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

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November 2025

Abstract

We study how the composition of school spending relates to school effectiveness. We assemble a new national panel dataset for Chile that links audited, highly disaggregated school-level expenditures to shrinkage-adjusted measures of school value added (SVA) for the period 2015–2022. These accounts classify annual spending into detailed categories—including distinct types of personnel remunerations, pedagogical quality programs, operations, infrastructure, and student well-being—allowing us to characterize how schools allocate resources over time and how these allocations relate to student learning. Three results emerge. First, schools display substantial and persistent heterogeneity in spending composition, even conditional on total expenditure and student demographics. Second, variation in school effectiveness is more closely aligned with spending composition than with overall resources: higher-SVA schools devote relatively more to instructional quality—particularly pedagogical supports, learning materials, and instructional support teachers—and relatively less to student well-being services. Third, schools that improve their SVA over time do not expand total spending more rapidly than others; instead, they reorganize their budgets, shifting resources toward specific personnel categories associated with instructional reinforcement. Taken together, these patterns show that differences in how schools allocate their budgets within institutions over time are strongly related to school effectiveness and highlight the importance of examining how schools use their resources, not only how much they spend.

JEL Codes: *I22*, *I25*, *H75*

Keywords: *School Spending Composition*, *School Value Added*, *Education Finance*

*We thank... All errors are our own.

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1 Introduction

Governments devote vast resources to education. On average, OECD countries spend nearly 5 percent of GDP on primary and secondary schooling, with the United States and Northern Europe closer to 6 percent. A large literature now provides compelling evidence that these investments pay off: increases in school spending improve test scores, attainment, and long-run earnings, especially for disadvantaged students (Jackson & Mackevicius, 2024; Jackson et al., 2016; Lafortune et al., 2018). This growing consensus reflects a shift from earlier debates, in which methodological limitations precluded sharp conclusions, toward a modern empirical literature exploiting quasi-experimental variation to generate credible causal estimates. Yet despite this progress, a central question remains unresolved: how money matters. Most existing work examines total resources or broad spending aggregates (**hanushek2003**; **greenwald1996**; **card2002**; e.g., Jackson et al., 2016; Lafortune et al., 2018), leaving open which types of expenditures generate the largest returns and which dimensions of learning they affect.

In this paper, we provide new evidence on the composition of school spending and its relationship with school effectiveness measured through test-score value added (SVA). We assemble what is, to our knowledge, the most comprehensive dataset linking school-level expenditures with administrative measures of school performance. In Chile, all publicly funded schools must submit detailed annual audited accounts that disaggregate spending across narrow functional and economic classifications, including teacher salaries, support staff (e.g., teaching assistants and administrative personnel), operations (e.g., utilities and maintenance), infrastructure (e.g., building repairs and equipment), quality programs (e.g., pedagogical materials and professional development), and student well-being (e.g., psychosocial support and school meals). We merge these accounts with administrative microdata from Chile's national standardized tests, which allow us to construct shrinkage-adjusted SVA at both the primary and secondary levels. We com-

plement these measures with rich information on school demographics and student composition. These data enable us to move beyond the question of whether resources matter and instead pursue two objectives: first, to understand how effective schools—those with high test-score value added—allocate their resources and how these patterns vary across school types and socioeconomic contexts; and second, to identify which categories of spending are most closely associated with school effectiveness.

Our analysis is carried out in two steps. First, we document the descriptive evolution of school spending across categories, stratifying schools by SVA and by the share of low-income students they serve. Chile's finance system generates substantial heterogeneity in per-student resources, even within a common national funding formula. Public rural schools tend to operate with considerably higher per-student resources than private urban voucher schools, reflecting structural factors such as rurality adjustments, minimum staffing requirements, and differences in enrollment size. Personnel dominates budgets across all school types, but the internal composition of personnel spending differs systematically: public schools allocate a larger share to classroom teachers, while private schools devote comparatively more to administrative, paraprofessional, and leadership positions. Non-personnel spending—operations, infrastructure, quality programs, and student well-being—constitutes a stable but heterogeneous share of budgets. Schools adopt markedly different spending profiles, and these differences persist over time.

Second, we examine how differences in spending composition relate to school effectiveness measured as test-score SVA. High-SVA and low-SVA schools do not differ meaningfully in total spending levels once we adjust for observable differences in sector, rurality, socioeconomic composition, and enrollment. Instead, the most salient differences appear within specific categories of non-personnel expenditures. Schools with higher SVA devote a larger share of their budgets to quality programs—including pedagogical supports, learning materials, and professional development—and a smaller share to student well-being services. These differences remain even after controlling for detailed school

characteristics. This suggests that the internal allocation of discretionary resources—not the overall level of resources—is more closely aligned with school effectiveness as captured by test-score gains.

To interpret these patterns, it is useful to clarify the source of variation underlying our estimates. Our empirical strategy exploits within-school differences in spending composition across cohorts, holding fixed time-invariant school characteristics and common shocks. By conditioning on school fixed effects, we compare a school to itself over time, asking whether cohorts exposed to different resource allocations within the same institution exhibit systematically different levels of test-score value added. By further conditioning on cohort timing and rich measures of student composition, we abstract from persistent differences across schools and from broad secular trends that affect all schools simultaneously.

Under two key assumptions, these estimates admit a causal interpretation. First, conditional on school fixed effects, cohort fixed effects, and observed time-varying controls, changes in spending composition must be orthogonal to unobserved shocks to student learning. That is, within a school, reallocations of resources across spending categories should not be driven by contemporaneous, unobserved changes in student ability or learning potential. Second, there must be no differential sorting of students across cohorts within schools that is correlated with spending reallocations and independently affects value added.

Several features of the Chilean institutional context make these assumptions plausible. School budgets are largely determined by mechanical funding formulas tied to enrollment, attendance, and student characteristics, and the scope for short-run discretionary reallocation is constrained by regulation and audit requirements. Admissions to publicly funded schools are centralized and governed by a deferred-acceptance mechanism with lotteries used to break ties, limiting schools' ability to selectively attract higher- or lower-achieving students in response to changes in spending priorities. As a result, cohort-to-

cohort variation in student composition within schools is limited and largely observable in administrative data.

Potential violations of these assumptions would arise if schools systematically reallocate spending in response to unobserved shocks that also affect learning. For example, a negative shock to student behavior or mental health could induce schools to shift resources toward student well-being services while simultaneously depressing test-score growth, generating a spurious negative association. Conversely, changes in leadership quality could simultaneously improve instructional effectiveness and alter spending priorities toward pedagogical supports. While we cannot fully rule out such mechanisms, several facts mitigate these concerns. First, we control flexibly for observed student composition and enrollment, which capture many relevant demand-side changes. Second, we show that total spending does not systematically increase in higher–value-added cohorts or in schools that improve over time, suggesting that our results are not driven by broad resource expansions correlated with unobserved shocks. Third, the patterns we document are highly specific to particular categories—such as instructional support teachers and learning materials—rather than reflecting uniform shifts across the budget, which would be more consistent with general improvements in school quality.

A large body of literature has examined the relationship between school resources and student outcomes. Early observational studies produced mixed results, with Hanushek (1996) famously concluding that additional spending yielded little systematic improvement in achievement. Krueger (1999, 2002) challenged this view, emphasizing rigorous evidence from the Tennessee STAR experiment that demonstrated sizable test-score and attainment gains from smaller classes. This methodological divide—between correlations vulnerable to omitted variables and estimates relying on experiments or natural experiments—shaped the debate for decades. Over the last ten years, however, the literature has converged sharply. Jackson et al. (2016) show that court-mandated school finance reforms in the United States substantially increased educational attainment, adult earnings,

and reduced poverty, particularly for students from low-income backgrounds. Lafortune et al. (2018) document gains in student achievement from reforms that partially equalized funding across districts. Biasi (2024) shows that capital investments in HVAC and safety upgrades generate large test-score gains, whereas investments in athletic facilities mainly raise property values. Dobbie and Fryer (2013) highlight that how money is used matters: investments in management practices, high-dosage tutoring, and frequent teacher feedback explain much of the variation in charter school effectiveness in New York City. Finally, the meta-analysis by Jackson and Mackevicius (2024) synthesizes the broader evidence base and shows robust positive average effects of increased per-pupil spending, with especially large impacts for disadvantaged districts.

Despite this progress, several gaps remain. First, most existing studies analyze total resources or broad aggregates such as "current" versus "capital" expenditures. We have limited evidence on narrowly defined spending categories—such as salaries for different types of staff, spending on specific pedagogical supports, student well-being programs, or infrastructure maintenance—a gap that reflects, in large part, the difficulty of obtaining detailed, comparable expenditure data at the school level. The dataset we assemble addresses this limitation directly, linking audited school-level accounts disaggregated across narrow functional and economic classifications with administrative measures of school performance. Second, nearly all large-scale studies come from high-income countries, particularly the United States. Evidence from other institutional contexts remains scarce, even though systems differ substantially in governance, accountability, and resource constraints. Third, much of the literature continues to focus on test-score levels, whereas value added—which captures the contribution of schools to student learning, net of prior achievement and background characteristics—provides a fairer and more informative measure of school effectiveness. Our analysis addresses these gaps by providing a national portrait of detailed school expenditure composition and by examining how these allocations relate to test-score value added.

Our contribution is threefold. First, we move beyond the question of whether resources matter to examine how they matter: which categories of spending are most closely associated with test-score value added. Second, we extend the literature beyond the U.S. context by analyzing comprehensive data from Chile, a country with high levels of education spending by international standards, substantial inequality in results, and unusually rich administrative data on expenditures and outcomes. Third, we document heterogeneity in the relationship between spending and effectiveness across schools serving different populations. Although our estimates are not fully causal, they exploit within-school, across-cohort variation and therefore provide unusually tight evidence on how money is used and which dimensions of spending are most closely linked to school effectiveness. The remainder of the paper is organized as follows. Sections 2 and 3 describe the institutional context and data. Section 4 presents the multivariate analyses documenting spending patterns and their relationship with school effectiveness. Section 5 presents the empirical strategy used to compute the SVA and relate it to spending. Section 6 presents the regression results on the associations between different spending categories and SVA. 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, and the rest fully private institutions. Private voucher schools encompass a wide range of models, from religious (mostly Catholic) schools to secular networks and institutions with specific pedagogical approaches (e.g., Montessori or Waldorf), and vary considerably in size, mission, and organizational structure.

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).

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. SEP resources may be allocated to a wide menu of eligible uses—including pedagogical materials, professional development, instructional support staff, and student well-being programs—but may not be used for regular personnel salaries or infrastructure unrelated to the school improvement plan. Importantly, schools classified as higher-performing (*autónomas*) enjoy greater autonomy in allocating SEP funds than those with lower performance ratings. Regulations define el-

igible 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 three 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, which compensate staff working in schools located 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*. Regula-

tions 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.

3.2 Student Achievement and SVA

Using student-level results from Chile's national standardized assessment system (SIMCE) and the university entrance exam (PSU/PAES), we construct multiple measures of 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, considering the available data.

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).

3.3 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.

3.4 Panel Structure

A central strength of the data is its longitudinal dimension. We observe detailed spending, school outcomes, and demographics for up to ten years per school, enabling us to track trajectories of investment and to mitigate concerns that observed correlations simply reflect persistent differences across institutions.

4 Multivariate Analyses

This section documents how Chilean schools allocate resources and how these patterns relate to differences in school value added (SVA). We begin by describing overall spending levels and composition, then compare schools with high and low value added. Next, we examine how changes in spending patterns correlate with changes in SVA over time. Finally, we present multivariate regressions that relate spending composition to school value added, and decompose these relationships within broad categories.

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 SEP and non-SEP resources and between public and private subsidized

schools. Two features stand out. First, SEP 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, non-SEP spending rises substantially for both sectors, but the increase is markedly steeper for public schools. As a result, the public–private gap in non-SEP 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 SEP 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.

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. 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.

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 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 used in the analysis. School value added (SVA) exhibits substantial dispersion, with standard deviations around 0.14–0.15. Mean per-student spending is approximately USD 3,071, but the interquartile range spans nearly USD 1,500, reflecting meaningful 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 or absorbed by fixed inputs. Instead, Chilean

schools employ diverse non-personnel strategies that can, in principle, 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%. These distributions reinforce the need to examine spending patterns in conjunction with the populations served.

Taken together, Figures 1–4 and Table 1 paint a picture of a system with substantial heterogeneity in both spending levels and composition. These descriptive facts motivate the subsequent sections, where we relate differences in spending patterns to differences in school value added.

4.2 Spending Patterns by School Effectiveness

To examine how spending composition varies with school effectiveness, Table 2 compares expenditure patterns across schools grouped into terciles of school value added (SVA). Panel A reports results for reading and Panel B for math. For each spending category, the table displays 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, enrollment, the level and concentration of low-SES students, and region-year fixed effects. These adjustments ensure that comparisons capture differences in spending patterns net of observable school characteristics.

Panel A shows that, 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 composition differences, however, these gaps disappear. This suggests that lower SVA among schools in the bottom tercile is not driven by systematically lower personnel spending or overall resource constraints, but rather by the populations they serve and the contexts in which they operate. In other words, differences in total spending alone are insufficient to

explain the distribution of school effectiveness.

More informative patterns emerge within non-personnel categories. High-SVA schools spend significantly more per student on quality programs after adjustment, with an adjusted high–low difference of USD 18. This difference is statistically significant at the one-percent level and reflects 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). This negative gap, also highly significant, likely reflects compensatory spending: schools facing more acute socioemotional and behavioral challenges may allocate disproportionate resources to well-being services and therefore exhibit lower learning gains, even when observable characteristics are held constant.

Infrastructure expenditures exhibit a similar pattern. Although high-SVA schools spend more on infrastructure in raw terms, this difference becomes statistically insignificant once compositional differences are accounted for. Operational spending follows the same logic: raw differences suggest higher spending among high-SVA schools, but these gaps are not robust after adjustment. In contrast, spending in the residual "other" category is slightly higher among high-SVA schools after controls are included, suggesting that some flexible or uncategorized expenditures may be deployed differently by more effective schools.

The expenditure shares paint a consistent picture. High-SVA schools allocate a smaller share of their budgets to personnel and student well-being, and a larger share to quality programs, even after covariate adjustment. While these proportional shifts are modest, they are systematic and statistically meaningful, and they point to a greater instructional and programmatic orientation among more effective schools.

Panel B reveals similar patterns for math SVA. Raw differences indicate that high-SVA schools spend less on personnel and student well-being and more on operations and infrastructure than low-SVA schools. After adjustment, however, the level differences in

personnel, operations, and infrastructure dissipate, while the gaps in quality programs and student well-being persist. High-SVA schools devote significantly more to quality programs (USD +16) and significantly less to student well-being (USD –16), with both differences statistically significant at the one-percent level. The "other" category again shows a positive adjusted difference for high-SVA schools. In terms of shares, high-SVA schools devote a smaller fraction of their budgets to personnel and student well-being and a larger fraction to quality programs, mirroring the reading results.

Taken together, Table 2 shows that differences in total or personnel spending do not explain variation in school value added once we adjust for observable school characteristics. Instead, systematic differences arise within non-personnel allocations. High-SVA schools tilt their budgets more heavily toward instructional quality—particularly pedagogical supports and quality-enhancing initiatives—and devote relatively fewer resources to socioemotional and compensatory services. These patterns indicate that the internal composition of the non-personnel budget, rather than its overall size, is more closely associated with differences in school effectiveness.

4.3 Spending Adjustments and Changes in Value Added

Table 3 examines whether schools that improved their school value added (SVA) between 2015 and 2022 ("improvers") adjusted their spending differently from those whose SVA declined ("decliners") or remained stable. For each expenditure category, the table reports the average change in per-student spending over the period. Columns (4) and (5) summarize the difference between improvers and decliners: Column (4) presents raw differences in means, while Column (5) reports differences adjusted for sector, rurality, PIE participation, enrollment, the level and concentration of low-SES students, and region fixed effects. Column (5) therefore measures how much more improvers increased per-student spending relative to decliners, holding these observed characteristics constant.

Panel A focuses on reading SVA. Across all schools, total per-student spending in-

creased substantially between 2015 and 2022, with average increases of roughly USD 530–560. Importantly, improvers did not raise total spending significantly more than decliners: the adjusted difference is only USD 12 and statistically insignificant. This indicates that improvements in reading SVA are not explained by faster growth in overall budgets.

More informative patterns emerge within specific expenditure categories. Personnel spending increases for all schools, but improvers increased these expenditures more rapidly. In raw terms, improvers raised personnel spending by USD 39 more than decliners, and although the adjusted difference falls to USD 27, it remains positive. The clearest distinction between improvers and decliners appears in the residual "other" category: improvers substantially reduced spending in this category relative to decliners. The adjusted improver–decliner gap is approximately USD –15 and statistically significant at the one-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. These patterns indicate that the primary compositional adjustments distinguishing improvers from decliners occur within the personnel budget and the miscellaneous "other" category.

Panel B presents the results for math SVA. As in reading, total per-student spending rose for all schools, with no evidence that improvers expanded their budgets more quickly than decliners. Personnel spending increased more among improvers in raw comparisons (USD 29), though the adjusted difference (USD 12) is not statistically significant. Infrastructure expenditures reveal a more distinct pattern: improvers increased infrastructure spending considerably less than decliners. The adjusted difference—approximately USD –8 and statistically significant—indicates that schools whose math SVA improved did not rely on expanded infrastructure investments during the period.

Consistent with the patterns in reading SVA, improvers reduced spending in the "other" category relative to decliners, with an adjusted gap near USD –13, significant at the five-

percent level. No robust differences emerge for operations, quality programs, or student well-being expenditures.

Taken together, the patterns in Table 3 indicate that schools that improved their SVA did not distinguish themselves by expanding total spending, but rather by reallocating resources within their budgets. In both reading and math, improvers shifted resources away from residual spending categories and placed somewhat greater emphasis on personnel expenditures, particularly relative to decliners. For math SVA, improvers also avoided large increases in infrastructure spending. These results suggest that changes in spending priorities—rather than changes in overall budgets— are more closely associated with improvements in school effectiveness over time.

4.4 OLS Associations Between Spending Composition and SVA

While Subsection 4.3 examined changes in overall spending and broad expenditure categories, Table 4 focuses specifically on changes in the composition of personnel remunerations. Because personnel expenditures represent the majority of school budgets and because the regression framework in Section 5 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.

Table 4 reports the average change in per-student remunerations between 2015 and 2022 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. Columns (4) and (5) present the difference in the growth of remunerations between improvers and decliners. Column (4) shows raw differences, 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 parallel the controls in the empirical specification,

$$SVA_{st} = \sum_k \theta_k C_{st}^{(k)} + \beta' X_{st} + \lambda_r + \lambda_t + \varepsilon_{st},$$

and thus shed light on whether observed remuneration patterns are consistent with the estimated relationships between spending composition and school value added.

4.4.1 Reading SVA

Panel A shows three salient patterns. First, improvers experience somewhat larger increases in expenditures on classroom teachers. The raw improver–decliner gap (USD 20.6) is significant at the ten-percent level, and the adjusted gap (USD 16.3) remains positive though not precisely estimated. This suggests that schools improving their reading SVA slightly strengthened classroom teacher remuneration relative to declining schools.

Second, the clearest and most robust distinction concerns instructional support teachers. Improvers increased remunerations for this category by USD 11.6 more than decliners in raw terms, and the adjusted difference (USD 11.3) 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. This descriptive evidence aligns with the regression model's expectation of potentially positive coefficients for instructional support categories.

Third, operational personnel (janitorial and maintenance assistants) also show larger increases among improvers, with both raw (USD 8.7) and adjusted (USD 7.1) differences statistically significant. 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 (social workers, psychologists), and school leadership are small and statistically insignificant after adjustment. Thus, improvements in reading SVA do not appear to be driven by growth in managerial or socioemotional staffing.

4.4.2 Math SVA

Panel B reveals similar but somewhat weaker patterns. Improvers again increased spending on classroom teachers more than decliners in raw terms (USD 23.8), though the adjusted difference is small and insignificant. As in reading, instructional support teachers constitute the most robust category: improvers raised remunerations by USD 12.8 more than decliners, with an adjusted difference near USD 9.7 and significant at conventional levels.

By contrast, adjusted differences for administrative staff, non-teaching professionals, leadership roles, and operational staff are statistically insignificant. Unlike for reading, operational remunerations do not meaningfully differ between improvers and decliners in math.

Overall, the patterns in Table 4 indicate that schools improving their SVA did not distinguish themselves by expanding total personnel remunerations, but rather by selectively increasing remuneration for specific categories. In both reading and math, improvers consistently expanded instructional support staff, and to a lesser extent classroom teachers, relative to decliners, while restraining growth in leadership, administrative, and socioemotional personnel categories. These descriptive adjustments align with a production model in which certain personnel inputs carry higher instructional returns (θ_k) than others. The patterns thus provide a descriptive foundation for the estimated associations between spending composition and school effectiveness presented in the regression analysis that follows.

5 Empirical Strategy

5.1 School Value Added (SVA)

We estimate school value added (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; λ_g and δ_t are grade and year fixed effects respectively. Because the relationship between current and prior achievement (test score persistence) may be stronger in some grades, we allow the lagged achievement coefficient, α_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 θ_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.

5.2 Relating Spending to SVA

Our primary interest is not only whether more resources improve outcomes, but *which types of spending matter most*. 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.

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

Our baseline specification is:

$$\text{SVA}_{st} \;=\; \delta\,\text{TotalSpend}_{st} \;+\; \theta_k\,C_{st}^{(k)} \;+\; \beta'\mathbf{X}_{st} \;+\; \mu_s \;+\; \lambda_t \;+\; \epsilon_{st}, \tag{2}$$

where $\mathbf{X}_{st}$ includes time-varying school covariates (enrollment, student composition), and μ_s and λ_t represent school and year fixed effects, respectively. By including total spending as a covariate, the $\hat{\theta}_k$ is interpreted as the effect on SVA of reallocating $\$1$ from any of the omitted categories to category k, holding overall resources fixed.

We estimate (2) separately for primary and secondary SVA, pooling math and Reading, and reporting subject-specific results in the appendix. All regressions weight observations by the inverse of the estimated variance of SVA and cluster standard errors at the school level.

6 Results

This section presents the estimates from the empirical strategy described in Section 5.

Figures 5–12 plot the estimated coefficients and 95 percent confidence intervals. We discuss the results moving from broad to increasingly disaggregated spending categories.

6.1 Total, SEP, and Non-SEP Expenditures

Figure 5 examines the association between SVA and broad expenditure categories: total spending, SEP spending, and non-SEP spending. Consistent with descriptive patterns, the coefficients are extremely small and statistically non-significant. Total per-student expenditure shows near-zero associations with both Reading and math SVA. SEP spending is slightly positive for math and close to zero for Reading, while non-SEP spending is slightly positive for Reading and slightly negative for math.

These results indicate that unconditional increases in school-level spending—whether targeted (SEP) or unrestricted (non-SEP)—are not predictive of higher value added. This pattern echoes international evidence suggesting that cross-sectional variation in total spending masks substantial heterogeneity in how schools deploy resources. The absence of clear effects at this aggregate level motivates examining the internal composition of spending.

6.2 Broad Spending Categories

Figure 6 decomposes total expenditures into five major functions: personnel, quality programs, student well-being, operations, and infrastructure. Some differences emerge.

First, spending on quality programs is positively associated with SVA, especially in math. These programs include pedagogical supports, professional development, and learning resources—inputs directly tied to instructional quality. While the magnitudes are modest, they are consistent and robust across specifications.

Second, student well-being spending is negatively associated with SVA in both subjects. The coefficients are larger in magnitude than those for any other broad category. We do not interpret this as evidence that well-being programs reduce learning. Rather, these negative associations likely reflect 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.

Third, personnel, operations, and infrastructure show small or imprecise associations. Personnel expenditures, in particular, conceal substantial internal heterogeneity, which we explore next.

6.3 Personnel Subcategories

Figure 7 disaggregates personnel spending, showing substantial heterogeneity across staff types. The most notable result is the positive association between SVA and spending on *instructional support teachers*. These staff include pedagogical specialists and instructional 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.

Performance-related salary increases and professionalized teacher contracts also show positive associations with SVA. These patterns align with the view that workforce quality and stability, rather than total staffing levels, are more strongly associated with school effectiveness.

By contrast, provisional contracts and miscellaneous personnel categories exhibit small or negative coefficients, consistent with lower instructional returns.

6.4 Quality Program Subcategories

Figure 8 decomposes quality programs into five categories: educational technical assistance (ATE), staff professional development, activities tied to strategic quality objectives, learning resources, and pedagogical support equipment.

Learning resources stand out with consistently positive and relatively precise estimates. Professional development shows modest but positive associations, particularly in math. Other categories—including ATE services—are generally positive but estimated

with considerable uncertainty.

The overall pattern suggests that the components of quality spending most tightly connected to classroom instruction—learning materials and professional development—are those most strongly associated with higher SVA.

6.5 Student Well-Being and Operational Subcategories

Figures 9 and 10 show results for student well-being and operational subcategories. Nearly all coefficients in the well-being domain are negative or near zero, with substantial magnitudes for student support, medical appointments, and clothing subsidies. As noted earlier, these negative associations likely reflect compensatory spending patterns: schools with higher needs devote more resources to these areas and tend to have lower SVA.

Operational subcategories exhibit a mix of small positive and negative coefficients. Spending on security is strongly negative, while basic and general services show small positive associations. These patterns likely reflect context-specific needs (such as security spending in high-risk areas) rather than direct effects on instructional quality.

6.6 Summary of Results and Interpretation

Across categories, three patterns emerge. First, not all dollars are equal: expenditures on instructional reinforcement, learning resources, and selected professional development activities are consistently associated with higher SVA. Second, student well-being and security-related expenditures are negatively associated with SVA, likely reflecting compensatory responses rather than causal impacts. Third, infrastructure and broad personnel categories show little contemporaneous relationship with SVA, suggesting that their effects may operate over longer horizons not captured by our short-run estimates.

These results highlight that the composition of school spending, rather than its aggregate level, is more informative about school effectiveness.

6.7 Caveats and Assumptions for Causal Interpretation

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 learning only after several years, whereas our fixed-effects specification captures only short-run associations. Finally, measurement error in expenditure reporting may bias estimates toward zero if it varies within schools over time.

Thus, while the patterns presented here are informative about correlates of school effectiveness, interpreting the coefficients as causal would require strong assumptions: that within-school changes in spending composition are exogenous to unobserved shocks to student achievement, and that there is no dynamic feedback from SVA to spending.

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 SVA. Future work should explore dynamic spending effects, heterogeneous impacts across school types, and the long-run returns to different investment categories.

7 Conclusion

This paper documents how the composition of school spending relates to school effectiveness. Using a new national panel of audited, highly disaggregated expenditure data linked to shrinkage-adjusted measures of school value added (SVA), we provide the first

comprehensive portrait of how schools allocate their resources across dozens of functional categories and how these allocations correlate with student learning.

Three patterns emerge. First, schools exhibit substantial and persistent heterogeneity 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 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, improvements in SVA over time are not associated with faster growth in total spending but with internal reallocations toward specific personnel categories linked to instructional reinforcement.

These descriptive findings highlight that the internal organization of school budgets is strongly related to school effectiveness. They suggest that policies focused solely on increasing overall expenditure may overlook meaningful variation in how schools deploy resources. At the same time, 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 to estimate the causal effects of spending composition on school value added, examine heterogeneous effects across school types, and study the dynamic returns to sustained investments in instructional quality. Together, these efforts aim to shed light on which uses of resources most effectively support learning and equity.

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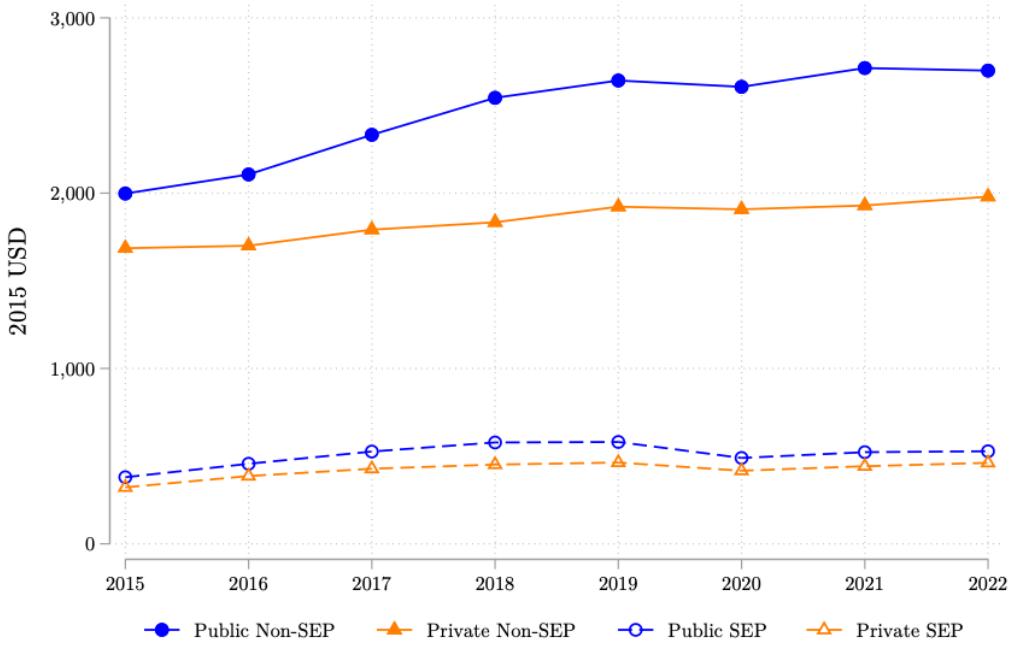
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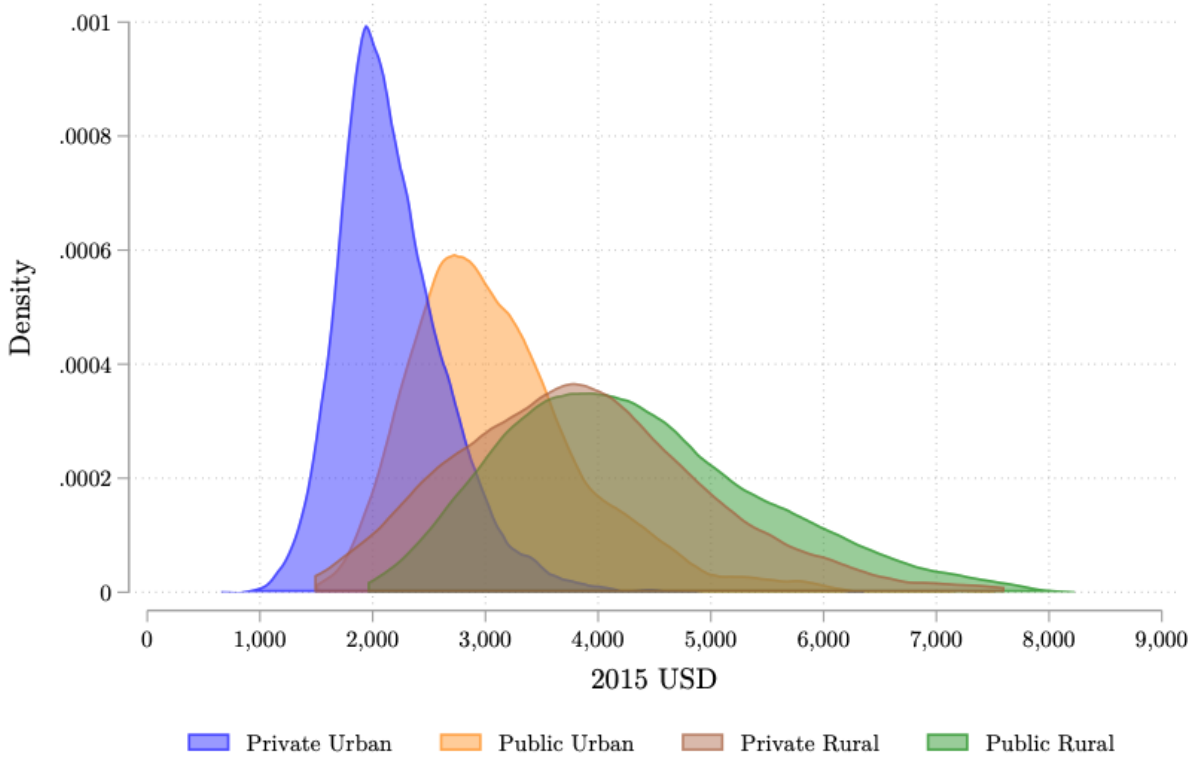
Figures

Figure 1: Evolution of Per-Student Expenditure



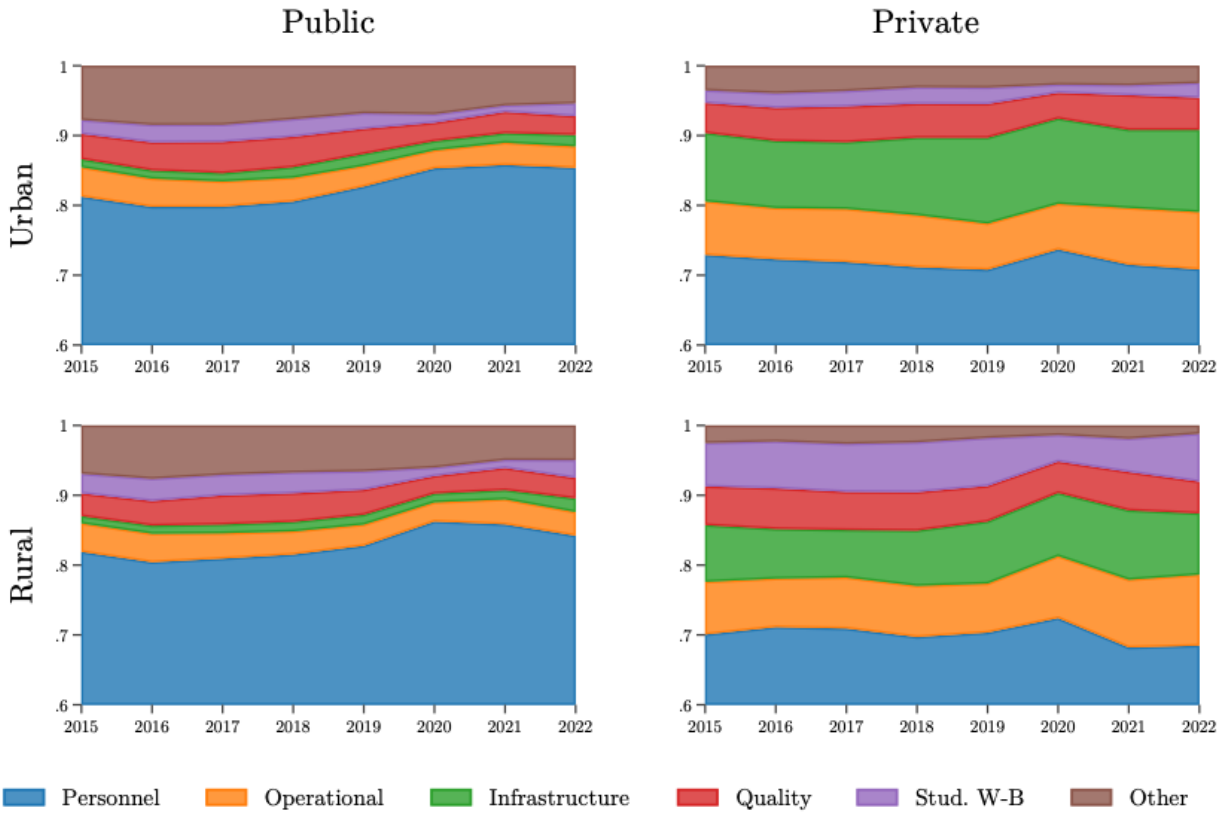
Notes: SEP spending refers to expenditures financed by the Subvención Escolar Preferencial, and Non-SEP covers all other expenditures. "Public" corresponds to municipal schools; "Private" corresponds to privately managed voucher schools.

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



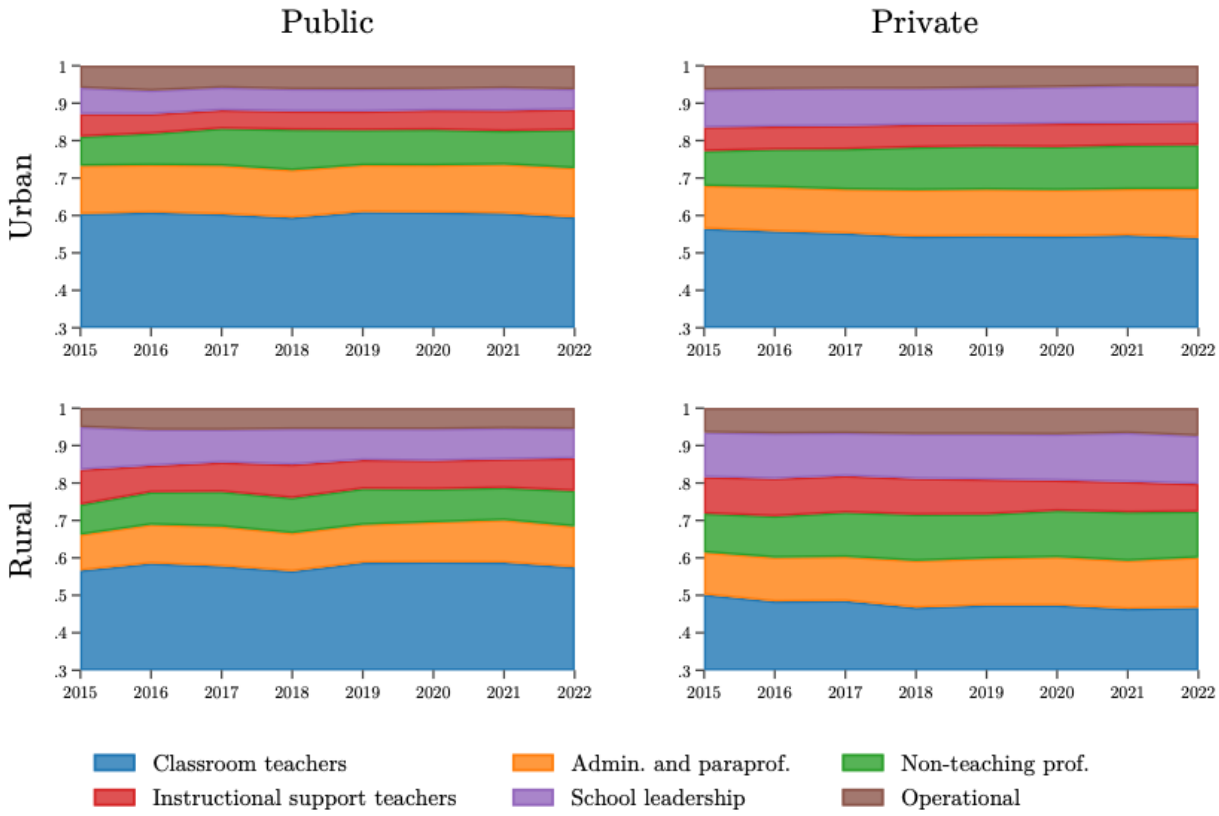
Notes: "Public" corresponds to municipal schools; "Private" corresponds to privately managed voucher schools.

Figure 3: Evolution of Expenditure Composition



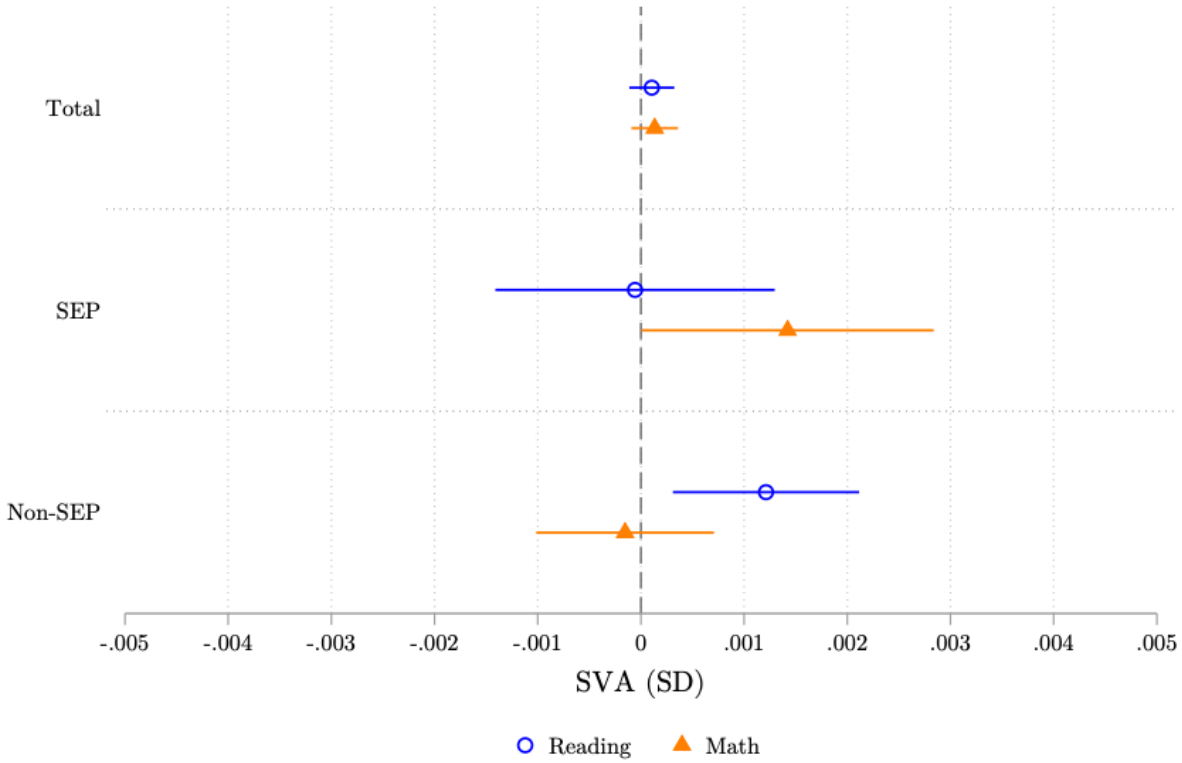
Notes: "Public" corresponds to municipal schools; "Private" corresponds to privately managed voucher schools.

Figure 4: Evolution of Personnel Expenditure Composition



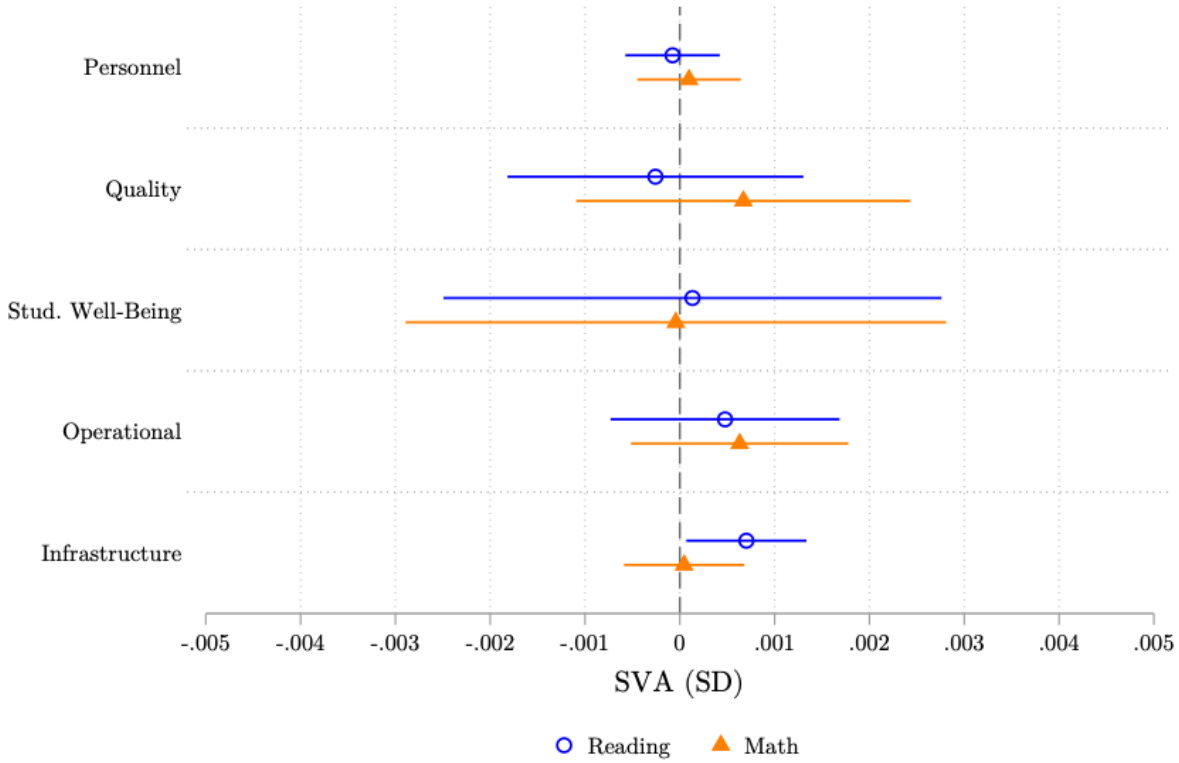
Notes: "Public" corresponds to municipal schools; "Private" corresponds to privately managed voucher schools. We use personnel expenditure categories reported by the Chilean Superintendencia de Educación, which classify school staff into six groups: Classroom teachers, School leadership (principals, vice-principals, instructional leaders), Instructional support teachers (instructional support teachers, pedagogical specialists), Non-teaching professionals (psychologists, social workers, etc.), Administrative and Para-professional staff (management support staff, administrative assistants, school monitors, and general administrative personnel), and Operational (janitorial and maintenance assistants).

Figure 5: School-level FE Model Estimates - Types of Expenditures



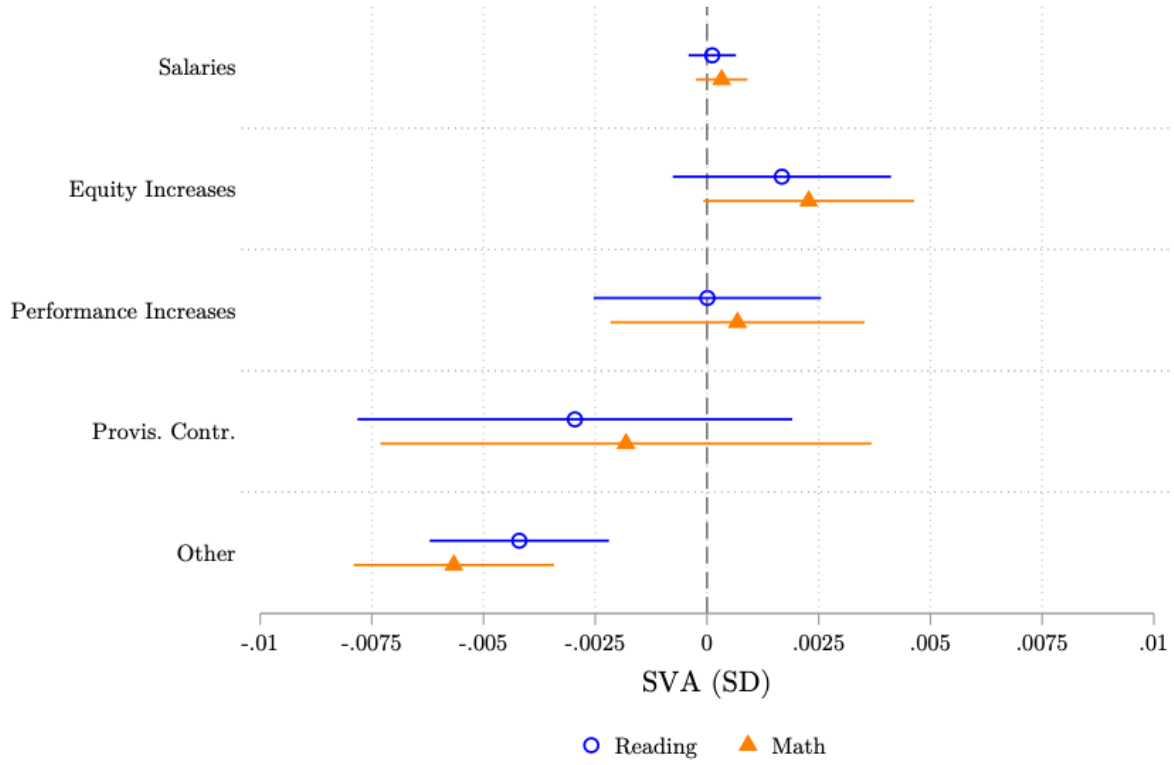
Notes: The figure plots coefficient estimates for each expenditure type listed on the vertical axis. Blue circles correspond to models using Reading SVA as the outcome, and orange diamonds correspond to models using Math SVA. All specifications include year and school fixed effects and control for average total expenditure, enrollment, the number and share of low-SES students, and indicators for the grade configurations used to construct the respective SVA measures. Expenditures are expressed in units of 10,000 (2015 USD), so each coefficient reflects the association between a USD 10,000 reallocation toward that expenditure type (holding total spending fixed) and the corresponding SVA outcome. The 95% confidence intervals reflect standard errors clustered at the school level.

Figure 6: School-level FE Model Estimates - Categories of Expenditure



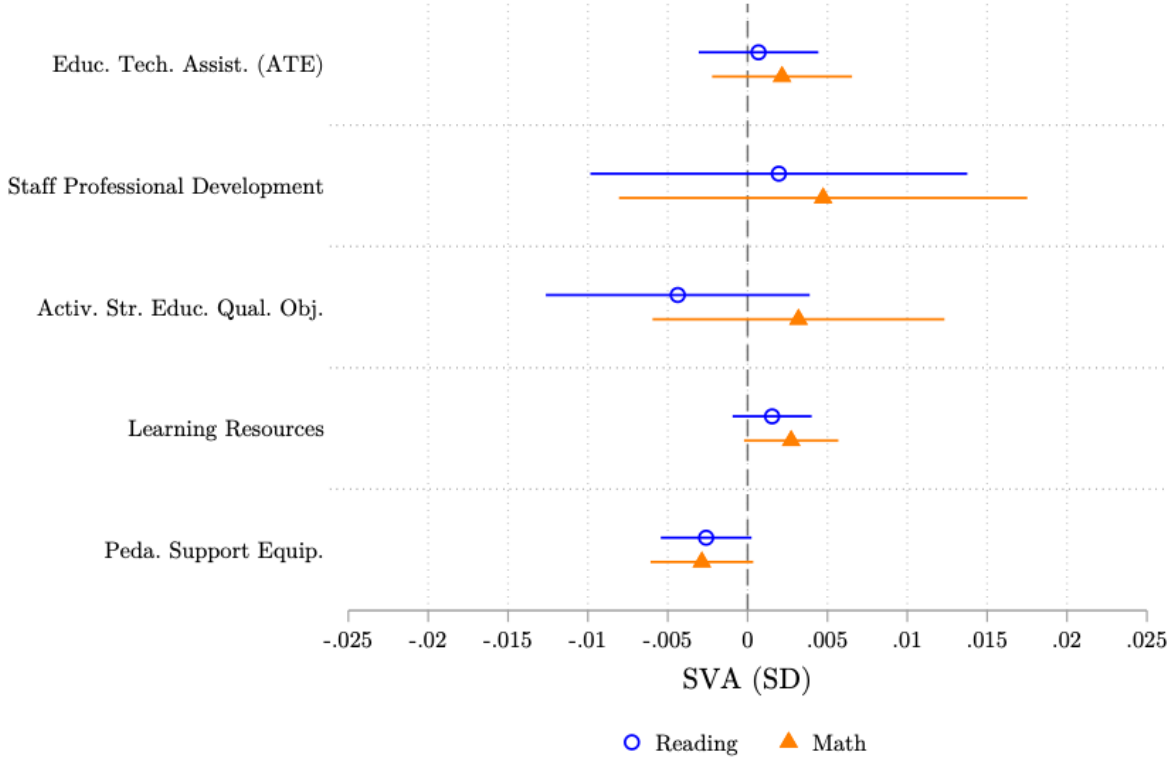
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Figure 7: School-level FE Model Estimates - Personnel Expenditure Subcategories



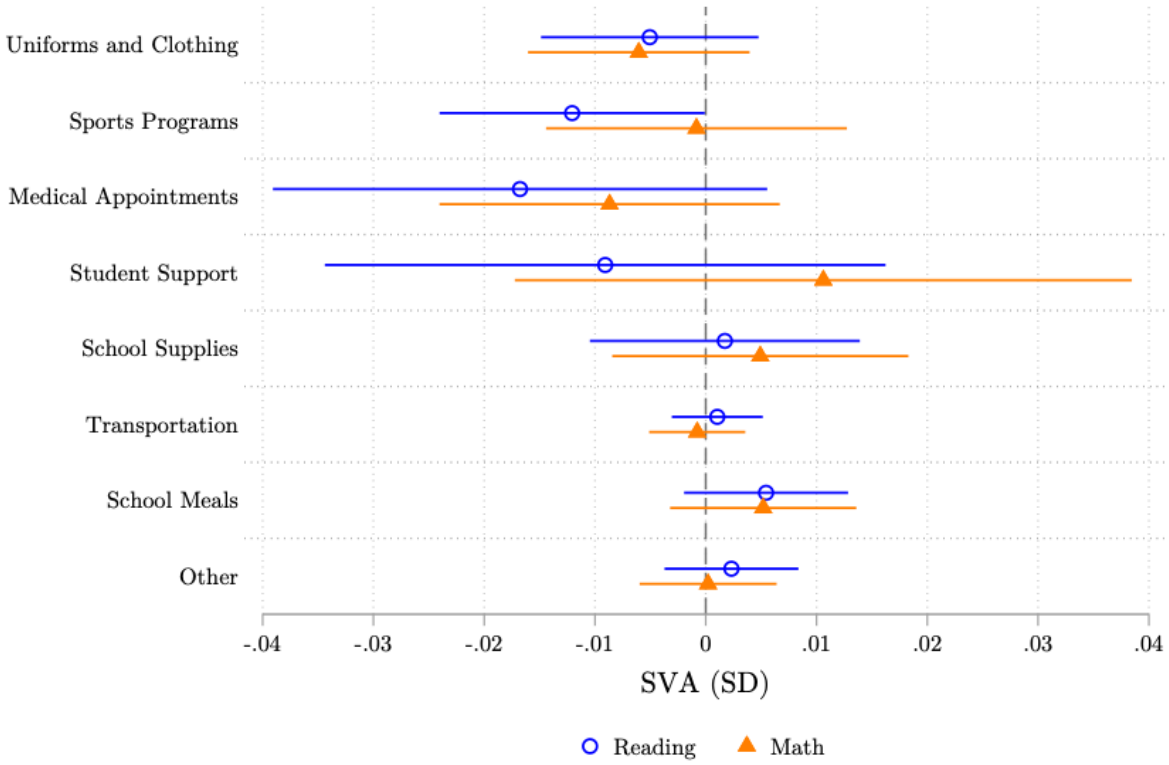
Notes: The figure plots coefficient estimates for each expenditure type listed on the vertical axis. Blue circles correspond to models using Reading SVA as the outcome, and orange diamonds correspond to models using Math SVA. All specifications include year and school fixed effects and control for average total expenditure, enrollment, the number and share of low-SES students, and indicators for the grade configurations used to construct the respective SVA measures. Expenditures are expressed in units of 10,000 (2015 USD), so each coefficient reflects the association between a USD 10,000 reallocation toward that expenditure type (holding total spending fixed) and the corresponding SVA outcome. The 95% confidence intervals reflect standard errors clustered at the school level.

Figure 8: School-level FE Model Estimates - Quality Expenditure Subcategories



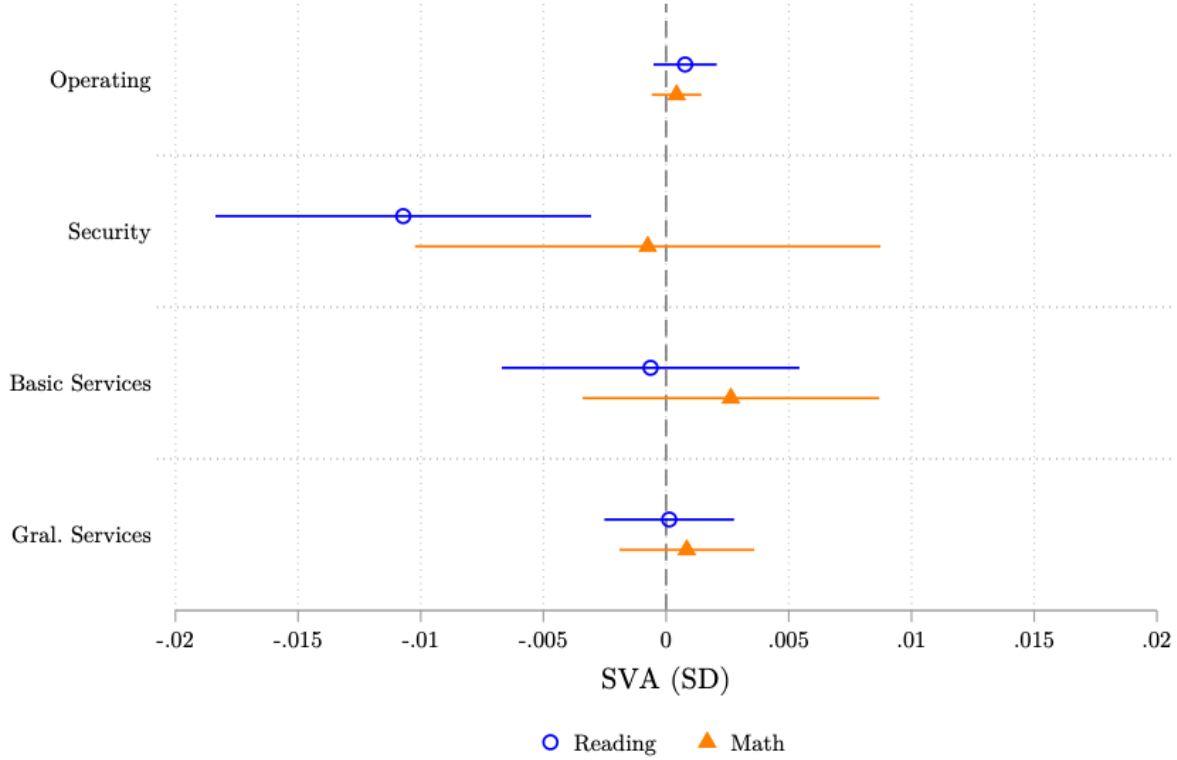
Notes: The figure plots coefficient estimates for each expenditure type listed on the vertical axis. Blue circles correspond to models using Reading SVA as the outcome, and orange diamonds correspond to models using Math SVA. All specifications include year and school fixed effects and control for average total expenditure, enrollment, the number and share of low-SES students, and indicators for the grade configurations used to construct the respective SVA measures. Expenditures are expressed in units of 10,000 (2015 USD), so each coefficient reflects the association between a USD 10,000 reallocation toward that expenditure type (holding total spending fixed) and the corresponding SVA outcome. The 95% confidence intervals reflect standard errors clustered at the school level.

Figure 9: School-level FE Model Estimates - Student Well Being Expenditure Subcategories



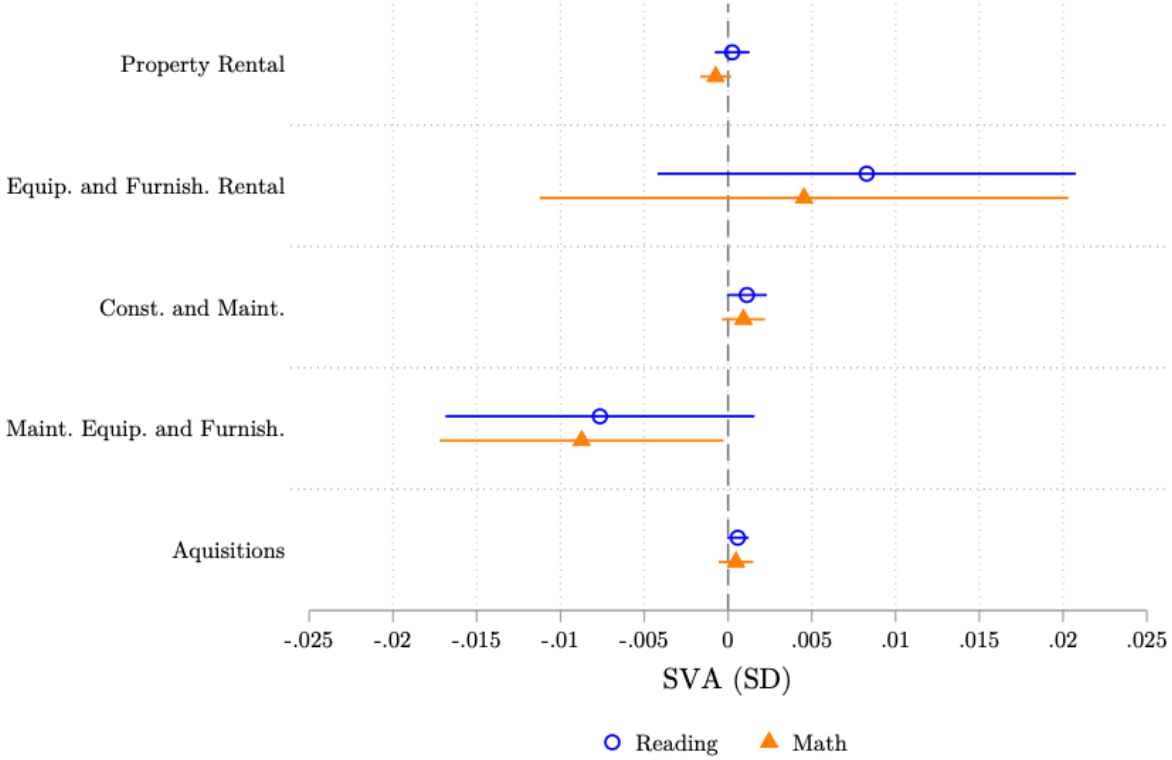
Notes: The figure plots coefficient estimates for each expenditure type listed on the vertical axis. Blue circles correspond to models using Reading SVA as the outcome, and orange diamonds correspond to models using Math SVA. All specifications include year and school fixed effects and control for average total expenditure, enrollment, the number and share of low-SES students, and indicators for the grade configurations used to construct the respective SVA measures. Expenditures are expressed in units of 10,000 (2015 USD), so each coefficient reflects the association between a USD 10,000 reallocation toward that expenditure type (holding total spending fixed) and the corresponding SVA outcome. The 95% confidence intervals reflect standard errors clustered at the school level.

Figure 10: School-level FE Model Estimates - Operational Expenditure Subcategories



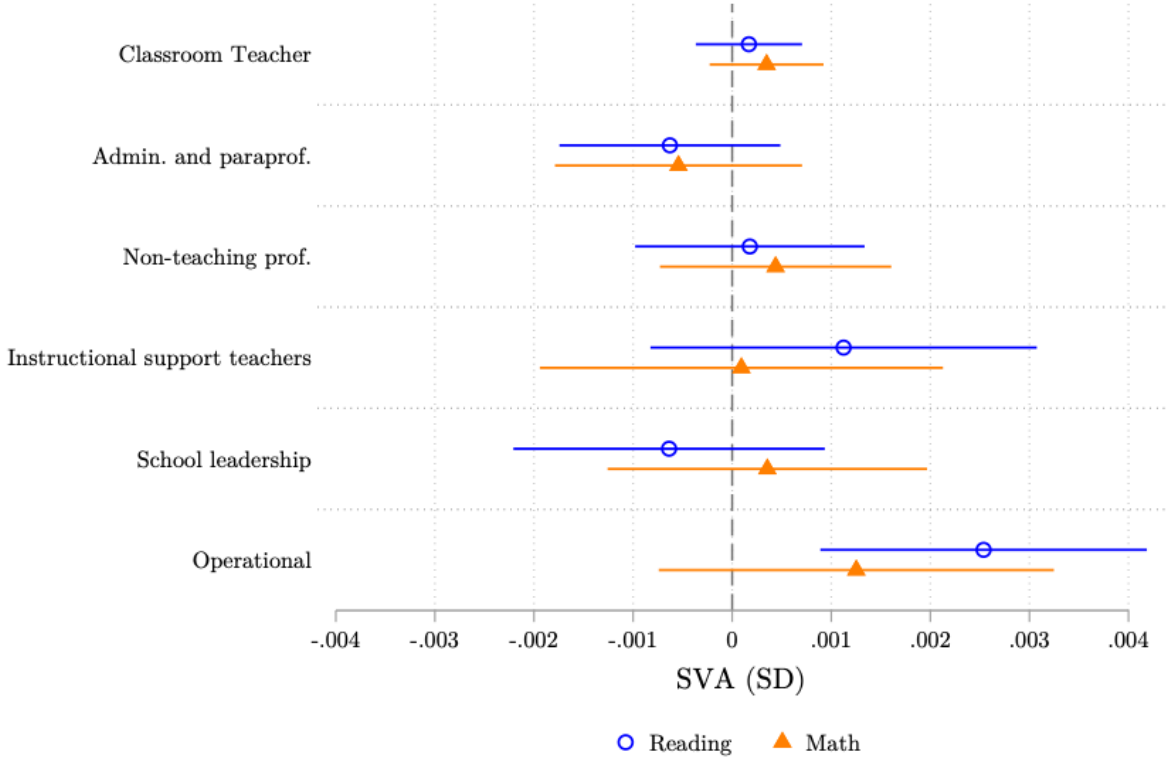
Notes: The figure plots coefficient estimates for each expenditure type listed on the vertical axis. Blue circles correspond to models using Reading SVA as the outcome, and orange diamonds correspond to models using Math SVA. All specifications include year and school fixed effects and control for average total expenditure, enrollment, the number and share of low-SES students, and indicators for the grade configurations used to construct the respective SVA measures. Expenditures are expressed in units of 10,000 (2015 USD), so each coefficient reflects the association between a USD 10,000 reallocation toward that expenditure type (holding total spending fixed) and the corresponding SVA outcome. The 95% confidence intervals reflect standard errors clustered at the school level.

Figure 11: School-level FE Model Estimates - Infrastructure Expenditure Subcategories



Notes: The figure plots coefficient estimates for each expenditure type listed on the vertical axis. Blue circles correspond to models using Reading SVA as the outcome, and orange diamonds correspond to models using Math SVA. All specifications include year and school fixed effects and control for average total expenditure, enrollment, the number and share of low-SES students, and indicators for the grade configurations used to construct the respective SVA measures. Expenditures are expressed in units of 10,000 (2015 USD), so each coefficient reflects the association between a USD 10,000 reallocation toward that expenditure type (holding total spending fixed) and the corresponding SVA outcome. The 95% confidence intervals reflect standard errors clustered at the school level.

Figure 12: School-level FE Model Estimates - Personnel Type Expenditure



Notes: The figure plots coefficient estimates for each expenditure type listed on the vertical axis. Blue circles correspond to models using Reading SVA as the outcome, and orange diamonds correspond to models using Math SVA. All specifications include year and school fixed effects and control for average total expenditure, enrollment, the number and share of low-SES students, and indicators for the grade configurations used to construct the respective SVA measures. Expenditures are expressed in units of 10,000 (2015 USD), so each coefficient reflects the association between a USD 10,000 reallocation toward that expenditure type (holding total spending fixed) and the corresponding SVA outcome. The 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: 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 4: 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. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

APPENDIX

Tables

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