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The Fiscal Consequences of School Closures in California: Evidence from a Statewide Synthetic Difference-in-Differences Design

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Abstract

School closures are frequently justified as fiscal necessities for districts confronting enrollment decline, rising per-pupil fixed costs, and persistent budgetary challenges. Yet causal evidence on their financial consequences remains limited. Drawing on data from all public school districts in California between 2011 and 2019, this study estimates the effect of entering a closure regime on district finances using a synthetic difference-in-differences design. This study estimates that school closures reduced per-pupil expenditures and revenues by approximately $440 each—a pattern of symmetric, imprecisely estimated effects that left districts' funding deficits and probability of achieving a balanced budget unchanged. These null effects were consistent across urban, rural, cash-strapped, and fiscally solvent district subgroups, and hold across a variety of robustness checks. Supplementary analyses reveal that closure regimes led to enrollment losses of 287 students, on average, but had no commensurate effects on the number of teachers, principals, or other district staff, leaving a predominant fixed-cost structure largely intact. These findings indicate (1) closures that occurred during the post-recession, pre-COVID decade did not, on average, improve the financial standing of California school districts; and (2) that the fiscal returns to closure were limited by closure-induced enrollment decline. Taken together, these findings suggest that school closure regimes should be understood as a complex financial restructuring process that affects expenditures and revenues through distinct mechanisms that can operate in offsetting ways. Moving forward, districts pursuing closures to improve their financial outlook should prioritize revenue optimization as a first-order objective, particularly in urban districts where revenue effects are most pronounced.

Keywords: school closures, district finance, synthetic difference-in-differences, Local Control Funding Formula, fiscal sustainability, California education policy

1. Introduction and Motivation

The permanent closure of public schools has become one of the most consequential and contested decisions in local educational governance. Across California and the United States, district administrators increasingly frame closure as a rational fiscal response to enrollment decline and rising per-pupil overhead—a strategy for consolidating underutilized facilities, reducing operating costs, and restoring budgetary balance (Hahnel & Pearman, 2023; Bifulco & Reback, 2014; Ladd & Singleton, 2017). The fiscal logic is straightforward: fewer buildings mean lower fixed costs, and lower fixed costs mean a healthier bottom line.

This logic, however, may discount institutional complexities that make the fiscal effects of closure empirically uncertain. Closures generate substantial transition costs—student reassignment, transportation reconfiguration, capital modifications at receiving schools, and legal and administrative expenses—that can offset near-term expenditure savings (Engberg et al., 2012; Brummet, 2014). Simultaneously, closure may alter district revenue streams through effects on enrollment. Under California's Local Control Funding Formula (LCFF), the vast majority of general-purpose revenue is allocated on a per-pupil (ADA) basis: enrollment losses, whether precipitated by or merely correlated with closure, directly reduce state apportionments. Because closure may simultaneously reduce both expenditures and revenues, its net fiscal consequences are not empirically obvious.

Existing research offers limited guidance: previous work focuses primarily on case studies of individual school districts that provide limited generalizability for California school districts (de la Torre et al., 2015; Larsen, 2020; Nguyen-Hoang, 2019); it disproportionately examines expenditure outcomes while neglecting revenues, leaving the overall fiscal picture incomplete (Nguyen-Hoang, 2019); and it relies on research designs that are difficult to defend when closure is precisely the response of fiscally deteriorating districts to pre-existing distress (i.e., endogeneity concerns) (Nguyen-Hoang, 2019; Rosburg et al., 2017). This study addresses each of these limitations through a synthetic difference-in-differences (SDID) design applied to the full population of California school districts between 2011 and 2019—a context that is particularly unique given several institutional features, including LCFF's enrollment-sensitive revenue system, county-office fiscal oversight, and the state's distinctive demographic trajectory.

2. State Context

LCFF's Enrollment-Sensitive Revenue Architecture. Enacted in 2013, California's Local Control Funding Formula consolidated a fragmented categorical funding system into a base grant allocated proportionally to average daily attendance, supplemented by equity-weighted grants for English learners, low-income students, and foster youth (Ladd & Singleton, 2017; Hahnel & Pearman, 2023). The defining feature of this system for the purposes of this study is its enrollment sensitivity: because the vast majority of general-purpose state revenue flows through an ADA-based formula, any reduction in average daily attendance—whether driven by demographic decline, family relocation, or the community disruption that school closure can produce—mechanically reduces state apportionments to the district. This linkage between enrollment and revenue is more direct and immediate in California than in states that distribute aid through block grants, foundation formulas with hold-harmless provisions, or property-tax-based systems less sensitive to short-run enrollment fluctuations, making revenue-side effects of closure particularly relevant in the California context (Nguyen-Hoang, 2019). Unlike many state funding systems, California's LCFF includes no permanent hold-harmless guarantee against enrollment-driven revenue losses; although multi-year ADA averaging can cushion short-term declines, sustained enrollment losses ultimately produce proportional reductions in state apportionments.

County-Office Fiscal Oversight. California operates one of the most active multilevel solvency oversight systems in the country. County offices of education (COEs) review annual district budgets and assign qualified or negative certifications to districts whose fiscal projections raise solvency concerns, with intervention powers ranging from expenditure restrictions to emergency apportionments and state receivership (Hahnel & Pearman, 2023). This oversight architecture creates institutional pressures that are directly relevant to closure decisions: districts approaching fiscal distress may accelerate consolidation plans to satisfy COE conditions for solvency certification, while COEs may explicitly recommend closure as part of a fiscal recovery plan. Assembly Bill 1912, enacted in September 2022, added a further procedural layer for financially distressed districts, requiring community engagement and a nine-metric equity impact analysis before any closure or consolidation can be approved. Together, these oversight mechanisms mean that closure decisions in California are not made in

isolation from state and county institutional actors—a feature that distinguishes the California context from states with weaker or purely advisory oversight regimes (Thompson, 2019; Saldána, 2025).

California's Distinctive Demographic Trajectory. California has experienced sustained and geographically uneven enrollment decline over the past two decades, driven by falling birth rates, domestic outmigration, and shifting immigration patterns (Hahnel & Pearman, 2023). Between 2003 and 2023, statewide public school enrollment fell by more than 700,000 students, with losses concentrated in urban core districts and older suburban communities while some exurban and rural districts maintained or grew their enrollment bases. This demographic unevenness matters for the study of school closure because it means that the districts most likely to enter closure regimes are those facing the sharpest enrollment declines—precisely the districts for whom the LCFF revenue mechanism creates the most acute fiscal exposure (e.g., districts that disproportionately serve high needs students). Understanding the fiscal consequences of closure in California thus requires attending to the demographic context in which closure decisions are made, including the likelihood that enrollment attrition both precedes and follows the onset of a closure regime.

Revenue Structure. In 2011, California districts drew approximately 55% of total revenues from state sources, 33% from local sources, and 13% from federal programs (NCES Common Core of Data, 2011). This state-heavy revenue mix means that enrollment-driven contractions in state apportionments represent the dominant fiscal channel through which demographic change affects district budgets—a structural feature that makes California's institutional context particularly relevant for studying the fiscal consequences of school closure.

3. Data

3.1 Analytic Sample

The primary sample consists of all traditional public school districts in California observed annually from fiscal year 2011 to 2019. The lower bound provides sufficient pre-treatment observations for SDID weight construction after the Great Recession; the upper bound excludes the COVID-19 period, during which federal emergency relief generated extraordinary fiscal shocks. Charter-only LEAs and county offices of education are excluded on governance grounds.

Four additional sample restrictions merit note. First, single-school districts are excluded from the primary analysis. In these cases, a school closure is functionally equivalent to district dissolution—a categorically different governance event with distinct fiscal mechanics that are not comparable to consolidation decisions within multi-school districts. Three further restrictions follow from the requirements of the SDID estimator. Second, SDID requires a balanced panel—every unit observed in every period—to construct the synthetic control weight matrix; districts missing any panel year are therefore excluded. Third, districts with missing values on any outcome variable in any year are dropped via listwise deletion, as unbalanced outcome coverage would likewise prevent weight construction. Fourth, districts first treated in the initial year of the panel (2011) are excluded because SDID requires at least one pre-treatment observation per unit to estimate the pre-treatment divergence that the unit weights are designed to minimize; districts treated at t = 1 provide no such baseline. The resulting primary panel contains approximately 796 districts per year, yielding 7,164 district-year observations.

3.2 School Closure Data

School closures are identified using the California Department of Education School Directory and cross-validated with the NCES Common Core of Data (CCD) School Universe Files. A school is coded as permanently closed if it ceases operations and does not reopen under the same CDS code within three years. The treatment definition excludes temporary closures, grade reconfigurations that do not eliminate a school entity, and closures of charter schools operating within district boundaries. This restriction targets genuine consolidation decisions rather than administrative reorganizations.

3.3 Financial Data

District fiscal data are drawn from the NCES Common Core of Data (CCD) Local Education Agency (School District) Finance Survey (F-33). The F-33 provides nationally standardized revenue and expenditure data collected annually from state education agencies, enabling consistent cross-district and cross-state comparisons. Key constructs include total revenues by source (local, state, and federal), current expenditures by function, and capital outlay—all reported at the LEA level. All financial variables are converted to constant 2019 dollars using the CPI-U.

4. Outcome Variables

Four outcome constructs capture distinct dimensions of district financial health.

Per-Pupil Funding Deficit. The primary outcome is the deficit per pupil, defined as $\text{Deficit}_{dt} = (E_{dt} - R_{dt}) / N_{d,2011}$, where E_{dt} and R_{dt} are total expenditures and revenues in district d at year t, and $N_{d,2011}$ is baseline enrollment. Anchoring the denominator to 2011 enrollment prevents mechanical inflation of per-pupil deficits from a declining enrollment base and preserves comparability across districts with different enrollment trajectories.

Balanced Budget Indicator. A binary indicator equal to one if $R_{dt} \geq E_{dt}$. This measure captures whether a district's revenue meets or exceeds its expenditures (i.e., attaining a balanced budget).

Per-Pupil Expenditures. Total inflation-adjusted expenditures per baseline pupil. Supplemental analyses disaggregate expenditures using F-33 subcategories including instruction, support services (encompassing pupil support, instructional staff support, and general administration), operations and maintenance, student transportation, and capital outlay, among others (see Table A in the Appendix).

Per-Pupil Revenues. Total inflation-adjusted revenues per baseline pupil. Supplementary analyses decompose total revenue into revenues from local sources (principally property taxes), revenues from state sources (including LCFF base grant apportionments and supplemental and concentration grants), and revenues from federal sources (including Title I Part A and IDEA).

5. Treatment

The primary treatment indicator is a binary, absorbing variable equal to one in all district-years at or after the district's first documented school closure between 2011 and 2019:

$$D_{dt} = \mathbf{1}(t \geq T_d) \quad (1)$$

where T_d is the first closure year for district d. Treating closure as absorbing reflects the institutional reality that districts rarely reopen closed schools and that entering a closure regime often initiates a multi-year process of consolidation and community adjustment. The primary estimand is the average treatment effect on the treated (ATT): the causal effect of entering a closure regime on the

fiscal outcomes of districts that actually entered one, relative to their counterfactual trajectory absent closure.

To approximate intensive-margin heterogeneity within this binary framework, supplementary analyses estimate separate models for districts closing exactly one school, exactly two schools, three or more schools, and at least 10% of their schools.

6. Estimation Strategy

6.1 Identification Challenge

Districts do not enter closure regimes at random. Closure is typically a response to enrollment decline, fiscal stress, and political pressures—forces predictive of the fiscal outcomes under study. Formally, if untreated potential outcomes follow a factor model admitting district-specific linear fiscal trends, $Y_{dt}(0) = \alpha_d + \lambda_t + \delta_d t + u_{dt}$, then closing districts likely have deteriorating pre-treatment trajectories ($\delta_d > 0$) that render the parallel trends assumption required for two-way fixed effects (TWFE) untenable. Staggered treatment timing compounds this problem: under heterogeneous treatment effects, TWFE assigns implicit negative weights across cohorts, generating estimates that are difficult to interpret causally (Goodman-Bacon, 2021; Callaway & Sant'Anna, 2021; Sun & Abraham, 2021).

6.2 Synthetic Difference-in-Differences

I adopt the synthetic difference-in-differences (SDID) estimator (Arkhangelsky et al., 2021) as the primary identification strategy. SDID combines the pre-treatment balancing logic of synthetic control with the differencing logic of DID, constructing unit weights w_d^{sc} that minimize the pre-treatment divergence between treated districts and a reweighted control group:

$$\min_w \Sigma_{t \le T_0} \lambda_t \left(\bar{Y}_{treated,t} - \Sigma_{d \in C} w_d Y_{dt} \right)^2, \quad \Sigma_d w_d = 1, \; w_d \ge 0 \qquad (2)$$

Time weights λ_t additionally downweight early pre-treatment periods less informative for predicting post-treatment dynamics. The resulting ATT estimator differences post-treatment divergence between treated and synthetic control groups, adjusted for residual pre-treatment differences:

$$\hat{\tau}^{SDID} = (\bar{Y}_{treated,post} - \Sigma_d \, w_d \, \bar{Y}_{d,post}) - (\bar{Y}_{treated,pre} - \Sigma_d \, w_d \, \bar{Y}_{d,pre}) \quad (3)$$

This two-stage adjustment yields an estimator that is doubly robust: consistent if either the unit reweighting or the time-differencing removes confounding (Arkhangelsky et al., 2021). The identifying assumption—that reweighted comparison districts provide valid post-treatment counterfactuals for treated districts—is substantially weaker than strict parallel trends and is evaluated empirically through event-study specifications and robustness checks.

6.3 Dynamic Event-Study Specifications

Fiscal adjustments following closure are likely to unfold over multiple years. To trace the adjustment path, I estimate dynamic specifications:

$$Y_{dt} = \alpha_d + \lambda_t + \Sigma_{k \neq -1} \beta_k \cdot \mathbf{1}(t - T_d = k) + \varepsilon_{dt} \quad (4)$$

where k indexes event time relative to first closure, with $k = -1$ as the reference period. Coefficients for $k < 0$ serve as pre-trend balance tests; coefficients for $k \geq 0$ trace the post-closure adjustment path.

6.4 Inference

All specifications use vce(bootstrap) as implemented in the sdid package, which resamples districts with replacement, reconstructs SDID weights, and re-estimates treatment effects across each iteration to propagate weight-construction uncertainty into inference. Standard errors and confidence intervals reported throughout are derived from this bootstrap procedure.

7. Results

7.1 Descriptive Summary

Figure 1 compares the financial standing of districts before and after school closure. For clarity of presentation, the figure is restricted to districts enrolling at least 5,000 students that experienced at least one closure between 2011 and 2019, and excludes three outlier districts whose revenue surplus or deficit in either period exceeded $50 million.

The horizontal axis represents a district's mean revenue surplus in the years preceding its first closure, with the vertical orange line indicating fiscal balance. Districts to the left of this line carried pre-closure funding deficits of varying magnitudes; districts to the right carried pre-closure revenue surpluses. The vertical axis represents the corresponding post-closure mean, with the horizontal orange line indicating fiscal balance in the post-closure period. Districts below this line were in deficit in the years following closure; districts above it had surpluses. Each marker represents a single district. Both axes are scaled in millions of constant 2019 dollars.

The intersecting reference lines partition the scatterplot into four quadrants. Districts in the upper-left quadrant entered closure with a funding deficit and exited with a revenue surplus—the most favorable fiscal trajectory among districts that closed with pre-existing deficits. Districts in the upper-right quadrant had surpluses both before and after closure. Districts in the lower-right quadrant transitioned from surplus to deficit following closure, suggesting deterioration from a position of relative stability. Districts in the lower-left quadrant remained in deficit throughout.

As shown in Figure 1, closing districts exhibit considerable heterogeneity in both pre- and post-closure fiscal standing, with roughly comparable representation across all four quadrants. Among districts that entered closure with a funding deficit—those to the left of the vertical reference line, for whom fiscal rationale for closure is most intuitive—a similar number remained in deficit as subsequently achieved surplus. Two contrasting cases illustrate this variation. Los Baños Unified and El Rancho Unified are similarly sized districts enrolling roughly 10,000 students, each closing a single school for the first time during the observation window. Both entered closure carrying a funding deficit of approximately $25 million. In the post-closure period, Los Baños remained in deficit at a comparable magnitude ($27 million), locating it in the lower-left quadrant, while El Rancho converted to a revenue surplus of $48 million, locating it in the upper-left quadrant.

The same heterogeneity characterizes districts that entered closure in fiscal surplus. Among districts to the right of the vertical reference line, post-closure outcomes are split roughly evenly between sustained surplus and subsequent deficit. Escondido Union and Rocklin Unified illustrate this pattern: each entered closure with a pre-closure surplus of approximately $90 million. Rocklin subsequently more than doubled its surplus, locating it in the upper-right quadrant, while Escondido transitioned to a deficit of $37 million, locating it in the lower-right quadrant.

Taken together, Figure 1 supports three descriptive conclusions. First, districts that enter closure regimes differ substantially in their fiscal standing in the years preceding closure, ranging from considerable surplus to notable deficit. Second, post-closure fiscal trajectories are similarly heterogeneous, with some districts improving and others deteriorating. Third, the probability of fiscal improvement following closure does not appear systematically related to pre-closure fiscal standing: with limited exceptions among a small cluster of districts in strong pre- and post-closure positions, the vertical distribution of outcomes is roughly uniform across the pre-closure fiscal distribution. There is, in other words, little descriptive evidence that financially distressed districts are especially well-positioned to realize post-closure savings, nor that financially stable districts are insulated from post-closure deterioration.

These patterns are informative but carry important limitations. Chief among them: descriptive patterns cannot establish causality. Closure may be both a response to fiscal distress and a contributor to longer-run fiscal trajectories, and the cross-sectional pre/post comparisons in Figure 1 cannot isolate closure's contribution from concurrent secular trends or district-specific shocks. The causal estimates in the following section address this limitation directly.

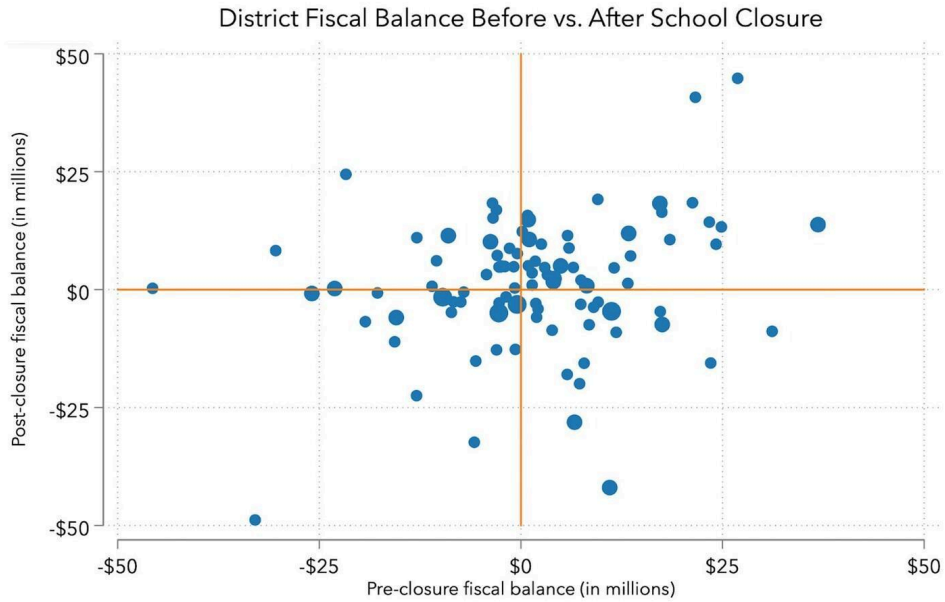

Figure 1. District Fiscal Balance Before vs. After School Closure. Each marker represents a single district. Axes are scaled in millions of constant 2019 dollars. Sample restricted to districts enrolling at least 5,000 students with at least one closure between 2011 and 2019; three outlier districts exceeding $50 million in surplus or deficit are excluded. Orange reference lines denote fiscal balance ($0) on each axis.

7.2 Main Regression Results

Table 1 presents SDID estimates of the ATT of entering a closure regime on each outcome, as specified in Equations 2–3. Table 2 reports estimates for four district subgroups: urban, rural, cash-strapped, and fiscally solvent districts. Columns report estimates for the per-pupil funding deficit, balanced-budget indicator, per-pupil total expenditures, and per-pupil total revenues. All expenditure, revenue, and deficit estimates are expressed as per-pupil dollar amounts.

Across all four outcomes, the primary SDID estimates for the full sample are statistically indistinguishable from zero. Table 1 indicates that entering a closure regime is associated with a $70.46 per-pupil reduction in the funding deficit, but this estimate is highly imprecise (SE = $204.62) and far from conventional significance thresholds. The balanced-budget indicator shows no statistically significant change (estimate = 0.03; SE = 0.05).

Point estimates are negative on both sides of the fiscal ledger in the full sample. The estimate for total expenditures is −$447.30 per pupil (SE = $387.86) and for total revenues is −$432.70 per pupil (SE = $443.78); neither approaches conventional significance thresholds. The near-symmetry of these negative point estimates is consistent with the null effects on funding deficit and budget balance: both sides of the ledger move in the same direction by roughly comparable magnitudes, leaving estimated net fiscal position unchanged.

Table 1. Synthetic Difference-in-Differences Estimates of the ATT of School Closures on California School District Finances, 2011–2019

	Funding Deficit	*Balanced Budget*	*Total Expenditures*	*Total Revenue*
School Closures	−70.46	0.03	−447.30	−432.70
	(204.62)	(0.05)	(387.86)	(443.78)
N	7,164	7,164	7,164	7,164

Note. All estimates for funding deficit, total expenditures, and total revenues are expressed as per-pupil dollar amounts. Funding deficit is total expenditures minus total revenue per baseline pupil. Balanced budget is a binary indicator of whether revenues exceeded expenditures. Standard errors clustered at the district level and shown in parentheses. *p < .05, **p < .01, ***p < .001 (two-tailed tests).

Table 2. Synthetic Difference-in-Differences Estimates of the ATT of School Closures on California School District Finances, by District Subgroup, 2011–2019

	Funding Deficit	*Balanced Budget*	*Total Expenditures*	*Total Revenue*
Panel A. Urban Districts				
School Closures	−386.84	0.15	−1,224.10*	−844.88***
	(237.90)	(0.10)	(489.55)	(251.88)
N	1,026	1,026	1,026	1,026
Panel B. Rural Districts				
School Closures	−65.16	0.06	−326.28	−888.41
	(1,003.92)	(0.09)	(1,508.38)	(1,821.60)
N	2,637	2,637	2,637	2,637
Panel C. Cash-Strapped School Districts				
School Closures	121.33	−0.02	−140.90	−220.27
	(258.39)	(0.11)	(413.78)	(283.88)
N	1,989	1,989	1,989	1,989
Panel D. Fiscally Solvent School Districts				
School Closures	−499.05	0.08	−692.56	−357.69
	(538.86)	(0.07)	(1,000.73)	(1,044.19)
N	3,006	3,006	3,006	3,006

Note. All estimates for funding deficit, total expenditures, and total revenues are expressed as per-pupil dollar amounts. Funding deficit is total expenditures minus total revenue per baseline pupil. Balanced budget is a binary indicator of whether revenues exceeded expenditures. Urban and rural classifications follow NCES locale codes. Cash-strapped districts are those whose financial position in the four years preceding the observation period (2007–2011) was characterized by average spending exceeding average revenue and average long-term debt exceeding average reserves. Fiscally solvent districts are those whose financial position during the same pre-observation period was characterized by average revenue exceeding average spending and average reserves exceeding average long-term debt. Standard errors clustered at the district level and shown in parentheses. *p < .05, **p < .01, ***p < .001 (two-tailed tests).

7.3 Event Study Results

The point estimates in Table 1 characterize average post-closure associations but do not reveal the temporal dynamics underlying them—whether fiscal effects emerge immediately and dissipate, accumulate gradually, or mask offsetting within-period movements. Figure 2 presents event-study estimates from Equation 4, tracing outcomes from five years before to five years after a district enters a closure regime. These specifications require a binary treatment indicator and express outcomes on a per-pupil basis; the robustness of these per-pupil estimates in Table 1 to alternative modeling and sample choices is documented in Table 3.

Several patterns emerge. First, across all four panels, pre-closure coefficients are small and tightly clustered around zero, providing strong evidence of pre-trend balance: districts that eventually

closed schools were not on meaningfully divergent fiscal trajectories in the years preceding closure, relative to their synthetic counterparts. This balance supports the validity of the SDID identifying assumption.

Second, Panel A shows that post-closure point estimates for the per-pupil funding deficit turn negative three years after entering a closure regime—indicating an improvement in fiscal position—but with confidence intervals that widen substantially across the post-closure window and encompass zero at all time points except for $k = 5$, for which the point estimate is statistically significant. Panel B is similar: the probability of achieving budget balance trends slightly upward in the post-closure period, but in this case no individual post-closure coefficient is statistically distinguishable from zero.

Third, Panels C and D reveal a more consistent negative pattern. Per-pupil expenditures decline markedly following closure, with point estimates in the range of −$600 to −$1,000 across post-closure event times $k = 1$ through $k = 5$. Per-pupil revenues exhibit a similar trajectory, with comparable negative point estimates across the post-closure window. In both panels the confidence bands are wide, and the per-pupil estimates cross zero in most individual years. Taken together, the event-study results reinforce the central finding: school closures do not, on average, improve the financial position of California districts.

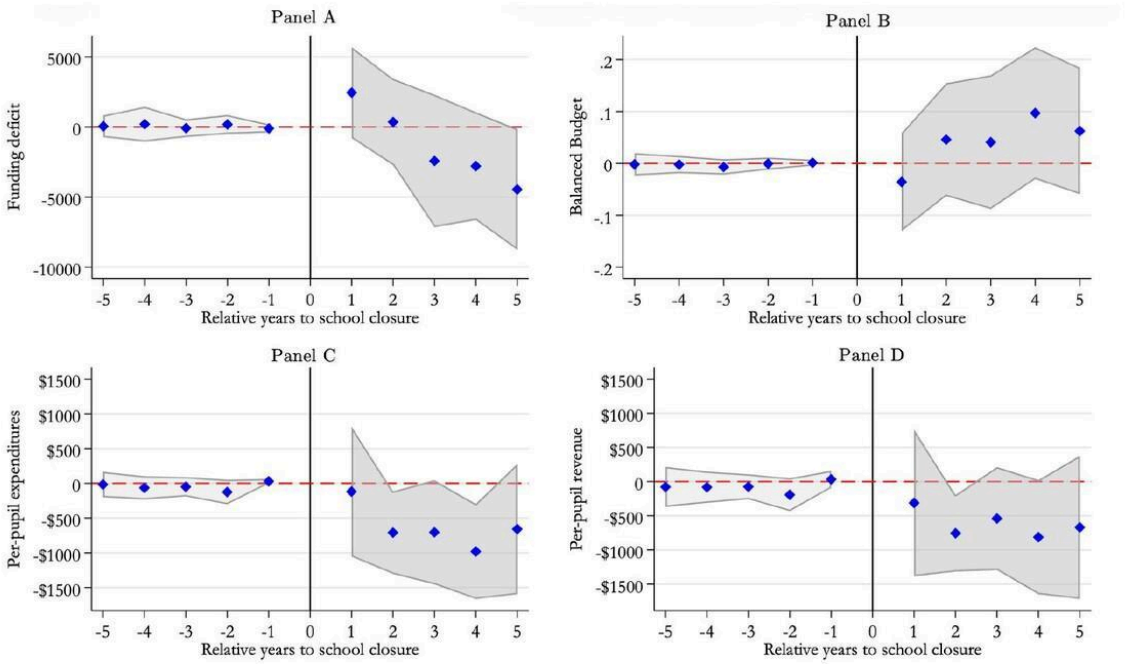

Figure 2. Event-Study Estimates of the Effect of School Closure on District Fiscal Outcomes, 2011–2019. Blue diamonds are SDID point estimates; shaded bands are 95% confidence intervals constructed via district-level block bootstrap. Event time k = −1 is the omitted reference year. Panel A: per-pupil funding deficit (in dollars); Panel B: balanced-budget probability; Panel C: per-pupil expenditures (in dollars); Panel D: per-pupil revenues (in dollars).

7.4 Subgroup Analyses

The main results characterize average effects across all California public school districts, but the fiscal consequences of closure may vary systematically with district characteristics. Table 2 reports SDID estimates separately for four district subgroups: urban districts, rural districts, cash-strapped districts, and fiscally solvent districts. Urban and rural classifications follow NCES locale codes. Cash-strapped districts are those whose financial position in the four years preceding the observation period (2007–2011) was characterized by average spending exceeding average revenue and average long-term debt exceeding average reserves. Fiscally solvent districts are those whose financial position during the same pre-observation period was characterized by average revenue exceeding average spending and average reserves exceeding average long-term debt.

Two dimensions of heterogeneity emerge from the subgroup analyses. First, the fiscal consequences of closure are meaningfully concentrated among urban districts. Panel A of Table 2

indicates that entering a closure regime in an urban district decreases per-pupil expenditures by $1,224.10 ($p < .05$) and per-pupil revenues by $844.88 ($p < .001$). Critically, the magnitude of revenue losses means that the relative financial standing of urban districts remains unchanged after entering a closure regime despite statistically meaningful declines in per-pupil expenditures. Neither the impact on funding deficits nor achieving a balanced-budget reaches statistical significance for urban districts.

Second, the overall pattern of null effects is robust across rural, cash-strapped, and fiscally solvent district subgroups. Panel B finds no statistically significant associations between closure and any fiscal outcome for rural districts, with standard errors approximately three to four times larger than the full-sample estimates, reflecting the heterogeneous fiscal circumstances and smaller treated sample in this classification. Panels C and D are similarly null: neither cash-strapped nor fiscally solvent districts show evidence of post-closure improvement or deterioration on any outcome of interest.

Of particular note is the null result among cash-strapped districts. This is the subset of California districts most likely to have pursued closure specifically as a fiscal intervention—confronting both the budgetary pressures that make closure attractive and the COE oversight architecture that may make it an expected condition of solvency certification. For this group, the study finds no evidence of post-closure improvement on any outcome. That is to say, even among districts with the strongest *ex ante* incentives to realize cost savings, closure is not associated with a measurable improvement in financial health.

7.5 Robustness Checks

Table 3 reports estimates from a battery of robustness checks designed to assess sensitivity to alternative modeling, measurement, and sample restrictions. The substantive conclusions are stable across specifications that (i) include charter schools in the closure count; (ii) include alternative schools in the closure count; (iii) restrict to closures of small schools by average enrollment threshold; (iv) use traditional two-way fixed effects or the Callaway–Sant'Anna estimator as alternative identification strategies; (v) employ treatment-onset lags of one, two, and three years to assess anticipation effects—which may arise because closure processes in California can span multiple years from announcement to implementation (Anglum, 2026); (vi) define treatment as closure of at least 10% of district schools; and (vii) include district-by-year time trends or district-level covariates. Placebo tests

assigning treatment to T+1, T+2, and T+3 produce estimates clustered around zero across all outcomes, providing reassurance that the primary null results are not an artifact of the SDID weight construction. Panel R restricts the treated sample to districts whose first closure occurred in 2015 or later to ensure that ARRA stimulus drawdown and the LCFF phase-in are fully absorbed into the pre-treatment baseline; estimates remain statistically indistinguishable from zero across all four outcomes, providing no evidence that these concurrent funding shocks are driving the primary null results.

Table 3. Synthetic Difference-in-Differences Estimates of the ATT of School Closures on District Finances, 2011–2019 — Robustness Checks

	Funding Deficit (per pupil, $)	*Balanced Budget*	*Total Expend. (per pupil, $)*	*Total Revenue (per pupil, $)*
Panel A. Primary Results				
School Closures	−70.46	0.03	−447.30	−432.70
	(291.23)	(0.05)	(387.86)	(443.78)
N	7,164	7,164	7,164	7,164
Panel B. Inclusion of Charter Schools				
School Closures	−177.25	0.03	−450.07	−337.70
	(203.75)	(0.04)	(334.34)	(352.52)
N	7,101	7,101	7,101	7,101
Panel C. Inclusion of Alternative Schools				
School Closures	−47.23	0.03	−465.83*	−478.14*
	(139.11)	(0.03)	(223.67)	(243.90)
N	7,164	7,164	7,164	7,164
Panel D. Closure of Small Schools (avg. enrollment < 100)				
School Closures	−139.84	0.05	−402.49	−353.78
	(182.38)	(0.05)	(333.75)	(307.39)
N	5,805	5,805	5,805	5,805
Panel E. Closure of Small Schools (avg. enrollment < 250)				
School Closures	−171.01	0.06	−526.46*	−425.98
	(199.43)	(0.05)	(246.62)	(228.49)
N	6,102	6,102	6,102	6,102
Panel F. Closure of Small Schools (avg. enrollment < 500)				
School Closures	−227.14	0.06	−573.49*	−404.11
	(172.47)	(0.04)	(260.68)	(222.75)
N	6,300	6,300	6,300	6,300
Panel G. Traditional Two-Way Fixed Effects				
School Closures	2.17	0.04	−35.49	−37.65
	(279.19)	(0.05)	(530.17)	(505.68)
N	7,164	7,164	7,164	7,164
Panel H. Callaway & Sant'Anna Estimator				
School Closures	−102.27	0.02	−677.60	−575.33
	(341.46)	(0.06)	(422.52)	(484.26)
N	7,164	7,164	7,164	7,164
Panel I. Treatment = 1-Year Lag				
School Closures	33.64	0.02	380.02	401.62
	(333.24)	(0.06)	(398.21)	(356.26)
N	6,975	6,975	6,975	6,975

	Funding Deficit	*Balanced*	*Total Expend.*	*Total Revenue*
Panel J. Treatment = 2-Year Lag				
School Closures	−270.59	0.02	380.96	607.90
	(332.91)	(0.07)	(521.48)	(494.16)
N	6,777	6,777	6,777	6,777
Panel K. Treatment = 3-Year Lag				
School Closures	−316.25	0.01	219.53	418.06
	(410.08)	(0.07)	(577.99)	(542.15)
N	6,633	6,633	6,633	6,633
Panel L. Treatment = 10% Closures				
School Closures	−237.49	0.05	−408.21	−245.39
	(226.95)	(0.04)	(542.56)	(476.86)
N	7,137	7,137	7,137	7,137
Panel M. Inclusion of District-by-Year Time Trends				
School Closures	−72.66	0.03	−447.07	−433.53
	(292.14)	(0.05)	(387.79)	(441.93)
N	7,164	7,164	7,164	7,164
Panel N. Inclusion of Covariates				
School Closures	−66.07	0.03	−429.80	−422.41
	(293.67)	(0.05)	(383.45)	(440.01)
N	7,164	7,164	7,164	7,164
Panel O. Placebo Test: T+1				
School Closures	−165.90	0.04	−201.26	−0.96
	(337.37)	(0.04)	(364.35)	(407.90)
N	7,164	7,164	7,164	7,164
Panel P. Placebo Test: T+2				
School Closures	−39.31	0.00	114.71	160.12
	(318.59)	(0.04)	(436.02)	(517.40)
N	7,164	7,164	7,164	7,164
Panel Q. Placebo Test: T+3				
School Closures	80.82	−0.02	282.57	266.89
	(325.48)	(0.04)	(543.17)	(668.74)
N	7,164	7,164	7,164	7,164
Panel R. Post-ARRA Cohorts Only (First Closure ≥ 2015)				
School Closures	174.01	0.07	50.46	756.92
	(805.01)	(0.09)	(1,315.39)	(1,457.17)
N	2,392	2,392	2,392	2,392

Note. All estimates for funding deficit, total expenditures, and total revenues are expressed as per-pupil dollar amounts. Funding deficit is total expenditures minus total revenue per baseline pupil. Balanced budget is a binary indicator of whether revenues exceeded expenditures. Standard errors in Panel A differ from those reported in Table 1 because Table 1 uses bootstrap standard errors while Table 3, Panel A, uses asymptotic cluster-robust standard errors; point estimates are identical. Standard errors clustered at the district level and shown in parentheses. *p < .05, **p < .01, ***p < .001 (two-tailed tests).

7.6 Supplementary Analyses

This section presents three supplementary analyses that characterize the mechanisms underlying the primary results: effects on district personnel, disaggregation of expenditure changes by F-33 category, and disaggregation of revenue changes by governmental source.

Personnel Impacts. Table 4 reports SDID estimates of the effect of entering a school closure regime on four district personnel outcomes: student enrollment, teacher counts, principal counts, and total district staff. The most notable finding is that closure is associated with a statistically significant decline of 287.67 students ($p < .05$), confirming that entering a closure regime is accompanied by meaningful enrollment attrition. This result is important for interpreting the primary financial findings: because LCFF apportions state general assistance on a per-ADA basis, enrollment losses of this magnitude translate directly into revenue reductions, providing a concrete empirical anchor for the mechanism described in the Discussion. In contrast, closure is not associated with statistically significant changes in teacher counts, principal counts, or total district staff, suggesting that personnel costs do not contract commensurately with the student population loss.

Table 4. Synthetic Difference-in-Differences Estimates of the ATT of School Closures on School District Personnel

	Students	*Teachers*	*Principals*	*Total District Staff*
School Closures	−287.67*	0.78	1.90	22.15
	(137.27)	(9.87)	(1.41)	(18.40)
N	7,164	6,984	6,975	6,984

Note. All outcomes are measured in count units (number of students, teachers, principals, or total staff). Standard errors are clustered at the district level and shown in parentheses. *p < .05, **p < .01, ***p < .001 (two-tailed tests).

Expenditure Decomposition. Supplemental analysis of expenditure changes by F-33 category is reported in Figure A1 in the Appendix. Point estimates are negative for both instructional expenditures and support services—the two largest operating cost categories—with estimates of approximately −$350,000 to −$450,000 and −$200,000 to −$300,000 respectively. Notably, the negative point estimate for instructional expenditures does not necessarily imply a reduction in teaching staff—a finding consistent with the null effects on teacher counts reported in Table 4. Rather, F-33 instructional expenditures encompass a broader set of costs including instructional materials, paraprofessional aides, and contracted instructional services, any of which may contract modestly following closure without a commensurate reduction in classroom teachers. Capital outlay and external payment

categories are near zero or statistically indistinguishable from zero. Taken together, the expenditure decomposition is consistent with the personnel findings: operating costs do not contract sharply or selectively in ways that would produce a meaningful fiscal benefits.

Revenue Decomposition. Supplemental disaggregation of revenue changes by governmental source is reported in Figures A2–A4 in the Appendix. At the state level, General Assistance revenue—the primary LCFF formula grant category—accounts for the largest single revenue movement, with a point estimate of approximately −$350,000 and a confidence interval spanning roughly −$500,000 to −$200,000. This pattern is a direct consequence of LCFF's ADA-based architecture: closures that induce enrollment attrition reduce state apportionments automatically and proportionally, making state general assistance the dominant channel through which closure affects district revenue in California. At the federal level, Title I Part A and IDEA both show negative point estimates consistent with the displacement of economically disadvantaged and disability-status students who carry federal formula weights, though both estimates are imprecise and cross zero. At the local level, revenue subcategory estimates are tightly clustered around zero. Together, these patterns confirm that enrollment-driven state revenue contraction is the primary fiscal mechanism at work.

8. Discussion

As school districts across California confront mounting enrollment losses and persistent budgetary pressures, school closure has emerged as a dominant administrative response, justified routinely on fiscal grounds. This study provides credibly causal evidence on whether that fiscal rationale holds. The findings are clear: entering a school closure regime does not, on average, improve the financial outlook of California school districts.

The revenue decomposition highlights an important mechanism. State General Assistance revenue—the primary formula grant under California's Local Control Funding Formula—accounts for the largest single revenue movement following closure, with point estimates suggesting declines of approximately $350,000, on average, when a district enters a closure regime. This is a predictable consequence of LCFF's architecture: because state revenue is allocated almost entirely on the basis of

average daily attendance, any closure-related enrollment attrition triggers an automatic and proportional contraction in state apportionments.

The personnel analysis reported in Table 4 confirms that this attrition is empirically real: entering a closure regime is associated with a statistically significant reduction of approximately 287 students. A back-of-the-envelope calculation illustrates the mechanism directly: at the statewide average LCFF base grant of approximately $8,500 per ADA, the estimated post-closure enrollment loss of 287 students translates to roughly $2.4 million in foregone state revenue per closure event—a figure broadly consistent with the total revenue point estimates reported in Table 1.

Notably, however, the same analysis finds no statistically significant reductions in teacher counts, principal counts, or total district staff following closure. This asymmetry is substantively important: it suggests that school closures in California occur largely in the absence of commensurate workforce reductions, leaving the fixed-cost structure of the district broadly intact even as the student population—and with it, ADA-based revenue—contracts. Under these conditions, the expenditure savings that motivate closure as a fiscal strategy are unlikely to materialize in full, which helps explain why point estimates for total expenditures are imprecise and why no net improvement in fiscal health is observed.

Among urban districts, expenditure and revenue declines are both precisely estimated and statistically significant, yet they are roughly symmetric in magnitude, again producing null effects on funding deficits and budget balance. This urban pattern is consistent with the broader literature on school closure and district finance: large urban districts, which rely heavily on enrollment-weighted state apportionments and serve higher concentrations of Title I and special education students, are especially exposed to the revenue consequences of post-closure enrollment attrition. That urban districts in California show the most precisely estimated effects on both sides of the ledger—while still showing null effects on fiscal health—speaks directly to the enrollment-revenue link that LCFF makes particularly acute.

The null result among cash-strapped districts is also notable. This is the subgroup for whom the fiscal rationale for closure is most intuitively compelling: districts that entered the study window already carrying deficits and long-term debt in excess of reserves, for whom cost reduction is not an aspiration but an institutional necessity. That even these districts show no evidence of post-closure

fiscal improvement suggests that the revenue mechanism is not selective. It does not spare districts that are most desperate for savings. The ADA-based revenue contraction operates regardless of a district's pre-closure fiscal position, offsetting whatever expenditure savings the consolidation process produces.

Four implications follow for policy and practice. First, districts considering school closure as a fiscal stabilization strategy should not assume that expenditure savings will translate into improved fiscal health. Under California's current funding system, that assumption is not supported by the evidence. Districts that close schools while experiencing enrollment attrition—whether driven by community flight, family reassignment decisions, or the signaling effects of closure itself—may find that revenues decline at roughly the same rate as instructional and support costs, leaving the net fiscal benefit close to zero.

Second, to the extent that districts can retain enrollment following closure—by investing in transition quality, managing the community engagement process in ways that limit family attrition, and targeting closures in ways that minimize displacement of federally weighted student populations—the revenue losses that currently offset expenditure savings could, in principle, be reduced. The personnel results reported in Table 4 underscore the stakes of this challenge: with an average post-closure student loss of approximately 287 students, the corresponding LCFF revenue reduction is not a marginal concern but a structural fiscal consequence that enrollment retention strategies must be designed to address. Whether and how that retention is achievable at scale is an empirical question that future research should address.

Relatedly, these findings suggest that the current approach to school closure is largely devoid of deliberate revenue-optimization strategies—a gap that both districts and state policymakers are well-positioned to address. In particular, the revenue side of school closure processes may offer meaningful opportunities for interventions. Beyond the enrollment-retention strategies described above, districts that close schools hold potentially valuable real property assets whose fiscal contribution to the district depends almost entirely on what is done with them after closure. A closure process designed with revenue generation as a first-order objective—rather than an afterthought—could look substantially different from current practice: it would prioritize buildings with

high repurposing potential, sequence closures to minimize ADA attrition, and engage revenue planning concurrently with the community engagement process that AB 1912 already requires.

In practice, however, converting a closed school into a revenue-generating asset is constrained by a dense regulatory environment. California's surplus property disposition framework—including right-of-first-refusal requirements under the Naylor Act and structural conversion requirements under the Field Act—creates legal and logistical barriers that extend the timeline between closure and any realized revenue, limiting districts' ability to monetize closed facilities on a timeline that would meaningfully offset the fiscal losses documented here. Streamlining these pathways, through legislative reform that gives financially distressed districts greater flexibility to repurpose, lease, or sell closed buildings on an accelerated timeline, could meaningfully alter the fiscal calculus that this study documents. Addressing these regulatory constraints alongside the enrollment-revenue dynamics that LCFF creates would represent a more complete and intentional policy response to the fiscal challenges that motivate school closure in the first place.

These findings should also be situated alongside evidence on the non-fiscal consequences of school closure. Prior research has documented that closures can adversely affect student achievement, reduce graduation rates, diminish long-run educational attainment and labor market outcomes, and exacerbate neighborhood instability, with effects concentrated among low-income students and students of color (Engberg et al., 2012; Brummet, 2014; Kim, 2023). Given the null findings observed in this study, the case for closure regimes as a general-purpose financial improvement strategy for California school districts rests on thin ground. Decisions to close schools will need to be weighed carefully against these broader social costs.

9. Conclusions

In an era of broadscale restructuring of California school districts, when administrators and policymakers are confronting enrollment losses and mounting budgetary pressures, this study provides evidence that school closure alone—absent deliberate strategies to retain enrollment and stabilize revenue—is unlikely to deliver the fiscal improvement districts anticipate. Moving forward, decision-making around school closures will need to account for the enrollment-revenue dynamics that

California's funding system creates, weigh potential fiscal adjustments against the broader social costs of closure, and attend carefully to the equity implications of consolidation decisions in communities that have historically borne the heaviest burden of disinvestment.

Appendix A

Expenditure and Revenue Disaggregation

Figures A1–A4 present SDID estimates of the effect of entering a school closure regime on district expenditures and revenues, disaggregated by F-33 category and governmental source respectively. These figures supplement the primary findings reported in Section 7.6.

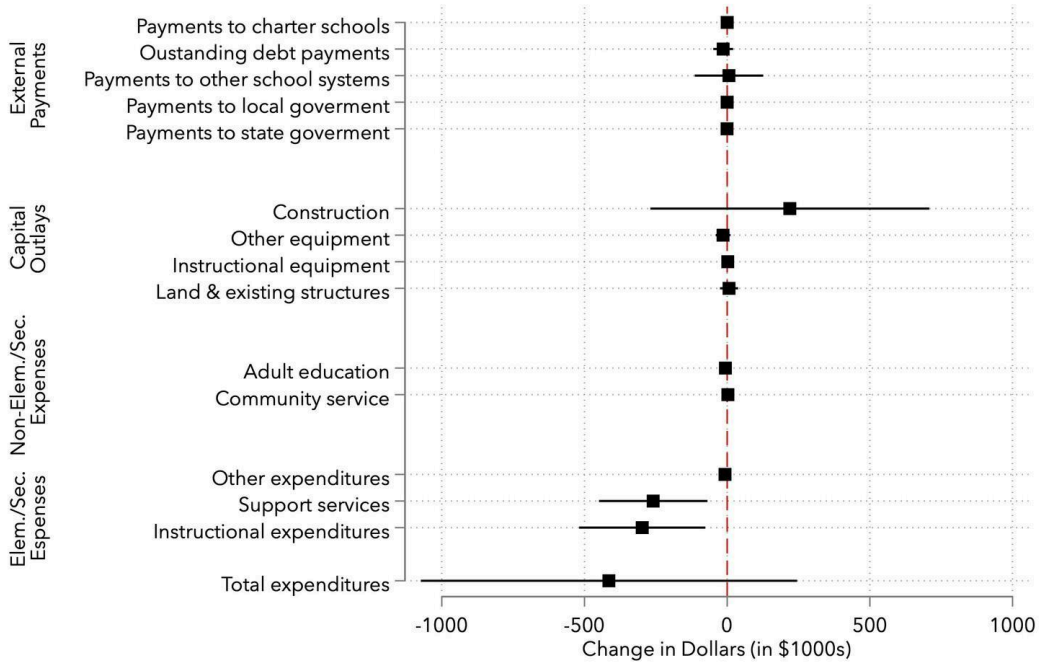

Figure A1. SDID Estimates of the Effect of School Closure on District Expenditures by F-33 Category. Point estimates and 95% confidence intervals. Categories are grouped by expenditure type: elementary and secondary expenses, non-elementary/secondary expenses, capital outlays, and external payments. All outcomes scaled in $1,000s.

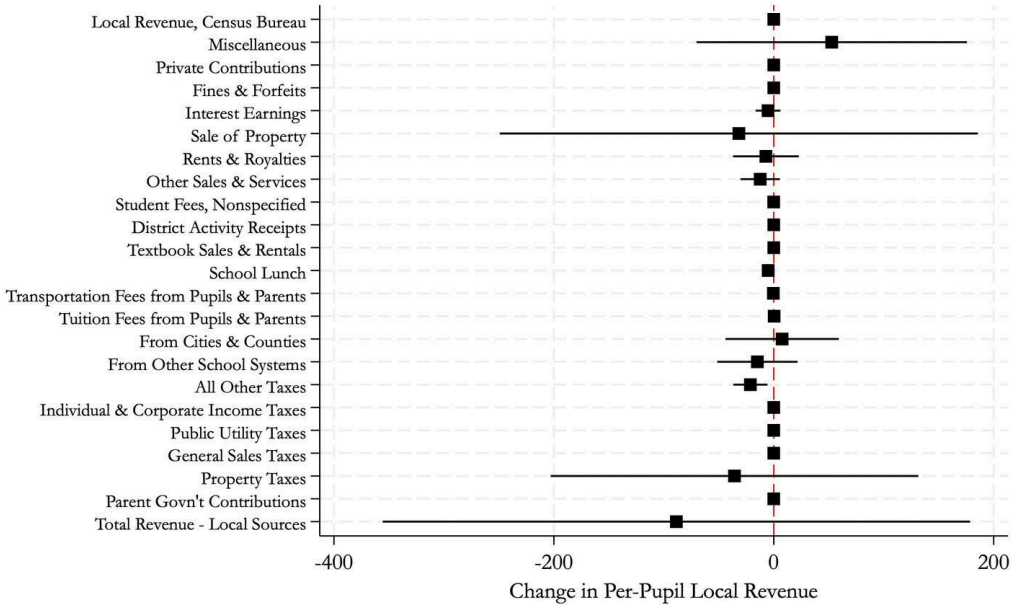

Figure A2. SDID Estimates of the Effect of School Closure on Per-Pupil Local Revenue by F-33 Subcategory. Point estimates and 95% confidence intervals. Outcome scaled as change in per-pupil local revenue (in dollars).

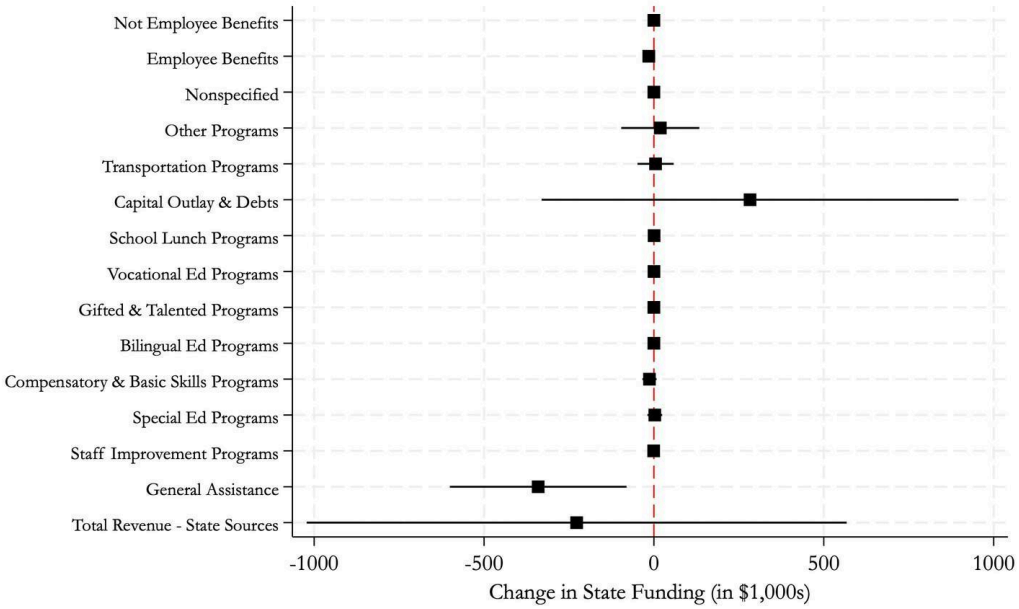

Figure A3. SDID Estimates of the Effect of School Closure on State Funding by F-33 Subcategory. Point estimates and 95% confidence intervals. All outcomes scaled in $1,000s.

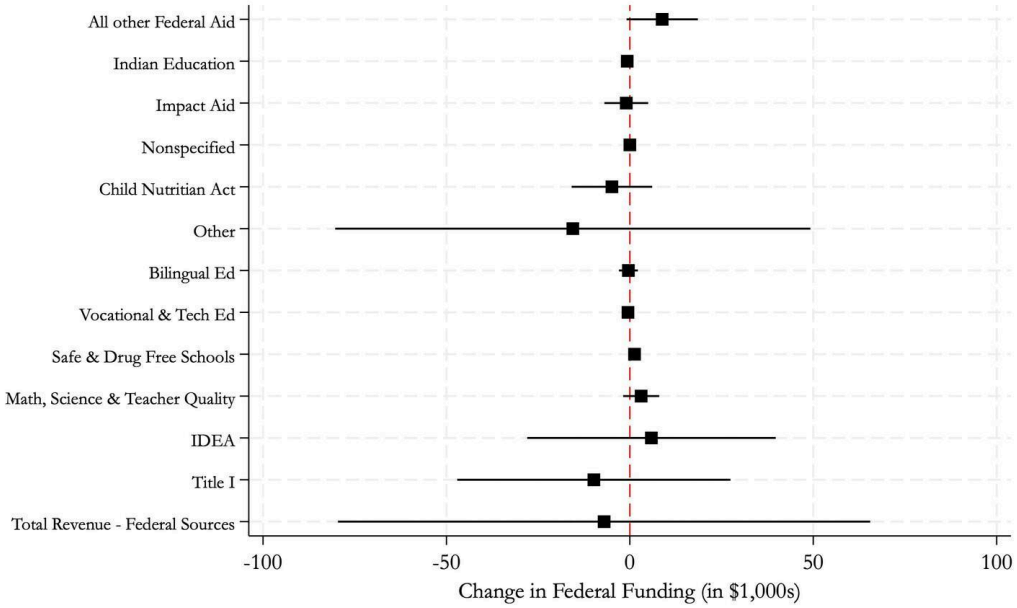

Figure A4. SDID Estimates of the Effect of School Closure on Federal Funding by F-33 Subcategory. Point estimates and 95% confidence intervals. All outcomes scaled in $1,000s.

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