

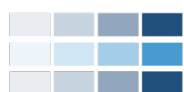
Descriptive Evidence on the Relationship Between School Board Training and Financial Deliberations

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Abstract

Education resources matter when they are allocated and used effectively. Yet, the upstream decisions school boards make about district budgets and resource allocation are understudied. In this descriptive study, we analyze data from 400 publicly available video recordings of financial deliberations in school board budget meetings between spring 2022 and spring 2023. Half of the video recordings are from school boards that received education finance training from the Edunomics Lab at Georgetown University. We find school boards discussed student outcomes in only 15-25% of board meetings focused on financial deliberations. Only about 11% of the variation in financial deliberations can be explained by district characteristics, student achievement, and community characteristics. We find no differences in the discussion of student outcomes for districts with and without the Edunomics training. However, descriptive evidence suggests a positive relationship between the Edunomics training and some summary measures of financial deliberations: the overall level of engagement in budgetary discussions; the likelihood per-unit cost and internal barriers (such as decision-making structure) were mentioned; and the likelihood that the budget was linked to outcomes. These findings underscore the variation in school board deliberations and suggest the potential value of training school board members to influence those deliberations.

1. Introduction

Studies suggest school districts on average explain about 10% of the variation seen in student test score achievement (e.g., Fahle & Reardon, 2018). Although the exact figure varies by state, even in states where districts explain relatively less variation in student test scores, the results are educationally meaningful (Chingos et al., 2015).¹ How districts matter to student achievement is less clear. Studies suggest that districts with more resources, on average, produce better student outcomes; but the estimates vary, and are often statistically insignificant (Handel & Hanushek, 2023).² These mixed results could reflect variation in sampling error and study settings, but they may also reflect some districts using their available resources more effectively than others. District resources matter, but how districts use them is equally important.

Whether districts use resources effectively is a complicated question. The answer depends on the daily actions of district administrators, principals, and teachers. But it also depends on an understudied phenomenon: the upstream decisions school boards make about district budgets and resource allocation. A limited set of studies suggests school board members rarely consider student achievement when making budget decisions (Levenson et al., 2014; Rosa & Anderson, 2024), but much remains to be learned. In this paper, we build on this nascent school board literature by examining school board budget deliberations and an effort to improve them.

¹ It is estimated to be as high as 20% in some states, but less than 2% in others (Fahle & Reardon, 2018). Chingos et al. find that the difference from the roughly the 30th to the 70th percentile of regression-adjusted district achievement represents 0.07–0.14 standard deviations in fourth- and fifth-grade student test scores, which is 20%–33% of a typical year’s student learning.

² The study finds that the median effect of a 10% increase in per-student spending on test scores is 0.07 standard deviations. The impact of a 10% increase in per-student spending on test scores, for example, ranges between -0.24 and 0.54 standard deviations across 16 rigorous studies reviewed by Handel and Hanushek (2023). Seven of the 16 studies find null effects by conventional standards.

To do so, we analyze data from 400 publicly available video recordings of financial deliberations in school board budget meetings between spring 2022 and spring 2023. Half of the video recordings are from school boards that received education finance training from the Edunomics Lab at the Georgetown University (the training occurred between the 2022 and 2023 recordings). The other half of the videos are from school boards that Edunomics identified as a comparison group. Prior to the current study, Edunomics coded all the videos using 20 indicators that it developed with the support of an advisory board. For our main analysis, we use these indicators along with seven underlying constructs estimated using a principal component analysis (PCA) and conduct a difference-in-differences (DD) analysis to examine the relationship between school boards' financial deliberations, a range of district characteristics, and the Edunomics training.

Central to this study is the question of whether the boards discuss student outcomes in their financial deliberations. Overall, we find school boards discussed student outcomes in 15-25% of school board meetings focused on financial deliberations. We find no differences in the discussion of student outcomes for districts with and without the Edunomics training (the training explained 4% of the variation in the deliberations overall). However, we find a positive relationship between the Edunomics training and some other summary measures of financial deliberations: the overall level of engagement in budgetary discussions; the likelihood per-unit cost and internal barriers (such as decision-making structure) were mentioned; and the likelihood that the budget was linked to outcomes. This descriptive evidence underscores the variation in school board deliberations and suggests the potential value of training school board members to influence those deliberations.

2. School Boards: Process and Potential to Influence Outcomes

School district budget approval processes typically start in the fall, with a draft budget prepared by school district staff (Figure 1). With rare exceptions (e.g., a state or mayoral takeover of a school district), an elected school board deliberates on a district's draft budget. After a few rounds of discussions between district staff and the elected board, the board votes to approve the final budget for the next school year. This process is typically completed in the late spring.

Districts rarely use this deliberation process to make significant changes to their budgets from year to year (Roza, 2022). The stability of district budgets can, in part, be explained by the budgeting process and the information school boards receive in budget packets (Roza, 2022). Typically, the process starts with projected expenditures based on the prior year's expenses and additional funding requests, anchoring this year's decisions to past decisions. Budget packets often present expenses broken out by function (e.g., instruction, student services, operation and maintenance) and object (e.g., personnel costs, operating expenses, capital outlay), without providing detailed information about the amounts allocated to specific programs and resources. Materials prepared by districts for board member meetings also typically do not include data on student outcomes or the impacts of resources. Without such information, spring budgeting discussions between the school board finance committee and district staff often focus on *balancing* the budget rather than comparing spending alternatives (Frank & Hovey, 2014). By the time the budget is presented for approval by the full school board, the scope for change is limited and the momentum of the past carries forward.

Academic studies of school boards date back more than 60 years (e.g., Kerr, 1964), but there is little published research on how the budgeting process could contribute to student outcomes. We know, for example, that effective school board actions that lead to improved

results involve establishing a clear vision and objectives, tracking progress through data, engaging district leaders and the community, and maintaining a sense of urgency (Johnson, 2010). We also know that who is on a school board matters. Shi and Singleton (2023), for instance, leverage the fact that candidate placement on a ballot in California is randomized to study the implications of educators being elected to a school board. They find that each additional school-elected board member (relative to the election of others) who self-identifies as an educator increases teacher salaries and reduces the number of charter schools. Finally, there is limited quantitative evidence about school board training, but qualitative evidence (Knudson & Castro, 2024) suggests that school board members often face a steep learning curve and there is limited training that they receive. Hence, purposeful onboarding training activities are key to focusing the board on shared objectives. Yet there is, to our knowledge, no published investigation of behaviors in financial decision-making or whether those behaviors might be influenced by training focused on financial governance.

3. Study Design

3.1 Edunomics Lab training on financial decision-making

To evaluate the extent to which boards engage on financial decision-making and to determine whether training alters that behavior, we study an intervention that is based on training materials developed and implemented by Georgetown University’s Edunomics Lab.³ For this study, the Edunomics Lab selected 100 school boards that had sent some of their trustees (typically one per board) for school finance training in the fall and winter of the 2022–23 school year. Each round of training was delivered over a minimum of 8 hours. Training modules included topics on basic budgeting processes, financial forecasting, and the role of the board; the

³ See <https://edunomicslab.org> for more information.

use of publicly available data tools such as the Comprehensive Center Network’s School Spending and Outcomes Snapshot;⁴ a framework for comparing proposed investments by return on investment (ROI); budget tradeoffs and assessment of impacts; a process for managing vendor contracts against ROI; and communication templates that emphasize cost and outcomes in budget tradeoffs.⁵

The module on integrating ROI into district practices provides an example of the material covered by the training. This module focuses on a budget cycle overview in which participants walk through the steps of producing and reviewing multi-year budget forecasts, analyzing spending and outcomes data across the district, and incorporating principal feedback and input on the budget. Another example is the module on managing vendor contracts against ROI. In this module, participants are asked to build a checklist of factors to consider when making procurement decisions. These factors include costs and likely impacts on student outcome goals. Finally, in the module on budget tradeoffs, participants are guided to use a tool to compare various cost-equivalent investments (e.g., tutoring and lengthening the school day) in terms of per-participating student costs, potential impacts on student outcomes, and risks. Participants are also asked to weigh these cost-equivalent options while navigating competing stakeholder priorities.

⁴ <https://compcenternetwork.org/ssos>.

⁵ A key goal of the trainings is to get participants to consider the implications of various inputs and investments (capital spendings, class size reduction, and investment in educator recruitment and retention) on student outcomes (Handel & Hanushek, 2023). This is important because, although budgeting and improving student outcomes are core responsibilities of school boards (National School Boards Association, 2020; Roza, 2022), school board meetings often treat them separately.

3.2 *Sample and data*

The 100 school boards that had their members receiving Edunomics training in education finance constitute the study treatment group.⁶ For each treated board, the Edunomics Lab selected a matched comparison board that was: from the same state and locality type (city, town, suburban, or rural); with similar number of operational schools (+/- 50 percent) and district enrollment sizes (+/- 10% if enrollment is smaller than 30,000 and +/- 20% if enrollment is 30,000 or more), and with similar student-teacher ratio (+/- 20 percent), student poverty rates (+/- 10 percentage points), per-pupil spending (+/- 10 percent), and per-pupil ESSER funding amounts. (+/- 10%).⁷

Two publicly available school board meeting videos, one before the treatment group received training (spring 2022) and one after (spring 2023), were viewed and coded by Edunomics researchers for each school board. A coding tool was developed with an advisory board to capture four domains of information: mechanics of deliberations, rationales considered, deliberation on alternatives, and discussion on barriers.

Mechanics of deliberations describe the nature of the meeting such as the number and percent of trustees present and whether time was given to public input. The other three domains are reflected by 20 indicators on whether a particular topic was mentioned during deliberation. *Rationales considered* include nine indicators on whether certain topics or rationales (e.g., per unit costs, sustainability, variation of spending impacts across schools and student type, and ROI) were discussed during budget deliberations. *Alternatives* include indicators on whether spending alternatives were presented or mentioned. Finally, *barriers* include nine indicators for

⁶ These school boards are from 27 states: AK, AZ, CA, CO, CT, DE, FL, GA, IL, IN, LA, MD, MI, MN, MO, NJ, NM, NV, NY, OH, OR, PA, TN, TX, VA, WA, and WY.

⁷ See Goldhaber and Falken (2024) for more details about the allocation of funding under the American Rescue Plan's Elementary and Secondary School Emergency Relief Fund (ESSER).

whether factors such as state/federal rules, union contract/collective bargaining agreement, decision making structure, and lack of familiarity with education finance were cited as limiting budget decision-making. A complete list of the topics can be found in Appendix A.

We combined the coded school board meeting videos with other data to examine potential correlates of the boards' deliberation behavior. These additional data (e.g., school district characteristics, student achievement, per pupil spending and ESSER funding, and community characteristics) come from the Common Core of Data from the National Center for Education Statistics, the National Education Resource Database on Schools from the Edunomics Lab, and the Stanford Education Data Archive (SEDA) (Fahle et al., 2024).⁸

3.3 *Sample characteristics*

The final analytic sample consists of 87 pairs of school boards. Sample loss is due to board meeting videos being removed from the public domain during the coding process. Both the treatment and comparison school boards are dropped whenever one of the videos becomes unavailable for the pair. The treated districts have larger average enrollment than the comparison districts (43,000 versus 30,000), more schools (71 versus 48), and higher per-pupil expenditure (\$16,000 versus \$15,000) and higher ESSER funding (\$4,670 versus \$3,480) (Table 1, top panel, Columns 1 and 2). Treated districts are also less suburban (37% versus 45%). However, none of these differences is statistically significant, except for per-pupil ESSER funding.

A closer inspection of the districts suggests that group differences are largely due to the inclusion of the Los Angeles Unified School District (LAUSD) in the treatment group. Its size and uniqueness make it difficult to find an appropriate comparison school district within the state, distorting the overall comparison. After removing LAUSD and its paired comparison

⁸ Retrieved from <https://purl.stanford.edu/cs829jn7849>.

district, the baseline characteristics become more comparable between the treatment and comparison groups (Appendix Table 1, Columns 1 and 2), although some differences remain.⁹

In the bottom two panels of Table 1, treatment and comparison school districts are contrasted using variables not used in matching. These variables were constructed by SEDA based on information collected in spring 2019, the most recent year available.¹⁰ The average student achievement in math and reading/language arts (Grades 3–8), the grade-to-grade learning rate, and the cohort-to-cohort performance trend are not significantly different between the treatment and comparison districts.¹¹ However, white-black and white-Hispanic school segregation¹² and poverty rates are higher in treatment districts than in comparison districts, and the differences are statistically significant.

The study sample is not designed to be a nationally representative sample of all districts. But to provide some context for the sample, we compare study districts to other districts in the same states (Table 1, Column 3) and to districts in the U.S. (Table 1, Column 4). The 27 states from which study districts are drawn account for nearly 70% of all school districts and 78% of student enrollment in the country in 2021–22, so the characteristics summarized in Columns 3 and 4 in Table 1 are similar and will be discussed together.

⁹ Because of the uniqueness of LAUSD, all regression analyses reported in later sections are also repeated for a restricted sample that excludes LAUSD and its paired comparison district. Results change minimally using the restricted sample, and they are available upon request.

¹⁰ Specifically, files “seda_geodist_poolsub_gcs_5.0” and “seda_cov_geodist_annual_5.0” downloaded from SEDA were used for this study.

¹¹ Student achievement was constructed by SEDA using test scores for Grades 3–8 that are standardized at the grade cohort level. For each subject, scores were pooled to the geographical school district level using a hierarchical linear model (HLM) with empirical Bayes adjustment. The learning rate is the estimated grade slope, and the achievement trend is the estimated cohort slope in the HLM model. More details can be found in SEDA 5.0 documentation at https://stacks.stanford.edu/file/druid:cs829jn7849/SEDA_documentation_v5.0.pdf.

¹² Between-school segregation is measured by the information theory index that equals 0 when there is no segregation and 1 when this is complete segregation (Reardon & Firebaugh, 2002).

Compared to the average school district, the enrollment size and the number of schools are several times larger in treated school districts, likely because treated districts are less rural. Students in treated districts have lower average achievement in math and reading, and they learn at a slower rate in math than students in other school districts. Schools in treated districts are also more racially segregated. Compared to the other communities, the communities where treated districts are located tend to have higher rates of poverty, unemployment, Supplemental Nutrition Assistance Program (SNAP) receipt, and single mother households, although they have similar median income and a higher share of the population with at least a bachelor's degree. It is important to keep these contrasts in mind when considering the study findings.

3.4 *Mechanics of school board deliberation*

The structure of school board deliberations is largely similar for the treatment and comparison groups in both time periods (spring 2022 and spring 2023) (Table 2). A typical school board meeting in the study sample had six trustees present who represented at least 90% of all trustees. Only about half of the trustees in attendance were observed speaking during the budget deliberation portion of the meetings. Trustees spent, on average, 35–50 minutes on budgetary discussions. Most of the meetings were working sessions (about 60%) with no budgets approved (46%–55%). In these working sessions, discussions about revenue typically occupied less than a quarter of the time spent on budget matters. Two-thirds of the meetings gave time for public input and discussed ESSER funding. A quarter of the meetings discussed or approved a labor raise. Vendor contract approval and financial consent came up in at least one-third of the meetings. T-tests (for continuous variables) and chi-squared tests (for categorical variables) show no statistically significant difference between the treatment and comparison groups, with the

exception that more trustees spoke, and more time was spent on budget, in comparison group meetings in the spring 2023 meetings.

3.5 Measures of financial deliberation

Topics discussed during financial deliberations

Figure 2 depicts the likelihood that each of the 20 topics was discussed during school board meetings (and how it changed between periods). The topics are listed along the *y*-axis, and the likelihood is displayed on the *x*-axis. The direction of the arrows reflects how the likelihood changes from 2022 to 2023; the symbol “^” is used to indicate that there was no change between periods. Blue arrows represent the comparison group, and red arrows represent the treatment group. As explored in the next section, the directions of change for seemingly similar topics are not always consistent.

Across both groups and time periods, sustainability and public input on budget were mentioned in about one-third of the meetings, making them the most covered topics in school board financial deliberation. The least frequently mentioned topics include Edunomics tools/concepts/data (0%–7%), staff and parent pushback (1%–3%), and union/collective bargaining as barriers (2%–7%). Discussions that associate education finance with outcomes are relatively infrequent, occurring only in roughly 15–25% of the observed board meetings.

Figure 2 also shows that the likelihood that a topic was mentioned rarely changes in the same direction over time for the treatment and comparison groups. The most divergent time trend is for discussions on budget choices and student outcomes (+ treatment, - comparison), public input on budget (- treatment, + comparison), and the unavailability of alternative plans or requested data as barriers (+ treatment, - comparison). These divergent trends result in

statistically significant differences between the treatment and the comparison groups in the likelihood they discussed these topics in the 2023 meetings (Appendix B, Table 2).

Underlying constructs measured by indicators

In general, the likelihood a topic was mentioned correlates weakly with the likelihood other topics were mentioned. Figure 3 displays pairwise correlations among the 20 topics. Darker red suggests stronger positive correlations, and darker blue suggests stronger negative correlations. As the figure shows, discussions on topics that connect budgets with outcomes tend to have the highest correlations (about 0.15–0.40) among themselves (the top left corner of Figure 3). Mentions of these topics also tend to correlate positively with discussions of the unavailability of alternative plans or requested data as barriers (topics 16 and 17), which may suggest school boards who pay more attention to ROI are also more aware of the need for data and policy options. Finally, school board meetings that cite the lack of data as a barrier are more likely to mention decision-making structure, the lack of time, and unfamiliarity with finances as limiters (the bottom right corner of Figure 3).

We reduce the dimensionality of Edunomics' codes in two ways (*ex post* and *ex ante*) to aid our analysis of the relationship between school board deliberations and the Edunomics' training (Section 4.3). *Ex post*, we use a data-driven approach and perform a PCA on the likelihood that a topic was mentioned during financial deliberations to uncover underlying themes/constructs and reduce the dimensionality of the topics to make them more computationally tractable.¹³ Results from the PCA show that there are no dominant components

¹³ A PCA generates linear combinations of the 20 indicators that a topic was mentioned to replicate the variance and covariance of the original indicators, with the goal that a few of the components may capture most information contained in the raw data and therefore reduce the dimensionality of the data. In addition, each combination (i.e., a principal component) can be generated such that it is orthogonal to other components, thereby partitioning the total variance into parts that are independent from each other.

that could capture a substantial portion of the overall variance, other than the first principal component, which explains 13% of the total variance across all 20 topics (Table 3). Other components explain a linearly decreasing portion of the total variance, as reflected by the eigen values depicted in Figure 4. The first seven principal components have eigen values higher than 1, and they collectively capture 52% of the total variance of all the indicator variables for whether a topic was mentioned during deliberations (Table 3).

Loadings are the weights used to combine these indicator variables into principal components, and they can help interpret what underlying construct each principal component measures. For example, nearly all indicator variables load positively for the first component, suggesting that Component 1 reflects the overall level of engagement with budgetary discussions during deliberation. Component 2 reflects a focus on alternatives, data, and navigating the budgeting process. For example, Component 2 will have higher value if spending alternatives were either presented or mentioned, or if board members cited the lack of data, time, or familiarity with finance as limiting factors.

Component 3 has an equity focus, and Component 4 reflects attention towards return on investments. For example, board meetings will have higher Component 3 scores if board members discussed how financial impacts could vary by school or student types, whereas Component 4 will increase if a meeting mentioned ROI or Edunomics tools/concepts/data that are designed to highlight ROI. Interestingly, Components 3 and 4 are both negatively associated with citing state/federal rules and union/collective bargaining as barriers, which could be viewed as deference to external constraints in the budgeting process. Component 5 is dominated by discussion about per-unit cost and decision-making structure. Mentions of these two topics will increase the value of Component 5 substantially.

Component 6, in contrast to Components 3 and 4, focuses a great deal on external inputs and barriers. Specifically, although mentions of state/federal rules and union/collective bargaining decrease the value of Components 3 and 4, these mentions increase the value of Component 6. In addition, although the loadings for mentioning public input are positive for all these components, it is three to four times as large for Component 6 as for Components 3 and 4. Finally, Component 7 emphasizes budget choices and student outcomes as well as mostly internal barriers to the budgeting process. Mentions of the relevance of budget choices to student outcomes will increase the value of Component 7 the most among all the topics. Additionally, mentions of barriers largely internal to the district, such as staff and parental pushback, and requested alternative plans not provided will increase the value of Component 7. This contrasts with Component 6, which decreases with the mention of these internal barriers.

Ex ante, we reduce the dimensionality of financial deliberation measures based on a classification structure suggested by the Edunomics education finance trainer. The trainer's classification structure groups some of the 20 topics into five broad categories of concepts:

- some deliberation on equity of allocations: Topics 3 and 4—financial/spending impacts by school and by student type;
- recognition of investing toward an outcome: Topics 5, 6, and 7—relevance of budget choices to student outcomes, ROI, and evidence of spending effects;
- deference to external constraints in budgeting: Topics 12, 13, and 14—state/federal rules, union/collective bargaining, and staff pushback;
- insisting on better information: Topics 16 and 17—requested alternative plans not provided, requested data unavailable; and

- attempts to navigate budgeting process: Topics 18 and 19—decision-making structure, lack of time.

For these categories, our analysis considers a category as being covered during a deliberation as long as one of the topics in the category was mentioned. In the analyses described below, we use both the PCA-derived and trainer-developed measures as dependent variables.

3.6 Estimating the association between training and financial deliberation behaviors

To estimate the association between finance training and school board deliberation, the study uses a DD approach. The approach compares the prepost difference in measures of finance deliberation for the treatment group (districts that received the Edunomics training) to the prepost difference for the comparison group (districts that did not receive the training).

Specifically, a measure of school board deliberation, Y_{st} , for school board s observed in period t is regressed on an indicator of the posttreatment period ($Post_t$), a treatment group indicator ($Treat_s$), and the interaction of the two indicators. The regression controls for additional, time invariant characteristics \mathbf{X}_s that may affect the outcome:

$$Y_{st} = \alpha_0 + \alpha_1 Post_t + \alpha_2 Treat_s + \alpha_3 Post_t * Treat_s + \mathbf{X}_s \boldsymbol{\beta} + \varepsilon_{st}. \quad (1)$$

Coefficient α_1 estimates the common time-trend in Y across all school boards; coefficient α_2 estimates the baseline difference between the treatment and comparison school boards; the coefficient of interest, α_3 , can be interpreted as the effect of finance training on the outcome of interest under the assumptions that (a) there are no other concurrent changes in factors that may affect the outcomes of interest and (b) pretreatment differences between the treatment and the comparison groups would have remained the same during the posttreatment period in the absence of finance training.

The key threat to the causal interpretation of the estimated association between finance training and board deliberation is that school boards that participated in such training could be fundamentally different from school boards in the comparison group. Some of the key differences may not be observable to researchers, and the contribution to these factors would be misattributed to finance training. The threat of this type of omitted variable bias is amplified by the lack of existing knowledge about the key correlates of school board deliberation. In addition, having only one baseline period exacerbates this threat because outcomes in the period immediately before the treatment could themselves be influenced by the same set of unobserved factors that drive both participation in training and posttreatment outcomes. Matching can alleviate the omitted variable bias only to the extent that observed variables used in matching are correlated with unobserved (and sometimes time-varying) factors.¹⁴

With these caveats in mind, Equation (1) is estimated as a linear probability model with control variables that include all district characteristics, student achievement, and community characteristics summarized in Table 1. In alternative specifications, we estimate the model without the control variables, with control variables replaced by district fixed effects, and as logistic regressions.¹⁵ The estimated correlations between measures of finance deliberation and training are nearly identical across all model specifications (Appendix B, Table 3).

¹⁴ A bounding analysis was conducted to investigate the extent to which the estimated coefficient is biased by omitted variables (Oster, 2019). The method relies on the relative strength of how unobservables and observables are related to treatment participation and generates bias-adjusted treatment effect estimates by using both how coefficient estimates and the R^2 change when new control variables are added. Unfortunately, the estimated coefficient barely changed after an extensive set of control variables were added, and the R^2 stayed low (in the 0.10–0.20 range) with all control variables added. Much is unknown about the unobservables, and extrapolation from observables does not seem credible.

¹⁵ Not surprisingly, the amount of time spent on financial deliberations increases the chance that a topic was mentioned during school board meetings. The correlation, however, is generally weak with coefficients between 0 and 0.004 and R^2 between 0.001 (for the likelihood of mentioning staff pushback) and 0.083 (for the likelihood of mentioning requested data not provided). Controlling for time does not change any of the findings, and importantly, time spent on financial deliberations may be affected by training and other covariates. As a result, time is not included in our preferred models as a covariate.

4. Results

4.1 *Variation in finance deliberations across both groups*

Comparisons between model specifications suggest that most of the variation in finance deliberation behavior is between school districts, and that very little of this variation can be explained by covariates commonly used in education research. Table 3 in Appendix B reports R-squared by model specification (columns) for each of the 20 indicators of deliberation behavior (rows). How R-squared changes with various combinations of covariates, depicted in Figure 5, has a clear pattern.

In the sparse model that includes no covariates other than the treatment indicator, the posttreatment indicator, and their interaction (Appendix B, Table 3, Column 1), education finance training explains no more than 4% of the variation in financial deliberations. In fact, training explains less than 2% of the variation for 16 out of the 20 indicators.

Columns 2–4 add three sets of covariates to the basic DD model. Column 2 adds baseline district characteristics (enrollment, student poverty rate, student–teacher ratio, number of schools, per-pupil expenditure, per-pupil ESSER funding, and locality). District characteristics explain an additional 2%–11% of the variation in measures of financial deliberation. Column 3 adds student achievement (the average achievement, the learning rate, and the achievement trend for both math and reading), which typically explains no more than an additional 4% of the variation. Column 4 adds community characteristics (school segregation, median income, percentage of residents with a bachelor’s degree or higher, poverty rate, unemployment rate, SNAP receipt rate, and single mother household rate). Community characteristics typically explain an additional 1%–8% of the variation in financial deliberation measures. Among the 20 indicators of finance deliberation, joint Wald tests show that district characteristics and student

achievement are not significant correlates of nine indicators and that community characteristics are not significant correlates of eight indicators.

Column 5 adds all three sets of covariates to the basic DD model. Together, these covariates explain on average an additional 11% of the variation in measures of financial deliberation. This is substantially smaller than the variation across school districts, which is 59% on average (Column 6).

4.2 *Relationship between training and financial deliberations*

The estimated association between receiving training and the likelihood that a topic was mentioned in financial deliberations is summarized in Figure 6, with complete results presented in Tables 4a and 4b. The estimated association is the x -axis, and the outcome variables are listed on the y -axis. Dots represent point estimates, and whiskers represent the 90% confidence intervals. A statistical power analysis estimates that the minimum detectable effect size with 87 pairs of observations at the 0.10 significance level with 80% power is 0.48 standard deviation, a large effect that is roughly equivalent to a change of likelihood from 10% to 20%. This is why we focus on the 90% instead of the conventional 95% confidence interval.

For most outcomes, the estimated confidence interval includes 0, suggesting a lack of detectable change in behavior associated with training. However, a few indicators are statistically significantly associated with training. For example, training is associated with an increased likelihood that a school board meeting mentioned budget choices and student outcomes (0.19), concepts and tools used in Edunomics training (0.06), and decision-making structure as a barrier (0.16). Training is also found to decrease the likelihood of mentioning public input in school board meetings (-0.31).

As shown in Figure 2, nearly all the significant associations appear to be driven as much by prepost changes in comparison group board meeting behavior as by prepost changes in treatment group behavior. To what extent the changes in comparison group behavior (and treatment group behavior for that matter) reflect idiosyncratic fluctuation *within* school district over time is unclear. The year-to-year correlation is low for some indicators (e.g., mentioning budget choices and student outcomes has a correlation coefficient of 0.07), suggesting large over-time variation; for other indicators, the year-to-year correlation is moderate (e.g., 0.26 for mentioning decision-making structure and 0.42 for public input).

As discussed in the previous section, the variation in deliberation behavior *across* school districts is also not adequately explained by commonly available measures of district characteristics, student achievement, and community attributes. Tables 4a and 4b report the full set of coefficients on covariates. Student poverty rate is the strongest correlate of deliberation behavior. Higher student poverty is associated with increased likelihood that school boards mentioned per-unit cost, sustainability, financial impact by student groups, Edunomics tools and data, and spending alternatives, as well as barriers like data availability, unions/collective bargaining, and unfamiliarity with finance. Interestingly, some measures of community economic stress (e.g., unemployment and SNAP receipt rates) appear to be negatively associated with many of these measures, possibly reflecting competing demands for financial support. For example, a higher unemployment rate in the community of the school district is associated with a lower likelihood that Edunomics tools and data, ROI, spending alternatives, and unions/collective bargaining were mentioned. A higher unemployment rate is also found to correlate with lower likelihood of mentioning the lack of time as a limitation.

A couple more findings are notable. First, there is generally no relationship between student achievement measures and any of the indicators of financial deliberation. Second, higher between-school segregation between White and Black students increases the mentioning of public input and spending alternatives, whereas higher segregation between White and Hispanic students decreases the likelihood of mentioning these topics. In addition, higher White–Hispanic segregation is correlated with higher likelihood of mentioning per-unit cost and state/federal rules and lower likelihood of mentioning the lack of time as a barrier. None of these indicators is associated with the White–Black segregation index. The underlying cause of these contrasts is unclear, and it warrants further investigation.

4.3 *Reduce dimensionality*

Based on these two methods of dimensionality reduction, Equation (1) is estimated for each of the seven principal components and the five trainer-defined constructs/categories. Results are reported in Tables 5 and 6, respectively. To facilitate interpretation, each principal component is standardized to have a mean of 0 and a standard deviation of 1.

Results show that principal components 1, 5, and 7 are significantly associated with receiving education finance training (Table 5). Based on component loadings discussed in Section 3.5, these results suggest that training is associated with an increased level of engagement with budgetary discussions, a higher likelihood of mentioning per-unit cost and decision-making structure, and more emphasis on budget choices and student outcomes as well as internal barriers to the budgeting process. In terms of trainer suggested constructs, receiving training is positively associated with an increased likelihood to insist on better information.

Although the number of hypotheses tested is greatly reduced by using principal components and the trainer-derived constructs/categories, the chances of false rejections remain

elevated, which calls for adjustment for multiple comparisons. Using Bonferroni adjustment, the association between training and mentioning per-unit cost and decision-making structure remains statistically significant, but the association with the relevance of budget choice to student outcomes and internal barriers is no longer statistically significant.¹⁶

5. Discussion

To the best of our knowledge, this study provides the first quantitative description of school board financial deliberations based on recorded school board meetings. The findings are consistent with anecdotal observations that school boards rarely discuss student outcomes during budget deliberations. We also find that most of the variation in observed deliberation behavior is between school districts, although the drivers of those differences are unclear (observable district, student, and community characteristics are weakly correlated with the deliberation behavior). More hopefully, we find some evidence that Edunomics' financial training is associated with some aspects of financial deliberation.

The study comes with caveats that have implications for future work, especially with regards to measurement and design. Although the coding instrument used in this study was developed with an expert panel, it has not been assessed for validity and reliability (the same is true of the coding process itself). In the future, validated measures and the use of multiple coders (or computer assisted transcription) could improve the quality of coded meeting data. The study design has limitations. A more rigorous research design could randomly assign some training applicants to receive the training earlier than others. This, combined with stronger correlates and better measures, could both provide more precise estimates of the causal impact of financial training and deepen our understanding of how district-level decisions may affect student success.

¹⁶ However, this association remains statistically significant using other multiple comparison adjustment methods such as the sharpened false discovery rate (known as the q -value) (Anderson, 2008; Benjamini et al., 2006).

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Tables and Figures

Table 1. Baseline characteristics of districts (mean with standard deviations in parentheses), by treatment status.

	(1)	(2)	(3)	(4)
Variable	Treatment	Comparison	Other districts in study states	Other districts in the nation
<i>A. Matching variables</i>				
Enrollment (in thousands)	43.05 (77.20)	30.00 (39.94)	2.66 *** (8.07)	2.45 *** (7.56)
Student poverty rate	0.49 (0.24)	0.46 (0.22)	0.46 (0.29)	0.45 (0.28)
Student-teacher ratio	16.04 (3.29)	16.16 (3.38)	14.85 (8.53)	14.29 (9.85)
Number of schools	71.45 (126.43)	47.93 (56.62)	5.02 *** (11.76)	4.82 *** (11.17)
Per-pupil expenditure (in thousands)	16.28 (5.63)	14.99 (6.02)	16.10 (19.08)	15.49 (16.16)
Per-pupil ESSER (in thousands)	4.67 (6.13)	3.48* (2.98)	–	–
Rural	0.03 (0.18)	0.03 (0.18)	0.35 *** (0.48)	0.42 *** (0.49)
Suburb	0.37 (0.49)	0.45 (0.50)	0.27 ** (0.44)	0.23 *** (0.42)
Town	0.11 (0.32)	0.10 (0.31)	0.15 (0.35)	0.16 (0.36)
<i>B. Student achievement</i>				
Average math achievement	5.12 (1.17)	5.26 (1.23)	5.53*** (1.13)	5.56*** (1.12)
Math learning rate/grade	0.95 (0.16)	0.97 (0.18)	1.02*** (0.17)	1.01*** (0.17)
Math achievement trend	-0.01 (0.06)	-0.02 (0.06)	0.00 (0.08)	-0.00 (0.08)
Average reading achievement	5.11 (1.16)	5.26 (1.21)	5.57*** (1.16)	5.58*** (1.11)
Reading learning rate/grade	0.99 (0.11)	0.99 (0.16)	1.00 (0.12)	0.99 (0.12)
Reading achievement trend	0.01 (0.06)	0.01 (0.06)	0.01 (0.07)	0.01 (0.07)
<i>C. Community characteristics</i>				
School white-black segregation	0.21 (0.15)	0.17* (0.14)	0.05*** (0.08)	0.05*** (0.08)
School white-Hispanic segregation	0.17	0.13**	0.03***	0.03***

	(0.13)	(0.11)	(0.06)	(0.06)
Log of median income	10.94	10.85	10.91	10.89
	(0.32)	(1.21)	(0.35)	(0.34)
Bachelors + degree rate	0.34	0.31	0.26***	0.25***
	(0.15)	(0.13)	(0.14)	(0.14)
Poverty rate	0.15	0.13*	0.12***	0.12***
	(0.07)	(0.07)	(0.06)	(0.06)
Unemployment rate	0.06	0.06	0.05***	0.05***
	(0.02)	(0.02)	(0.02)	(0.02)
SNAP receipt rate	0.13	0.11	0.11***	0.11***
	(0.08)	(0.07)	(0.06)	(0.06)
Single mother household rate	0.22	0.20	0.15***	0.15***
	(0.09)	(0.08)	(0.06)	(0.06)
N	87	87	13,424	19,388

– Data not available.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Stars denote statistically significant difference from the treatment group.

Note: All matching variables are from the 2021–22 NCES Common Core of Data except for per-pupil ESSER, which is from Edunomics Lab’s National Education Resource Database on Schools. Student poverty rate is the free/reduced price lunch rate where it is available; when it is unavailable, direct certification rate is used.

Student achievement and community characteristics are from spring 2019 using data compiled by the Stanford Education Data Archive (SEDA). More details about the construction of these variables can be found at https://stacks.stanford.edu/file/druid:cs829jn7849/SEDA_documentation_v5.0.pdf. Briefly, Grades 3–8 student test scores from spring 2019 were standardized at the grade cohort level. For each subject, scores were pooled to the geographical school district level using a hierarchical linear model (HLM) with empirical Bayes adjustment. The learning rate is the estimated grade slope, and the achievement trend is the estimated cohort slope in the HLM model. Between-school segregation is measured by the information theory index that equals 0 when there is no segregation and 1 when this is complete segregation (Reardon & Firebaugh, 2002).

Table 2. Comparison of meeting mechanics between treatment and comparison school boards, by year: 2021–22 and 2022–23

	Pre (2021-22)		Post (2022-23)	
	Treatment	Comparison	Treatment	Comparison
<i>A. Mean and standard deviation</i>				
Number of trustees present	6.09 (1.72)	6.17 (1.53)	6.29 (1.86)	6.45 (1.53)
Percent of trustees present	0.90 (0.13)	0.93 (0.11)	0.93 (0.12)	0.95 (0.09)
Number of trustees spoke	3.25 (2.49)	2.86 (2.02)	3.49 (2.56)	2.77* (2.45)
Percent of trustees spoke	0.53 (0.38)	0.48 (0.34)	0.55 (0.35)	0.42*** (0.35)
Time spent on budget (minutes)	40.36 (39.48)	35.10 (33.56)	47.69 (43.69)	36.31* (33.62)
<i>B. Percent (column)</i>				
Meeting description				
Approval	16.09	17.24	21.84	21.84
Other	11.49	6.90	6.90	6.90
Update (financial)	10.34	16.09	9.20	12.64
Working session	62.07	59.77	62.07	58.62
Budget approved				
No	55.17	49.43	52.33	46.43
Other	4.60	10.34	3.49	2.38
Requested	6.90	6.90	10.47	9.52
Yes	33.33	33.33	33.72	41.67
Percent budget discussion devoted to revenues				
0<25%	51.72	43.68	48.28	45.98
25<50%	26.44	31.03	34.48	28.74
50<75%	17.24	16.09	10.34	18.39
75<100%	4.60	9.20	6.90	6.90
Introduced new financial item				
No	90.70	89.66	91.86	89.66
Yes	9.30	10.34	8.14	10.34
Time given to public input				
No	24.14	26.44	32.18	27.59
Yes	75.86	73.56	67.82	72.41
Labor raise				
Approved - no discussion	4.60	4.60	4.60	6.90
Approved - with discussion	3.45	1.15	1.15	
Mention/acknowledgement of a raise	18.39	20.69	19.54	22.99
No	12.64	12.64	11.49	11.49
Not approved	3.45	1.15	4.60	
Not mentioned	50.57	54.02	50.57	52.87

Yes	6.90	5.75	8.05	5.75
Vendor contract approval				
No	62.07	60.92	62.07	63.22
Yes	37.93	39.08	37.93	36.78
Consent agenda items				
No	34.48	34.48	41.38	35.63
Unknown		3.45		2.30
Yes	9.20	10.34	10.34	10.34
Yes - financial	40.23	36.78	32.18	35.63
Yes - non-financial	16.09	14.94	16.09	16.09
ESSER				
No	26.44	37.93	35.63	34.88
Yes	73.56	62.07	64.37	65.12

* p<0.10, ** p<0.05. Stars denote statistically significant difference from the treatment group based on *t*-tests (for continuous variables) and χ^2 tests (for categorical variables).

Table 3. Principal component (PC) loadings, eigenvalues, and proportion of total variance explained

	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7
Variable	Engagement	Alternatives, data, process	Equity	ROI	Per-unit cost, structure	External inputs and barriers	Budget and outcomes, internal barriers
Per-unit cost	0.24	-0.08	0.22	0.00	0.46	-0.17	-0.24
Sustainability	0.20	0.09	0.23	0.02	-0.02	0.09	-0.20
Financial impacts by school	0.33	-0.35	0.20	-0.08	-0.22	-0.17	0.08
Financial impacts by student type	0.29	-0.39	0.11	-0.04	-0.20	-0.01	-0.11
Budget choices and student outcomes	0.34	-0.07	0.02	0.15	0.15	0.09	0.35
Return on investment	0.23	-0.07	-0.22	0.27	0.15	-0.24	-0.41
Evidence on spending effects	0.29	-0.25	0.03	0.03	0.16	0.18	0.21
Public input on budget	0.10	0.13	0.14	0.19	-0.22	0.56	-0.31
Ednomics tools/concepts/data	0.16	0.03	-0.36	0.49	0.21	0.15	0.23
Spending alternatives presented	0.22	0.30	0.06	-0.11	-0.05	-0.34	-0.34
Spending alternatives mentioned	0.27	0.27	-0.25	0.18	-0.02	0.16	-0.19
State/federal rules	0.20	-0.01	-0.26	-0.22	-0.03	0.23	0.15
Union/collective bargaining	0.21	-0.13	-0.06	-0.17	-0.43	0.12	-0.01
Staff pushback	0.05	0.35	0.23	0.18	-0.19	-0.17	0.30
Parent pushback	0.02	0.00	0.40	0.27	0.20	-0.06	0.10
Requested alternative plans not provided	0.22	0.09	0.02	0.21	-0.31	-0.39	0.24
Requested data unavailable	0.31	0.22	0.15	-0.34	0.17	0.24	-0.02
Decision making structure	0.12	0.04	-0.23	-0.46	0.32	-0.14	0.17
Lack of time	0.22	0.33	-0.31	-0.11	-0.17	-0.16	0.04
Unfamiliar with finances	0.09	0.38	0.34	-0.11	0.08	0.13	0.20
Eigenvalue	2.63	1.58	1.41	1.30	1.23	1.11	1.06
Proportion of total variance explained	0.13	0.08	0.07	0.06	0.06	0.06	0.05
Cumulative proportion variance explained	0.13	0.21	0.28	0.35	0.41	0.46	0.52

Note. The remaining 13 PCs have eigenvalues less than 1, and they explain smaller proportions of the total variance than the seven PCs presented here. Those PCs are not displayed for brevity.

Table 4a. OLS estimates of the relationship between receiving training and the chances that a topic was discussed during school board deliberation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	Per-unit cost	Sustaina- bility	Financial impact on schools	Financial impact on students	Budget and outcome	Return on investment	Spending effect	Public input	Edunomics	Spending alternative presented
Treated X Post	0.095 (0.082)	-0.012 (0.105)	0.024 (0.087)	0.074 (0.094)	0.193** (0.096)	-0.077 (0.064)	0.075 (0.081)	-0.307*** (0.102)	0.064* (0.037)	0.050 (0.066)
Enrollment (in thousands)	0.002 (0.002)	-0.004** (0.002)	-0.000 (0.002)	0.002 (0.002)	0.001 (0.002)	0.001 (0.001)	0.002 (0.002)	0.002 (0.002)	0.001 (0.001)	0.001 (0.002)
Poverty rate	0.330** (0.136)	0.371** (0.164)	0.188 (0.125)	0.338** (0.131)	0.130 (0.137)	-0.050 (0.091)	0.003 (0.105)	0.186 (0.147)	0.126** (0.060)	0.164** (0.073)
Student-teacher ratio	-0.004 (0.007)	0.036*** (0.011)	-0.000 (0.008)	0.002 (0.010)	0.005 (0.010)	0.002 (0.005)	0.010 (0.007)	0.008 (0.011)	-0.000 (0.004)	-0.016*** (0.005)
Number of schools	-0.001 (0.001)	0.003*** (0.001)	-0.000 (0.001)	-0.002 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.000)	-0.000 (0.001)
Per-pupil expenditure (in thousands)	-0.011 (0.007)	-0.009 (0.009)	0.003 (0.008)	-0.011 (0.008)	-0.004 (0.009)	-0.001 (0.005)	0.007 (0.007)	-0.007 (0.010)	-0.004 (0.003)	-0.006 (0.006)
Per-pupil ESSER (in thousands)	-0.010* (0.006)	-0.003 (0.010)	-0.008 (0.006)	-0.010 (0.007)	0.002 (0.006)	0.006* (0.004)	-0.001 (0.004)	0.004 (0.009)	0.000 (0.002)	-0.004 (0.005)
Rural	0.105 (0.156)	0.143 (0.196)	-0.025 (0.133)	0.205 (0.197)	-0.094 (0.168)	-0.058 (0.073)	0.059 (0.139)	-0.159 (0.182)	-0.016 (0.041)	0.272 (0.176)
Suburb	0.046 (0.067)	0.013 (0.082)	-0.076 (0.067)	-0.017 (0.075)	-0.035 (0.078)	-0.035 (0.048)	-0.017 (0.062)	-0.159* (0.083)	-0.050* (0.027)	0.096** (0.047)
Town	0.019 (0.100)	-0.076 (0.132)	0.075 (0.112)	0.058 (0.106)	-0.015 (0.109)	0.033 (0.080)	0.019 (0.096)	-0.193* (0.116)	-0.005 (0.056)	0.158* (0.093)
<i>Student achievement</i>										
Average math	0.092 (0.092)	-0.041 (0.121)	0.007 (0.102)	-0.015 (0.109)	-0.110 (0.112)	0.107 (0.071)	0.070 (0.093)	0.041 (0.115)	-0.074 (0.053)	0.087 (0.074)
Math learning rate	-0.578 (0.427)	0.487 (0.606)	-0.229 (0.532)	-0.237 (0.554)	-0.541 (0.558)	-0.174 (0.334)	0.188 (0.475)	-0.003 (0.589)	-0.037 (0.209)	0.235 (0.330)
Math trend	-0.809	-1.678	0.980	0.646	1.764	-0.853	0.456	-0.332	-0.204	-0.738

	(0.969)	(1.204)	(1.039)	(1.136)	(1.170)	(0.771)	(0.969)	(1.198)	(0.329)	(0.790)
Average reading	0.037	0.172	0.088	-0.010	0.107	-0.061	-0.023	-0.103	0.057	-0.121
	(0.090)	(0.117)	(0.084)	(0.099)	(0.107)	(0.061)	(0.094)	(0.108)	(0.052)	(0.075)
Reading learning	0.153	-0.544	0.993*	0.268	0.494	-0.090	-0.175	-0.275	-0.079	-0.716*
rate	(0.526)	(0.689)	(0.570)	(0.590)	(0.604)	(0.373)	(0.488)	(0.690)	(0.240)	(0.414)
Reading trend	0.378	0.645	-2.337*	-0.814	-1.887	0.923	-0.835	0.859	-0.031	0.929
	(1.169)	(1.345)	(1.231)	(1.296)	(1.277)	(0.860)	(1.107)	(1.242)	(0.587)	(0.875)
<i>Community characteristics</i>										
School segregation	-0.283	0.299	0.132	0.041	0.382	0.193	0.209	1.269***	0.150	-0.061
(white-black)	(0.321)	(0.358)	(0.326)	(0.351)	(0.339)	(0.236)	(0.330)	(0.332)	(0.114)	(0.197)
School segregation	0.742*	0.111	0.682	0.693	0.198	-0.344	0.164	-1.735***	-0.124	-0.188
(white-Hispanic)	(0.422)	(0.477)	(0.460)	(0.494)	(0.468)	(0.329)	(0.456)	(0.430)	(0.163)	(0.265)
Log of median	0.052	0.141	0.306	0.263	-0.055	-0.114	0.152	0.870***	0.149	-0.001
income	(0.240)	(0.293)	(0.274)	(0.278)	(0.274)	(0.191)	(0.250)	(0.276)	(0.096)	(0.175)
Bachelors +	0.171	-0.187	-0.346	0.567	0.501	0.070	-0.266	-0.156	0.208	0.317
degree rate	(0.379)	(0.441)	(0.361)	(0.423)	(0.445)	(0.259)	(0.339)	(0.441)	(0.134)	(0.296)
Poverty rate	1.139	1.346	0.068	-0.312	0.140	-0.511	1.327	3.594***	0.017	1.544*
	(1.123)	(1.401)	(1.318)	(1.283)	(1.263)	(0.898)	(1.290)	(1.284)	(0.412)	(0.786)
Unemployment	-0.655	0.640	1.536	1.029	-3.039	-3.810***	-0.958	-0.401	-1.500**	-0.204
rate	(1.931)	(2.483)	(2.067)	(2.195)	(2.255)	(1.409)	(1.849)	(2.755)	(0.752)	(1.341)
SNAP receipt rate	0.333	0.137	-0.593	0.556	-0.347	-0.316	-0.681	-1.866*	0.621	-0.499
	(0.816)	(1.066)	(0.902)	(0.873)	(0.986)	(0.710)	(0.879)	(1.070)	(0.409)	(0.618)
Single mother	-0.171	0.414	1.200	0.657	-0.618	1.378**	0.064	1.000	-0.151	-0.483
household rate	(0.869)	(0.981)	(0.845)	(0.994)	(0.945)	(0.553)	(0.697)	(0.985)	(0.406)	(0.588)
N	310	312	312	311	312	312	311	312	312	312
R-squared	0.14	0.17	0.11	0.12	0.12	0.09	0.09	0.23	0.10	0.17

Note: All models include treatment status and post-treatment indicator variables. * p<0.10, ** p<0.05, *** p<0.01.

Table 4b. OLS estimates of the relationship between receiving training and the chances that a topic was discussed during school board deliberation

	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Variable	Spending alternative mentioned	State/federal rules	Union/collective bargaining	Staff push back	Parent push back	Alt plan not provided	Data not available	Decision making structure	Lack of time	Unfamiliar with finance
Treated X Post	0.066 (0.065)	-0.025 (0.086)	-0.051 (0.035)	-0.012 (0.034)	0.013 (0.038)	0.063 (0.064)	0.154 (0.094)	0.159** (0.075)	0.051 (0.068)	0.064 (0.072)
Enrollment (in thousands)	0.000 (0.001)	0.003 (0.002)	-0.000 (0.001)	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.002)	0.005** (0.002)	0.002 (0.002)	-0.001 (0.001)
Poverty rate	0.157* (0.083)	0.133 (0.128)	0.106* (0.058)	0.033 (0.045)	-0.010 (0.051)	0.090 (0.083)	0.437*** (0.136)	-0.049 (0.091)	-0.021 (0.120)	0.281** (0.110)
Student-teacher ratio	0.001 (0.008)	-0.008 (0.008)	-0.001 (0.004)	-0.001 (0.002)	0.001 (0.005)	0.000 (0.005)	-0.018* (0.009)	0.003 (0.007)	-0.009 (0.007)	0.001 (0.007)
Number of schools	-0.000 (0.001)	-0.002 (0.001)	0.000 (0.001)	-0.001 (0.001)	0.000 (0.000)	0.001 (0.001)	0.000 (0.001)	-0.002** (0.001)	-0.001 (0.001)	0.001 (0.001)
Per-pupil expenditure (in thousands)	-0.004 (0.006)	0.003 (0.008)	0.002 (0.004)	-0.000 (0.003)	0.002 (0.004)	0.006 (0.005)	-0.020** (0.008)	0.008 (0.006)	-0.001 (0.006)	-0.014** (0.006)
Per-pupil ESSER (in thousands)	0.007** (0.003)	0.010 (0.009)	0.003 (0.002)	-0.001 (0.003)	-0.004 (0.003)	-0.002 (0.003)	0.004 (0.009)	-0.003 (0.005)	0.003 (0.004)	0.007 (0.008)
Rural	0.186 (0.163)	-0.241** (0.119)	-0.069** (0.031)	0.008 (0.031)	-0.024 (0.036)	0.020 (0.072)	0.170 (0.207)	-0.021 (0.161)	0.056 (0.082)	0.352* (0.195)
Suburb	-0.063 (0.047)	-0.012 (0.065)	-0.028 (0.019)	-0.008 (0.015)	0.033 (0.028)	0.016 (0.049)	0.076 (0.070)	-0.061 (0.055)	0.046 (0.053)	0.103* (0.058)
Town	0.186** (0.093)	-0.124 (0.098)	-0.021 (0.019)	0.036 (0.046)	-0.049** (0.024)	0.109 (0.098)	0.064 (0.117)	0.151 (0.111)	0.274** (0.109)	-0.037 (0.063)
<i>Student achievement</i>										
Average math	0.049 (0.064)	-0.021 (0.097)	-0.061 (0.039)	0.016 (0.032)	0.058 (0.036)	0.066 (0.071)	-0.066 (0.110)	0.114 (0.090)	0.010 (0.065)	-0.056 (0.085)
Math learning rate	0.269 (0.390)	0.682 (0.500)	0.121 (0.229)	0.039 (0.134)	-0.375* (0.201)	0.279 (0.393)	0.206 (0.567)	-0.062 (0.477)	0.554* (0.326)	0.225 (0.448)
Math trend	0.268	0.547	-0.050	-0.241	0.112	-0.331	-0.729	0.524	-0.922	-0.661

	(0.771)	(1.025)	(0.475)	(0.417)	(0.416)	(0.703)	(1.125)	(0.836)	(0.684)	(0.854)
Average reading	-0.064	-0.045	0.039	-0.005	-0.001	-0.078	-0.025	-0.086	-0.147***	0.063
	(0.072)	(0.093)	(0.034)	(0.040)	(0.036)	(0.058)	(0.104)	(0.081)	(0.054)	(0.083)
Reading learning	-0.429	-1.230**	-0.185	-0.070	0.417	-0.343	-0.530	0.168	-0.729*	-0.230
rate	(0.425)	(0.545)	(0.294)	(0.091)	(0.263)	(0.497)	(0.640)	(0.526)	(0.387)	(0.494)
Reading trend	0.016	0.922	0.594	0.263	-0.377	0.484	0.512	-0.469	1.682**	0.492
	(0.870)	(1.070)	(0.699)	(0.394)	(0.534)	(0.984)	(1.171)	(0.911)	(0.828)	(0.773)
<i>Community characteristics</i>										
School segregation	0.506**	-0.065	-0.106	0.022	0.067	-0.230	0.181	0.067	0.150	0.112
(white-black)	(0.240)	(0.285)	(0.106)	(0.124)	(0.173)	(0.213)	(0.377)	(0.277)	(0.229)	(0.222)
School segregation	-0.630**	0.919**	0.045	0.059	-0.035	0.128	-0.116	0.133	-0.560**	-0.159
(white-Hispanic)	(0.305)	(0.388)	(0.166)	(0.153)	(0.186)	(0.326)	(0.442)	(0.348)	(0.284)	(0.251)
Log of median	0.049	-0.180	0.004	-0.062	0.080	0.306*	0.052	-0.560**	0.223	0.010
income	(0.157)	(0.216)	(0.088)	(0.090)	(0.113)	(0.183)	(0.254)	(0.224)	(0.218)	(0.165)
Bachelors +	0.172	-0.160	0.093	0.124	-0.088	0.099	0.787*	0.159	0.350	0.199
degree rate	(0.334)	(0.348)	(0.143)	(0.111)	(0.124)	(0.305)	(0.401)	(0.360)	(0.300)	(0.268)
Poverty rate	1.144	-0.101	0.190	-0.003	0.512	1.285	0.570	-0.907	1.291	0.200
	(0.777)	(1.064)	(0.527)	(0.526)	(0.594)	(0.978)	(1.248)	(1.112)	(1.018)	(0.810)
Unemployment	-3.088**	-1.548	-2.093***	0.970	2.048*	-2.070	1.169	1.639	-3.788**	1.428
rate	(1.538)	(2.138)	(0.799)	(0.879)	(1.117)	(1.552)	(2.348)	(1.844)	(1.838)	(1.805)
SNAP receipt rate	-1.601**	0.362	-0.174	0.020	-0.195	0.711	-1.208	-0.550	0.785	-0.049
	(0.749)	(0.887)	(0.414)	(0.250)	(0.286)	(0.814)	(0.900)	(0.868)	(0.799)	(0.590)
Single mother	0.920*	-1.495**	0.032	-0.128	-0.363	0.126	-0.126	-0.702	-0.313	-0.367
household rate	(0.528)	(0.709)	(0.282)	(0.195)	(0.286)	(0.611)	(0.895)	(0.715)	(0.487)	(0.606)
N	311	312	312	312	312	312	312	311	312	312
R-squared	0.16	0.13	0.11	0.05	0.09	0.14	0.14	0.13	0.14	0.09

Note: All models include treatment status and post-treatment indicator variables. * p<0.10, ** p<0.05, *** p<0.01.

Table 5. OLS estimates of the relationship between receiving training and principal components of school board deliberations

	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7
Variable	Engagement	Alternatives, data, process	Equity	ROI	Per-unit cost, structure	External inputs and barriers	Budget and outcomes, internal barriers
Treated X Post	0.350* (0.211)	0.060 (0.228)	-0.062 (0.222)	-0.136 (0.232)	0.553** (0.217)	-0.321 (0.222)	0.533** (0.221)
Enrollment (in thousands)	0.007 (0.004)	0.001 (0.005)	-0.009* (0.005)	-0.003 (0.005)	0.005 (0.006)	-0.002 (0.005)	0.003 (0.006)
Poverty rate	1.168*** (0.302)	0.404 (0.309)	0.575* (0.347)	-0.041 (0.330)	0.002 (0.319)	0.393 (0.272)	-0.152 (0.270)
Student-teacher ratio	-0.002 (0.020)	-0.030 (0.020)	0.020 (0.022)	0.034 (0.023)	0.004 (0.020)	0.025 (0.021)	0.003 (0.024)
Number of schools	-0.003 (0.003)	-0.001 (0.003)	0.005** (0.003)	0.001 (0.003)	-0.003 (0.004)	-0.000 (0.003)	-0.003 (0.003)
Per-pupil expenditure (in thousands)	-0.024 (0.019)	-0.037* (0.020)	-0.019 (0.019)	0.001 (0.020)	-0.016 (0.019)	-0.025 (0.018)	0.025 (0.020)
Per-pupil ESSER (in thousands)	0.002 (0.012)	0.024 (0.021)	-0.029 (0.021)	0.001 (0.016)	-0.010 (0.016)	0.032** (0.013)	-0.003 (0.013)
Rural	0.380 (0.418)	0.742* (0.412)	0.502 (0.383)	-0.270 (0.430)	0.190 (0.330)	-0.388 (0.459)	-0.355 (0.379)
Suburb	-0.055 (0.171)	0.242 (0.176)	0.277* (0.166)	-0.246 (0.171)	0.119 (0.170)	-0.345** (0.165)	-0.034 (0.158)
Town	0.421 (0.305)	0.439 (0.317)	-0.469* (0.263)	-0.178 (0.323)	-0.141 (0.245)	-0.835*** (0.293)	-0.076 (0.243)
<i>Student achievement</i>							
Average math	0.050 (0.257)	0.031 (0.247)	0.119 (0.246)	0.059 (0.287)	0.217 (0.251)	-0.523** (0.253)	-0.359 (0.262)
Math learning rate	0.543 (1.304)	1.598 (1.256)	-1.614 (1.186)	-1.417 (1.463)	-2.039* (1.175)	0.481 (1.238)	-0.023 (1.316)

Math trend	-0.363 (2.468)	-4.067 (2.768)	-0.741 (2.439)	-0.471 (2.557)	-0.050 (2.502)	1.671 (2.712)	3.871 (2.697)
Average reading	-0.060 (0.225)	-0.296 (0.233)	0.298 (0.239)	0.151 (0.243)	0.116 (0.255)	0.332 (0.235)	0.291 (0.249)
Reading learning rate	-1.373 (1.431)	-2.927** (1.378)	2.442* (1.434)	1.138 (1.676)	1.482 (1.288)	-0.675 (1.505)	1.296 (1.418)
Reading trend	0.185 (2.912)	5.870* (3.092)	-2.534 (3.001)	-0.954 (3.393)	-2.405 (3.130)	-0.722 (3.195)	-4.332 (3.038)
<i>Community Characteristics</i>							
School segregation (white-black)	1.051 (0.694)	1.091 (0.941)	-0.260 (0.830)	1.179 (0.899)	0.014 (0.817)	2.394*** (0.780)	-0.597 (0.798)
School segregation (white-Hispanic)	0.347 (1.069)	-2.882*** (1.045)	1.052 (1.062)	-1.757 (1.121)	0.629 (0.957)	-1.900** (0.946)	2.014* (1.151)
Log of median income	0.658 (0.626)	-0.090 (0.633)	0.610 (0.600)	1.468** (0.633)	-1.128* (0.620)	0.846 (0.632)	-0.433 (0.701)
Bachelors + degree rate	1.280 (0.902)	1.678 (1.079)	-0.673 (0.825)	-0.402 (1.041)	0.225 (0.918)	-0.524 (0.872)	0.424 (0.955)
Poverty rate	4.293 (3.182)	3.433 (3.453)	2.713 (2.941)	2.607 (2.882)	-2.192 (3.234)	1.487 (3.377)	-3.167 (3.525)
Unemployment rate	-9.209* (5.019)	-0.679 (6.430)	19.171*** (5.826)	-7.891 (5.553)	5.233 (5.254)	0.866 (5.167)	6.283 (5.407)
SNAP receipt rate	-1.225 (2.445)	-0.164 (2.252)	-2.052 (2.136)	0.986 (2.295)	-0.727 (2.256)	-3.202 (2.319)	3.340 (2.331)
Single mother household rate	0.922 (2.185)	-2.253 (2.224)	-0.214 (2.027)	3.211 (2.381)	-2.013 (2.059)	-0.553 (1.882)	-5.103** (2.007)
N	306	306	306	306	306	306	306
R-squared	0.24	0.10	0.14	0.07	0.12	0.18	0.12

Note: PC1–PC7 are principal components that have eigenvalues of at least 1. They are all standardized to have a mean of 0 and standard deviation of 1. All models include treatment status and post-treatment indicator variables. * p<0.10, ** p<0.05, *** p<0.01.

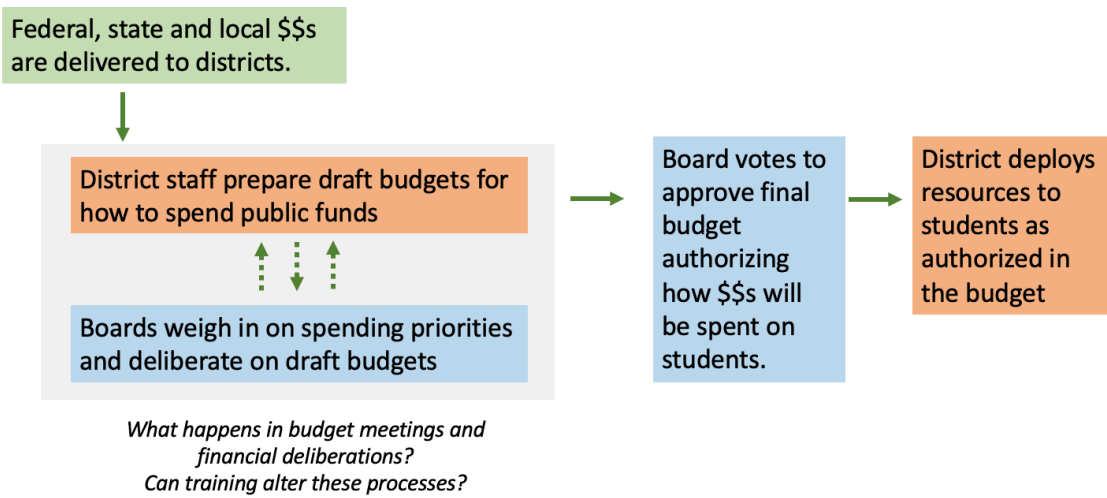
Table 6. OLS estimates of the relationship between receiving training and aggregated measures of school board deliberations

Variable	(1) Equity of allocations	(2) Investing toward an outcome	(3) Deference to external constraints	(4) Insisting on better information	(5) Navigate budgeting process
Treated X Post	0.076 (0.100)	0.154 (0.106)	-0.012 (0.090)	0.166* (0.100)	0.141 (0.090)
Enrollment (in thousands)	0.000 (0.002)	0.003 (0.002)	0.002 (0.002)	-0.002 (0.002)	0.006*** (0.002)
Poverty rate	0.495*** (0.136)	0.083 (0.150)	0.213 (0.134)	0.519*** (0.147)	-0.004 (0.140)
Student-teacher ratio	0.002 (0.010)	0.015 (0.011)	-0.009 (0.009)	-0.020** (0.009)	-0.006 (0.010)
Number of schools	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.003** (0.001)
Per-pupil expenditure (in thousands)	-0.015* (0.009)	0.000 (0.010)	0.003 (0.008)	-0.019** (0.009)	0.007 (0.008)
Per-pupil ESSER (in thousands)	-0.017** (0.007)	0.001 (0.007)	0.010 (0.009)	0.001 (0.009)	0.001 (0.006)
Rural	0.188 (0.209)	-0.037 (0.195)	-0.264** (0.120)	0.144 (0.216)	0.002 (0.172)
Suburb	0.008 (0.082)	-0.045 (0.087)	-0.022 (0.066)	0.087 (0.078)	-0.042 (0.072)
Town	0.125 (0.120)	-0.122 (0.115)	-0.091 (0.104)	0.095 (0.139)	0.255** (0.121)
<i>Student achievement</i>					
Average math	-0.043 (0.113)	0.008 (0.123)	-0.003 (0.101)	-0.035 (0.116)	0.113 (0.099)
Math learning rate	-0.338 (0.557)	-0.247 (0.608)	0.675 (0.513)	0.389 (0.604)	0.235 (0.510)
Math trend	0.671 (1.167)	1.333 (1.257)	0.441 (1.054)	-0.786 (1.186)	-0.392 (0.993)

Average reading	0.073 (0.107)	0.042 (0.115)	-0.059 (0.098)	-0.066 (0.111)	-0.186** (0.092)
Reading learning rate	0.851 (0.613)	0.006 (0.680)	-1.273** (0.573)	-0.716 (0.697)	-0.254 (0.588)
Reading trend	-1.796 (1.299)	-1.254 (1.396)	1.293 (1.102)	0.837 (1.238)	1.196 (1.098)
<i>Community Characteristics</i>					
School segregation (white-black)	0.008 (0.355)	0.655* (0.378)	-0.062 (0.299)	0.172 (0.387)	0.135 (0.306)
School segregation (white-Hispanic)	1.108** (0.482)	-0.196 (0.512)	0.918** (0.404)	-0.184 (0.466)	-0.156 (0.395)
Log of median income	0.341 (0.286)	0.107 (0.304)	-0.242 (0.227)	0.339 (0.271)	-0.315 (0.270)
Bachelors + degree rate	0.399 (0.449)	0.157 (0.485)	0.008 (0.365)	0.861* (0.446)	0.473 (0.416)
Poverty rate	-0.149 (1.374)	1.413 (1.457)	-0.268 (1.147)	1.195 (1.395)	-0.585 (1.250)
Unemployment rate	3.868 (2.392)	-5.796** (2.583)	-1.446 (2.265)	-0.074 (2.674)	-2.762 (2.348)
SNAP receipt rate	-0.133 (0.986)	-0.581 (1.049)	0.305 (0.934)	0.147 (1.037)	1.005 (0.992)
Single mother household rate	0.840 (1.005)	0.423 (1.028)	-1.415* (0.748)	-0.391 (0.958)	-0.976 (0.828)
N	312	312	312	312	312
R-squared	0.17	0.13	0.14	0.16	0.15

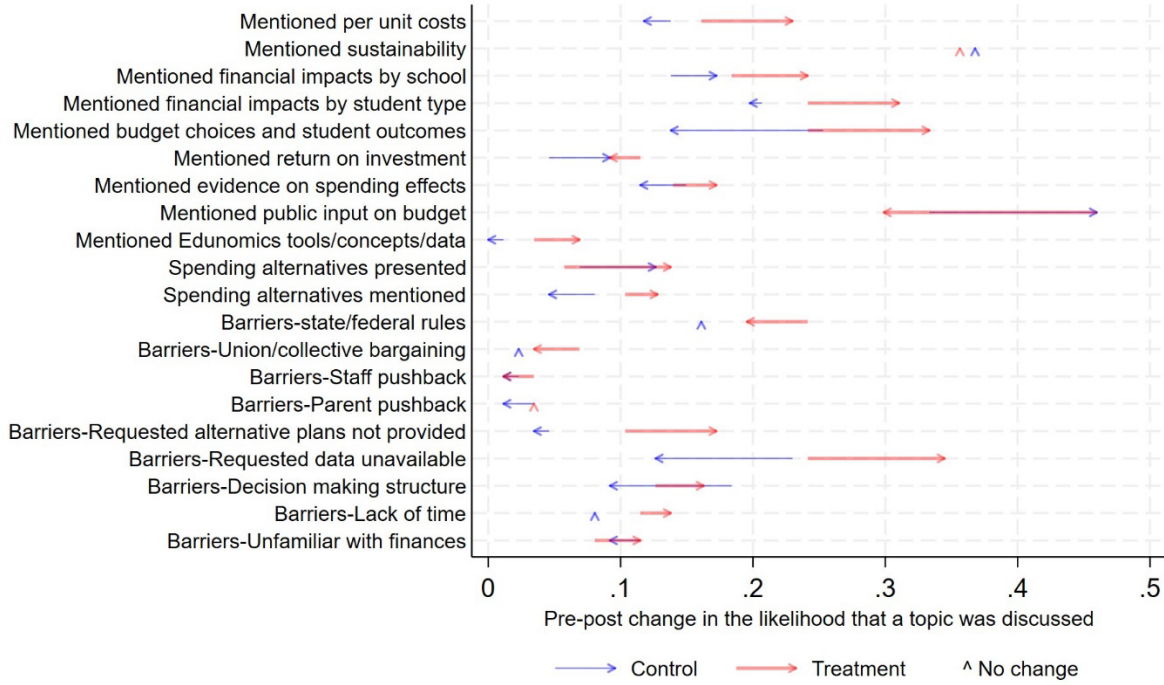
All models include treatment status and post-treatment indicator variables. * p<0.10, ** p<0.05, *** p<0.01.

Figure 1. District budget development involves school board deliberation and approval



Sources: Roza, M. (2022, November). Time to change the district budget dance. *School Business Affairs*, 8-10. The Association of School Business Officials International. <https://edunomicslab.org/wp-content/uploads/2022/11/Time-to-Change-the-District-Budget-Dance.pdf>.

Figure 2. Prepost change in the likelihood that a topic was discussed in school board deliberations, by treatment status.



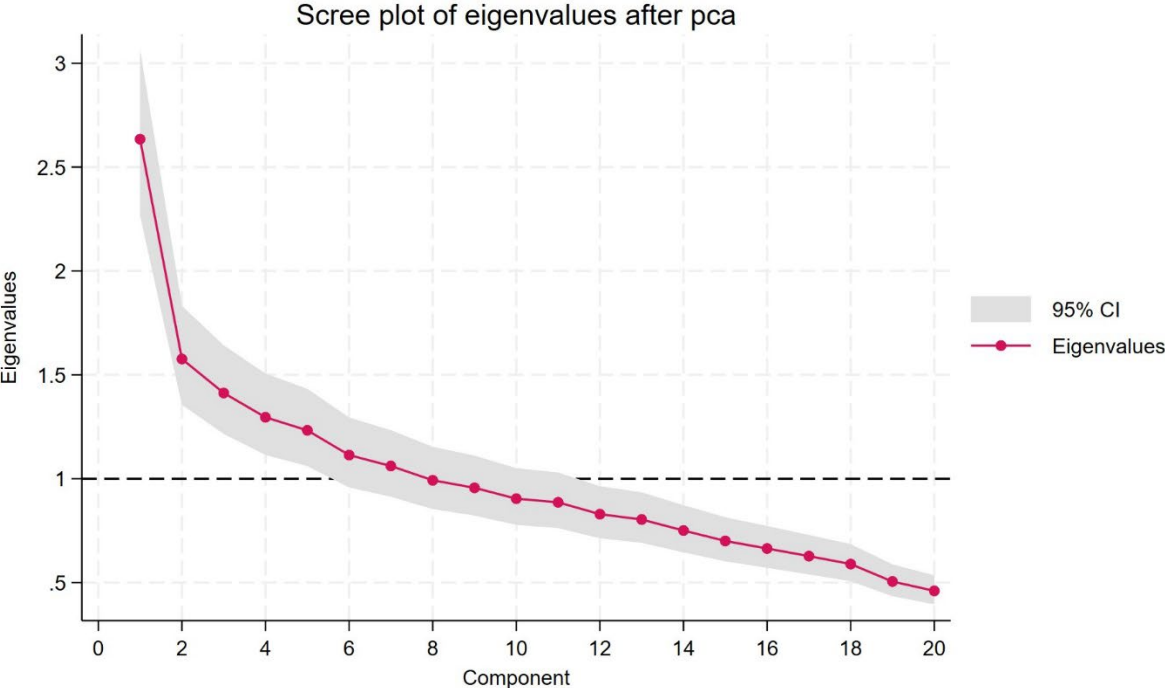
Note: The direction of the arrows represents the change from the pretreatment period to the posttreatment period for the corresponding topics listed on the y-axis. Blue arrows represent the comparison group, and red arrows represent the treatment group.

Figure 3. Correlations of the likelihood that a topic was mentioned during school board deliberations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1) per-unit cost	1.00																			
(2) sustainability	0.13	1.00																		
(3) financial impacts by school	0.16	0.10	1.00																	
(4) financial impacts by student type	0.13	0.05	0.44	1.00																
(5) budget choices and student outcomes	0.18	0.10	0.23	0.15	1.00															
(6) return on investment	0.18	0.05	0.15	0.13	0.12	1.00														
(7) evidence on spending effects	0.13	0.11	0.28	0.20	0.24	0.09	1.00													
(8) public input on budget	0.00	0.04	0.03	0.08	0.03	0.02	0.03	1.00												
(9) Edunomics tools/concepts/data	0.06	-0.02	-0.04	0.03	0.23	0.20	0.13	0.04	1.00											
(10) spending alternatives presented	0.16	0.07	0.05	0.06	0.05	0.12	0.04	0.04	-0.06	1.00										
(11) spending alternatives mentioned	0.03	0.15	-0.01	0.07	0.14	0.17	0.14	0.14	0.19	0.18	1.00									
(12) state/federal rules	0.05	0.01	0.08	0.10	0.10	0.04	0.15	0.01	0.09	0.08	0.12	1.00								
(13) union/collective bargaining	-0.01	0.10	0.18	0.14	0.14	0.05	0.09	0.07	-0.03	0.04	0.05	0.14	1.00							
(14) staff pushback	-0.01	0.02	0.04	-0.08	0.06	-0.04	-0.06	0.06	-0.03	0.10	0.10	-0.02	-0.03	1.00						
(15) parent pushback	0.11	0.05	0.01	-0.02	0.07	0.01	0.08	0.04	-0.03	0.00	-0.05	-0.08	-0.03	0.10	1.00					
(16) requested alternative plans not provided	0.03	0.11	0.17	0.12	0.14	0.05	0.05	-0.01	0.13	0.15	0.12	0.01	0.10	0.10	0.01	1.00				
(17) requested data unavailable	0.20	0.16	0.13	0.11	0.24	0.03	0.11	0.11	-0.01	0.15	0.17	0.11	0.11	0.02	-0.01	0.02	1.00			
(18) decision making structure	0.09	-0.03	0.04	0.01	0.06	0.03	0.09	-0.11	-0.02	0.04	0.08	0.10	0.01	-0.06	-0.07	-0.01	0.17	1.00		
(19) lack of time	-0.04	0.03	0.07	-0.02	0.09	0.14	0.00	0.02	0.12	0.20	0.21	0.14	0.14	0.09	-0.06	0.14	0.19	0.14	1.00	
(20) unfamiliar with finances	0.04	0.10	-0.01	-0.05	0.02	-0.07	0.00	0.08	0.00	0.13	0.00	0.02	-0.07	0.16	0.06	0.07	0.26	0.00	0.05	1.00

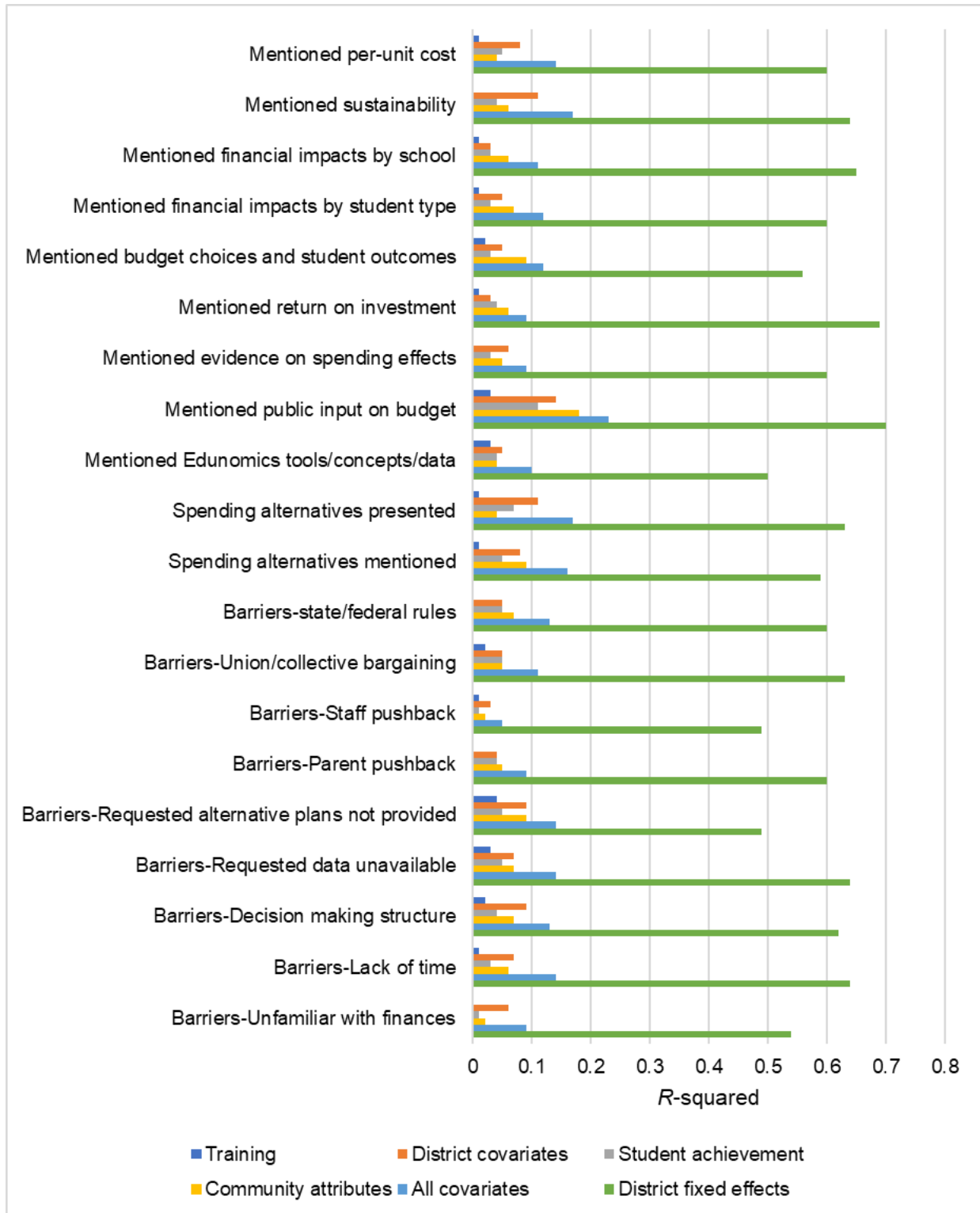
Note: Red indicates a positive correlation, and blue indicates a negative correlation. Darker shades suggest stronger correlations in either direction.

Figure 4. Eigenvalues of principal components estimated using the correlations of the likelihood that a topic was mentioned during school board deliberations



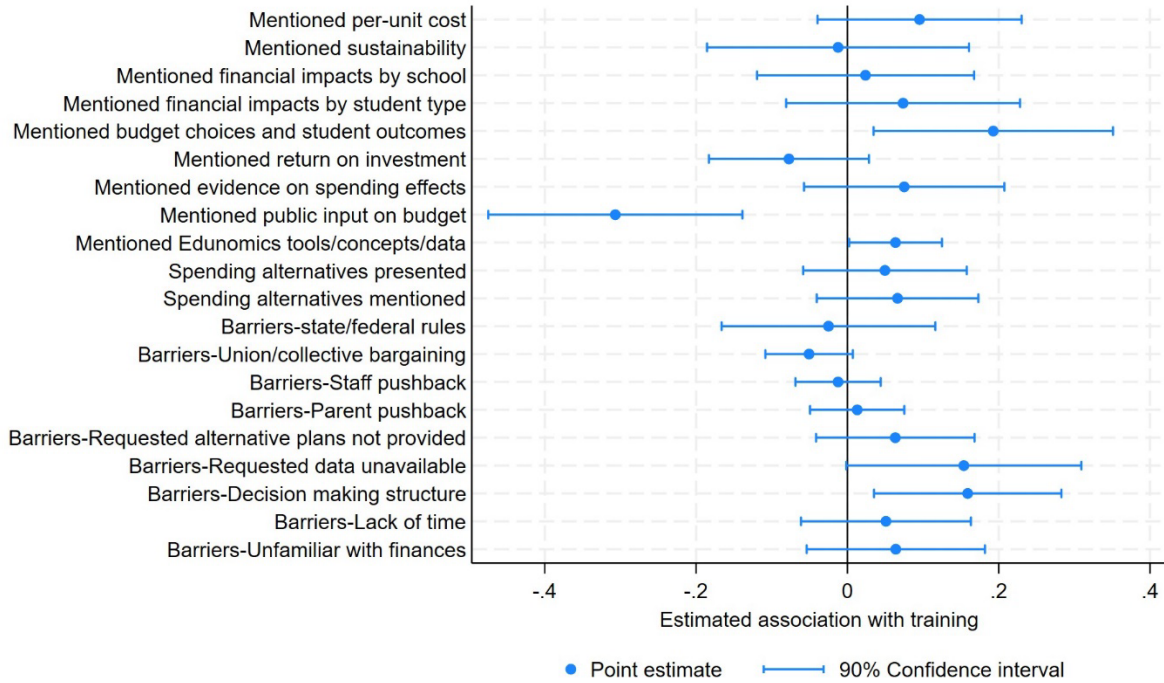
Note: CI = confidence interval.

Figure 5. Proportion of variance (R-squared) explained by covariates



Note: All models include the treatment indicator, the posttreatment indicator, and their interaction.

Figure 6. Difference-in-differences estimates of the association between receiving finance training and measures of school board deliberations



Note: All coefficients are estimated using OLS regression that include the treatment indicator, the posttreatment indicator, and their interaction as well as district covariates (enrollment, student poverty rate, student-teacher ratio, number of schools, per-pupil expenditure, per-pupil ESSER fund, and locality indicators), student achievement (the average achievement, learning rate, and achievement trend in Grade 3–8 math and reading), and community characteristics (school white-black segregation, school white-Hispanic segregation, logarithm of median income, percentage of residents with a bachelor’s degree or higher, poverty rate, unemployment rate, SNAP receipt rate, and single mother household rate).

Appendix A. Video Coding

The Edunomics Lab created an indicator variable for each of the following 20 topics that may have been discussed (1 if mentioned, 0 if not) during school board financial deliberations:

Rationales considered

1. Per unit costs
2. Multi-year impacts (sustainability)
3. Financial/spending impacts by school
4. Financial/spending impacts by student type
5. Relevance of budget choices to student outcomes
6. ROI (cost vs. value)
7. Evidence of spending effects
8. Public input on the budget
9. Edunomics tools/concepts

Alternatives

10. Spending alternatives presented
11. Spending alternatives mentioned

Barriers

12. State/federal rules restrict options
13. Union contract/collective bargaining agreement as a limiter
14. Staff pushback
15. Parent pushback
16. Request for alternative (e.g., cuts and investments) but none provided
17. Requests for data that are not available at meeting
18. Hindrances related to structure of decision making
19. Lack of time
20. Trustee lack of familiarity with finances

The Advisory Board members who provided input and feedback on the coding tool include **Ethan Charles Ashley**, Co-founder and Partner at School Board Partners; **AJ Crabill**, Director of Governance at the Council of the Great City Schools; **Jonathan Collins**, the Brown University Mary Tefft and John Hazen White Sr. Assistant Professor of Political Science, Education and International and Public Affairs; and **Rosita Ramirez**, the National Director of Constituency Services Director for the National Association of Latino Elected & Appointed Officials (NALEO) Educational Fund.

Appendix B. Tables

Table 1. Baseline characteristics of districts excluding Los Angeles Unified School District and its comparison district, by treatment status.

Variable	(1) Treatment	(2) Comparison
<i>A. Matching variables</i>		
Enrollment (in thousands)	38.49 (64.75)	29.25 (39.54)
Student poverty rate	0.49 (0.24)	0.46 (0.22)
Student-teacher ratio	15.99 (3.28)	16.09 (3.33)
Number of schools	63.23 (101.15)	46.44 (55.21)
Per-pupil expenditure (in thousands)	16.24 (5.78)	14.97 (6.05)
Per-pupil ESSER (in thousands)	4.62 (5.64)	3.46* (3.00)
Rural	0.03 (0.18)	0.03 (0.18)
Suburb	0.37 (0.49)	0.45 (0.50)
Town	0.12 (0.32)	0.10 (0.31)
<i>B. Student achievement</i>		
Average math achievement	5.13 (1.17)	5.27 (1.24)
Math learning rate/grade	0.95 (0.17)	0.97 (0.18)
Math achievement trend	-0.01 (0.06)	-0.02 (0.06)
Average reading achievement	5.13 (1.16)	5.26 (1.21)
Reading learning rate/grade	0.99 (0.11)	0.98 (0.16)
Reading achievement trend	0.01 (0.06)	0.01 (0.06)
<i>C. Community characteristics</i>		
School white-black segregation	0.21 (0.15)	0.17* (0.13)
School white-Hispanic segregation	0.16 (0.13)	0.12** (0.11)
Log of median income	10.94	10.85

	(0.32)	(1.22)
Bachelors + degree rate	0.34	0.31
	(0.15)	(0.13)
Poverty rate	0.15	0.13*
	(0.07)	(0.07)
Unemployment rate	0.06	0.06
	(0.02)	(0.02)
SNAP receipt rate	0.13	0.11
	(0.08)	(0.07)
Single mother household rate	0.22	0.20
	(0.09)	(0.08)
N	86	86

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Stars denote statistically significant difference from the treatment group.

Note: All matching variables are from the 2021–22 NCES Common Core of Data except for per-pupil ESSER, which is from Edunomics Lab’s National Education Resource Database on Schools. Student poverty rate is the free/reduced price lunch rate where it is available; when it is unavailable, direct certification rate is used.

Student achievement and community characteristics are from spring 2019 using data compiled by the Stanford Education Data Archive (SEDA). More details about the construction of these variables can be found at https://stacks.stanford.edu/file/druid:cs829jn7849/SEDA_documentation_v5.0.pdf. Briefly, Grades 3–8 student test scores from spring 2019 were standardized at the grade cohort level. For each subject, scores were pooled to the geographical school district level using a hierarchical linear model (HLM) with empirical Bayes adjustment. The learning rate is the estimated grade slope, and the achievement trend is the estimated cohort slope in the HLM model. Between-school segregation is measured by the information theory index that equals 0 when there is no segregation and 1 when this is complete segregation (Reardon & Firebaugh, 2002).

Table 2. Comparison of the likelihood that a topic was mentioned during school board financial deliberations between treatment and comparison school boards, by year: 2021–22 and 2022–23

Topic	Pre (2021-22)		Post (2022-23)	
	Treatment	Comparison	Treatment	Comparison
Mentioned per-unit cost	0.16	0.14	0.23	0.12 *
Mentioned sustainability	0.36	0.37	0.36	0.37
Mentioned financial impacts by school	0.18	0.14	0.24	0.17
Mentioned financial impacts by student type	0.24	0.21	0.31	0.20 *
Mentioned budget choices and student outcomes	0.24	0.25	0.33	0.14 ***
Mentioned return on investment	0.11	0.05*	0.09	0.09
Mentioned evidence on spending effects	0.14	0.15	0.17	0.11
Mentioned public input on budget	0.46	0.33*	0.30	0.46 **
Mentioned Edunomics tools/concepts/data	0.03	0.01	0.07	0.00 **
Spending alternatives presented	0.06	0.07	0.14	0.13
Spending alternatives mentioned	0.10	0.08	0.13	0.05 *
Barriers-state/federal rules	0.24	0.16	0.20	0.16
Barriers-Union/collective bargaining	0.07	0.02	0.03	0.02
Barriers-Staff pushback	0.03	0.02	0.01	0.01
Barriers-Parent pushback	0.03	0.03	0.03	0.01
Barriers-Requested alternative plans not provided	0.10	0.05	0.17	0.03 ***
Barriers-Requested data unavailable	0.24	0.23	0.34	0.13 ***
Barriers-Decision making structure	0.13	0.18	0.16	0.09
Barriers-Lack of time	0.11	0.08	0.14	0.08
Barriers-Unfamiliar with finances	0.08	0.11	0.11	0.09
N	87	87	87	87

Note: Statistically significant difference between the treatment and comparison group, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3. The estimated relationship between training and outcomes, by model specification and topics mentioned during school board financial deliberations

Dependent variable	(1) OLS no covariates	(2) OLS district covariates	(3) OLS student scores	(4) OLS commu- nity cov.	(5) OLS all covariates	(6) District FE	(7) Logit w/o covariates	(8) Logit all covariates
Per-unit cost	0.099 (0.085)	0.097 (0.083)	0.099 (0.084)	0.101 (0.084)	0.095 (0.082)	0.090 (0.077)	0.099 (0.084)	0.092 (0.078)
N	310	310	310	310	310	310	310	308
R-squared	0.01	0.08	0.05	0.04	0.14	0.60		
Sustainability	-0.012 (0.111)	-0.012 (0.106)	-0.012 (0.110)	-0.012 (0.109)	-0.012 (0.105)	-0.012 (0.094)	-0.012 (0.110)	-0.013 (0.101)
N	312	312	312	312	312	312	312	310
R-squared	0.00	0.11	0.04	0.06	0.17	0.64		
Financial impact by schools	0.024 (0.088)	0.024 (0.088)	0.024 (0.088)	0.024 (0.087)	0.024 (0.087)	0.024 (0.074)	0.024 (0.088)	0.024 (0.083)
N	312	312	312	312	312	312	312	310
R-squared	0.01	0.03	0.03	0.06	0.11	0.65		
Financial impact by students	0.073 (0.096)	0.073 (0.095)	0.072 (0.096)	0.074 (0.094)	0.074 (0.094)	0.063 (0.087)	0.073 (0.095)	0.071 (0.090)
N	311	311	311	311	311	311	311	311
R-squared	0.01	0.05	0.03	0.07	0.12	0.60		
Budget and outcome	0.193** (0.097)	0.193** (0.097)	0.193** (0.098)	0.193** (0.095)	0.193** (0.096)	0.193** (0.093)	0.193** (0.097)	0.197** (0.092)
N	312	312	312	312	312	312	312	310
R-squared	0.02	0.05	0.03	0.09	0.12	0.56		
ROI	-0.077 (0.065)	-0.077 (0.065)	-0.077 (0.064)	-0.077 (0.064)	-0.077 (0.064)	-0.077 (0.051)	-0.077 (0.064)	-0.077 (0.061)
N	312	312	312	312	312	312	312	302
R-squared	0.01	0.03	0.04	0.06	0.09	0.69		
Spending effect	0.075 (0.081)	0.075 (0.080)	0.075 (0.081)	0.074 (0.080)	0.075 (0.081)	0.077 (0.073)	0.075 (0.080)	0.075 (0.077)
N	311	311	311	311	311	311	311	309
R-squared	0.00	0.06	0.03	0.05	0.09	0.60		
Public input	-0.307*** (0.110)	-0.307*** (0.105)	-0.307*** (0.107)	-0.307*** (0.102)	-0.307*** (0.102)	-0.307*** (0.086)	-0.307*** (0.110)	-0.309*** (0.098)
N	312	312	312	312	312	312	312	310
R-squared	0.03	0.14	0.11	0.18	0.23	0.70		
Edunomics	0.064* (0.037)	0.064* (0.037)	0.064* (0.037)	0.064* (0.037)	0.064* (0.037)	0.064* (0.038)	†	†
N	312	312	312	312	312	312		
R-squared	0.03	0.05	0.04	0.04	0.10	0.50		
Spending alternative presented	0.050 (0.069)	0.050 (0.066)	0.050 (0.067)	0.050 (0.069)	0.050 (0.066)	0.050 (0.060)	0.050 (0.068)	0.046 (0.059)
N	312	312	312	312	312	312	312	310
R-squared	0.01	0.11	0.07	0.04	0.17	0.63		
Spending alternative mentioned	0.066 (0.068)	0.065 (0.066)	0.066 (0.067)	0.066 (0.066)	0.066 (0.065)	0.065 (0.062)	0.066 (0.068)	0.070 (0.060)
N	311	311	311	311	311	311	311	309
R-squared	0.01	0.08	0.05	0.09	0.16	0.59		

State/ federal rules	-0.025 (0.088)	-0.025 (0.088)	-0.025 (0.087)	-0.025 (0.087)	-0.025 (0.086)	-0.025 (0.079)	-0.025 (0.088)	-0.022 (0.084)
N	312	312	312	312	312	312	312	302
R-squared	0.00	0.05	0.05	0.07	0.13	0.60		
Union/ collective bargaining	-0.051 (0.035)	-0.051 (0.035)	-0.051 (0.035)	-0.051 (0.035)	-0.051 (0.035)	-0.051 (0.031)	-0.051 (0.035)	-0.029 (0.036)
N	312	312	312	312	312	312	312	280
R-squared	0.02	0.05	0.05	0.05	0.11	0.63		
Staff push back	-0.012 (0.034)	-0.012 (0.034)	-0.012 (0.034)	-0.012 (0.034)	-0.012 (0.034)	-0.012 (0.034)	-0.012 (0.033)	-0.006 (0.035)
N	312	312	312	312	312	312	312	302
R-squared	0.01	0.03	0.01	0.02	0.05	0.49		
Parent push back	0.013 (0.038)	0.013 (0.038)	0.013 (0.038)	0.013 (0.038)	0.013 (0.038)	0.013 (0.034)	0.013 (0.038)	0.016 (0.037)
N	312	312	312	312	312	312	312	280
R-squared	0.00	0.04	0.04	0.05	0.09	0.60		
Alt plan not provided	0.063 (0.064)	0.063 (0.064)	0.063 (0.065)	0.063 (0.064)	0.063 (0.064)	0.063 (0.066)	0.063 (0.064)	0.056 (0.061)
N	312	312	312	312	312	312	312	302
R-squared	0.04	0.09	0.05	0.09	0.14	0.49		
Data not available	0.154 (0.096)	0.154 (0.096)	0.154 (0.096)	0.154 (0.096)	0.154 (0.094)	0.154* (0.082)	0.154 (0.096)	0.155* (0.090)
N	312	312	312	312	312	312	312	312
R-squared	0.03	0.07	0.05	0.07	0.14	0.64		
Decision making structure	0.157** (0.077)	0.159** (0.075)	0.156** (0.077)	0.158** (0.076)	0.159** (0.075)	0.168** (0.069)	0.157** (0.077)	0.163** (0.071)
N	311	311	311	311	311	311	311	309
R-squared	0.02	0.09	0.04	0.07	0.13	0.62		
Lack of time	0.051 (0.071)	0.051 (0.069)	0.051 (0.070)	0.051 (0.070)	0.051 (0.068)	0.051 (0.060)	0.051 (0.070)	0.050 (0.066)
N	312	312	312	312	312	312	312	302
R-squared	0.01	0.07	0.03	0.06	0.14	0.64		
Unfamiliar with finance	0.064 (0.072)	0.064 (0.071)	0.064 (0.073)	0.064 (0.072)	0.064 (0.072)	0.064 (0.069)	0.064 (0.072)	0.066 (0.069)
N	312	312	312	312	312	312	312	310
R-squared	0.00	0.06	0.01	0.02	0.09	0.54		

† Omitted because comparison group in the post period predicts failure perfectly.

* p<0.10, ** p<0.05, *** p<0.01.

Note: All models include the treatment indicator, the post-treatment indicator, and their interaction. The coefficient for the interaction term is presented with its standard error in parentheses. Marginal effects are presented for logistic models.

Table 4. Multiple comparison adjustments for the estimated relationship between receiving training and principal components (PC)

Principal components	<i>p</i> -value	Bonferroni adjustment	Adjusted <i>q</i> -values
PC 1	0.098	0.687	0.196
PC 2	0.793	5.548	0.515
PC 3	0.780	5.461	0.515
PC 4	0.560	3.917	0.506
PC 5	0.012	0.081	0.062
PC 6	0.148	1.037	0.228
PC 7	0.017	0.116	0.062

Note: Multiple comparisons adjustment using sharpened two-stage *q*-values follows Benjamini et al. (2006).