”¹² What had been a negative association before LCFF, improves substantially after LCFF such that it becomes a positive association. Here again, what's relevant is the increase in the coefficient (showing a more positive relationship between spending and outcomes) and not the initial non-positive sign.

Can LCFF be celebrated as triggering an improvement in productivity? Short answer: “Possibly”

All told, it seems promising that public schooling in California is now measuring as more productive—meaning that higher expenditures are associated with higher student outcomes. What *caused* that change is more difficult to pinpoint. While LCFF implementation did coincide with the change in results, so did a host of other factors. Thus, to appropriately interpret the findings, we must address the significant caveats we've emphasized throughout this paper.

Specifically, we must acknowledge the other relevant factors at play during the period studied, including the change in student assessment. We know that mean scale scores from the new assessment are more positively correlated with per-pupil expenditures. But what we don't know is whether some aspect of the assessment sorts student performance differently (and perhaps overcomes whatever other factors were also responsible for the negative correlation between spending and outcomes pre-LCFF, such as the assessments use of complex vocabulary). It's also possible that the new assessments prompted new (more effective) teaching techniques that are the root cause of the improved relationship between spending and outcomes.

California also experienced an economic boom coinciding with LCFF implementation. But this analysis doesn't measure any possible ripple effects from the boom, such as the impact of improved state-wide employment on families or student outcomes. There

12. California Department of Education, “2009-10 APR Glossary-Growth API,” <https://www.cde.ca.gov/ta/ac/ap/glossary10e.asp>, accessed 30 October 2017.

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also could be some financial threshold such that a district crossing this funding threshold is what makes a positive difference in outcomes and if a district doesn't hit the threshold, the effect of additional funding is negative. We cannot isolate such a possibility in this analysis. In fact, we haven't measured any other factors at all during the timeframe studied.

So, in sum, LCFF *could* be partially responsible for this positive change. But the analysis does not definitively identify the financial reform as the cause of it.

Exploring different elements of LCFF: Could flexibility be a factor in the improved relationship?

Implementation of LCFF ushered in several changes at once in California districts, most notably an infusion of new funding (yielding greater equity with a formula that targeted high-needs students) and increased flexibility. The constraints of this analysis are such that we do not and cannot identify which of these is the responsible factor—or the more responsible factor—for the findings surfaced here.

That said, we did attempt to isolate the change in funding within districts to see if we could tease out any specific association between changes in funding within districts and improvements in student test scores before and after LCFF. Because of the change in the student assessment, we couldn't look at the change over the implementation period of LCFF, or at changes greater than one year since post-LCFF data was only available for 2015 to 2016. To try to isolate the effect of new funding, we analyzed the relationship between a change in per-pupil revenues within each district and the change in student test scores in the same district over the same time period. (Again, controlling for the percent of students with limited English proficiency and those receiving federally subsidized free or reduced-price lunch services). But looking at one-year changes both before and after LCFF, we find that a change in per-pupil revenues had no statistically significant association with changes in mean scale scores. (See Appendix I on p. X for more detailed analysis and findings).

Here again, similar cautions apply with the additional concern that we can only isolate the change from 2015 to 2016—a single year of an implementation underway since 2013. And because changes in mean scale score over the course of a single year are very small, it's difficult to find a significant relationship when attempting to measure the effects of a change in funding over time on student performance.

If later analysis continues to provide findings consistent with the analyses done here—and it continues to appear that a change in funding isn't what's driving the improved relationship between spending and outcomes—it's plausible that the increased flexibility in the California funding law may be playing a role in the more productive relationship.

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Such flexibility may translate into schools allocating funds more effectively now that many spending restrictions have been eliminated. But at this stage, such an explanation is merely a theory. Proving causation is beyond the scope of this limited analysis.

Key takeaways and looking ahead

Our early findings cautiously suggest a more positive relationship between level of funding and student outcomes after LCFF than before LCFF. In fact, the relationship between money and outcomes changed from relatively high levels of funding being associated with relatively lower outcomes before LCFF to relatively high levels of funding being associated with relatively higher outcomes after LCFF. Given the many factors not controlled for in this study, the pre-LCFF negative correlation should not be interpreted as “more money hurts outcomes.” But, although the analysis post-LCFF lacks the same controls, it still shows a more positive association.

We don't yet know whether these early student outcome trends relate to either of the key dimensions of LCFF: (1) substantial new dollars tied to student needs; (2) greater local flexibility in using those dollars. Or whether these early trends relate to myriad environmental factors not controlled for in this analysis. These factors could include everything from a more rigorous curriculum or higher-quality teacher training or increased community expectations for student outcomes—or simply a more robust economy. In our single-year analysis, we did not find that a change in funding within districts was associated with greater student achievement.

As more states continue to consider weighted student funding, there is a clear need for future research to help definitively answer whether LCFF and similar WSF initiatives are indeed prompting an improved relationship between money and outcomes, as these early findings suggest. After decades of research on whether more money matters, it's time to figure out what kind of policy can help ensure that money matters more.

THIS SERIES OF RAPID RESPONSE BRIEFS IS DESIGNED TO BRING RELEVANT FISCAL ANALYSES TO POLICYMAKERS AND EDUCATION LEADERS AMIDST THE CURRENT ECONOMIC ENVIRONMENT.

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Edunomics Lab is a university-based research center dedicated to exploring and modeling complex education fiscal decisions and growing the capacity of education leaders on the topic of education finance. The Edunomics Lab is affiliated with the McCourt School of Public Policy at Georgetown University.