# Not All Dollars Are Equal: The Composition of School Spending and Student Outcomes*

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**Abstract**

The central question in school finance is not whether resources matter, but how their allocation shapes distinct dimensions of human capital formation. We study this question using audited, disaggregated expenditure data linked to shrinkage-adjusted school value added in test scores, attendance, chronic absenteeism, and dropout for nearly all publicly funded schools in Chile. We document three findings. First, variation in effectiveness aligns with spending composition rather than aggregate resources: higher-value-added schools devote more to instructional quality and less to student well-being when effectiveness is measured through test scores. Second, these associations are outcome-specific: well-being expenditures negatively associated with test-score gains are positively associated with attendance and reduced absenteeism, and infrastructure spending supports attendance in ways not captured by learning assessments. Third, test-score improvements over time reflect internal budget reallocations toward instructional personnel, whereas non-cognitive improvements are less clearly tied to compositional shifts. These patterns suggest that evaluating school spending through a single outcome lens risks mischaracterizing the returns to specific expenditure categories.

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*All errors are our own.

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# 1 Introduction

Whether money matters for student achievement is among the most contested questions in the economics of education. For decades, the debate centered on a simple binary: do higher expenditures improve outcomes? A generation of studies—from Hanushek (2003)'s influential skepticism to the meta-analytic rebuttals of Greenwald et al. (1996) and the quasi-experimental evidence assembled by Card and Payne (2002), Jackson et al. (2016), and Lafortune et al. (2018)—has largely resolved this question in the affirmative. Yet a policy-relevant frontier remains: not whether schools should spend more, but *how* the composition of spending shapes distinct dimensions of human capital formation. This gap is consequential: school principals and policymakers do not choose how much to spend in the aggregate; they decide how to allocate fixed budgets across personnel categories, pedagogical programs, student services, and infrastructure. Understanding which allocations matter—and for which outcomes—is the policy-relevant margin.

This paper brings new evidence to that frontier. We exploit detailed administrative records on the universe of Chilean schools over 2014–2022, linking audited expenditure data—disaggregated into personnel, operational, infrastructure, and subcontracted-service categories—to multidimensional measures of school effectiveness. Chile provides a compelling setting for three reasons. First, a national voucher system generates wide variation in spending decisions across public and private-voucher schools operating under a common regulatory framework. Roughly 90 percent of Chilean students attend publicly funded schools—40 percent in municipal public schools and 45 percent in privately managed voucher schools—providing a large and institutionally diverse sample. Second, a targeted equity subsidy (Subvención Escolar Preferencial, or SEP) creates within-school variation in earmarked versus discretionary resources. Third, the government administers standardized assessments of both academic achievement and non-cognitive outcomes—attendance, chronic absenteeism, and dropout—permitting us to construct

school value-added measures across four distinct dimensions of human capital. All publicly funded schools submit detailed annual accounts to the Superintendency of Education, disaggregating spending into dozens of functional categories: six types of personnel, five quality-program subcategories, eight student well-being subcategories, and further categories for operations and infrastructure. This level of granularity—audited and reported under a common accounting framework—is rare in education finance data. Merging these accounts with student-level test score data, attendance records, and enrollment files yields a balanced panel of approximately 6,000 schools observed annually over eight years (2015–2022). To our knowledge, this is the most comprehensive dataset linking detailed school expenditure composition to multiple measures of school effectiveness.

Our first finding is that the *composition* of spending is far more predictive of school effectiveness than its *level*. Aggregate per-pupil expenditure bears no systematic relationship with value-added in any dimension. Once we disaggregate into broad functional categories, however, clear patterns emerge: schools with higher test-score value added allocate more to quality programs (pedagogical materials, professional development) and less to student well-being, while schools with higher attendance value added spend more on infrastructure and well-being services. After adjusting for school sector, enrollment, student composition, and region-year fixed effects, schools in the top tercile of test-score SVA spend USD 17 more per student on quality programs (reading) and USD 15 more (math) than those in the bottom tercile, but USD 10 to 16 *less* on student well-being. These compositional differences persist after conditioning on school fixed effects and rich time-varying controls, and they are not driven by differences in total resources.

Second, these associations are strikingly outcome-specific. Within the personnel category, spending on instructional staff predicts higher test-score value-added but is unrelated to non-cognitive outcomes, whereas spending on well-being professionals—counselors, psychologists, social workers—predicts improvements in attendance and dropout prevention but not test scores. The well-being result is especially notable: when measured

as a *share* of total spending, well-being personnel are *negatively* associated with test-score value-added, suggesting a genuine trade-off in resource allocation across human capital dimensions. Yet for attendance and chronic absenteeism, the association reverses: schools in the top tercile of chronic-absenteeism SVA spend USD 9 more per student on well-being and USD 13 more on infrastructure than those in the bottom tercile. Within personnel subcategories, the differentiation is equally sharp: instructional support teachers are the strongest predictor of test-score gains, school leadership is the strongest predictor of attendance, and classroom teachers are the strongest predictor of dropout prevention. No single spending category improves all outcomes, implying that single-outcome evaluations risk mischaracterizing the productivity of specific expenditure types.

Third, we find evidence of dynamic complementarities. Schools that reallocate toward personnel—and specifically toward instructional and well-being staff—over time exhibit the largest gains in effectiveness. Schools that improve their test-score SVA shift budgets toward instructional personnel and quality programs—particularly learning resources and professional development—consistent with a deliberate reorientation toward instructional quality. Improvements in non-cognitive outcomes are less clearly tied to observable compositional shifts, suggesting that the mechanisms through which spending supports attendance and retention may operate through channels not fully captured by expenditure categories alone, such as organizational culture, leadership quality, or the intensity with which existing resources are deployed. This within-school evidence, which absorbs time-invariant confounders, suggests that the cross-sectional composition patterns reflect causal mechanisms rather than mere sorting.

These findings advance several strands of the literature. A first strand estimates the returns to aggregate school spending. The seminal work of Jackson et al. (2016) uses court-ordered finance reforms to show that a 10 percent increase in per-pupil spending throughout the school years increases adult earnings by 7 percent for children from low-income families. Lafortune et al. (2018) exploit post-*Serrano* finance equalization to doc-

ument positive effects on test scores, with the largest gains in low-income districts. Biasi et al. (2025) isolate the effects of capital investments using narrow bond-election victories and find that infrastructure spending raises test scores with heterogeneous returns across project types. Dobbie and Fryer (2013) show that management practices, high-dosage tutoring, and data-driven instruction—rather than class size, per-pupil spending, or teacher certification—explain charter school effectiveness, pointing toward spending composition. We complement this work by decomposing expenditure into narrowly defined functional categories and showing that the composition margin dominates the level margin across multiple outcome dimensions. This granularity matters because policy levers operate at the level of hiring decisions, program investments, and budget line items, not at the level of total spending.

A second strand extends the measurement of school effectiveness beyond test scores. Jackson (2020) demonstrates that schools' effects on non-cognitive skills are only weakly correlated with their effects on test scores, arguing that test-score value added captures at most half of schools' total contribution to student welfare. Chetty et al. (2011) find that students randomly assigned to higher-quality kindergarten classrooms earn more as adults, even though the test-score advantage fades by middle school—suggesting that non-cognitive channels drive the long-run returns. Deming (2011) documents that access to better schools through lotteries reduces criminal behavior, an effect concentrated among students whose test scores did not improve. We contribute by linking spending composition directly to these multiple dimensions, providing evidence on *which inputs* produce *which outputs*. The well-being reversal—negative for test scores, positive for attendance—is a concrete illustration: a budget reallocation from quality programs to student well-being would lower measured test-score SVA while potentially improving attendance and reducing chronic absenteeism.

A third strand examines education production in developing and middle-income countries, where institutional constraints, teacher labor markets, and resource levels differ

substantially from high-income settings. While the school spending literature has concentrated overwhelmingly on the United States, the policy questions it addresses—how to allocate scarce resources across competing uses—are arguably more pressing in middle-income countries where per-pupil budgets are tighter and trade-offs are sharper. Chile's universal voucher system, centralized admissions, and mandatory expenditure reporting make it an informative setting for studying how schools allocate resources under a common funding formula but with substantial autonomy over internal budget decisions. The coexistence of public and private providers allows us to examine whether spending-effectiveness associations differ by sector—they do, with quality-program advantages concentrated in public schools where discretionary budgets are more likely to flow through formal quality programs.

Our identification strategy relies on within-school variation over time, controlling for school fixed effects and common year shocks. We estimate school value-added using empirical Bayes shrinkage following Morris (1983) and Angrist et al. (2017), with separate models for test-score outcomes (which exploit a cohort-based structure) and non-cognitive outcomes (which use an annual panel). Chile's institutional features support identification: mechanical per-student funding formulas limit discretionary reallocation of total resources, and since 2016 centralized admissions with lottery tie-breaking constrain schools' ability to selectively attract students in response to spending changes. While our estimates are descriptive rather than causal, the within-school design absorbs the most salient confounders—neighborhood characteristics, parental sorting, and time-invariant school quality—and the specificity of our findings provides reassurance against generic threats. Different spending categories predict different outcomes in detailed, category-specific patterns that are difficult to reconcile with a single omitted confounder: a positive shock to school quality would not explain why instructional support teachers predict test scores but not attendance, or why well-being spending is negatively associated with achievement but positively associated with chronic absenteeism reduction.

The remainder of the paper is organized as follows. Section 2 describes the Chilean education system and the SEP policy. Section 3 presents the data sources. Section 4 documents baseline patterns in spending composition and school effectiveness. Section 5 details the empirical strategy. Section 6 presents the main results, and Section 7 concludes.

# 2 Context

Chile's K–12 system combines three types of schools: municipal public, privately managed but publicly funded voucher schools, and a small fully private sector. By 2017, about 40 percent of students attended public schools, 45 percent voucher schools, encompassing a wide range of models—religious, secular, Montessori, and Waldorf, among others—, and the rest fully private institutions.

The school finance system was established during the 1980s reforms. Municipalities assumed responsibility for public schools, while private providers were allowed to enter the system with public funding. Core financing takes the form of a per-student subsidy (*Subvención Escolar*), which is conditional on verified monthly attendance. This basic voucher has been gradually complemented with additional components: higher transfers for rural schools, increments for boarding schools, and targeted subsidies for students with special educational needs (IDB, 2015). In 2008, the Preferential School Subsidy (*SEP*) introduced an equity dimension, allocating higher funding for disadvantaged students, conditional on schools signing an improvement agreement and implementing a School Improvement Plan (IDB, 2015). SEP resources may be used for instructional materials, professional development, psychosocial support, infrastructure improvements, and student well-being services, but not for base personnel salaries or general operating costs already covered by the regular voucher. Schools classified as high-performing enjoy greater autonomy in how they allocate SEP funds, while those with lower performance ratings face tighter oversight and prescribed spending targets.

For many years, voucher schools were also permitted to charge fees to parents. These charges allowed schools to combine public subsidies with private contributions but also created socioeconomic stratification. Empirical evidence shows that higher-income students clustered in voucher schools charging copayments, while lower-income students were concentrated in public schools (Elacqua, 2009; Hsieh & Urquiola, 2006). Responding to concerns over equity and segregation, the 2015 Inclusion Law eliminated copayments, prohibited for-profit operation among voucher schools, and banned selective admissions. By 2018, all publicly funded schools were required to be tuition-free and non-profit (IDB, 2015). A complementary reform in 2017 began transferring public school administration from municipalities to new Local Public Education Services (*SLEP*), designed to improve oversight and reduce disparities across municipalities.

Schools have discretion over how to use general subsidies, but earmarked funds such as SEP must be spent according to program guidelines. Regulations define eligible uses and require schools to submit annual audited reports through the Ministry of Education's reporting platform. Since 2012, the Superintendency of Education has monitored compliance, with authority to demand restitution or impose sanctions in cases of misuse (IDB, 2015). The Quality Assurance Agency complements this oversight by linking resource use with learning outcomes and equity indicators.

Admissions policies were also restructured. Before 2015, many voucher schools selected students directly, reinforcing stratification. Since 2016, admissions to all publicly funded schools have been handled by the Centralized Admission System (*SAE*). The system assigns students using a deferred-acceptance algorithm, with lotteries used to break ties in oversubscribed schools. This reform ended discretionary selection and aligned admissions with the new rules on finance and equity.

# 3 Data

Our analysis brings together several administrative datasets that cover nearly all publicly funded schools in Chile.

## 3.1 School Finance Data

We use audited annual reports of income and expenditures submitted by schools to the Ministry of Education between 2015 and 2022. These accounts disaggregate resources into detailed categories. On the income side, schools report the amounts received from base subsidy, increments for special education needs (*PIE*), rurality, and zone adjustments, and earmarked funds such as maintenance grants and retention programs. On the spending side, broader categories include *remunerations* (e.g., base salaries, overtime, allowances for difficult conditions (compensating staff stationed in remote, hard-to-reach, or high-risk areas)), *operations* (e.g., utilities, materials, services), *infrastructure and maintenance*, and specific programs for *student well-being and pedagogical support*. Regulations require schools to classify all resources into these categories and to submit annual audited reports through the Ministry's online platform, which the Superintendency of Education monitors for compliance. All monetary values are expressed in 2015 U.S. dollars.

## 3.2 Test-Score Value Added

Using student-level results from Chile's national standardized assessment system (SIMCE) and the university entrance exam (PSU/PAES), we construct measures of test-score SVA. As SIMCE is applied in selected grades of basic and secondary education, while the exit exam is taken annually by 12th graders, the data allow us to estimate the academic value added for primary and secondary institutions. At the primary level, we follow cohorts from 4th to 6th grade, from 6th to 8th grade, and from 4th to 8th grade. At the secondary level, we construct SVA from 8th grade to 10th grade, from 10th grade to the exit exam,

and from 8th grade to the exit exam. Table A.1 summarizes the pairs of grades and years for which the academic SVA can be constructed.

For each feasible baseline–endline pair, we estimate SVA by regressing achievement on prior scores, student demographics, grade, year, and school fixed effects. To mitigate noise, the estimated school fixed effect coefficients are shrunk toward the grand mean using an empirical Bayes procedure, yielding comparable measures across schools and years (Morris, 1983). Because SIMCE is not administered every year in every grade, test-score SVA is observed only for specific cohort transitions, not annually.

### 3.3 Attendance, Chronic Absenteeism, and Dropout Value Added

We complement the test-score measures with SVA estimates for three non-cognitive outcomes: attendance rate, chronic absenteeism (the proportion of students missing more than 10 percent of school days), and dropout rate. Unlike test scores, these outcomes are observed annually for every student enrolled in every school, yielding a balanced panel of school-year observations over the period 2015–2022.

For each outcome, we estimate SVA using a specification analogous to the test-score model, but adapted to the annual panel structure. We regress school-level outcomes on lagged outcomes, student composition, and school and year fixed effects. The school fixed effects are again shrunk using empirical Bayes to reduce noise, yielding comparable measures of non-cognitive value added across schools and years. This approach follows the growing literature that extends value-added estimation beyond standardized tests to capture broader dimensions of school effectiveness (Jackson, 2020).

An important distinction between the two types of SVA is worth emphasizing. Test-score SVA is identified from cohort-specific transitions between testing points; because SIMCE is not administered annually, SVA can only be computed for the particular cohort-grade-year combinations in which both a baseline and an endline test are observed. Attendance, chronic absenteeism, and dropout SVA, by contrast, are computed from an an-

nual panel of all schools, exploiting year-to-year variation within schools. This difference in data structure has implications for the empirical strategy, which we discuss in Section 5.

### 3.4 School, Student, and Teacher Administrative Records

We complement these data with administrative records on schools (enrollment, grade offerings, gender composition), students (socioeconomic distribution, demographic profiles), and teachers (number of teachers, contract type, qualification levels). These covariates allow us to benchmark schools by the populations they serve and to study heterogeneity in the relationship between spending and outcomes.

### 3.5 Panel Structure and Sample

A central strength of the data is its longitudinal dimension. We observe detailed spending, school outcomes, and demographics for up to eight years per school, enabling us to track trajectories of investment and to mitigate concerns that observed correlations simply reflect persistent differences across institutions. Our estimation sample restricts attention to schools that offer basic or secondary education, have at least ten enrolled students, report per-student spending between USD 100 and USD 10,000, and appear in all eight years of the panel. These restrictions yield a balanced panel of approximately 6,000 schools observed annually between 2015 and 2022.

## 4 Multivariate Analyses

This section documents how Chilean schools allocate resources and how these patterns relate to differences in school value added (SVA) across multiple outcome dimensions: test scores, attendance, chronic absenteeism, and dropout. We begin by describing overall spending levels and composition, then compare schools with high and low value added separately for each outcome. Next, we examine how changes in spending pat-

terns correlate with changes in SVA over time. Finally, we decompose these relationships across personnel categories to identify which staffing investments support effectiveness on different margins.

## 4.1 Baseline Patterns of School Spending

We begin by documenting broad patterns in the level and composition of school spending in Chile. Figures 1–4 and Table 1 summarize how resources evolve over time, how they are distributed across schools, and how the allocation of funds differs across spending categories. Together, these descriptive patterns provide a foundation for understanding the heterogeneity in resource use across schools and motivate the subsequent analysis on spending composition and school value added.

### 4.1.1 Evolution of Spending Levels

Figure 1 plots the evolution of per-student expenditure between 2015 and 2022, distinguishing between targeted equity funding (SEP) and discretionary funding (non-SEP) and between public and private subsidized schools. Two features stand out. First, targeted equity spending grows slowly until 2019 and then plateaus, a pattern consistent with the program's design: allocations depend mechanically on the share of vulnerable students, and no major expansions took place during this period. Second, discretionary spending rises substantially for both sectors, but the increase is markedly steeper for public schools. As a result, the public–private gap in discretionary expenditures widens over time, reflecting faster growth of unrestricted operational resources in the public sector. These patterns indicate that most of the secular rise in school funding is driven by flexible, non-targeted subsidies, rather than expansions of the targeted equity program.

### 4.1.2 Cross-School Variation in Spending Levels

Figure 2 highlights substantial heterogeneity in spending levels across schools. We plot the distribution of per-student expenditures for four groups: public urban, public rural, private urban, and private rural. Three facts emerge. For reference, public urban schools account for approximately 25 percent of observations, public rural for 30 percent, private urban for 40 percent, and private rural for 5 percent.

First, spending levels are systematically ordered across groups. Private urban schools exhibit the lowest and most compressed distribution, centered near USD 2,000–2,500. Public urban schools spend more, with a distribution centered near USD 3,000. Private rural schools exhibit a broader distribution centered at higher levels, while public rural schools lie at the top of the spectrum, with expenditures extending from roughly USD 3,000 to USD 7,000 or more. This stratification indicates that rural schools—particularly public ones—operate with significantly higher resources per student, driven in part by adjustments for rurality and fixed-cost structures in small schools.

Second, dispersion varies markedly across groups. Private urban schools have the narrowest distribution, whereas public rural schools display a long right tail, reflecting considerable variation in local transfers, enrollment size, and municipal funding practices.

Third, the distributions overlap only partially. Most private urban schools operate at spending levels far below those of public rural schools, and only moderately overlap with public urban and private rural schools. These patterns underscore that Chile's school finance system yields distinct resource regimes depending on sector and geography.

### 4.1.3 The Composition of School Budgets

While levels differ substantially across schools, the composition of spending also varies in meaningful ways. Figure 3 depicts how schools allocate their budgets across six categories—personnel, operations, infrastructure, quality programs, student well-being, and other

expenditures—separately for public and private schools and for urban and rural areas.

Across all settings, personnel constitutes the largest share of the budget, ranging from roughly 80–85% in public schools to 65–75% in private schools. Notably, this gap has widened over the period: while public schools' personnel shares have remained stable, private schools have progressively shifted toward non-personnel spending, suggesting diverging resource allocation strategies. The magnitude of this share is consistent with international evidence, but the remaining 15–35% of the budget is distributed across a diverse set of non-personnel categories rather than concentrated in a single function. This diversification matters: operations, infrastructure, and quality programs each account for 4–6% of total spending on average, with student well-being comprising an additional 2–3%. The stability of these shares over time suggests persistent structural differences in how schools deploy funds.

At the same time, Figure 3 reveals subtle but systematic variation across contexts. Public schools devote relatively more to quality programs, while private rural schools allocate a larger share to student well-being. Private urban schools allocate more to operations and infrastructure, consistent with greater flexibility in investment decisions. Some shifts occur during the pandemic years: public schools exhibit a temporary increase in personnel shares around 2020, while private schools show rising operational and infrastructure shares during 2018–2020, suggesting differential adjustments to pandemic-related disruptions.[1]

#### 4.1.4 The Composition of the Personnel Budget

Figure 4 disaggregates personnel spending into six categories following the Superintendencia de Educación's official classification. Classroom teachers consistently account for the largest share of personnel expenditures, but important differences emerge across sectors. Public schools devote approximately 55–60% of personnel spending to classroom

[1]During school closures, non-personnel procurement was severely constrained, which may mechanically inflate the personnel share in public schools even without deliberate reallocation.

teachers, whereas private schools devote a smaller share (45–55%), reflecting a more diversified staffing structure.

Private schools allocate substantially larger portions of their personnel budgets to administrative and paraprofessional staff, non-teaching professionals, and school leadership. Together, these categories comprise 25–30% of their personnel spending, compared with roughly 15–20% in public schools. This indicates that private voucher schools maintain a more management- and support-intensive staffing model, while public schools direct a larger fraction of payroll resources toward classroom instruction.

Over time, the personnel composition is relatively stable, though public schools show modest increases in spending on instructional support teachers and non-teaching professionals around 2019–2021, consistent with increased demand for pedagogical reinforcement and socioemotional services during the pandemic.

#### 4.1.5 Summary Statistics

Table 1 summarizes the main variables. School value added exhibits substantial dispersion across all four outcome dimensions, with standard deviations around 0.14–0.15 for test scores. Mean per-student spending is approximately USD 3,071, but the interquartile range spans nearly USD 1,500, reflecting substantial heterogeneity in school resources.

Panels B and C show that although personnel dominates in levels, the remaining 22% of the budget is distributed across several targeted functions: operations, infrastructure, quality programs, and student well-being. This contrasts with systems where non-personnel spending is largely residual. Instead, Chilean schools employ diverse non-personnel strategies that can shape both learning and broader student outcomes.

School characteristics in Panel D indicate heterogeneity in size, rurality, and socioeconomic composition. Rural schools represent nearly 30% of observations and tend to be smaller, while the average share of low-SES students is 41%.

Figures 1–4 and Table 1 establish that Chile's school system exhibits substantial het-

erogeneity in both spending levels and composition. These patterns motivate the subsequent sections, where we relate differences in spending composition to differences in school value added across multiple outcome dimensions.

## 4.2 Spending Patterns by School Effectiveness

To examine how spending composition varies with school effectiveness, Tables 2 and 3 compare expenditure patterns across schools grouped into terciles of school value added (SVA). For each spending category, the tables display mean per-student expenditures and budget shares for low-, mid-, and high-SVA schools, as well as high–low differences. The last two columns report raw gaps and adjusted gaps that condition on sector, rurality, PIE participation (Chile's special education integration program, *Programa de Integración Escolar*), enrollment, the level and concentration of low-SES students—which mechanically determines the volume of targeted equity (SEP) resources a school receives—, and region-year fixed effects. These adjustments ensure comparisons capture differences in spending patterns net of observable school characteristics.

### 4.2.1 Test-Score SVA

Table 2 presents results separately for reading (Panel A) and math (Panel B). In raw terms, high-SVA schools spend less in total and devote fewer dollars to personnel than low-SVA schools. Once we account for sectoral and compositional differences, however, these gaps disappear, suggesting that lower SVA among schools in the bottom tercile reflects the populations they serve rather than resource scarcity.

More informative patterns emerge within non-personnel categories. High-SVA schools spend significantly more per student on quality programs after adjustment, with adjusted high–low differences of USD 17 for reading and USD 15 for math, both significant at the one-percent level. These differences reflect greater investment in pedagogical support, instructional materials, and targeted quality-enhancing initiatives. Conversely, high-SVA

schools spend substantially less on student well-being after adjustment (USD $-10$ for reading, USD $-16$ for math), also highly significant. This negative gap likely reflects compensatory spending: schools facing acute socioemotional and behavioral challenges allocate disproportionate resources to well-being services and exhibit lower learning gains, even controlling for observable characteristics. Student well-being subcategories include psychosocial support, medical appointments, school meals, uniforms and clothing, transportation, sports programs, and school supplies.

The expenditure shares paint a consistent picture. High-SVA schools allocate smaller shares of their budgets to personnel and student well-being, and larger shares to quality programs, even after covariate adjustment. While these proportional shifts are modest, they are systematic and statistically meaningful, pointing to a greater instructional and programmatic orientation among more effective schools. This is consistent with evidence that investments in pedagogical supports and learning materials can generate meaningful achievement gains (Dobbie & Fryer, 2013; Muralidharan & Sundararaman, 2011).

#### 4.2.2 Attendance and Chronic Absenteeism SVA

Table 3 extends the analysis to non-cognitive outcomes. The patterns differ markedly from test-score results.

For attendance, high-SVA schools spend less in total after adjustment (USD $-62$), driven primarily by a large negative gap in personnel spending (USD $-133$). Once we control for school characteristics, schools with higher attendance effectiveness operate with leaner personnel budgets. However, high-attendance-SVA schools spend significantly more on quality programs (USD 12), infrastructure (USD 8), and the residual "other" category (USD 54), all significant after adjustment. The infrastructure result is notable: physical school conditions may support attendance in ways that do not register through test scores. Strikingly, the negative association between student well-being spending and SVA that appears for test scores disappears for attendance: the adjusted

difference is small and statistically insignificant, and for budget shares, high-attendance-SVA schools allocate a modestly *larger* share to student well-being (significant at five percent). This reversal suggests that well-being expenditures, which appear to depress learning gains, may nonetheless support student engagement and regular attendance.

For chronic absenteeism, patterns closely mirror attendance. High-SVA schools spend more on quality programs (USD 12), well-being (USD 9), and infrastructure (USD 13) after adjustment, all significant at the one-percent level. The well-being result is particularly striking: unlike the test-score findings, schools that more effectively reduce chronic absenteeism devote significantly more resources to student well-being services. This divergence across outcome dimensions underscores that spending categories may serve different functions depending on the margin of school effectiveness considered.

#### 4.2.3 Dropout SVA

Panel C of Table 3 presents results for dropout SVA. Schools with higher dropout value added exhibit sharply different spending profiles. After adjustment, high-SVA schools spend significantly less on total expenditures (USD $-148$), personnel (USD $-96$), student well-being (USD $-28$), operations (USD $-5$), and infrastructure (USD $-25$). The quality-program advantage persists (USD 7, significant at one percent), albeit smaller than for test scores. These patterns suggest that schools most effective at retaining students do so with fewer overall resources but with a disproportionate orientation toward quality programs.

#### 4.2.4 Summary

Tables 2 and 3 yield three overarching conclusions. First, differences in total or personnel spending do not explain variation in school value added once we adjust for observable school characteristics—this holds across all outcome dimensions. Second, quality programs show a consistently positive association with SVA regardless of outcome: schools spending more on pedagogical supports and instructional quality are more effec-

tive across test scores, attendance, chronic absenteeism, and dropout. Third, the association between student well-being spending and school effectiveness is outcome-specific. Well-being expenditures are negatively associated with test-score and dropout SVA but positively associated with attendance and chronic absenteeism SVA. This pattern suggests that well-being services support student engagement and regular attendance, outcomes that may not translate directly into higher test scores but are themselves important determinants of educational attainment.

## 4.3 Spending Adjustments and Changes in Value Added

Tables 4 and 6 examine whether schools that improved their school value added (SVA) between the first and last observed periods adjusted their spending differently from those whose SVA declined. For each expenditure category, the tables report the average change in per-student spending over the period. Column (4) presents raw differences in means, while Column (5) reports adjusted differences that condition on sector, rurality, PIE participation, enrollment, the level and concentration of low-SES students, and region fixed effects. These adjusted comparisons measure how much more improvers increased per-student spending relative to decliners, holding observed characteristics constant.

### 4.3.1 Test-Score SVA

Table 4 presents results separately for reading (Panel A) and math (Panel B). For reading, improvers did not raise total spending significantly more than decliners: the adjusted difference is small and statistically insignificant. This indicates that improvements in reading SVA are not explained by faster budget growth.

More informative patterns emerge within specific categories. Improvers increased personnel spending more rapidly than decliners, with an adjusted gap of approximately USD 24 (significant at ten percent). The clearest distinction appears in the residual "other" category: improvers substantially reduced spending in this category relative to decliners.

The adjusted improver–decliner gap is approximately USD −13 and statistically significant at the five-percent level. This suggests that improving schools reallocated resources away from flexible or residual budget lines toward more structured components of their spending. Differences in operational, infrastructure, quality-program, and student well-being expenditures are small and statistically insignificant after adjustment.

For math, Panel B reveals similar patterns. Personnel spending increased more among improvers, though the adjusted difference is not always precisely estimated. The "other" category again shows a robust negative gap for improvers (USD −13, significant at five percent). No robust differences emerge for operations, quality programs, or student well-being.

#### 4.3.2 Attendance and Chronic Absenteeism SVA

Table 6 extends the dynamics analysis to non-cognitive outcomes. The patterns differ markedly from test-score results.

For attendance, improvers did not expand total or personnel spending relative to decliners; if anything, adjusted differences are negative (USD −36 for total, USD −30 for personnel, both significant at ten percent). The most robust finding is that attendance improvers reduced operational spending relative to decliners (USD −9, significant at one percent). No significant differences emerge for quality programs, student well-being, or infrastructure.

Chronic absenteeism improvers display a similar pattern. The strongest finding is again the negative adjusted gap in operational spending (USD −8, significant at one percent). No other category shows a robust adjusted difference, suggesting that improvements in chronic absenteeism are not clearly associated with compositional shifts in broad spending categories. This contrasts with the test-score dynamics, where improvers shifted resources toward personnel and away from the "other" category, indicating that improvements in student engagement may operate through channels other

than observable shifts in aggregate spending categories—such as changes in the quality of implementation, school climate, or teacher effort that accounting data do not capture.

#### 4.3.3 Dropout SVA

Panel C of Table 6 presents results for dropout SVA. Dropout improvers sharply reduced spending across nearly all categories relative to decliners. The adjusted gaps are USD $-78$ for total spending, USD $-38$ for personnel, USD $-10$ for student well-being, USD $-7$ for operations, and USD $-7$ for infrastructure, all statistically significant. The "other" category also shows a significant negative gap (USD $-14$). These pervasive reductions suggest that schools improving their dropout performance did so while contracting budgets, possibly reflecting enrollment declines or structural adjustments that simultaneously improved retention and reduced per-student costs.

#### 4.3.4 Summary

The dynamics analysis yields three conclusions. First, for test scores, the key mechanism distinguishing improvers from decliners is internal reallocation—particularly shifting resources toward personnel and away from residual spending—rather than budget expansion. Second, for attendance and chronic absenteeism, improvements are not clearly associated with observable shifts in broad spending composition, suggesting that non-cognitive margins of effectiveness may respond to unmeasured dimensions of resource use. Third, for dropout, improvement correlates with broad spending reductions rather than targeted reallocations. These differential patterns reinforce the value of examining multiple outcome dimensions: the mechanisms linking spending to effectiveness differ fundamentally across margins of school performance.

## 4.4 OLS Associations Between Spending Composition and SVA

While the previous subsection examined changes in overall spending and broad expenditure categories, Tables 5 and 7 focus specifically on changes in the composition of personnel remunerations. Because personnel expenditures represent the majority of school budgets and because the regression framework relates school value added (SVA) to the allocation of spending across categories, these descriptive patterns provide complementary evidence on how staffing structures evolve among schools with different trajectories of effectiveness.

The tables report the average change in per-student remunerations between the first and last observed periods for decliners, stable schools, and improvers, using the six staff categories defined by the Superintendencia de Educación: classroom teachers, administrative and paraprofessional staff, non-teaching professionals, instructional support teachers, school leadership, and operational staff. Column (4) presents raw differences between improvers and decliners, while Column (5) reports adjusted differences that condition on sector, rurality, PIE participation, enrollment, the level and concentration of low-SES students, and region fixed effects.

### 4.4.1 Test-Score SVA

Table 5 presents results separately for reading (Panel A) and math (Panel B). For reading, improvers experience somewhat larger increases in expenditures on classroom teachers, with an adjusted improver–decliner gap of USD 16 (significant at ten percent), suggesting that schools improving their reading SVA slightly strengthened classroom teacher remuneration relative to declining schools.

The clearest and most robust distinction concerns instructional support teachers. Improvers increased remunerations for this category by approximately USD 12 more than decliners, and the adjusted difference remains statistically significant. Because these

roles include pedagogical specialists and instructional support staff, this pattern suggests that improving schools increased their investment in targeted pedagogical reinforcement. Operational personnel (janitorial and maintenance assistants) also show larger increases among improvers, with the adjusted difference (USD 7) statistically significant at the five-percent level. Although these positions are not instructional, they may improve school functioning and climate in ways that indirectly support teaching and learning. Differences across administrative and paraprofessional staff, non-teaching professionals, and school leadership are small and statistically insignificant after adjustment.

For math, Panel B reveals similar but somewhat weaker patterns. Improvers again increased spending on classroom teachers and instructional support teachers relative to decliners. Non-teaching professionals show a significant positive gap (USD 9), suggesting that schools improving in math invested in specialists such as psychologists and curriculum coordinators. No robust differences emerge for administrative staff, leadership, or operational personnel.

#### 4.4.2 Attendance and Chronic Absenteeism SVA

Table 7 extends the analysis to non-cognitive outcomes. The staffing dynamics for attendance and chronic absenteeism (Panels A and B) differ markedly from the test-score results.

For attendance, the most notable finding is that improvers increased remunerations for non-teaching professionals (social workers, psychologists, and counselors) by USD 16 more than decliners, significant at the five-percent level. This stands in sharp contrast to the test-score pattern, where non-teaching professionals showed no robust difference. Instructional support teacher remunerations declined significantly more among attendance improvers (USD $-20$, significant at five percent). Classroom teachers, administrative staff, leadership, and operational staff show no robust differences after adjustment.

Chronic absenteeism improvers display nearly identical patterns: non-teaching pro-

fessionals show a positive gap (USD 15, significant at five percent), while instructional support teachers show no significant difference. These results suggest that improvements in student engagement are associated with investments in socioemotional and support-oriented staff rather than in instructional specialists—precisely the reverse of the test-score pattern.

#### 4.4.3 Dropout SVA

Panel C of Table 7 shows that dropout improvers reduced remunerations relative to decliners across most staff categories, consistent with the broad spending reductions documented previously. The largest adjusted gaps are for non-teaching professionals (USD $-13$, significant at five percent), school leadership (USD $-10$, significant at five percent), and operational staff (USD $-7$, significant at ten percent). Administrative/paraprofessional staff also show a significant negative gap (USD $-9$). Only instructional support teachers show no significant difference.

#### 4.4.4 Summary

The personnel decomposition reinforces the central message of the descriptive analysis: the staffing adjustments associated with school improvement differ fundamentally across outcome dimensions. For test scores, improving schools invest more in instructional support and classroom teachers. For attendance and chronic absenteeism, improvements are associated with greater investment in non-teaching professionals—precisely the socioemotional and counseling staff whose broader spending category (student well-being) is negatively correlated with test-score SVA. For dropout, improvement correlates with broad staff reductions. These patterns illustrate that school effectiveness is a multi-dimensional construct, and the personnel investments that support one margin of effectiveness may not support—and may even trade off against—others.

# 5 Empirical Strategy

This section describes our empirical approach. We first define how school value added is estimated for each of the four outcome dimensions. We then present the specifications that relate spending composition to SVA, exploiting within-school variation over time.

## 5.1 School Value Added (SVA)

We estimate school value added (SVA) for four outcome dimensions: test scores (reading and math), attendance, chronic absenteeism, and dropout. The estimation approach follows the same logic in all cases—regressing outcomes on prior measures and covariates, extracting school fixed effects, and applying empirical Bayes shrinkage—but the data structure differs between test scores and the non-cognitive outcomes in ways that affect the identification strategy.

### 5.1.1 Test-Score SVA

We estimate test-score SVA separately for math and reading using SIMCE microdata from 2015–2024. We construct two stage-specific measures: (i) *Primary SVA*, based on student achievement growth from 4th grade to 6th or 8th grade (depending on availability), and (ii) *Secondary SVA*, based on achievement growth from 8th grade through the 12th grade university entrance exam (PSU/PAES).

Following the literature on SVA (Andrabi et al., 2025; Angrist et al., 2017; Bau & Das, 2020; Chetty et al., 2014), we estimate:

$$y_{isgt} \;=\; \alpha_g\, y_{isg,t-1} \;+\; \theta_s \;+\; \lambda_g \;+\; \delta_t \;+\; \varepsilon_{isgt}, \tag{1}$$

where $y_{isgt}$ is student $i$'s test score in school $s$, grade $g$, and year $t$; $y_{isg,t-1}$ is the prior score in the same subject; $\lambda_g$ and $\delta_t$ are grade and year fixed effects respectively. Because test-

score persistence may vary by grade, we allow the lagged achievement coefficient $\alpha_g$ to vary by grade (Andrabi et al., 2025; Chetty et al., 2014). The school's contribution to learning is captured by the school fixed effect $\theta_s$. We apply empirical Bayes shrinkage, pulling $\hat{\theta}_s$ toward the grand mean in proportion to its sampling variance, to reduce noise and yield comparable EB-adjusted SVA measures across schools. We aggregate these measures to the school-by-year level, weighting by their precision.

An important feature of the test-score data is that SIMCE is not administered annually in every grade. Test-score SVA is therefore observed only for specific cohort-transition combinations (e.g., a cohort tested in 4th grade in 2015 and 6th grade in 2017). This cohort-based structure means that spending variables must be averaged over the exposure window corresponding to each cohort transition, and the fixed effects in the spending equation must account for the transition structure rather than simple calendar years.

#### 5.1.2 Attendance, Chronic Absenteeism, and Dropout SVA

For the three non-cognitive outcomes, the data structure differs fundamentally. Attendance rates, chronic absenteeism rates, and dropout rates are observed annually for every school, yielding a balanced school-by-year panel. We estimate SVA using:

$$y_{st} \;=\; \alpha\, y_{s,t-1} \;+\; \theta_s \;+\; \delta_t \;+\; \gamma' \mathbf{W}_{st} \;+\; \varepsilon_{st}, \tag{2}$$

where $y_{st}$ is the outcome (attendance rate, chronic absenteeism rate, or dropout rate) for school $s$ in year $t$; $y_{s,t-1}$ is the lagged outcome; $\theta_s$ and $\delta_t$ are school and year fixed effects; and $\mathbf{W}_{st}$ includes time-varying school covariates such as enrollment and student composition. As with test scores, we apply empirical Bayes shrinkage to the estimated school effects to yield comparable SVA measures.

The annual panel structure of these outcomes has two implications. First, spending variables can be measured contemporaneously or with a simple one-year lag, rather than

averaged over a multi-year cohort exposure window. Second, the identification of school effects exploits year-to-year variation within schools, which is more granular but potentially noisier than the cohort-to-cohort variation underlying test-score SVA.

## 5.2 Relating Spending to SVA

Our primary interest is not only whether more resources improve outcomes, but *which types of spending matter most* and *for which dimensions of school effectiveness*. Schools face binding budget constraints, so understanding the effectiveness of different allocations—between teachers, support staff, materials, operations, or infrastructure—is critical for policy. We therefore study the relationship between school effectiveness and the *composition* of spending, rather than focusing solely on levels.

### 5.2.1 Test-Score Specification

For test-score SVA, we construct average spending over each cohort's exposure window (from the baseline to the year before the endline test). Denote this as $\text{TotalSpend}_{st}$ and its decomposition into $K$ categories as $\{C_{st}^{(k)}\}_{k=1}^{K}$, where $t$ indexes the cohort transition.

Our baseline specification is:

$$\text{SVA}_{st} \;=\; \delta\,\text{TotalSpend}_{st} \;+\; \sum_{k} \theta_k\, C_{st}^{(k)} \;+\; \beta'\mathbf{X}_{st} \;+\; \mu_s \;+\; \lambda_\tau \;+\; \epsilon_{st}, \tag{3}$$

where $\mathbf{X}_{st}$ includes time-varying school covariates (enrollment, student composition), $\mu_s$ represents school fixed effects, and $\lambda_\tau$ represents transition fixed effects that absorb common shocks to all schools tested in the same grade-year combination. Transition fixed effects are essential because SIMCE is administered in different grades across different years; the cohort structure means that variation in the timing of testing must be absorbed to isolate the within-school spending association. By including total spending as a covari-

ate, the $\hat{\theta}_k$ is interpreted as the association between SVA and reallocating one dollar from the omitted categories to category $k$, holding overall resources fixed.

### 5.2.2 Non-Cognitive Outcome Specification

For attendance, chronic absenteeism, and dropout SVA, the annual panel structure permits a simpler specification:

$$\text{SVA}_{st} \;=\; \delta\,\text{TotalSpend}_{st} \;+\; \sum_{k} \theta_k\, C_{st}^{(k)} \;+\; \beta' \mathbf{X}_{st} \;+\; \mu_s \;+\; \lambda_t \;+\; \epsilon_{st}, \tag{4}$$

where $t$ now indexes calendar years and $\lambda_t$ are year fixed effects. Because these outcomes are observed annually for all schools, the transition-specific fixed effects required for test scores are replaced by standard year fixed effects that absorb common annual shocks (e.g., pandemic disruptions in 2020–2021). The spending variables are measured at the school-year level rather than averaged over a multi-year cohort window.

### 5.2.3 Estimation and Inference

We estimate (3) and (4) separately by outcome. For test scores, we pool math and reading, reporting subject-specific results in the appendix. We progressively disaggregate spending from five broad categories (personnel, quality, student well-being, operations, infrastructure) to six personnel subcategories (classroom teachers, administrative/paraprofessional, non-teaching professionals, instructional support, leadership, operational staff) and further to quality and well-being subcategories (learning resources, staff professional development, extracurricular activities, educational technology, student assessments; and uniforms, school meals, transportation, student support, medical, sports, school supplies, and other well-being services).

All regressions weight observations by the inverse of the estimated variance of SVA and cluster standard errors at the school level. Spending categories are expressed in thou-

sands of 2015 USD. Our estimates should be interpreted as conditional associations rather than causal effects, though the within-school, over-time variation they exploit is substantially more demanding than cross-sectional comparisons.

# 6 Results

This section presents the estimates from the empirical strategy described in Section 5. We organize the results by level of disaggregation, moving from broad spending categories to personnel subcategories and then to quality and well-being subcategories. Throughout, we present results for all four outcome dimensions—test scores (pooling reading and math), attendance, chronic absenteeism, and dropout—to examine whether the associations between spending composition and school effectiveness vary across margins. As a starting point, we note that aggregate spending—whether total, targeted equity (SEP), or discretionary (non-SEP)—shows no significant association with SVA for any outcome (Appendix Figure A.1). This null result motivates examining the internal composition of spending.

## 6.1 Broad Spending Categories

Table 8 and Figure 5 decompose total expenditures into five major functions: personnel, quality programs, student well-being, operations, and infrastructure. The results reveal that the association between spending composition and SVA depends critically on the outcome considered.

For test scores, spending on quality programs is positively associated with SVA, and student well-being spending is negatively associated with SVA in both subjects. The quality coefficients, while modest in magnitude, are consistent and robust across specifications. The negative well-being association likely reflects compensatory allocations: schools facing greater behavioral, socioemotional, or health challenges spend more on

well-being services and tend to exhibit lower SVA, even after conditioning on rich controls and school fixed effects. Infrastructure spending is positively associated with attendance SVA, suggesting that physical school conditions support regular attendance in ways that do not register through test scores. Personnel, operations, and the remaining categories show small or imprecise associations for test scores.

For attendance and chronic absenteeism, the pattern shifts. Quality programs remain positive, but the magnitude is smaller. Infrastructure spending shows a large and significant positive association with attendance SVA. Most strikingly, well-being spending is not negatively associated with attendance or chronic absenteeism SVA—in fact, for chronic absenteeism, the association is positive and significant. This reversal is the central finding of the multidimensional analysis: the spending category most negatively associated with test-score effectiveness is positively associated with attendance-related effectiveness.

For dropout, quality programs again show a positive association, and personnel spending shows a significant positive coefficient—one of the few outcomes for which personnel matters at the broad level. Well-being spending is negatively associated with dropout SVA, resembling the test-score pattern.

## 6.2 Personnel Subcategories

Table 9 and Figure 6 disaggregate personnel spending into six staff types. The most notable result for test scores is the positive association between SVA and spending on *instructional support teachers*—pedagogical specialists and reinforcement personnel. Their coefficients are consistently positive and larger than those of classroom teachers, suggesting that targeted instructional reinforcement may yield higher returns than marginal changes in baseline classroom staffing. *Operational staff* (janitorial and maintenance) also show a surprisingly positive association with test-score SVA, possibly capturing school-climate effects.

For attendance, *classroom teachers* and *school leadership* show the strongest positive as-

sociations. The instructional support coefficient, while positive, is less precisely estimated than for test scores. For chronic absenteeism, the pattern is similar, with classroom teachers and leadership remunerations most strongly associated with lower absenteeism rates.

For dropout, *personnel spending matters most broadly*: classroom teachers, instructional support, and operational staff all show significant positive associations with dropout SVA, suggesting that staffing investments across multiple categories support student retention.

## 6.3 Quality Program Subcategories

Table 10 decomposes quality programs into five subcategories: learning resources, staff professional development, extracurricular activities, educational technology (ATE, a Chilean program providing external pedagogical advisory services to schools), and student assessments.

For test scores, *learning resources* stand out with a consistently positive and relatively precise estimate. Professional development shows a modest positive association, particularly in math. Other subcategories are generally positive but estimated with considerable uncertainty.

For attendance and chronic absenteeism, the quality subcategory effects are generally smaller and less precisely estimated, though learning resources retain a positive point estimate. For dropout, the positive association is driven primarily by educational technology and learning resources. The overall pattern suggests that the components of quality spending most tightly connected to classroom instruction—learning materials and professional development—are those most robustly associated with higher test-score SVA, while the associations with non-cognitive outcomes are less consistent.

## 6.4 Student Well-Being Subcategories

Table 11 decomposes well-being spending into eight subcategories: uniforms and clothing, school meals, transportation, student support, medical appointments, sports programs, school supplies, and other well-being.

For test scores, *school meals* show a large positive and significant coefficient, standing out against the otherwise negative well-being associations. This suggests that nutritional support may contribute directly to learning, even as other well-being categories—such as medical appointments and student support—are negatively associated with test-score SVA. Uniforms show a significant negative association with chronic absenteeism SVA (i.e., higher uniform spending is associated with lower absenteeism), consistent with uniform policies reducing barriers to school attendance. *Transportation* spending is positively associated with dropout SVA, indicating that school transportation services support retention.

These subcategory results illuminate why the aggregate well-being coefficient differs across outcomes: the category contains items with very different functions. School meals may support cognitive function; uniforms and transportation reduce barriers to attendance; student support and medical services address underlying needs that are positively correlated with disadvantage. The multidimensional framework disentangles these competing mechanisms.

## 6.5 Public versus Private Schools

Table 12 examines whether the spending–SVA associations differ by school sector. We estimate separate models for public and private subsidized schools. The quality-program advantage is concentrated among public schools, where discretionary non-personnel budgets are more likely to be channeled through quality programs. For private schools, the associations are generally weaker and less precisely estimated, consistent with greater heterogeneity in how private institutions allocate non-personnel resources.

Since personnel accounts for roughly 78% of total expenditures and the broad personnel coefficient flips sign across sectors—positive in public schools for test scores and dropout, negative in private schools—we push the heterogeneity analysis further by decomposing personnel into six staff types (Table 13, Figure 8). In the joint specification, three patterns stand out. First, instructional support teachers are positively associated with test-score SVA in public schools but not in private schools, suggesting that the pedagogical specialist model—a distinctive feature of Chile's targeted equity funding—operates primarily through the public sector. Second, administrative and paraprofessional staff show significant positive associations with attendance and chronic absenteeism SVA in public schools, with no counterpart in the private sector. This is consistent with the hypothesis that administrative capacity is binding in public schools, where bureaucratic demands on principals are higher. Third, operational staff spending is significantly associated with lower chronic absenteeism in public schools, reinforcing the school-climate channel identified in the pooled estimates.

For private schools, the most notable result is the positive association between school leadership spending and attendance SVA, consistent with the possibility that private institutions benefit from marginal investments in principal quality. The remaining personnel subcategories show no significant differences across sectors.

Appendix Tables A.2 and A.3 extend the heterogeneity analysis to quality and well-being subcategories. For quality programs, learning resources show a significant positive association with test-score SVA in public schools but not in private schools, while staff professional development is positively associated with dropout SVA in public schools but negatively associated with attendance SVA, again suggesting compensatory allocation. For well-being, the most notable finding is that school meals are positively associated with test-score SVA in private schools, and school supplies with attendance SVA in both sectors.

## 6.6 Summary of Results and Interpretation

Across categories and outcomes, four patterns emerge. First, not all dollars are equal: expenditures on instructional reinforcement, learning resources, and selected professional development activities are consistently associated with higher test-score SVA. Second, student well-being spending is negatively associated with test-score and dropout SVA, likely reflecting compensatory responses rather than causal impacts, but is positively associated with attendance and chronic absenteeism SVA, suggesting that well-being investments serve student engagement margins not captured by test scores. Third, infrastructure spending shows a significant positive association with attendance SVA that does not appear for test scores, indicating that physical school conditions may matter for dimensions of effectiveness that learning assessments miss. Fourth, personnel spending operates through specific staff types: instructional support teachers for test scores, classroom teachers and leadership for attendance, and broad staffing investments for dropout prevention.

These results highlight that the composition of school spending, rather than its aggregate level, is the most informative dimension for understanding school effectiveness—and that the composition that matters depends on which outcome we examine. Table 14 provides a compact summary of the direction and significance of associations across all spending categories and outcome dimensions.

## 6.7 Caveats

While our empirical strategy leverages rich controls and school fixed effects, several caveats remain. First, contemporaneous SVA may influence current spending choices (reverse causality). Schools experiencing declines in performance may redirect spending toward student well-being or security services. Second, omitted time-varying factors—such as leadership changes, neighborhood shocks, or municipal budget reallocations—

may affect both expenditures and SVA. Third, many spending categories likely operate with lags. Infrastructure, professional development, and staffing changes may affect outcomes only after several years, whereas our fixed-effects specification captures relatively short-run associations. Finally, measurement error in expenditure reporting may bias estimates toward zero if it varies within schools over time. The fact that the spending–SVA associations differ systematically across outcome dimensions provides some additional reassurance against generic confounders, as a simple omitted variable would need to generate outcome-specific patterns matching the detailed category-level associations we document.

Taken together, the results suggest that schools that improve their effectiveness tend to allocate discretionary resources toward instructional quality—particularly instructional support teachers and learning resources—while schools facing greater behavioral or socioemotional challenges allocate more to student well-being, corresponding to lower test-score SVA but higher attendance effectiveness. Future work should explore dynamic spending effects and leverage Chile's centralized admissions lotteries to estimate the causal effects of spending composition on multidimensional school value added.

# 7 Conclusion

This paper documents how the composition of school spending relates to multiple dimensions of school effectiveness. Using a new national panel of audited, highly disaggregated expenditure data linked to shrinkage-adjusted measures of school value added (SVA) for test scores, attendance, chronic absenteeism, and dropout, we provide the first comprehensive portrait of how schools allocate their resources across dozens of functional categories and how these allocations correlate with student outcomes along cognitive and non-cognitive margins.

Four patterns emerge. First, schools exhibit substantial and persistent heterogene-

ity in spending composition, even among institutions with similar total resources and student demographics. Second, differences in school effectiveness align more closely with how resources are allocated than with how much is spent: schools with higher test-score SVA devote relatively more to instructional quality—especially pedagogical supports, learning materials, and instructional support teachers—and comparatively less to student well-being services. Third, the associations between spending composition and school effectiveness are outcome-specific: the well-being expenditures negatively associated with test-score SVA are positively associated with attendance and chronic absenteeism SVA, and infrastructure spending supports attendance effectiveness in ways not captured by learning assessments. Fourth, improvements in test-score SVA over time are associated with internal budget reallocations toward instructional personnel, whereas improvements in non-cognitive outcomes are less clearly tied to observable compositional shifts, suggesting that the mechanisms through which spending supports different margins of effectiveness may operate through distinct channels.

These findings carry two implications. The first is methodological: single-outcome analyses of school spending—which dominate the existing literature—risk mischaracterizing the returns to specific expenditure categories. A spending category that appears unproductive through the lens of test-score gains may nonetheless support student engagement and retention. Evaluating school spending through a multidimensional lens is therefore necessary for a complete accounting of how resources translate into educational outcomes.

The second implication is for policy. The consistent positive association between quality-program spending and SVA across all outcome dimensions suggests that investments in pedagogical supports, learning materials, and professional development represent a robust use of marginal educational resources. At the same time, the positive attendance and absenteeism associations with well-being spending imply that policymakers should be cautious about interpreting compensatory spending patterns as evidence

of waste. Schools serving disadvantaged populations may allocate more to well-being services precisely because these investments support the student engagement that is a precondition for learning—even if the test-score effects are not immediately visible.

Because our estimates are not causal, they should be interpreted as patterns that inform rather than substitute for causal identification. Future work will exploit quasi-experimental variation from Chile's centralized admissions system—which assigns students through tie-breaking lotteries—to estimate the causal effects of spending composition on multidimensional school value added. Additional extensions include examining heterogeneous effects across school types, studying the dynamic returns to sustained investments in instructional quality, and testing whether the spending–effectiveness associations documented here extend to long-run outcomes such as educational attainment and labor market participation.

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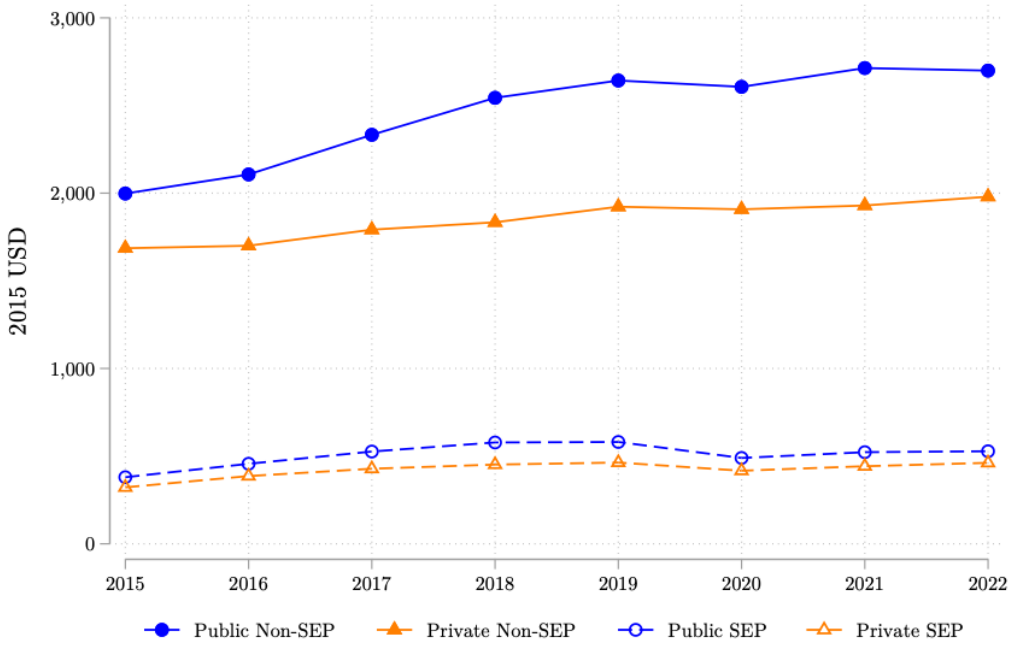
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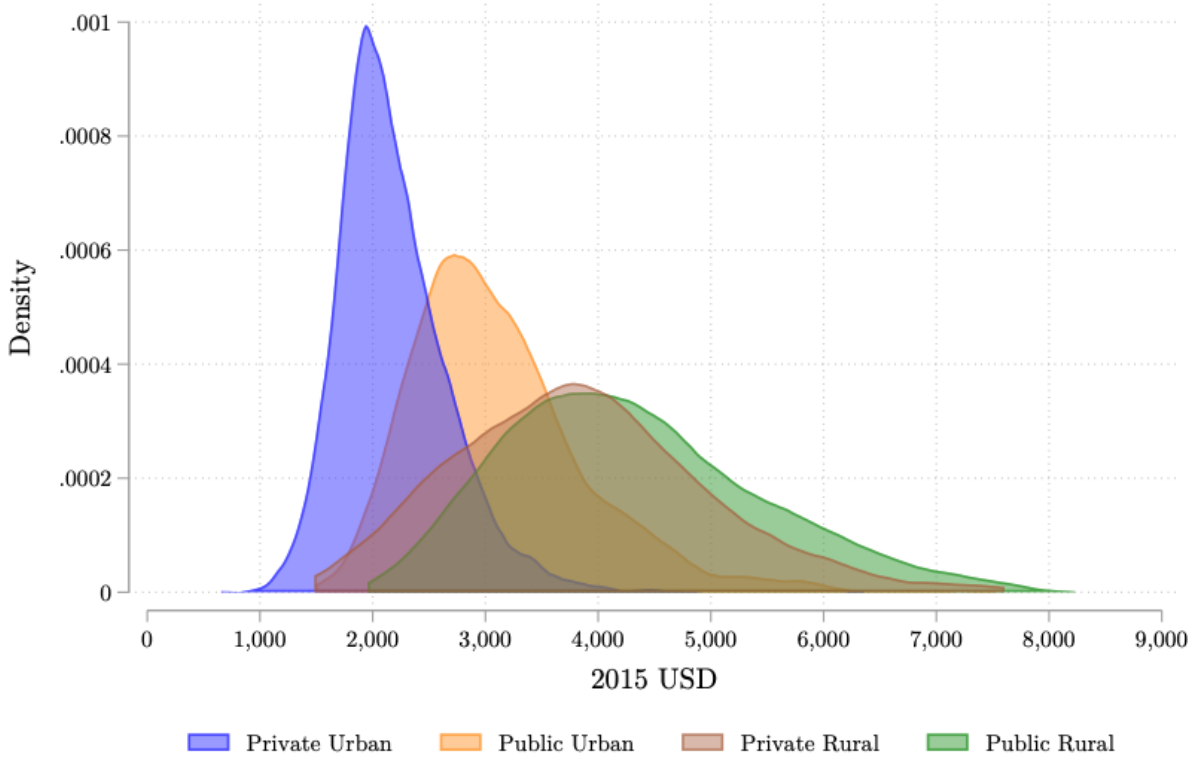
# Figures

**Figure 1:** Evolution of Per-Student Expenditure



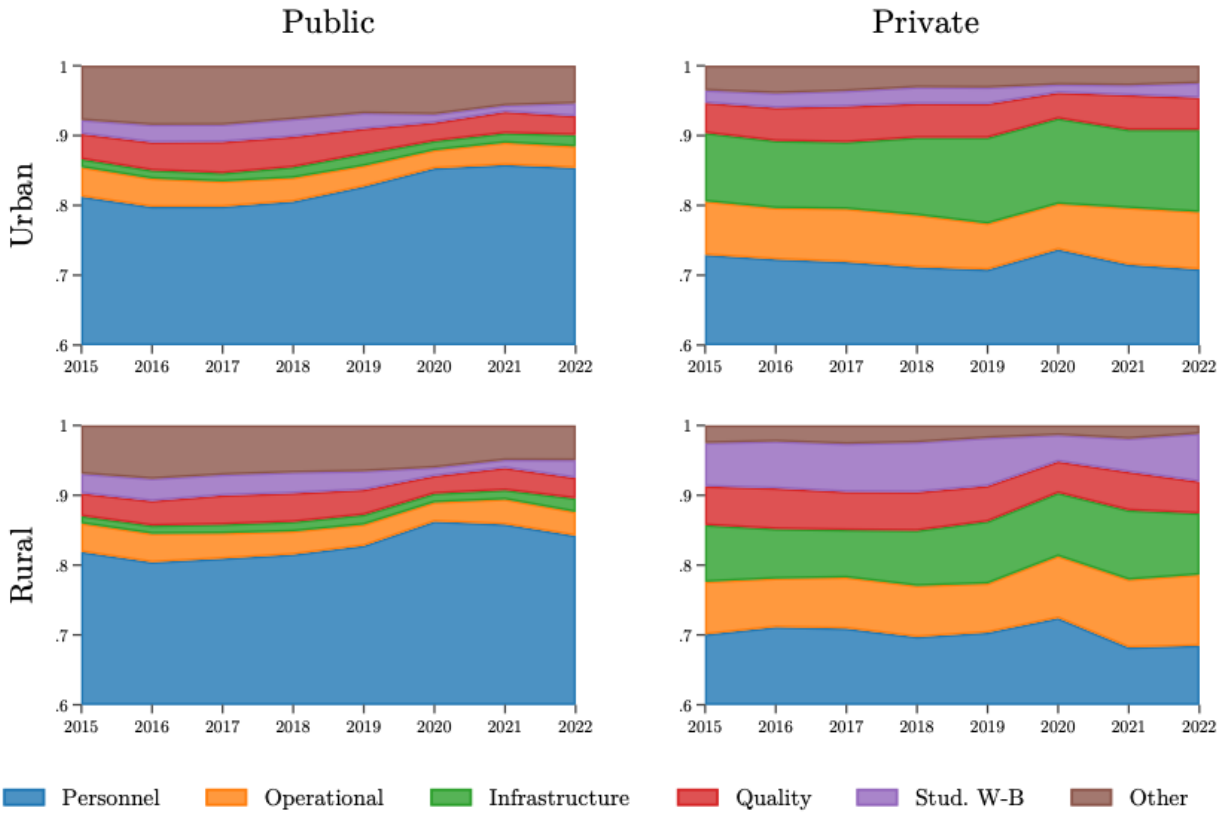

*Notes*: Targeted equity funding refers to expenditures financed by the Subvención Escolar Preferencial (SEP); discretionary funding covers all other expenditures from the regular per-student voucher. "Public" corresponds to municipal schools; "Private" corresponds to privately managed voucher schools.

**Figure 2:** Average (2015–2022) Per-Student Expenditure Distribution



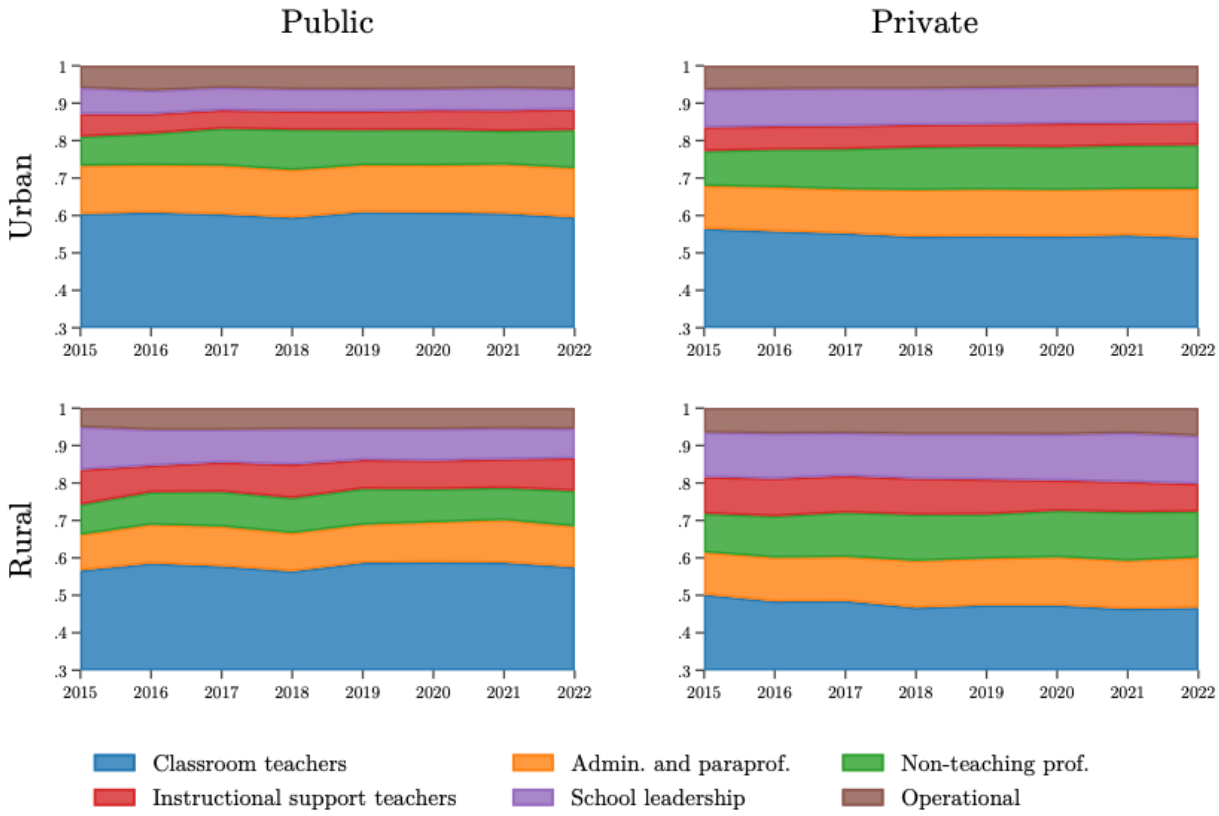

*Notes*: "Public" corresponds to municipal schools; "Private" corresponds to privately managed voucher schools.

**Figure 3:** Evolution of Expenditure Composition



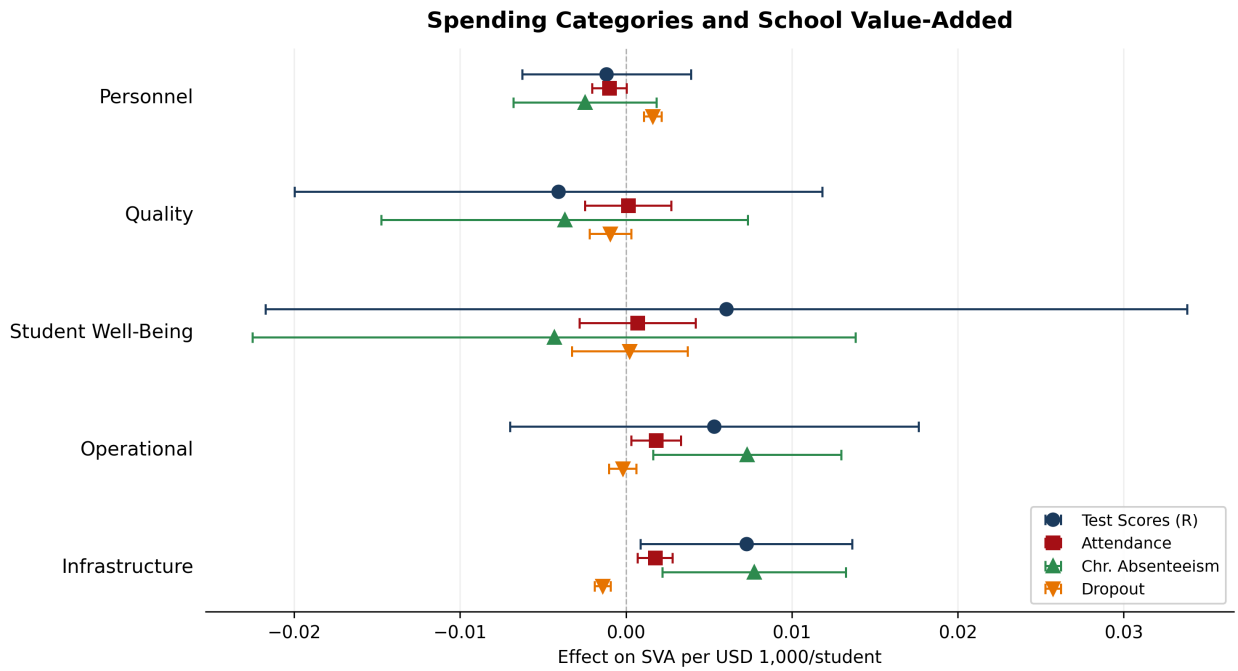

*Notes*: "Public" corresponds to municipal schools; "Private" corresponds to privately managed voucher schools.

**Figure 4:** Evolution of Personnel Expenditure Composition



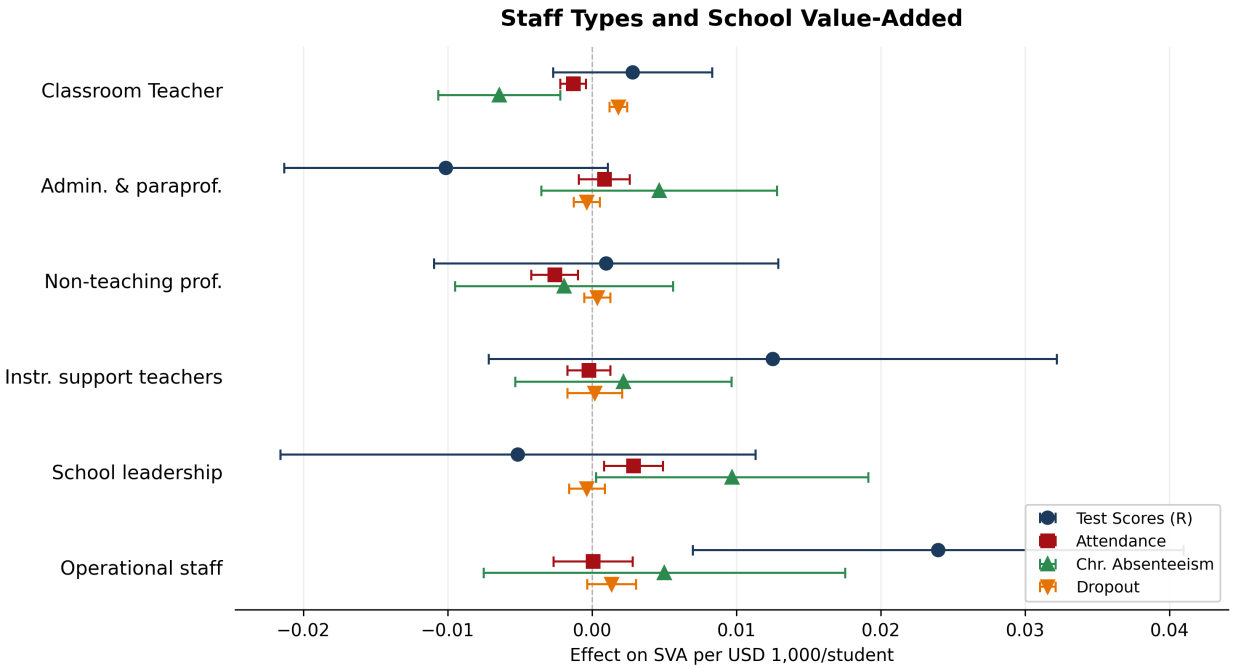

*Notes*: "Public" corresponds to municipal schools; "Private" corresponds to privately managed voucher schools. Personnel categories follow the Chilean Superintendencia de Educación's classification: Classroom teachers, School leadership (principals, vice-principals, instructional leaders), Instructional support teachers (pedagogical specialists), Non-teaching professionals (psychologists, social workers), Administrative and Paraprofessional staff (management support, assistants, monitors), and Operational staff (janitorial and maintenance).

**Figure 5:** Spending Composition and School Value-Added: Broad Categories



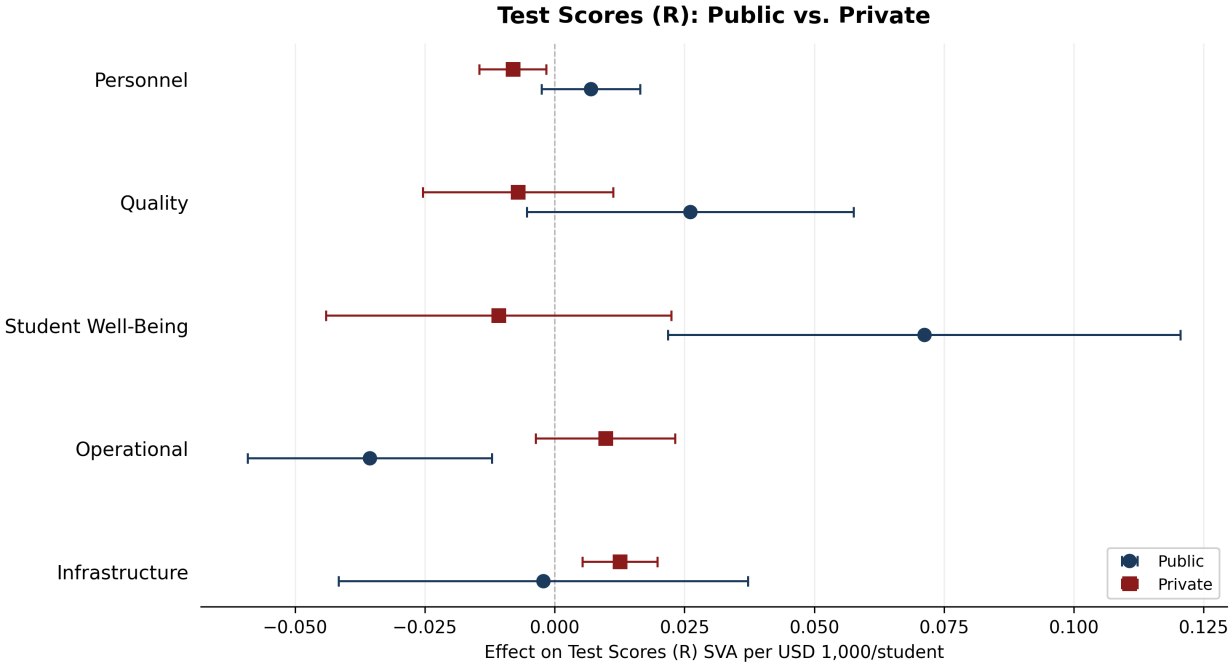

*Notes*: The figure plots coefficient estimates from school fixed-effects regressions of SVA on spending shares for five broad expenditure categories. Each marker represents a different outcome dimension: test scores (reading and math), attendance, chronic absenteeism, and dropout. All specifications include school and year fixed effects and control for total expenditure, enrollment, and the number and share of low-SES students. Expenditures are expressed in units of 10,000 (2015 USD). The 95% confidence intervals reflect standard errors clustered at the school level.

**Figure 6:** Spending Composition and School Value-Added: Personnel Types



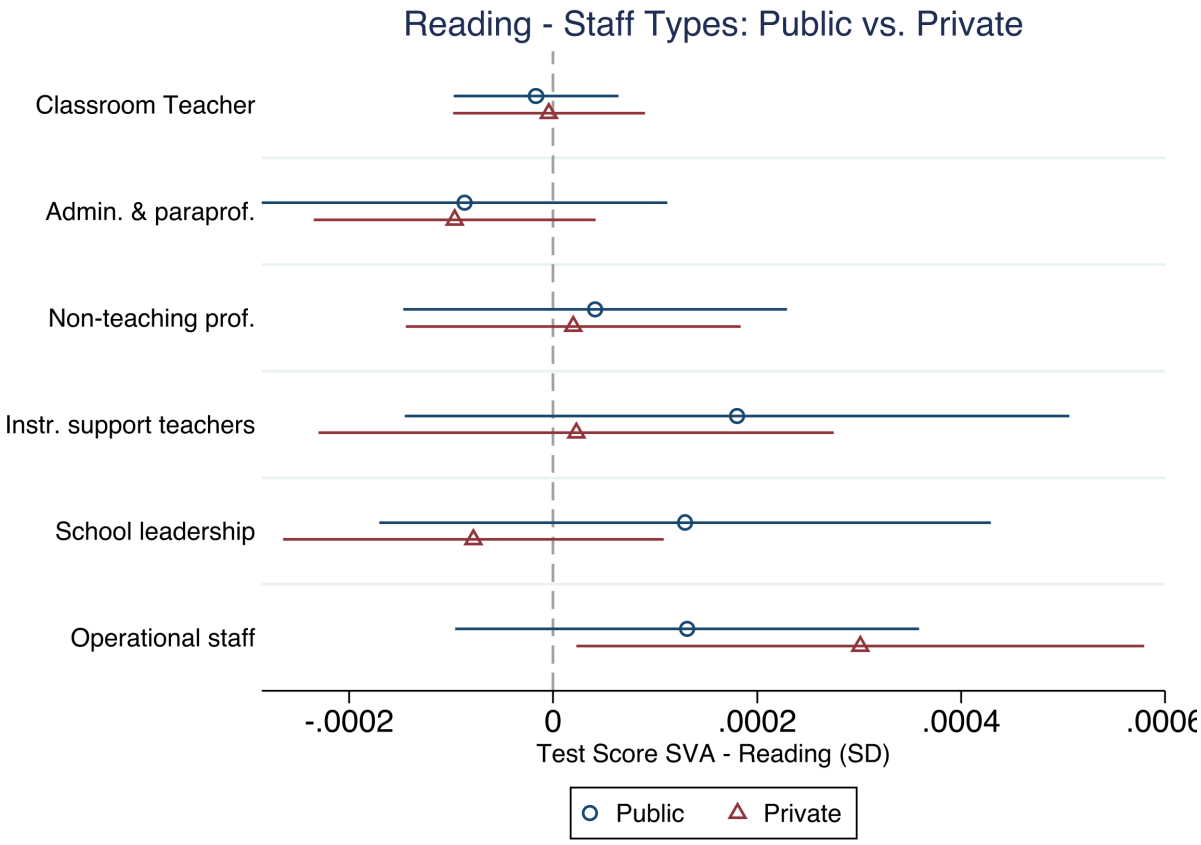

*Notes*: The figure plots coefficient estimates from school fixed-effects regressions of SVA on spending shares for six personnel types. Each marker represents a different outcome dimension: test scores (reading and math), attendance, chronic absenteeism, and dropout. All specifications include school and year fixed effects and control for total expenditure, enrollment, and the number and share of low-SES students. Expenditures are expressed in units of 10,000 (2015 USD). The 95% confidence intervals reflect standard errors clustered at the school level.

**Figure 7:** Broad Spending Categories and SVA: Public vs. Private Schools (Test Scores)




*Notes*: The figure plots coefficient estimates from separate school fixed-effects regressions for public and private subsidized schools. All specifications include school and year fixed effects and control for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% confidence intervals reflect standard errors clustered at the school level.

**Figure 8:** Personnel Subcategories and SVA: Public vs. Private Schools (Test Scores)




*Notes*: The figure plots coefficient estimates from separate school fixed-effects regressions for public (navy) and private subsidized (maroon) schools. All six personnel types are entered jointly. Specifications include school and year fixed effects and control for total expenditure, enrollment, and student composition. Expenditures in units of USD 1,000 (2015 prices). 95% confidence intervals reflect standard errors clustered at the school level.

# Tables

**Table 1:** Summary Statistics by SVA: School-Year Level (2015–2022)

| | Mean | SD | P25 | P75 |
|---|---|---|---|---|
| **A. School Value Added** | | | | |
| Reading (SD) | -0.026 | 0.143 | -0.116 | 0.065 |
| Math (SD) | -0.038 | 0.153 | -0.142 | 0.051 |
| **B. Expenditures (2015 USD per student)** | | | | |
| Total expenditure | 3,071 | 1,171 | 2,180 | 3,702 |
| Personnel | 2,431 | 1,032 | 1,631 | 3,004 |
| Operations | 149 | 91 | 90 | 180 |
| Infrastructure | 136 | 147 | 34 | 197 |
| Quality programs | 114 | 76 | 63 | 151 |
| Student well-being | 86 | 112 | 24 | 102 |
| **C. Shares of Total Expenditure** | | | | |
| Personnel | 0.783 | 0.092 | 0.724 | 0.854 |
| Operations | 0.052 | 0.032 | 0.030 | 0.066 |
| Infrastructure | 0.053 | 0.059 | 0.010 | 0.086 |
| Quality programs | 0.039 | 0.025 | 0.022 | 0.051 |
| Student well-being | 0.026 | 0.027 | 0.009 | 0.031 |
| **D. School Characteristics** | | | | |
| Rural | 0.296 | 0.454 | 0.000 | 1.000 |
| PIE program | 0.748 | 0.406 | 0.625 | 1.000 |
| Enrollment | 449 | 424 | 149 | 612 |
| Prop. female students | 0.481 | 0.102 | 0.447 | 0.507 |
| Prop. low SES students | 0.411 | 0.070 | 0.385 | 0.459 |

*Notes*:

**Table 2:** Spending Composition by School Value-Added Group

| | Low SVA | Mid SVA | High SVA | High – Low Raw | High – Low Adjusted |
|---|---|---|---|---|---|
| | | | ***Panel A: Reading*** | | |
| **Expenditures (2015 USD per student)** | | | | | |
| Total expenditure | 3,093 | 3,160 | 2,936 | -157*** | 30 |
| Personnel | 2,484 | 2,507 | 2,275 | -209*** | 0 |
| Operations | 142 | 150 | 155 | 13*** | -2 |
| Infrastructure | 114 | 131 | 166 | 52*** | -3 |
| Quality programs | 111 | 120 | 110 | -1 | 18*** |
| Student well-being | 89 | 91 | 78 | -11*** | -10*** |
| Other | 154 | 161 | 152 | -2 | 26*** |
| **Shares of Total Expenditure** | | | | | |
| Personnel | 0.796 | 0.784 | 0.767 | -0.029*** | -0.007*** |
| Operations | 0.049 | 0.051 | 0.057 | 0.009*** | -0.000 |
| Infrastructure | 0.043 | 0.051 | 0.068 | 0.025*** | -0.001 |
| Quality programs | 0.038 | 0.041 | 0.038 | 0.000 | 0.006*** |
| Student well-being | 0.027 | 0.027 | 0.023 | -0.004*** | -0.003*** |
| Other | 0.047 | 0.046 | 0.046 | -0.001 | 0.006*** |
| | | | ***Panel B: Math*** | | |
| **Expenditures (2015 USD per student)** | | | | | |
| Total expenditure | 3,170 | 3,069 | 2,878 | -292*** | 15 |
| Personnel | 2,553 | 2,442 | 2,229 | -324*** | -10 |
| Operations | 142 | 148 | 151 | 9*** | -5* |
| Infrastructure | 108 | 135 | 166 | 58*** | -5 |
| Quality programs | 114 | 114 | 111 | -4 | 16*** |
| Student well-being | 94 | 83 | 72 | -23*** | -16*** |
| Other | 158 | 147 | 149 | -9* | 33*** |
| **Shares of Total Expenditure** | | | | | |
| Personnel | 0.800 | 0.785 | 0.766 | -0.034*** | -0.008*** |
| Operations | 0.047 | 0.052 | 0.057 | 0.009*** | -0.001*** |
| Infrastructure | 0.039 | 0.054 | 0.069 | 0.030*** | -0.001 |
| Quality programs | 0.038 | 0.039 | 0.040 | 0.002** | 0.007*** |
| Student well-being | 0.028 | 0.025 | 0.022 | -0.006*** | -0.005*** |
| Other | 0.048 | 0.044 | 0.046 | -0.002 | 0.007*** |

*Notes*: Schools grouped by terciles of school value added (low, mid, high). The last two columns report differences in means: the first is raw (unadjusted), the second controls for sector (public/private), locale (urban/rural), in school integration program (PIE), number and proportion of low-SES students, enrollment, and region fixed effects. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

**Table 3:** Spending Composition by School Value-Added Tercile: Non-Cognitive Outcomes

| | Mean Per-Student Spending (USD) | | | High–Low Difference | |
|---|---|---|---|---|---|
| | Low SVA | Mid SVA | High SVA | Raw | Adjusted |
| *Panel C: Attendance (N = 6,084)* | | | | | |
| Total | 2954 | 3095 | 3187 | 234*** | -62** |
| Personnel | 2439 | 2437 | 2432 | -8 | -133*** |
| Personnel (share) | 0.816 | 0.776 | 0.758 | -0.058*** | -0.024*** |
| Quality | 99 | 116 | 127 | 28*** | 12*** |
| Quality (share) | 0.036 | 0.040 | 0.041 | 0.006*** | 0.004*** |
| Student WB | 60 | 82 | 117 | 57*** | 2 |
| Student WB (share) | 0.019 | 0.025 | 0.033 | 0.014*** | 0.002** |
| Operations | 125 | 156 | 166 | 41*** | -5 |
| Operations (share) | 0.045 | 0.056 | 0.056 | 0.011*** | -0.000 |
| Infrastructure | 96 | 139 | 172 | 76*** | 8** |
| Infrastructure (share) | 0.039 | 0.057 | 0.064 | 0.024*** | 0.004*** |
| Other | 135 | 164 | 174 | 38*** | 53*** |
| Other (share) | 0.045 | 0.047 | 0.048 | 0.003** | 0.014*** |
| *Panel D: Chronic Absenteeism (N = 6,084)* | | | | | |
| Total | 2881 | 3042 | 3313 | 432*** | 11 |
| Personnel | 2370 | 2397 | 2540 | 170*** | -65*** |
| Personnel (share) | 0.812 | 0.777 | 0.762 | -0.050*** | -0.020*** |
| Quality | 99 | 113 | 130 | 32*** | 12*** |
| Quality (share) | 0.036 | 0.039 | 0.041 | 0.005*** | 0.004*** |
| Student WB | 53 | 80 | 126 | 72*** | 9*** |
| Student WB (share) | 0.018 | 0.025 | 0.035 | 0.017*** | 0.004*** |
| Operations | 125 | 154 | 169 | 44*** | -3 |
| Operations (share) | 0.047 | 0.056 | 0.054 | 0.008*** | -0.002* |
| Infrastructure | 98 | 138 | 171 | 73*** | 13*** |
| Infrastructure (share) | 0.042 | 0.056 | 0.061 | 0.019*** | 0.005*** |
| Other | 136 | 161 | 177 | 41*** | 44*** |
| Other (share) | 0.046 | 0.047 | 0.047 | 0.001 | 0.010*** |
| *Panel E: Dropout (N = 6,085)* | | | | | |
| Total | 3206 | 3393 | 2635 | -571*** | -148*** |
| Personnel | 2569 | 2663 | 2075 | -493*** | -96*** |
| Personnel (share) | 0.797 | 0.779 | 0.773 | -0.024*** | -0.000 |
| Quality | 110 | 128 | 103 | -8*** | 6*** |
| Quality (share) | 0.036 | 0.040 | 0.041 | 0.005*** | 0.005*** |
| Student WB | 100 | 108 | 51 | -49*** | -28*** |
| Student WB (share) | 0.029 | 0.030 | 0.019 | -0.010*** | -0.006*** |
| Operations | 146 | 162 | 139 | -7** | -5** |
| Operations (share) | 0.048 | 0.051 | 0.058 | 0.010*** | 0.003*** |
| Infrastructure | 134 | 132 | 142 | 9* | -25*** |
| Infrastructure (share) | 0.048 | 0.047 | 0.064 | 0.017*** | -0.005*** |
| Other | 147 | 200 | 125 | -22*** | 0 |
| Other (share) | 0.043 | 0.052 | 0.045 | 0.003* | 0.003** |

*Notes:* Per-student spending in 2015 USD. SVA terciles computed from the school-level mean of empirical Bayes shrinkage-adjusted value added. Adjusted differences condition on sector, rurality, PIE participation, enrollment, the level and concentration of low-SES students, and region fixed effects. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

**Table 4:** Changes in Per-Student Spending (2015 USD) by School SVA Dynamics

| | Decliners | Stable | Improvers | Imp. – Dec. Raw | Imp. – Dec. Adjusted |
|---|---|---|---|---|---|
| ***Panel A: Reading SVA*** | | | | | |
| Δ Total expenditure | 528 | 548 | 557 | 29 | 12 |
| Δ Personnel | 435 | 454 | 474 | 39** | 27 |
| Δ Operations | 14 | 10 | 12 | -2 | -2 |
| Δ Infrastructure | 44 | 49 | 48 | 4 | 2 |
| Δ Quality programs | 18 | 20 | 20 | 2 | 2 |
| Δ Student well-being | 8 | 9 | 7 | -1 | -2 |
| Δ Other | 10 | 7 | -2 | -12** | -15*** |
| ***Panel B: Math SVA*** | | | | | |
| Δ Total expenditure | 532 | 573 | 540 | 8 | -12 |
| Δ Personnel | 435 | 480 | 464 | 29* | 12 |
| Δ Operations | 14 | 11 | 9 | -5 | -4 |
| Δ Infrastructure | 50 | 53 | 41 | -9** | -8* |
| Δ Quality programs | 19 | 18 | 20 | 2 | 2 |
| Δ Student well-being | 6 | 7 | 6 | 0 | -1 |
| Δ Other | 8 | 6 | -1 | -9* | -13** |

*Notes*: Schools are classified as *improvers*, *stable*, or *decliners* based on their change in SVA in the 2015-2022 period. The last two columns report differences in means: the first is raw (unadjusted), the second controls for sector (public/private), locale (urban/rural), in school integration program (PIE), number and proportion of low-SES students, enrollment, and region fixed effects. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

**Table 5:** Changes in Per-Student Remunerations (2015 USD) by School SVA Dynamics

| | Decliners | Stable | Improvers | Imp. – Dec. Raw | Imp. – Dec. Adjusted |
|---|---|---|---|---|---|
| ***Panel A: Reading SVA*** | | | | | |
| Δ Classroom teachers | 269.609 | 291.297 | 290.187 | 20.578* | 16.340 |
| Δ Admin. and paraprof. | 60.835 | 55.981 | 62.827 | 1.991 | -1.719 |
| Δ Non-teaching prof. | 71.825 | 68.534 | 75.350 | 3.525 | -0.468 |
| Δ Instructional support teachers | 23.034 | 29.647 | 34.659 | 11.625* | 11.341* |
| Δ School leadership | 26.623 | 24.827 | 23.997 | -2.626 | -4.436 |
| Δ Operational | 21.874 | 27.601 | 30.612 | 8.739*** | 7.081** |
| ***Panel B: Math SVA*** | | | | | |
| Δ Classroom teachers | 270.581 | 299.716 | 294.413 | 23.832** | 9.269 |
| Δ Admin. and paraprof. | 59.191 | 63.210 | 58.356 | -0.835 | -4.355 |
| Δ Non-teaching prof. | 69.416 | 69.270 | 78.923 | 9.507* | 6.636 |
| Δ Instructional support teachers | 19.010 | 32.680 | 31.845 | 12.836* | 9.689 |
| Δ School leadership | 26.413 | 23.626 | 26.514 | 0.102 | -1.147 |
| Δ Operational | 23.934 | 28.058 | 27.162 | 3.229 | 0.212 |

*Notes*: Schools are classified as *improvers*, *stable*, or *decliners* based on their change in SVA in the 2015-2022 period. We use personnel expenditure categories reported by the Chilean Superintendencia de Educación, which classify school staff into six groups: Classroom teachers, Administrative and Paraprofessional staff (management support staff, administrative assistants, school monitors, and general administrative personnel), Non-teaching professionals (psychologists, social workers, etc.), Instructional support teachers (instructional support teachers, pedagogical specialists), School leadership (principals, vice-principals, instructional leaders), and Operational (janitorial and maintenance assistants). The last two columns report differences in means: the first is raw (unadjusted), the second controls for sector (public/private), locale (urban/rural), in-school integration program (PIE), number and proportion of low-SES students, enrollment, and region fixed effects. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

**Table 6:** Changes in Per-Student Spending by SVA Dynamics (Improvers vs. Decliners)

| | Mean Δ Per-Student Spending (USD) | | | Improver–Decliner Diff. | |
|---|---|---|---|---|---|
| | Decliners | Stable | Improvers | Raw | Adjusted |
| *Panel A: Reading (N = 5,770)* | | | | | |
| Total | 479 | 500 | 499 | 19 | 8 |
| Personnel | 400 | 419 | 432 | 31** | 24* |
| Quality | 11 | 8 | 8 | -3 | -3 |
| Student WB | 39 | 44 | 43 | 4 | 2 |
| Operations | 16 | 17 | 17 | 1 | 2 |
| Infrastructure | 7 | 7 | 5 | -2 | -3 |
| Other | 7 | 5 | -5 | -12** | -13** |
| *Panel B: Math (N = 5,331)* | | | | | |
| Total | 482 | 516 | 495 | 13 | 0 |
| Personnel | 397 | 439 | 432 | 35** | 22* |
| Quality | 12 | 8 | 7 | -5* | -3 |
| Student WB | 45 | 48 | 37 | -8* | -6 |
| Operations | 17 | 15 | 18 | 1 | 2 |
| Infrastructure | 5 | 5 | 4 | -0 | -2 |
| Other | 6 | 3 | -4 | -10* | -13** |
| *Panel C: Attendance (N = 6,084)* | | | | | |
| Total | 422 | 413 | 454 | 32 | -36* |
| Personnel | 327 | 305 | 355 | 28* | -30* |
| Quality | 1 | 13 | 8 | 8 | 4 |
| Student WB | 16 | 21 | 17 | 1 | -0 |
| Operations | 32 | 31 | 26 | -6** | -9*** |
| Infrastructure | 22 | 25 | 30 | 8*** | -0 |
| Other | 24 | 19 | 18 | -7 | -1 |
| *Panel D: Chronic Absenteeism (N = 6,084)* | | | | | |
| Total | 415 | 406 | 468 | 54*** | -19 |
| Personnel | 316 | 307 | 363 | 47*** | -11 |
| Quality | 3 | 11 | 8 | 4 | 1 |
| Student WB | 20 | 18 | 17 | -3 | -7 |
| Operations | 32 | 29 | 28 | -4 | -8*** |
| Infrastructure | 22 | 24 | 30 | 8*** | -1 |
| Other | 21 | 16 | 23 | 2 | 7 |
| *Panel E: Dropout (N = 6,085)* | | | | | |
| Total | 637 | 536 | 505 | -132*** | -77*** |
| Personnel | 559 | 476 | 463 | -96*** | -38*** |
| Quality | 7 | 8 | 1 | -6* | -1 |
| Student WB | 48 | 52 | 42 | -7 | -10** |
| Operations | 12 | 11 | 4 | -8*** | -7*** |
| Infrastructure | 2 | 4 | -1 | -4 | -7** |
| Other | 8 | -13 | -4 | -12* | -14** |

*Notes:* Changes in per-student spending (2015 USD) between first and last observed period. Decliners, stable, and improvers defined by terciles of the within-school change in SVA. Adjusted differences condition on sector, rurality, PIE participation, enrollment, the level and concentration of low-SES students, and region fixed effects. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

**Table 7:** Changes in Per-Student Remunerations by SVA Dynamics (Improvers vs. Decliners)

| | Mean Δ Per-Student Remun. (USD) | | | Improver–Decliner Diff. | |
|---|---|---|---|---|---|
| | Decliners | Stable | Improvers | Raw | Adjusted |
| *Panel A: Reading (N = 5,770)* | | | | | |
| Classroom Teachers | 248.2 | 270.2 | 266.3 | 18.1* | 16.0* |
| Admin/Paraprofessional | 56.2 | 52.1 | 58.0 | 1.8 | -1.1 |
| Non-teaching Professionals | 66.5 | 65.2 | 70.7 | 4.2 | 0.9 |
| Instructional Support | 20.9 | 26.9 | 33.3 | 12.3* | 12.1* |
| School Leadership | 24.1 | 22.1 | 22.2 | -1.9 | -3.4 |
| Operational Staff | 19.9 | 25.8 | 27.7 | 7.8*** | 6.5** |
| *Panel B: Math (N = 5,331)* | | | | | |
| Classroom Teachers | 247.7 | 277.5 | 273.7 | 26.0** | 14.5 |
| Admin/Paraprofessional | 54.6 | 58.2 | 54.6 | -0.0 | -2.9 |
| Non-teaching Professionals | 64.5 | 65.0 | 75.2 | 10.7** | 8.7* |
| Instructional Support | 17.7 | 29.5 | 30.8 | 13.1* | 9.4 |
| School Leadership | 22.9 | 20.8 | 24.7 | 1.9 | 1.0 |
| Operational Staff | 21.6 | 26.1 | 25.3 | 3.7 | 1.3 |
| *Panel C: Attendance (N = 6,084)* | | | | | |
| Classroom Teachers | 185.1 | 167.3 | 198.1 | 13.0 | -8.0 |
| Admin/Paraprofessional | 47.6 | 49.6 | 57.1 | 9.5** | 0.1 |
| Non-teaching Professionals | 62.2 | 57.8 | 76.9 | 14.7** | 15.8** |
| Instructional Support | 11.4 | -9.6 | -12.3 | -23.7** | -19.6** |
| School Leadership | 3.6 | 26.9 | 19.0 | 15.5** | 8.0 |
| Operational Staff | 25.5 | 22.0 | 26.6 | 1.1 | -1.9 |
| *Panel D: Chronic Absenteeism (N = 6,084)* | | | | | |
| Classroom Teachers | 178.6 | 170.9 | 200.9 | 22.2* | -4.2 |
| Admin/Paraprofessional | 46.7 | 48.4 | 59.3 | 12.6*** | 0.9 |
| Non-teaching Professionals | 63.6 | 55.2 | 77.8 | 14.3** | 14.6** |
| Instructional Support | 6.8 | -8.6 | -7.2 | -14.1 | -6.2 |
| School Leadership | 3.7 | 24.9 | 20.8 | 17.1** | 10.0 |
| Operational Staff | 24.4 | 20.3 | 29.3 | 4.9 | 0.8 |
| *Panel E: Dropout (N = 6,085)* | | | | | |
| Classroom Teachers | 350.8 | 310.9 | 300.5 | -50.4*** | -5.2 |
| Admin/Paraprofessional | 75.5 | 61.4 | 58.3 | -17.2*** | -8.8* |
| Non-teaching Professionals | 81.9 | 78.8 | 67.4 | -14.4** | -13.4** |
| Instructional Support | 25.7 | 28.9 | 27.0 | 1.2 | 9.0 |
| School Leadership | 37.5 | 27.3 | 22.1 | -15.4*** | -9.6** |
| Operational Staff | 38.8 | 31.2 | 30.7 | -8.2** | -6.9* |

*Notes:* Changes in per-student remunerations (2015 USD) between first and last observed period. Categories follow the Superintendencia de Educación classification: classroom teachers (*docaul*), administrative/paraprofessional (*asipar*), non-teaching professionals (*asipro*), instructional support teachers (*doctep*), school leadership (*docdir*), and operational staff (*asiaux*). Adjusted differences condition on sector, rurality, PIE participation, enrollment, low-SES student shares, and region FE. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

**Table 8:** Spending Composition and School Value-Added: Broad Categories

| | Test Scores (R) | Attendance | Chr. Absenteeism | Dropout |
|---|---|---|---|---|
| | *Panel A: Regression coefficients* | | | |
| Personnel | -0.001 | -0.001** | -0.002 | 0.002*** |
| | (0.003) | (0.001) | (0.002) | (0.000) |
| Quality | -0.004 | 0.000 | -0.004 | -0.001 |
| | (0.008) | (0.001) | (0.006) | (0.001) |
| Student Well-Being | 0.006 | 0.001 | -0.004 | 0.000 |
| | (0.014) | (0.002) | (0.009) | (0.002) |
| Operational | 0.005 | 0.002** | 0.007*** | -0.000 |
| | (0.006) | (0.001) | (0.003) | (0.000) |
| Infrastructure | 0.007** | 0.002*** | 0.008*** | -0.001*** |
| | (0.003) | (0.001) | (0.003) | (0.000) |
| Observations | 15,534 | 17,080 | 17,080 | 17,082 |
| | *Panel B: Spending per student (USD, 2015 prices)* | | | |
| Personnel | 1,808 (686) | | | |
| Quality | 96 (74) | | | |
| Student Well-Being | 54 (65) | | | |
| Operational | 128 (115) | | | |
| Infrastructure | 111 (141) | | | |

*Notes:* Urban schools only. Each cell reports the coefficient from a separate regression of the SVA outcome on the indicated spending category, controlling for total spending, enrollment, number of priority and preferential students, and share of priority students. All models include school and year fixed effects. Test score models also include a transition fixed effect. Clustered standard errors at the school level in parentheses. Panel B reports the mean and standard deviation (in parentheses) of per-student spending for each category in the estimation sample (USD, 2015 prices). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

**Table 9:** Staff Spending and School Value-Added: Remuneration Types

| | Test Scores (R) | Attendance | Chr. Absenteeism | Dropout |
|---|---|---|---|---|
| | *Panel A: Regression coefficients* | | | |
| Classroom Teacher | 0.003 | -0.001*** | -0.006*** | 0.002*** |
| | (0.003) | (0.000) | (0.002) | (0.000) |
| Admin. | paraprof. | -0.010* | 0.001 | 0.005 |
| -0.000 | | | | |
| | (0.006) | (0.001) | (0.004) | (0.000) |
| Non-teaching prof. | 0.001 | -0.003*** | -0.002 | 0.000 |
| | (0.006) | (0.001) | (0.004) | (0.000) |
| Instr. support teachers | 0.013 | -0.000 | 0.002 | 0.000 |
| | (0.010) | (0.001) | (0.004) | (0.001) |
| School leadership | -0.005 | 0.003*** | 0.010** | -0.000 |
| | (0.008) | (0.001) | (0.005) | (0.001) |
| Operational staff | 0.024*** | 0.000 | 0.005 | 0.001* |
| | (0.009) | (0.001) | (0.006) | (0.001) |
| Observations | 14,881 | 16,908 | 16,908 | 16,632 |
| | *Panel B: Spending per student (USD, 2015 prices)* | | | |
| Classroom Teacher | | 1,074 (472) | | |
| Admin. | paraprof. | | | |
| 223 (156) | | | | |
| Non-teaching prof. | | 179 (150) | | |
| Instr. support teachers | | 107 (125) | | |
| School leadership | | 165 (133) | | |
| Operational staff | | 116 (89) | | |

*Notes:* Urban schools only. Each cell reports the coefficient from a separate regression of the SVA outcome on the indicated spending category, controlling for total spending, enrollment, number of priority and preferential students, and share of priority students. All models include school and year fixed effects. Test score models also include a transition fixed effect. Clustered standard errors at the school level in parentheses. Panel B reports the mean and standard deviation (in parentheses) of per-student spending for each category in the estimation sample (USD, 2015 prices). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

**Table 10:** Quality Program Spending and School Value-Added: Subcategories

| | Test Scores (R) | Attendance | Chr. Absenteeism | Dropout |
|---|---|---|---|---|
| | *Panel A: Regression coefficients* | | | |
| Educ. Tech. Assist. (ATE) | -0.001 | 0.003 | 0.008 | 0.002 |
| | (0.020) | (0.002) | (0.010) | (0.002) |
| Staff Prof. Development | 0.008 | -0.013* | -0.070** | 0.001 |
| | (0.083) | (0.008) | (0.035) | (0.005) |
| Strategic Quality Activities | -0.009 | -0.009 | -0.093 | -0.005 |
| | (0.043) | (0.016) | (0.072) | (0.005) |
| Learning Resources | 0.028** | -0.000 | -0.008 | -0.001 |
| | (0.014) | (0.002) | (0.008) | (0.001) |
| Pedagogical Support Equip. | -0.010 | 0.002 | 0.009 | -0.002 |
| | (0.016) | (0.003) | (0.012) | (0.001) |
| Observations | 12,924 | 14,997 | 14,997 | 14,883 |
| | *Panel B: Spending per student (USD, 2015 prices)* | | | |
| Educ. Tech. Assist. (ATE) | 17 (34) | | | |
| Staff Prof. Development | 4 (10) | | | |
| Strategic Quality Activities | 0 (2) | | | |
| Learning Resources | 51 (46) | | | |
| Pedagogical Support Equip. | 25 (29) | | | |

*Notes:* Urban schools only. Each column is a separate regression including all subcategories jointly, controlling for total spending, enrollment, number of priority and preferential students, and share of priority students. All models include school and year fixed effects. Test score models also include a transition fixed effect. Clustered standard errors at the school level in parentheses. Panel B reports the mean and standard deviation (in parentheses) of per-student spending for each subcategory in the estimation sample (USD, 2015 prices). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

**Table 11:** Student Well-Being Spending and School Value-Added: Subcategories

| | Test Scores (R) | Attendance | Chr. Absenteeism | Dropout |
|---|---|---|---|---|
| | *Panel A: Regression coefficients* | | | |
| Uniforms & Clothing | -0.006 | -0.014* | -0.078** | -0.002 |
| | (0.051) | (0.008) | (0.035) | (0.005) |
| Other Student Well-Being | 0.042 | -0.001 | -0.004 | 0.008 |
| | (0.036) | (0.003) | (0.015) | (0.007) |
| Sports Programs | -0.086 | 0.012 | -0.001 | -0.006 |
| | (0.080) | (0.009) | (0.047) | (0.004) |
| Medical Appointments | -0.168 | 0.030 | 0.070 | -0.022** |
| | (0.135) | (0.037) | (0.177) | (0.010) |
| Student Support | -0.093 | -0.010 | 0.050 | 0.016 |
| | (0.155) | (0.047) | (0.228) | (0.025) |
| School Supplies | 0.005 | 0.014* | 0.051 | 0.000 |
| | (0.069) | (0.008) | (0.038) | (0.006) |
| Transportation | 0.022 | 0.002 | 0.001 | 0.004** |
| | (0.028) | (0.002) | (0.011) | (0.002) |
| School Meals | 0.105** | -0.000 | -0.016 | -0.006 |
| | (0.043) | (0.007) | (0.032) | (0.005) |
| Observations | 11,502 | 16,244 | 16,244 | 12,648 |
| | *Panel B: Spending per student (USD, 2015 prices)* | | | |
| Uniforms & Clothing | 8 (16) | | | |
| Other Student Well-Being | 10 (19) | | | |
| Sports Programs | 1 (4) | | | |
| Medical Appointments | 1 (2) | | | |
| Student Support | 0 (1) | | | |
| School Supplies | 3 (8) | | | |
| Transportation | 21 (44) | | | |
| School Meals | 10 (21) | | | |

*Notes:* Urban schools only. Each column is a separate regression including all subcategories jointly, controlling for total spending, enrollment, number of priority and preferential students, and share of priority students. All models include school and year fixed effects. Test score models also include a transition fixed effect. Clustered standard errors at the school level in parentheses. Panel B reports the mean and standard deviation (in parentheses) of per-student spending for each subcategory in the estimation sample (USD, 2015 prices). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

**Table 12:** Public vs. Private: Spending Categories and School Value-Added

| | Test Scores (R) | | Attendance | | Chr. Absenteeism | | Dropout | |
|---|---|---|---|---|---|---|---|---|
| | Public | Private | Public | Private | Public | Private | Public | Private |
| Personnel | 0.007 | -0.008** | -0.000 | 0.000 | -0.001 | 0.003 | 0.001*** | -0.000 |
| | (0.005) | (0.003) | (0.001) | (0.001) | (0.003) | (0.003) | (0.000) | (0.000) |
| Quality | 0.026* | -0.007 | -0.001 | 0.001 | -0.012 | 0.001 | -0.002 | 0.000 |
| | (0.016) | (0.009) | (0.003) | (0.001) | (0.011) | (0.005) | (0.001) | (0.001) |
| Student Well-Being | 0.071*** | -0.011 | -0.001 | 0.002 | -0.024 | 0.007 | -0.000 | 0.002 |
| | (0.025) | (0.017) | (0.004) | (0.001) | (0.018) | (0.007) | (0.002) | (0.003) |
| Operational | -0.036*** | 0.010 | 0.002 | 0.000 | 0.007 | 0.002 | 0.003* | -0.000 |
| | (0.012) | (0.007) | (0.002) | (0.000) | (0.006) | (0.003) | (0.001) | (0.000) |
| Infrastructure | -0.002 | 0.013*** | -0.010*** | 0.001 | -0.019 | 0.003 | -0.001 | -0.000 |
| | (0.020) | (0.004) | (0.004) | (0.001) | (0.016) | (0.003) | (0.002) | (0.000) |

*Notes:* Each column reports the coefficient from a school fixed-effects regression of SVA on spending shares for the five broad categories, estimated separately for public (municipal) and private (voucher) schools. All specifications include school and year fixed effects and control for total expenditure, enrollment, and the number and share of low-SES students. Expenditures in units of 10,000 (2015 USD). Standard errors clustered at the school level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

**Table 13:** Public vs. Private Schools: Personnel Subcategories and SVA

| | Test Scores (R) | | Attendance | | Chr. Absenteeism | | Dropout | |
|---|---|---|---|---|---|---|---|---|
| | (1) Public | (2) Private | (3) Public | (4) Private | (5) Public | (6) Private | (7) Public | (8) Private |
| Classroom Teacher | 0.0001 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | -0.0000 | 0.0000 | 0.0000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Admin. & paraprof. | 0.0000 | 0.0001 | 0.0000* | -0.0000 | 0.0002** | -0.0001 | 0.0000 | 0.0000* |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Non-teaching prof. | 0.0002 | -0.0002 | -0.0000** | 0.0000 | -0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Instr. support teachers | 0.0004* | -0.0003 | -0.0000 | -0.0000 | -0.0000 | 0.0000 | -0.0000 | 0.0000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| School leadership | 0.0004 | -0.0002 | -0.0000 | 0.0000* | -0.0001 | 0.0001 | -0.0000 | 0.0000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Operational staff | -0.0002 | -0.0003 | 0.0001 | 0.0000 | 0.0003** | 0.0001 | -0.0000 | -0.0000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Observations | 2,064 | 2,453 | 5,058 | 5,273 | 5,058 | 5,273 | 2,527 | 2,472 |
| Adj. R-squared | 0.357 | 0.328 | 0.388 | 0.482 | 0.417 | 0.537 | 0.591 | 0.662 |

Standard errors in parentheses
Urban schools only. All 6 staff types entered jointly.
School and year FE, total spending, and covariates included.
Expenditures in units of USD 1,000 (2015 prices).
Clustered SE at school level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 14:** Summary of Spending–Effectiveness Associations

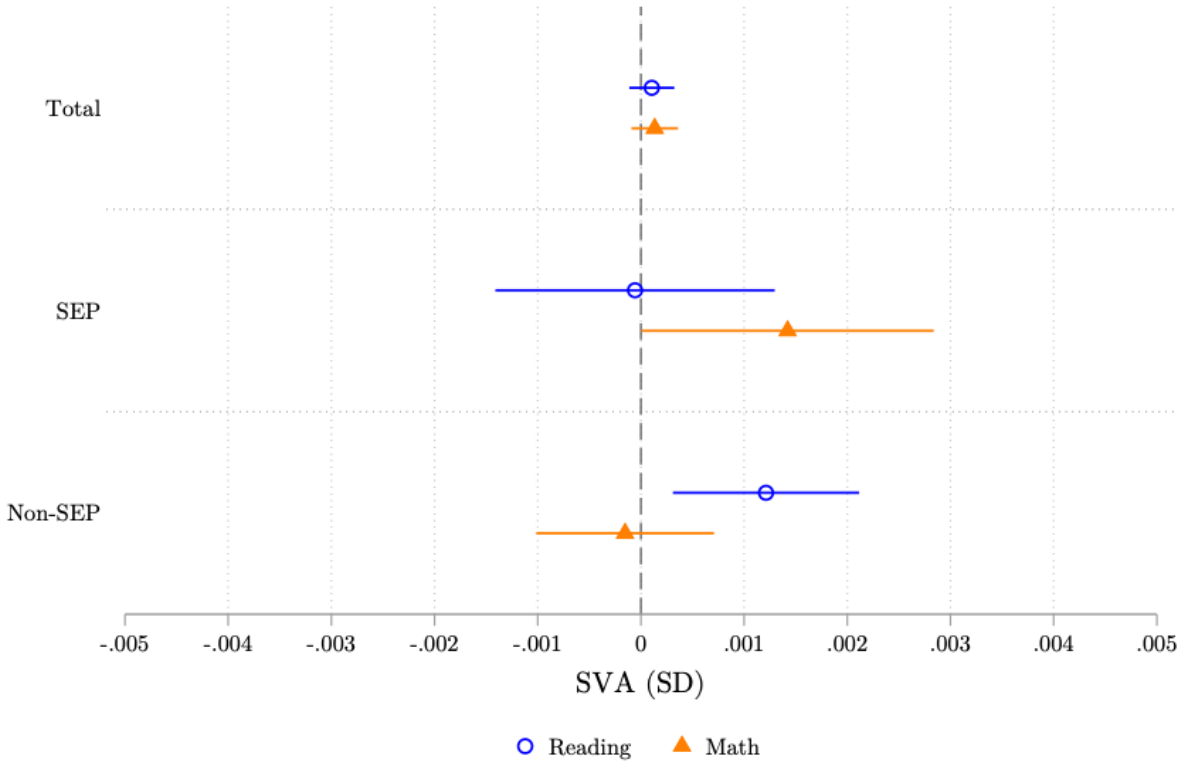
| | Test Scores | Attendance | Chr. Absent. | Dropout | Interpretation |
|---|---|---|---|---|---|
| *Panel A: Broad spending categories* | | | | | |
| Personnel | ∘ | − | ∘ | ++ | Retains students; not tied to learning |
| Quality programs | ∘ | ∘ | ∘ | ∘ | Null when entered jointly |
| Student well-being | ∘ | ∘ | ∘ | ∘ | Masks heterogeneous subcategories |
| Operational | ∘ | + | ++ | ∘ | Day-to-day operations support attendance |
| Infrastructure | + | ++ | ++ | − | Facilities reduce absenteeism |
| *Panel B: Personnel subcategories* | | | | | |
| Classroom teachers | ∘ | − | −− | ++ | Core staff prevents dropout |
| Admin. & paraprofessionals | − | ∘ | ∘ | ∘ | No clear productivity channel |
| Non-teaching professionals | ∘ | −− | ∘ | ∘ | Compensatory: deployed where needs are greatest |
| Instructional support | ∘ | ∘ | ∘ | ∘ | Positive for reading (individual spec.) |
| School leadership | ∘ | ++ | + | ∘ | Leadership drives engagement |
| Operational staff | ++ | ∘ | ∘ | ∘ | School climate channel |
| *Panel C: Selected subcategories* | | | | | |
| Learning resources | + | ∘ | ∘ | ∘ | Direct instructional input |
| Prof. development | ∘ | − | −− | ∘ | Compensatory: high-turnover schools invest more |
| School meals | + | ∘ | ∘ | ∘ | Nutrition–cognition channel |
| Uniforms & clothing | ∘ | − | −− | ∘ | Compensatory: proxies for disadvantage |
| Transportation | ∘ | ∘ | ∘ | + | Removes access barriers to retention |
| Medical appointments | ∘ | ∘ | ∘ | − | Compensatory allocation |
| *Panel D: Public vs. private divergence* | | | | | |
| *Broad categories* | | | | | |
| Personnel | Pub + / Priv − | ∘ / ∘ | ∘ / ∘ | Pub + / ∘ | Public schools benefit from staffing |
| Quality programs | Pub + / ∘ | ∘ / ∘ | ∘ / ∘ | ∘ / ∘ | Quality returns concentrated in public sector |
| Student well-being | Pub ++ / ∘ | ∘ / ∘ | ∘ / ∘ | ∘ / ∘ | Public: positive for test scores |
| Infrastructure | ∘ / Priv ++ | Pub − / ∘ | ∘ / ∘ | ∘ / ∘ | Private schools benefit from capital |
| *Personnel subcategories (joint specification)* | | | | | |
| Instr. support | Pub + / ∘ | ∘ / ∘ | ∘ / ∘ | ∘ / ∘ | Public sector returns to ped. specialists |
| Admin. & paraprof. | ∘ / ∘ | Pub + / ∘ | Pub ++ / ∘ | ∘ / Priv + | Administrative capacity matters in public |
| Non-teaching prof. | ∘ / ∘ | Pub −− / ∘ | ∘ / ∘ | ∘ / ∘ | Compensatory in public sector |
| Operational staff | ∘ / ∘ | ∘ / ∘ | Pub ++ / ∘ | ∘ / ∘ | Public school maintenance reduces absences |
| School leadership | ∘ / ∘ | ∘ / Priv + | ∘ / ∘ | ∘ / ∘ | Private leadership drives attendance |

*Notes:* Symbols: ++/−− = significant at 5% or better; +/− = significant at 10%; ∘ = not significant. All estimates from school FE regressions controlling for total spending, student composition, and year effects (urban schools only). Panels A–C: pooled estimates. Panel D: separate regressions by sector (Public / Private); personnel subcategories from joint specification (Table 13). "Compensatory" = association likely reflects allocation toward greater needs rather than a causal effect. See Tables 8–13.

# APPENDIX

## A.1 Aggregate Spending and School Value-Added

**Figure A.1:** School-level FE Model Estimates — Aggregate Expenditure Types




*Notes*: The figure plots coefficient estimates for total, targeted equity (SEP), and discretionary (non-SEP) expenditures. Blue circles correspond to Reading SVA; orange diamonds to Math SVA. All specifications include school and year fixed effects and control for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered standard errors.

## A.2 Value-Added Construction

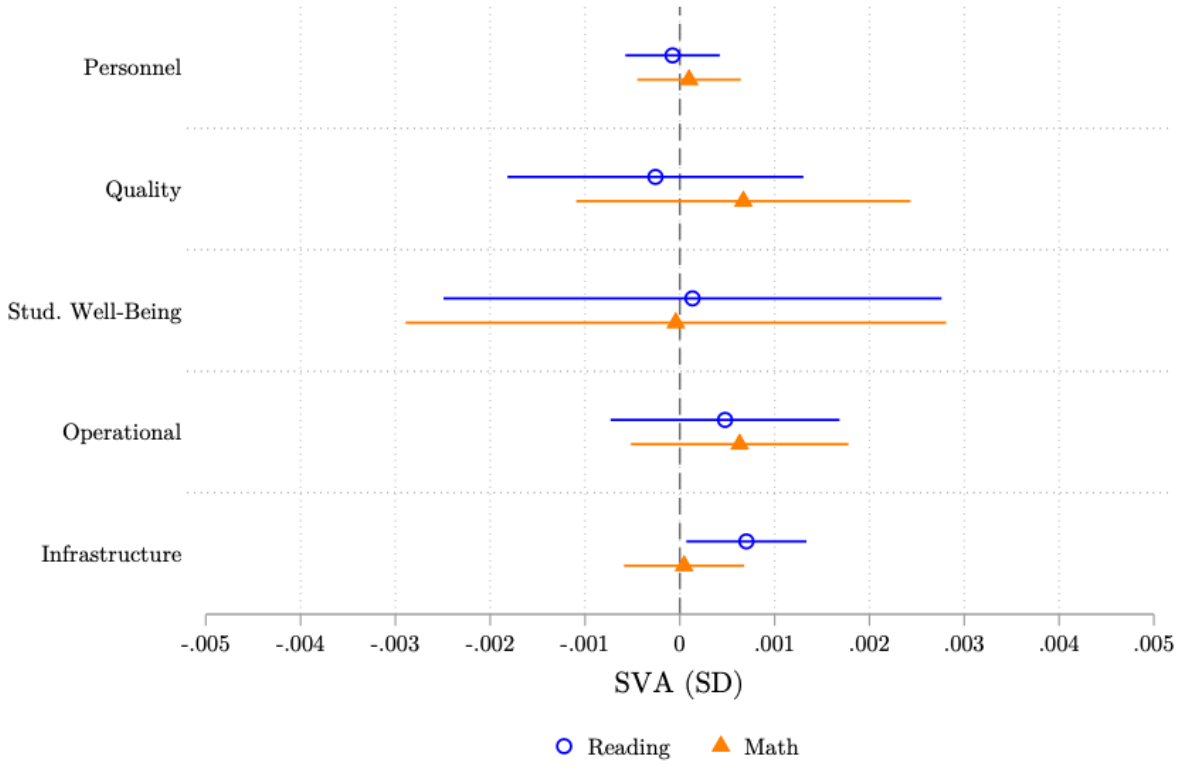
**Table A.1:** Feasible Baseline–Endline Pairs for SVA Estimation (2015–2024)

| VA Type | Baseline | | | Endline | | |
|---|---|---|---|---|---|---|
| | Grade | Year | Test | Grade | Year | Test |
| Primary 2→4 | 2 | 2015 | SIMCE | 4 | 2017 | SIMCE |
| Primary 4→6 | 4 | 2016 | SIMCE | 6 | 2018 | SIMCE |
| | 4 | 2022 | SIMCE | 6 | 2024 | SIMCE |
| Primary 4→8 | 4 | 2015 | SIMCE | 8 | 2019 | SIMCE |
| Primary 6→8 | 6 | 2015 | SIMCE | 8 | 2017 | SIMCE |
| Secondary 6→10 | 6 | 2018 | SIMCE | 10 | 2022 | SIMCE |
| Secondary 8→10 | 8 | 2015 | SIMCE | 10 | 2017 | SIMCE |
| Secondary 10→12 | 10 | 2015 | SIMCE | 12 | 2017 | PSU |
| | 10 | 2016 | SIMCE | 12 | 2018 | PSU |
| | 10 | 2017 | SIMCE | 12 | 2019 | PSU |
| | 10 | 2018 | SIMCE | 12 | 2020 | PDT |
| | 10 | 2022 | SIMCE | 12 | 2024 | PAES |
| Secondary 8→12 | 8 | 2017 | SIMCE | 12 | 2021 | PDT |
| | 8 | 2019 | SIMCE | 12 | 2023 | PAES |

*Notes:* Each row lists a feasible baseline–endline pair for constructing school value added. SIMCE is Chile's national standardized assessment; PSU is the former university entrance exam; PDT and PAES are its successive replacements. Primary pairs use within-basic-education transitions; secondary pairs link basic education to the exit exam.

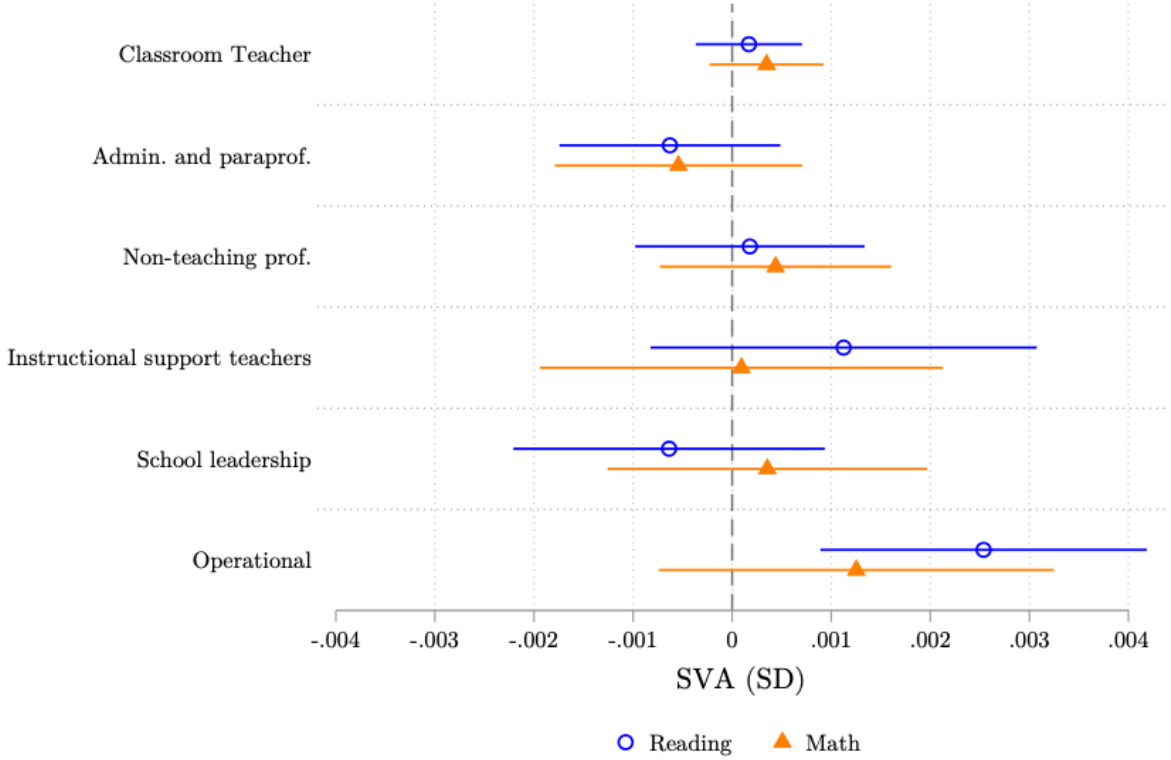
## A.3 Coefficient Plots by Spending Subcategory (Test Scores)

**Figure A.2:** Test-Score SVA and Broad Spending Categories (Reading vs. Math)



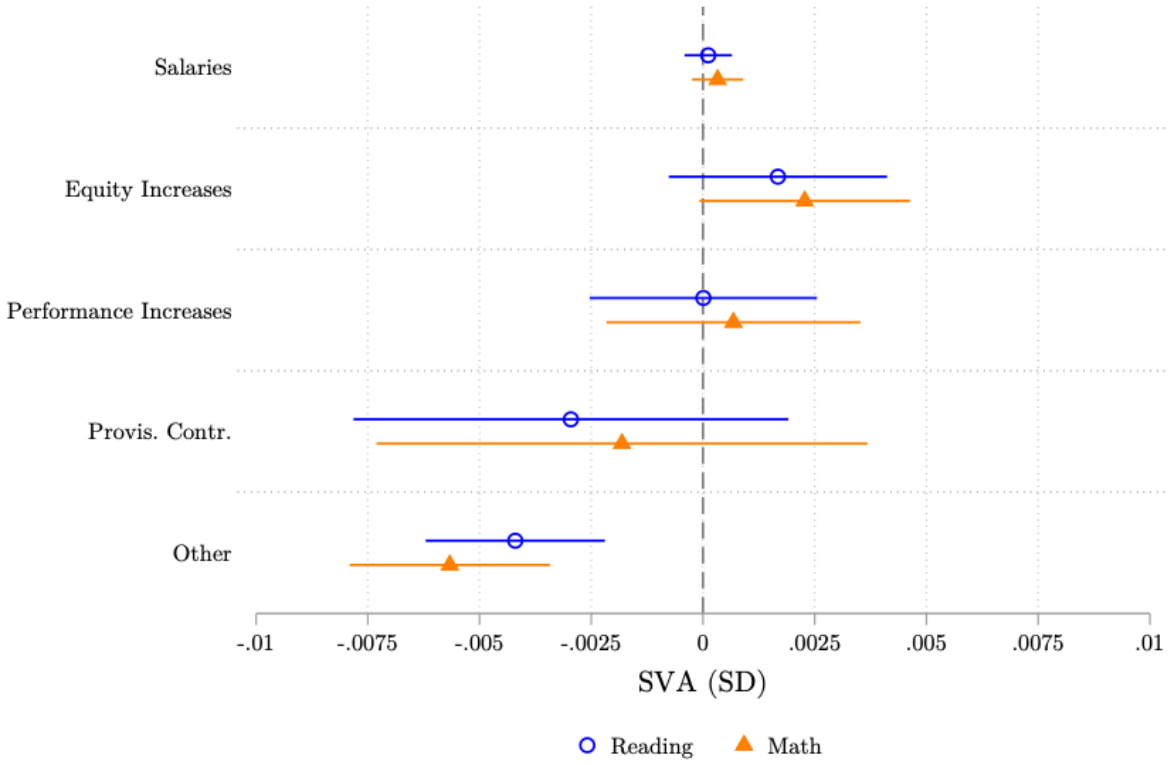

*Notes*: Blue circles = Reading SVA; orange diamonds = Math SVA. School and year FE; controls for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered SE.

**Figure A.3:** Test-Score SVA and Personnel Types



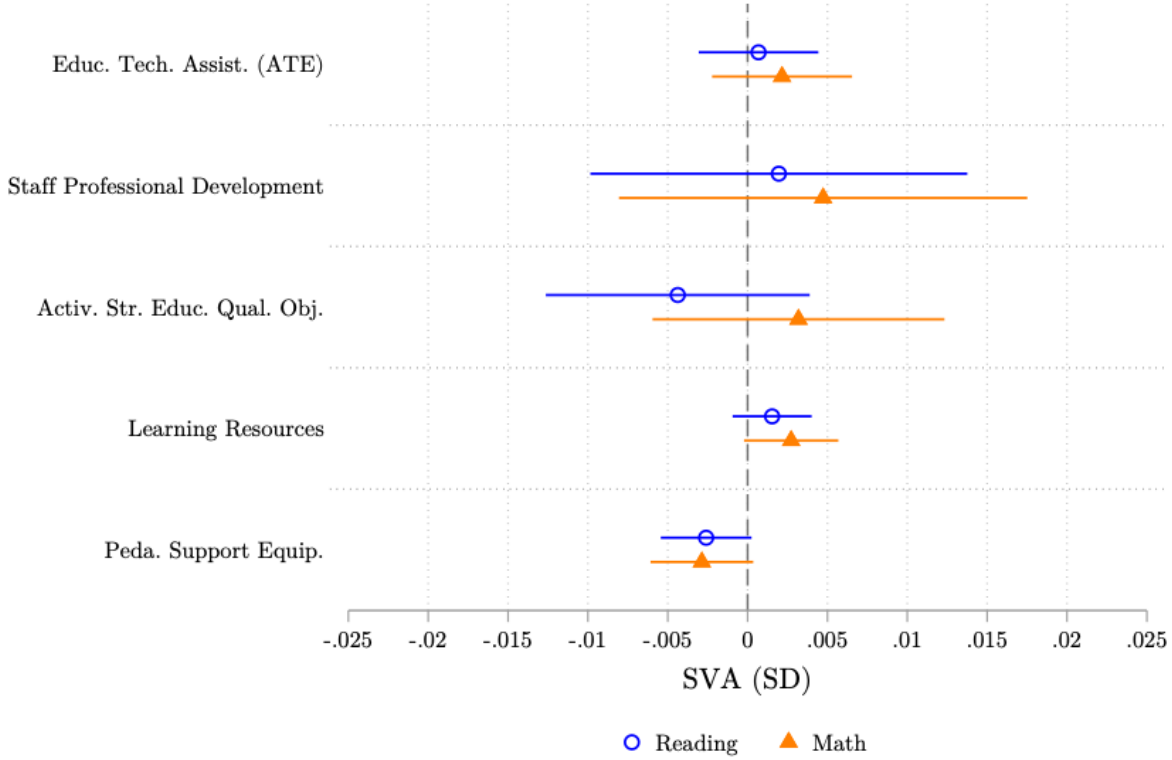

*Notes*: Blue circles = Reading SVA; orange diamonds = Math SVA. School and year FE; controls for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered SE.

**Figure A.4:** Test-Score SVA and Personnel Expenditure Subcategories



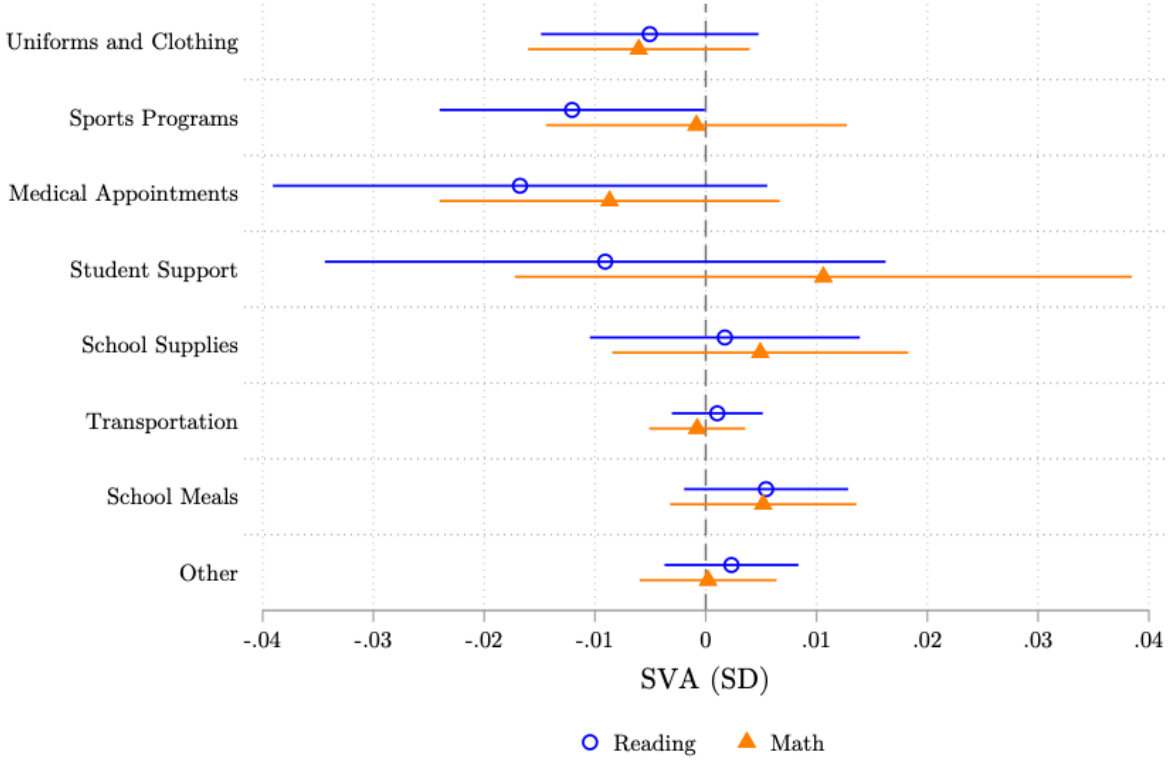

*Notes*: Blue circles = Reading SVA; orange diamonds = Math SVA. School and year FE; controls for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered SE.

**Figure A.5:** Test-Score SVA and Quality Expenditure Subcategories



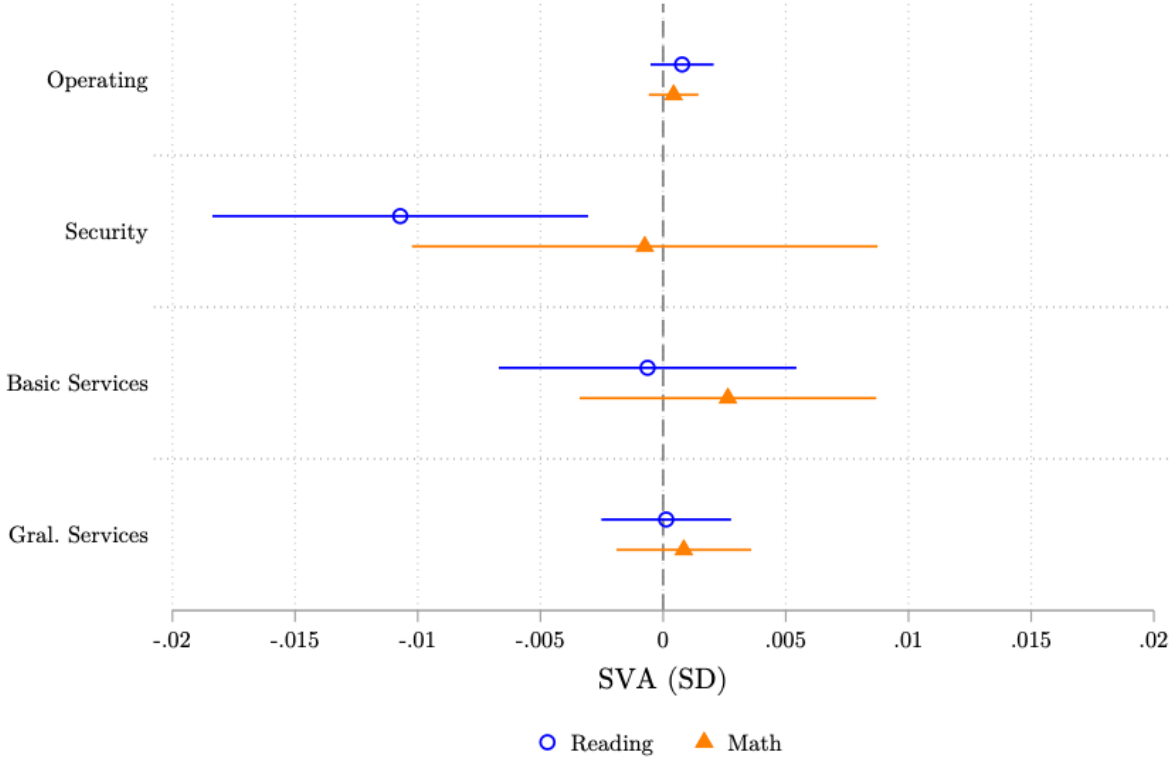

*Notes*: Blue circles = Reading SVA; orange diamonds = Math SVA. School and year FE; controls for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered SE.

**Figure A.6:** Test-Score SVA and Student Well-Being Expenditure Subcategories



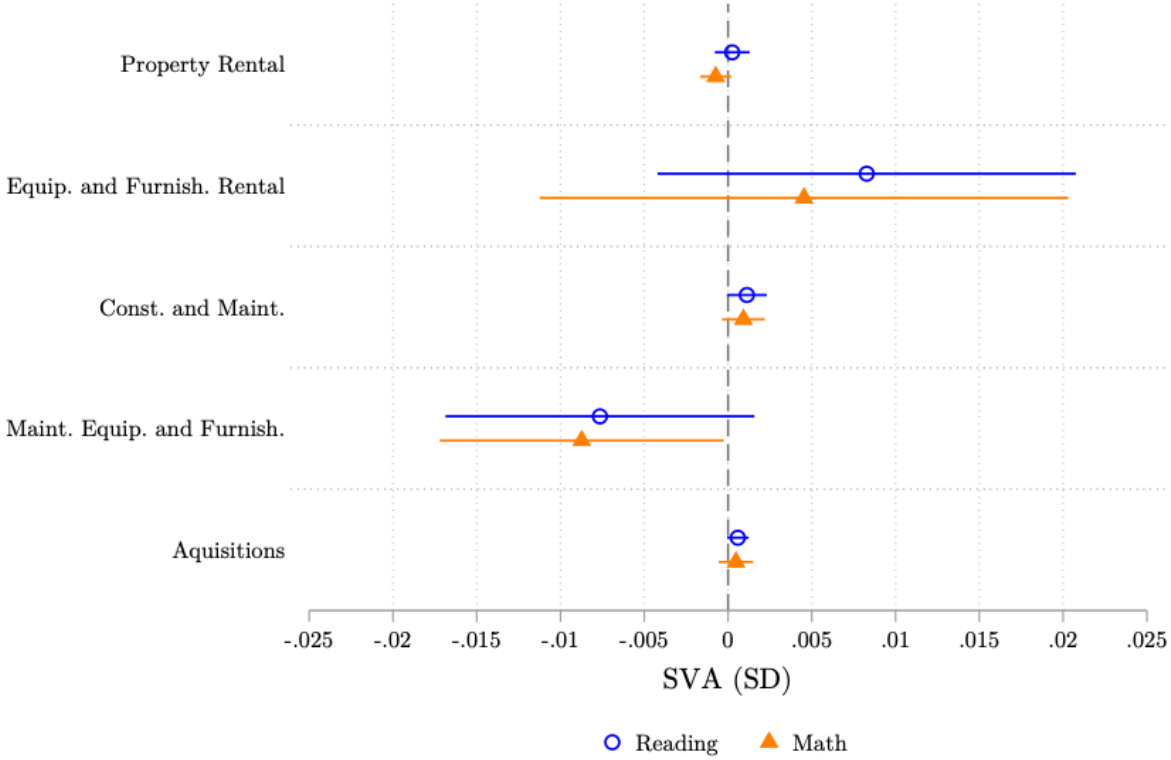

*Notes*: Blue circles = Reading SVA; orange diamonds = Math SVA. School and year FE; controls for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered SE.

**Figure A.7:** Test-Score SVA and Operational Expenditure Subcategories




*Notes*: Blue circles = Reading SVA; orange diamonds = Math SVA. School and year FE; controls for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered SE.

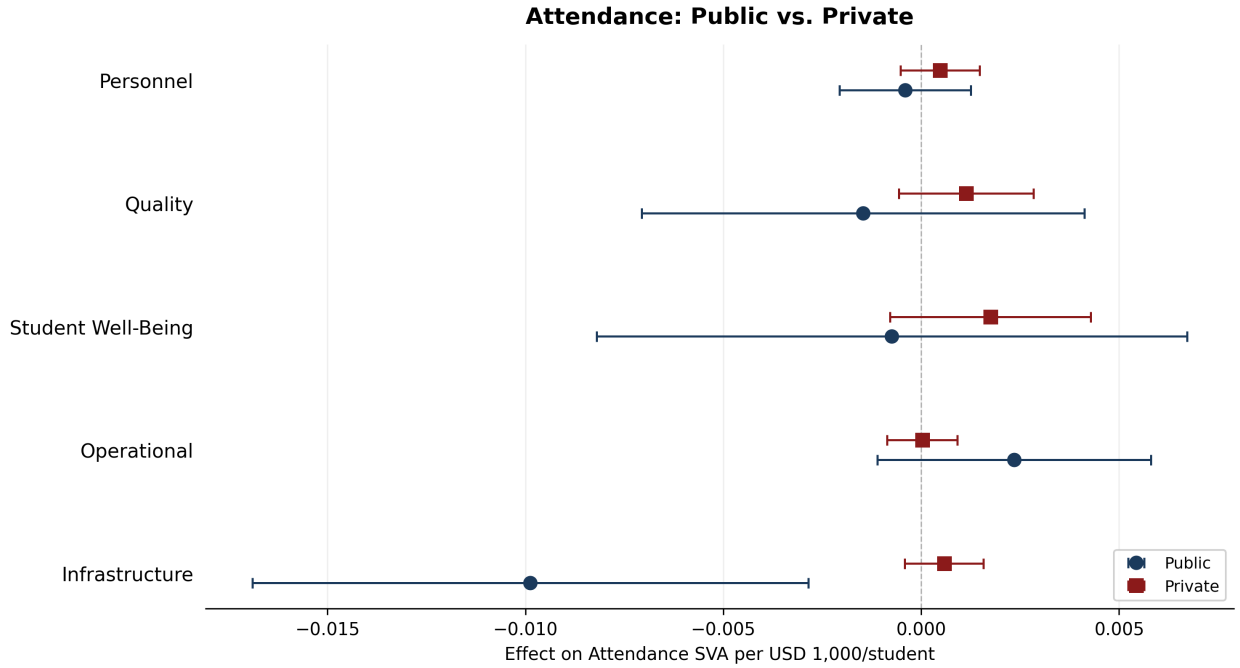
**Figure A.8:** Test-Score SVA and Infrastructure Expenditure Subcategories




*Notes*: Blue circles = Reading SVA; orange diamonds = Math SVA. School and year FE; controls for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered SE.

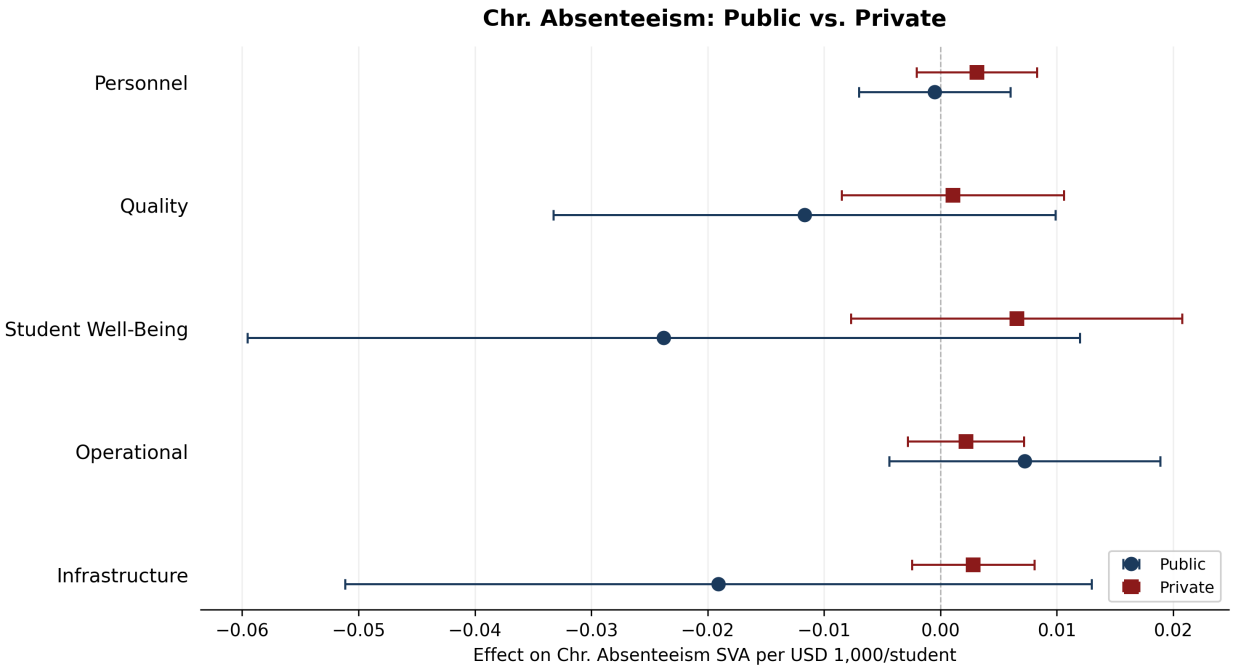
## A.4 Public vs. Private Schools: Non-Cognitive Outcomes

**Figure A.9:** Broad Spending Categories and SVA: Public vs. Private Schools (Attendance)



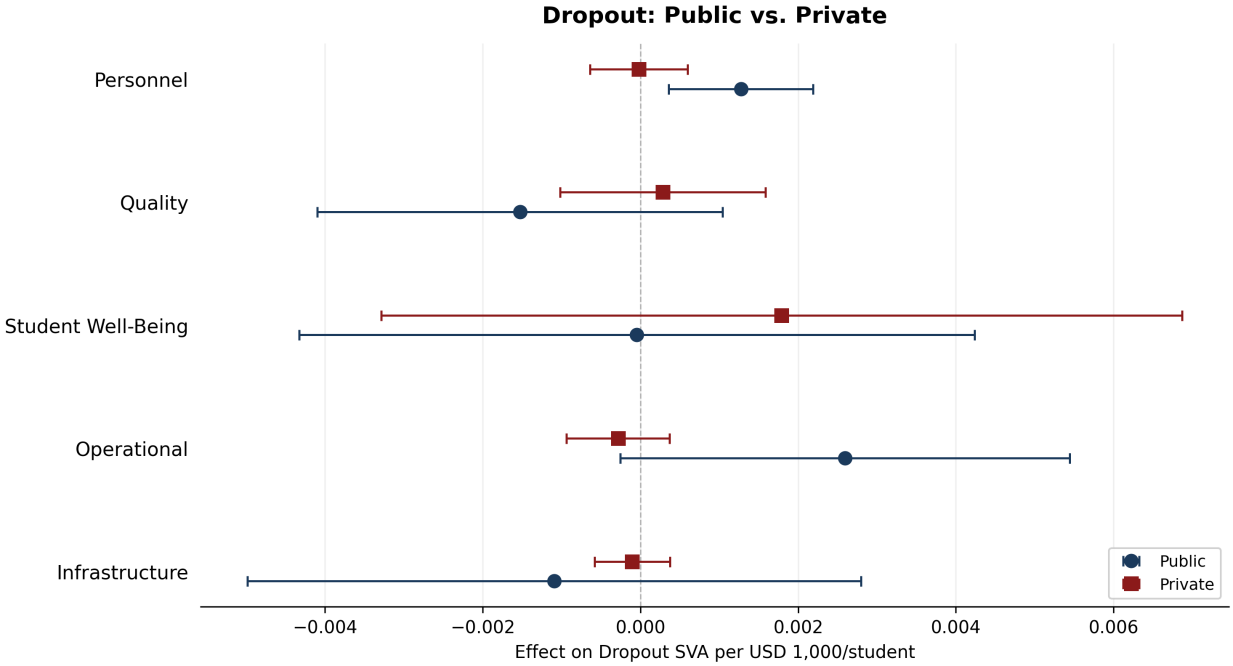

*Notes*: Separate school FE regressions for public and private subsidized schools. Controls for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered SE.

**Figure A.10:** Broad Spending Categories and SVA: Public vs. Private Schools (Chronic Absenteeism)




*Notes*: Separate school FE regressions for public and private subsidized schools. Controls for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered SE.

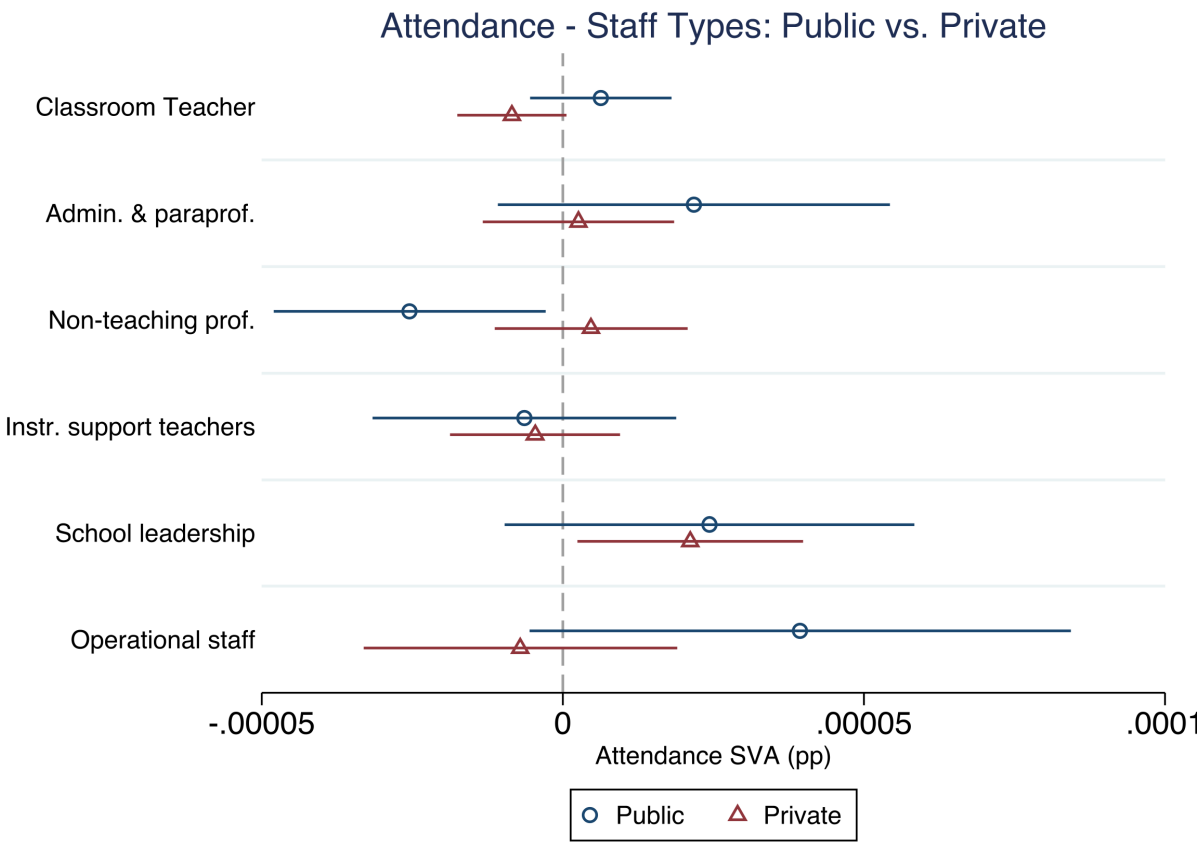
**Figure A.11:** Broad Spending Categories and SVA: Public vs. Private Schools (Dropout)




*Notes*: Separate school FE regressions for public and private subsidized schools. Controls for total expenditure, enrollment, and student composition. Expenditures in units of 10,000 (2015 USD). 95% CI with school-clustered SE.

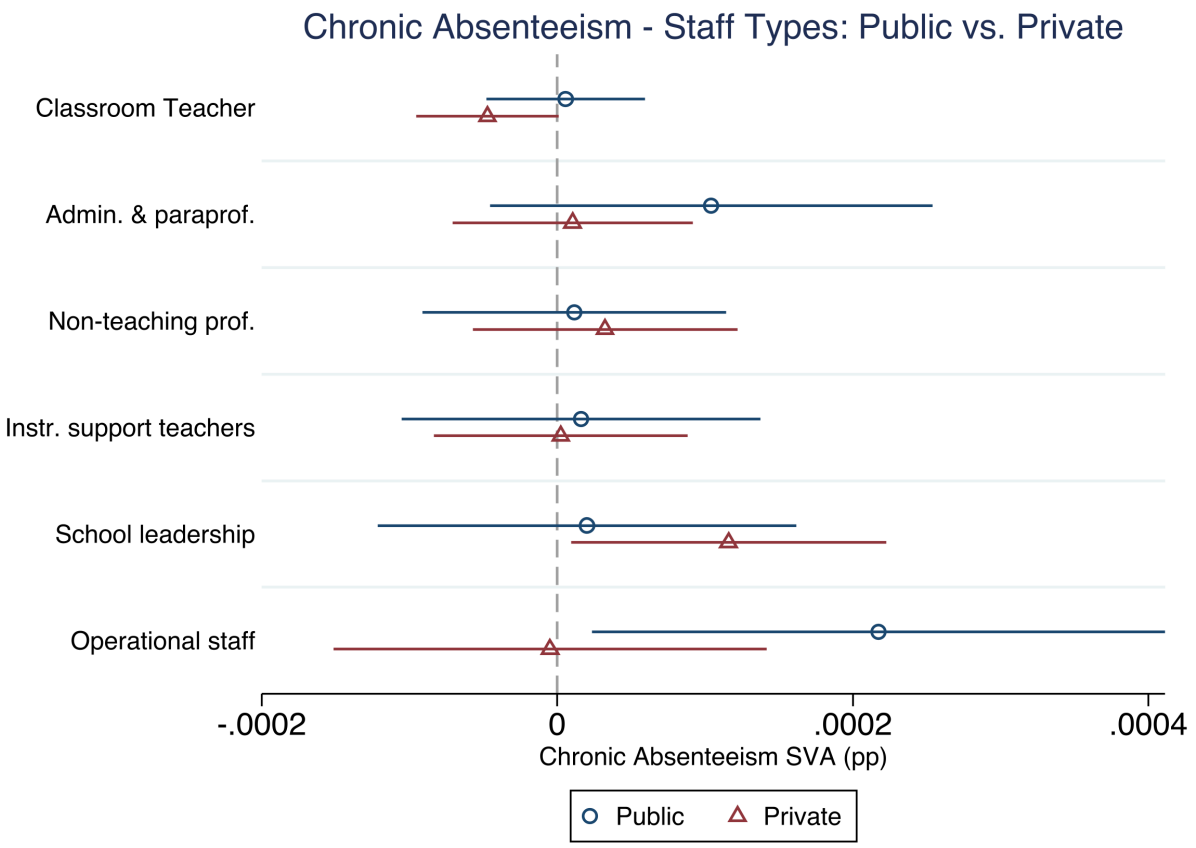
## A.5 Public vs. Private Schools: Personnel Subcategories (Non-Cognitive Outcomes)

**Figure A.12:** Personnel Subcategories and SVA: Public vs. Private Schools (Attendance)



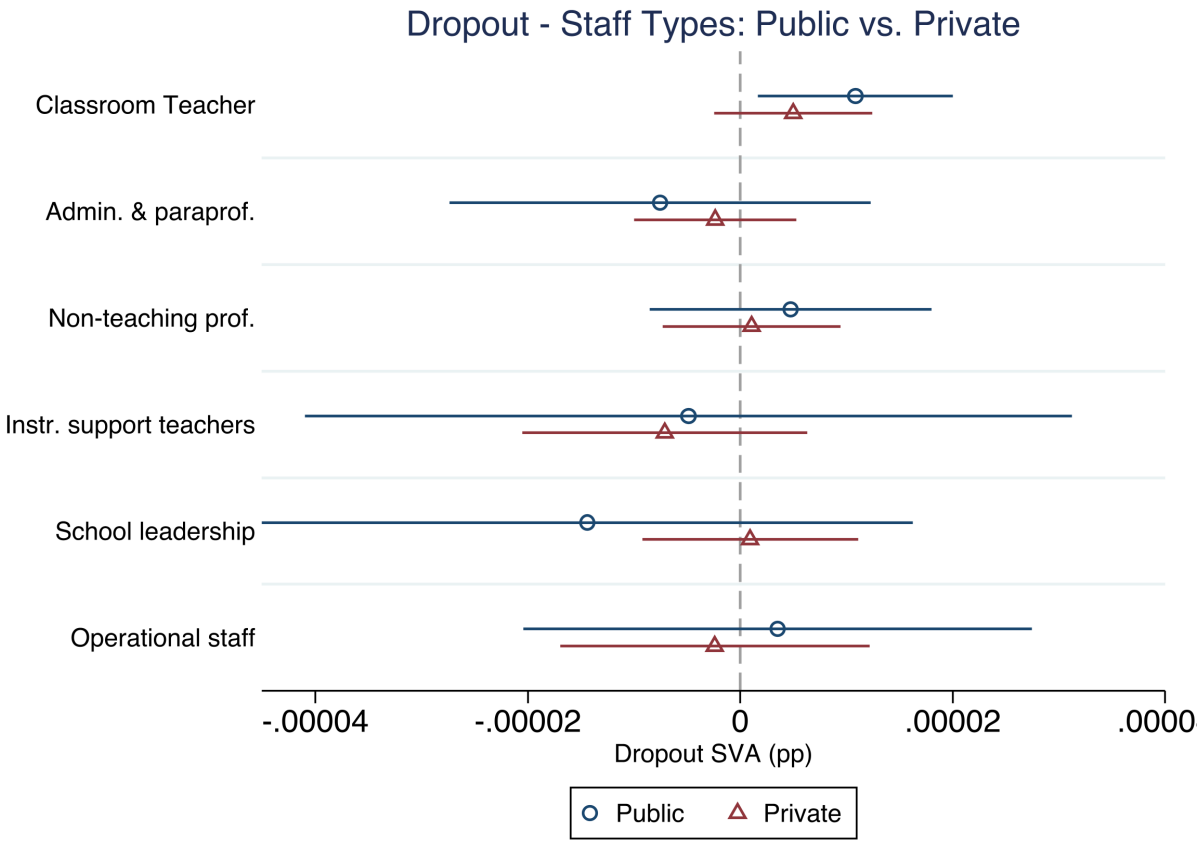

*Notes*: Separate school FE regressions for public and private subsidized schools. All six personnel types entered jointly. Controls for total expenditure, enrollment, and student composition. Expenditures in units of USD 1,000 (2015 prices). 95% CI with school-clustered SE.

**Figure A.13:** Personnel Subcategories and SVA: Public vs. Private Schools (Chronic Absenteeism)




*Notes*: Separate school FE regressions for public and private subsidized schools. All six personnel types entered jointly. Controls for total expenditure, enrollment, and student composition. Expenditures in units of USD 1,000 (2015 prices). 95% CI with school-clustered SE.

**Figure A.14:** Personnel Subcategories and SVA: Public vs. Private Schools (Dropout)




*Notes*: Separate school FE regressions for public and private subsidized schools. All six personnel types entered jointly. Controls for total expenditure, enrollment, and student composition. Expenditures in units of USD 1,000 (2015 prices). 95% CI with school-clustered SE.

## A.6 Public vs. Private Schools: Quality and Well-Being Subcategories

**Table A.2:** Quality Subcategories by School Sector

| | Test Scores (R) | | Attendance | | Chr. Absenteeism | | Dropout | |
|---|---|---|---|---|---|---|---|---|
| | (1) Public | (2) Private | (3) Public | (4) Private | (5) Public | (6) Private | (7) Public | (8) Private |
| Educ. Tech. Assistance (ATE) | 0.000 | 0.000 | -0.000 | 0.000** | -0.000 | 0.000 | 0.000 | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Staff Prof. Development | 0.002 | -0.000 | -0.000*** | -0.000 | -0.002** | -0.000 | 0.000** | -0.000 |
| | (0.002) | (0.001) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) |
| Strategic Quality Activities | -0.001 | 0.000 | -0.000 | -0.000 | -0.001 | -0.001 | -0.000*** | 0.000 |
| | (0.001) | (0.001) | (0.000) | (0.000) | (0.001) | (0.001) | (0.000) | (0.000) |
| Learning Resources | 0.001** | 0.000 | -0.000 | 0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Pedagogical Support Equip. | 0.000 | -0.000 | 0.000 | 0.000 | 0.000 | 0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Observations | 6,134 | 6,569 | 7,496 | 7,461 | 7,496 | 7,461 | 7,486 | 7,351 |
| Adj. R-squared | 0.337 | 0.262 | 0.356 | 0.516 | 0.387 | 0.564 | 0.596 | 0.639 |

Standard errors in parentheses
Urban schools only. All quality subcategories entered jointly.
School and year FE, total spending, and covariates included.
Expenditures in units of USD 1,000 (2015 prices).
Clustered SE at school level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table A.3:** Student Well-Being Subcategories by School Sector

| | Test Scores (R) | | Attendance | | Chr. Absenteeism | | Dropout | |
|---|---|---|---|---|---|---|---|---|
| | (1) Public | (2) Private | (3) Public | (4) Private | (5) Public | (6) Private | (7) Public | (8) Private |
| Uniforms & Clothing | 0.000 | -0.001 | -0.000 | 0.000** | -0.001* | 0.001** | -0.000 | -0.000 |
| | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Other Student Well-Being | 0.001** | 0.000 | -0.000 | -0.000 | -0.000 | -0.000 | 0.000 | 0.000 |
| | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Sports Programs | 0.001 | -0.002 | 0.000 | -0.000** | 0.000 | -0.001** | 0.000 | -0.000 |
| | (0.001) | (0.001) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) |
| Medical Appointments | 0.007** | -0.002 | 0.000 | -0.000 | 0.000 | -0.002 | -0.000 | -0.000 |
| | (0.003) | (0.002) | (0.001) | (0.000) | (0.003) | (0.002) | (0.000) | (0.000) |
| Student Support | -0.001 | -0.001 | -0.000 | -0.000 | 0.001 | 0.000 | 0.000 | -0.000 |
| | (0.003) | (0.002) | (0.001) | (0.000) | (0.003) | (0.002) | (0.000) | (0.000) |
| School Supplies | -0.000 | 0.000 | 0.000* | 0.000*** | 0.000 | 0.001*** | -0.000 | 0.000 |
| | (0.001) | (0.001) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) |
| Transportation | 0.001 | -0.000 | -0.000 | 0.000** | -0.001** | 0.000* | 0.000* | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| School Meals | 0.001 | 0.002** | 0.000 | -0.000*** | 0.001 | -0.001*** | -0.000 | -0.000 |
| | (0.000) | (0.001) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) |
| Observations | 5,882 | 5,381 | 7,467 | 8,777 | 7,467 | 8,777 | 7,204 | 5,284 |
| Adj. R-squared | 0.342 | 0.295 | 0.355 | 0.582 | 0.386 | 0.551 | 0.599 | 0.665 |

Standard errors in parentheses
Urban schools only. All well-being subcategories entered jointly.
School and year FE, total spending, and covariates included.
Expenditures in units of USD 1,000 (2015 prices).
Clustered SE at school level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$