The Real Effects of Debt Relief: Evidence from Independent School Districts in Texas*

Thomas S. Lee†

April, 2025

Click here for the latest version

U.S. school districts face pressing needs for facility improvements, yet limited debt capacity hampers their ability to raise sufficient funding for these projects. I study how capital spending affects educational outcomes in heavily indebted school districts. Using a novel quasi-natural experiment, I find that debt support helps school districts raise additional capital spending, leading to substantial long-term improvements in educational outcomes, including higher test scores and graduation rates. The findings suggest that state intervention in debt capacity can produce long-run positive effects by revitalizing previously forgone high-impact projects.

*I'm highly indebted to Clemens Sialm, Travis Johnson, and Aaron Pancost for their unconditional support and guidance. I also thank Jonathan Cohn, Sara Holland, Sam Kruger, Changyong Song, Eric Vance, and other participants at UT Austin and 2024 FMA Annual Meeting for their helpful comments. I'm grateful to the Texas Education Research Center for access to the data. The conclusions of this research do not necessarily reflect the opinion or official position of the Texas Education Research Center, the Texas Education Agency, the Texas Higher Education Coordinating Board, the Texas Workforce Commission, or the State of Texas. All errors are my own.

†McCombs School of Business, University of Texas at Austin. Email: thomas.lee@mccombs.utexas.edu

Deteriorating school facility conditions in the U.S. pose a major threat to the quality of public education. Poor infrastructure creates unsafe learning environments and limits students' access to technology essential for digital-age learning. In 2012, total deferred maintenance costs reached $200 billion (Alexander and Lewis (2014)), which has nearly tripled over the last decade (Filardo (2021)). School districts frequently issue debt for large-scale capital projects, repaying it through local property taxes. However, state-imposed caps on property tax revenues often restrict some districts' debt capacities for financing necessary facility improvements. Additionally, these districts face constraints in raising debt because potential educational gains from these infrastructure projects cannot be pledged. Consequently, such disparities in access to physical capital can significantly impact human capital development during the K-12 years, the most crucial period for human capital formation, further widening the education gap and income inequality (e.g., Card et al. (2022), Chetty et al. (2014), Huggett et al. (2011)).

This paper investigates whether increased capital spending on school facilities improves educational outcomes, using a quasi-natural experiment in which a state government subsidizes school district debt payments. The effect is ex-ante unclear, as districts sometimes allocate funds inefficiently toward non-instructional amenities.[1] I first show that heavily indebted school districts substantially increase capital spending shortly after receiving debt subsidies. Importantly, I find that state-sponsored infrastructure investment translates into significant improvements in educational outcomes in the long run, such as higher test scores and completion rates. The estimated effects on academic performance are comparable to those observed in the class size reduction experiment in Tennessee (e.g., Chetty et al. (2011)). The findings provide evidence that state-led debt assistance enables school districts to initiate value-adding projects, leading to an improved quality of public education.

Identifying the causal effect of capital spending on educational outcomes is challenging

[1] Examples include La Joya ISD, TX, which spent $20 million on a school-owned water park, and Mountain View Whisman School District, CA, which spent $315,000 on energy healing services.

due to unobservable factors influencing both. For example, wealthier districts with strong economies and established buildings can raise more funds but may allocate marginal spending to low-impact projects, biasing OLS estimates downward. To alleviate these endogeneity concerns, I include district and year fixed effects to account for time-invariant factors and aggregate shocks. Nonetheless, unobservable temporal variations in local economic conditions may still bias the estimates, and additional controls for district characteristics are unlikely to fully resolve this concern.

To strengthen the causal interpretation of the results, I exploit a novel quasi-natural experiment in Texas. In 1998, the state began subsidizing school district debt payments, later expanding the program with a second initiative in 2000. Since their inception, these efforts have resulted in state allocations totaling approximately $84 billion for debt assistance. The program appealed to heavily indebted districts, as their high debt burdens increased their need for funding and qualified them for greater state contributions by design. Heterogeneous responses to the program, driven by districts' pre-existing indebtedness, generate plausibly exogenous variations in capital expenditures by alleviating their debt burdens. This policy-driven debt assistance, strongly correlated with pre-existing debt levels, ensures that the resulting spending changes are unrelated to unobservable local economic trends.

Districts with high pre-existing debt burdens significantly increase their capital spending following the debt assistance program. These highly leveraged districts allocate roughly $570 more per student to capital projects, or 22% more cumulatively over three years, than their less-indebted counterparts. Over 85% of this incremental spending is directed toward major construction or renovation projects. This translates to an extra $2.3 million in capital expenditures for an average-sized district, covering roughly 70% of the funding required to bring school buildings up to good condition.[2]

[2] In 2013, the estimated average cost for necessary repairs, renovations, and modernizations to achieve good building condition was $4.5 million among survey respondents Alexander and Lewis (2014), equivalent to approximately $3.3 million in 2000 after adjusting for inflation.

Utilizing the natural experiment, I find significant long-term benefits of capital investment across various measures of student outcomes. For example, academic achievement, measured by standardized 8th-grade reading and math scores, increases by 0.06 and 0.12 standard deviations, respectively, five years after a $1,000 per pupil increase in capital spending. Incremental infrastructure investments also lead to lasting improvements in non-test outcomes, such as high school completion and attendance rates, with additional positive but statistically insignificant effects on college entrance exam participation and enrollment rates. Moreover, these projects yield modest yet positive benefits in early-career labor market outcomes.

A comparison between the short- and long-term results aligns with prior studies that highlight the delayed realization of benefits from educational infrastructure improvements (e.g., Cellini et al. (2010) and Jackson and Mackevicius (2021)). While the positive effects of capital spending are muted or negligible in the short term, they become pronounced in the long run. For example, short-term disruptions like loud noise or temporary portable classrooms during construction may hinder student learning. However, once projects are completed, improved school facilities yield significant educational gains, including higher test scores and completion rates.

The magnitude of the effect in this study is larger than in existing studies that rely on the discontinuity around the threshold in bond elections, which often find weak or no effects. This discrepancy arises because the districts on the margin differ in two settings; close elections capture school districts that hold elections, whereas state intervention in this paper supports heavily indebted districts that often face financial or political barriers to pursuing bond elections. In addition, high-impact projects are more likely to be neglected by school districts with heavy debt burdens for the same reasons. Hence, the effects found in this paper are more pronounced because state intervention helps initiate these capital projects that would otherwise be beyond their reach without such support.

To ensure the internal validity of the results, I conduct a comprehensive set of robustness tests. I first investigate several alternative channels through which similar effects could arise. For example, increases in operational spending or teacher quality could improve student outcomes even in the absence of additional capital spending. However, the previous findings of muted short-term responses across various measures suggest that students fully benefit from enhanced facilities only after the projects are completed. Moreover, additional analyses do not support these alternative explanations. Teacher quality does not change significantly, but the data suggest an influx of less experienced teachers to support the growing student population. Additionally, current spending decreases rather than increases, which contradicts the idea that improvements in operational spending or teacher quality are driving the observed outcomes. These patterns reinforce the conclusion that capital spending, rather than other potential channels, is the primary driver of the observed educational gains.

Next, I rerun the empirical tests excluding a subset of school districts that were significantly affected by concurrent events, such as fracking booms, which boosted the local tax base and could have confounded the results. Additionally, I examine the relationship between various measures of local economic growth and school district indebtedness during the pre-policy period to ensure that differential trends in local economic conditions do not bias the findings. I further confirm the robustness of the findings by including interaction terms between 1990 Census variables and linear trends. Lastly, I test for a composition effect, where educational improvements in treated districts could be driven by the migration of higher-performing students anticipating better facilities. However, the results are driven by students who remained in the same district, indicating that the observed improvements are attributable to those who had direct exposure to the facility upgrades.

Overall, this paper causally identifies the substantial positive effects of capital investment on educational quality. By exploiting a novel quasi-natural experiment, the paper examines the impact of capital spending on infrastructure projects that were previously unattainable for heavily indebted districts. These results offer important insights for policymakers and school administrators, suggesting that targeted financial interventions can enhance educational outcomes. Given the hazardous infrastructure conditions many students currently face, the findings emphasize the crucial role of debt support in improving educational outcomes and safeguarding student well-being.

1. Related Literature

This paper adds to several strands of the literature. First, a growing body of research in finance examines the real effects of financing constraints on local and state governments. Adelino et al. (2017) show that increases in credit supply due to the credit rating recalibration positively affect government expenditures and private-sector employment. Exploiting the small issuer cutoff, Dagostino (2018) finds that an exogenous increase in the cutoff leads to increases in issuance volume, employment, and wages at the county level. Agrawal and Kim (2022) indicate that the cross-sectional variation in water quality stems from the deterioration in bond credit rating following the demise of monoline insurers. Posenau (2022) examines the bond covenant and finds that the violation of covenants induces utility districts to charge higher prices and lower water system expenses. Yi (2021) uses a change in the banking regulation to document that issuers significantly reduce issuance amount when the demand from banks declines.

I contribute to this literature by utilizing a unique dataset within the context of school districts to examine the real effects of reducing debt financing costs on measurable outcomes. School districts mainly serve the purpose of delivering quality public education to students, with standardized outcomes such as test scores and graduation rates. Together with the granularity of school district data, this setting captures how alleviating debt burdens can benefit students through increased capital investment, thereby shedding light on the impacts of financial flexibility on public goods provision.

This paper also relates to literature that investigates the marginal effect of additional capital spending on the quality of education. Several studies examine the relationship between capital spending and student outcomes through close bond elections.[3] Cellini et al. (2010) is the first paper that exploits close school bond elections to identify the causal impact of capital spending. They find that school districts that pass the bond measures exhibit improvements in test scores and growth in housing prices in the long run. Other researchers utilize a similar setting, but their results are mixed. Martorell et al. (2016) use the same TEA data to show modest facility improvement after the school district passes bond elections. However, they do not find any significant effect on test scores. Baron (2022) shows similar results using close bond elections in Wisconsin that capital spending does not affect test scores, dropout rates, and college enrollment rates. On the other hand, some papers provide evidence in support of the positive effects of capital spending. Rauscher (2020) focus on California school districts and show that the effect mainly comes from low-socioeconomic-status (SES) students, suggesting heterogeneous effects depending on district characteristics. Biasi et al. (2023) highlights that the impact of capital expenditure varies by its nature; renovations and construction of instructional facilities enhance test scores, while investments in non-instructional infrastructure like stadiums do not. Boyson and Liu (2022) finds that bond elections in California school districts alleviate financial constraints for low-wealth districts, yielding better test scores and home values but incurring higher debt issuance costs.

This paper provides a complementary view to analyze the efficiency of capital spending by focusing on debt-constrained school districts. The debt assistance programs provide greater debt support to school districts with overwhelming outstanding debt burdens, which often cannot even resort to bond elections. By focusing on debt subsidy, this paper highlights the relevant margin, where marginal spending can be allocated to high-impact projects that were previously infeasible without federal or state support.

[3] Papers that do not rely on the discontinuity in bond elections include, for example, Conlin and Thompson (2017), Goncalves (2015), Lafortune and Schönholzer (2022), and Neilson and Zimmerman (2014).

2. Institutional Details

2.1. Financing Capital Investment

In 2020, U.S. public school districts spent over $870 billion to provide an adequate level of public education to students. More than 10% of the total expenditure was spent on capital outlays. Capital spending is a crucial part of school district expenditures as it is typically used to construct new facilities, renovate existing buildings, and/or purchase educational equipment such as school buses. Given the scale of the infrastructure projects, a combination of local taxes or state support allocated to facilities maintenance each year is insufficient to cover the associated costs.[4] As a result, school districts almost always rely on debt financing.

The most common type of municipal bonds issued by school districts is called general obligation (GO) bonds.[5] GO bonds are backed by the taxing power of the issuer. School districts often pledge ad valorem taxes, or property taxes, to repay bondholders. In addition to the exemption from federal income tax, this feature allows school districts to borrow at relatively low interest rates compared to other types of financing. Hence, school districts typically use GO bonds and increase property tax rates to cover the debt service payments.

However, some school districts remain underfunded without federal or state intervention since they differ vastly in their ability to raise property tax rates for many reasons.[6] For example, the issuance of GO bonds requires the issuer to receive voter approval. School

[4] Plant maintenance and operation spending explains around 9% of current spending among independent school districts in Texas. However, it cannot be used to, for example, build another campus for the following reasons. The usage of maintenance expenditures is limited to daily maintenance and operation of facilities, which often excludes major improvements. Even if those funds can be spent at the district's own discretion, it would require absurdly high property tax rates to raise enough capital funding. In addition, some districts may find maintenance expenditures insufficient for the regular upkeep of existing buildings if most of their buildings are severely outdated.

[5] Some school districts issue other types such as revenue bonds. Local governments issue revenue bonds to finance a specific project. They pay debt service on the bonds using the cash flows generated from the project. However, school districts rarely use revenue bonds as most of instructional facilities do not generate revenues.

[6] States and federal government pay less than a quarter of the capital outlay and debt service, and 11 states do not provide any funding to school districts.

districts with tax-sensitive voters may not be able to increase property tax rates if they cannot pass bond measures. Furthermore, high property taxes can lead to an increase in net out-migration which can erode the tax base (Tiebout (1956)). State governments often impose debt restrictions on school districts as well to maintain the financial health of local governments.

2.2. State Debt Assistance Programs in Texas

Until the 1990s, Texas school districts already under a large debt burden found it challenging to raise additional debt from local sources in the absence of state or federal support for capital spending. Such concerns directed attention toward the equalization of facilities funding, which led the state of Texas to pass the Instructional Facilities Assistance (IFA) program in 1998.[7]

The IFA was the first state-level intervention in Texas to provide continuing support to school districts. By sharing the debt service of the newly issued bonds throughout their life, the state intended to boost capital investment by school districts. The program provides a guaranteed yield of $35 per average daily attendance (ADA) for each penny of Interest and Sinking (I&S) tax effort.[8] For example, the state would support 60% of annual debt service for qualifying bonds if an independent school district has $140,000 of taxable wealth per ADA.[9] Figure A3 presents the potential IFA assistance as a function of local taxable value per pupil.[10]

[7]Since 1984, Edgewood Independent School District and others have filed a series of school finance lawsuits, known as the *Edgewood* cases. The Texas Supreme Court ruled the state's school finance system unconstitutional, leading policymakers to revise the funding formula and redistribute excess revenue from wealthy to property-poor districts. However, this finance equalization was limited to current spending, covering only day-to-day school operations.

[8]Texas school districts charge two types of property tax rates. The school district uses I&S taxes to service debt and Maintenance and Operations (M&O) taxes to fund daily operations.

[9]In this example, the state pays 60%(=1-$140,000÷$350,000) of the district's debt service payments on the approved bonds because the district can raise 40%(=$140,000÷$350,000) under the current assessed property valuation.

[10]The IFA assistance is not zero for some districts with taxable property wealth above the guaranteed yield ($350,000) due to some additional factors. School districts with less than 400 ADA were treated as if they had 400 students. Taxable wealth was adjusted downwards if the district experienced high enrollment growth over the past 5 years or was denied IFA assistance during the prior biennium.

The IFA significantly lowered the local share of the debt burden. Around 30% of school districts received the funding during the first 4 rounds. They were able to borrow approximately $5.6 billion with state support, only paying 42% of debt service for the qualifying bonds on average. A total of $620 million was appropriated to help school districts pay for the first annual debt service on eligible debts across 11 funding rounds. The state continues to provide debt subsidies for the approved bonds, although no funding has been allocated to the IFA since 2017.

To be eligible for IFA assistance, the district has to meet several requirements. First, districts must apply for the funding as the IFA assistance is not automatically granted. The state funding was secured for the life of the eligible debt, so districts do not have to reapply for the funding in the following years. Also, the usage of bond proceeds is strictly limited to the instructional facilities. Next, districts must have sufficient authorized issuance amounts from the previous bond elections.

While the IFA made substantial progress toward capital spending equalization, there were some limitations. The funding rounds were competitive as the funding fell short of the growing demand for modernizing school facilities. The state prioritized low-property wealth districts when the total amount of assistance requested exceeded the available funding at each round. In addition, the state only supported the newly issued debt. Bonds issued before 1998 were not eligible for debt assistance, meaning that the issuers of these bonds unfortunately had to manage their debt on their own. Lastly, a concurrent legislative change partially negated the state's equalization effort. Both types of property tax rates (M&O and I&S) were initially subject to the recapture in 1993. However, districts have been allowed to retain excess revenues from I&S rates since 1997. This provision effectively induced property-rich districts to issue more debt, aggravating the inequalities in facilities spending.

The state of Texas subsequently launched the Existing Debt Allotment (EDA) program in 2000 to reduce the local share of the debt service on the existing debt. The EDA covered most of the new money bonds that did not qualify for IFA assistance, but non-GO bonds such as revenue bonds were excluded.[11] The EDA also operated under a guaranteed-yield approach, where the state guarantees the same $35 per ADA for each penny of I&S tax effort up to $0.29 per $100 of assessed property valuation.[12] Unlike the IFA, districts are automatically eligible for EDA assistance as long as their taxable property value per pupil is below the threshold. Figure 1 presents the time-series of I&S tax rates during 1994-2006. Since the EDA came into effect in 2000, school districts almost halved I&S tax rates.

Figure 2 shows the proportion of state debt subsidy relative to the district's annual debt service costs. The increase in debt subsidies is modest in the first two years of the IFA as the state only subsidized newly issued debt. However, the state's share of debt service has jumped to roughly 30% since the EDA was introduced. Over 57% of independent school districts in Texas benefited from the EDA during the first biennium, and the state continues to share the debt burden with more than 80% of them as of 2022.

In sum, both the IFA and EDA provided substantial debt financing aid to the highly indebted school districts, expanding their debt capacity. The IFA reduced the marginal debt financing costs by allowing the district to issue new debt with smaller increases in property tax rates than before. On the other hand, the EDA lowered the servicing costs of the existing debt, which in turn created more room for taking on additional debt.[13]

[11] Revenue bonds are another commonly issued municipal bonds. Issuers of revenue bonds typically pledge future cash flows from a specific project. Since most facilities in school districts do not generate cash flows, revenue bonds were rarely issued by districts.

[12] In fact, the I&S tax rate eligible for the EDA funding is limited to the smaller of the three rates: the actual I&S rate during the second year of the preceding biennium, the I&S rate sufficient to pay the annual debt servicing costs on the EDA eligible bonds, and the statutory limit 0.29%.

[13] See Clark (2001) and Plummer (2006) for more detailed descriptions of both programs.

3. Data and Summary Statistics

3.1. Data

The estimation sample comes from four main sources. First, data on the student-level outcomes come from the Texas Education Agency (TEA), which covers all public K-12 students in Texas since 1993. The TEA records contain granular information on the student demographics, curricular activities, and educational outcomes. Individuals are anonymized with the identifier, allowing researchers to observe any public K-12 students in Texas throughout their school years. However, the TEA stops to track students moving out of the state. Following the literature, I assume those students dropped out of school and exclude them from the estimation sample (e.g. Cabral et al. (2021)).

I obtain administrative data on all public post-secondary institutions in Texas from the Texas Higher Education Coordinating Board (THECB). The THECB provides individual-level information on student enrollment, admissions, and graduation since 2004. As it shares the same individual identifier as the TEA records, the THECB is a useful source for observing whether students pursue a higher degree. Similar to the TEA data, the THECB does not report students who attend out-of-state higher education institutions. I assume the students in the TEA but not in the THECB do not pursue post-secondary degrees.

I use district financials from the merged dataset consisting of the TEA district income statement data and the Common Core of Data (CCD) hosted by the National Center for Education Statistics (NCES). The merged dataset covers the universe of Texas school districts and includes information on revenues and expenditures as well as outstanding bond principals. Most of the school district financial characteristics date back to 1987, but detailed bond issuance information becomes available in 1993. All financial variables are converted to 2000 dollars using the historical CPI for all urban consumers.

Lastly, I collect other district characteristics from the Academic Excellence Indicator System (AEIS) provided by the TEA. The AEIS mainly publishes student performance at the district level, but it also provides information on district demographics and tax collection data in the 1994-2011 school years.

To understand the effect of debt support on the average student in the district I construct 5 district-level student outcomes from the resulting merged dataset. First, I define capital spending per pupil as the total capital outlays divided by the number of total enrolled students.[14] To measure student academic achievement, I standardize statewide 8th-grade reading and math individual test scores each year and aggregate these measures across all students in the same district-year group. I also define the graduation rates as the fraction of 12th-grade students graduating within the district-year group. College entrance exam participation rates are defined as the fraction of 12th-grade students who took either the SAT or ACT. Lastly, I construct college enrollment rates, defined as the fraction of 12th-grade students who enroll in any 2-year or 4-year institutions within 3 years of graduation.

The estimation sample includes approximately 870 unique independent school districts in Texas from 1994 to 2004 that were eligible to receive any debt support as of 1994. Since I do not observe the actual eligibility measures, I construct a hypothetical debt assistance percentage using the IFA funding formula as a proxy for each district's funding eligibility.[15] Applying this filter effectively excludes around 90 property-rich school districts from the sample. I prefer to focus on the sample of districts eligible for debt assistance for stronger identification. Property-rich districts were likely to benefit from the removal of the I&S tax recapture, as described earlier. Since this change occurred around the same time as the IFA's implementation, it could introduce bias if property-wealthy districts increased capital expenditures independently of the debt assistance programs.[16] Lastly, the sample period reflects the availability of dependent variables in the data and the long-run analysis in this paper.

[14] In the main analyses, I subtract the direct state subsidy to capital expenditures to mitigate the effects of state assistance prior to the IFA and EDA.

[15] Since the IFA had multiple funding rounds, the state adjusted the property wealth of districts that applied but failed to receive debt support in the previous round. The imputed eligibility measure does not consider such adjustments because I do not observe the IFA application records.

[16] In untabulated results, I find that including these districts does not qualitatively alter the findings.

3.2. Summary Statistics

Table 1 describes the district characteristics between 1994 and 2004. All variables are winsorized at the 1st and 99th percentiles to minimize the influence of outliers. The average district has a 20% higher net outstanding debt relative to its property tax levy between 1987 and 1991, where net outstanding debt is computed as the long-term bond principal minus the debt service fund balance. The large standard deviation relative to its mean indicates that there are substantial variations in local debt burden. The state is expected to cover 54% of the school district's debt servicing costs on average. Together with the average per pupil property wealth well below the proposed threshold of $350,000, a vast majority of Texas school districts are eligible for any debt support through the IFA or EDA. The average district spends around $975 per pupil on large-scale facilities improvement projects every year. Capital spending is a large part of total expenditures, as it alone represents around 11.9% of total expenditures per pupil. Also, capital expenditures tend to be lumpy, often clustering around the bond issuance. Figure 3 plots the average per pupil spending around bond issuance years. School districts typically allocate a significant portion of bond proceeds within a few years of issuance, as indicated by relatively lower levels of capital spending outside these years. This is consistent with the nature of infrastructure projects, which often require a lump sum payment at the beginning. Therefore, I aggregate the three-year cumulative capital spending to capture the full scope of capital investment activity in the following analysis.

4. Empirical Specification

This paper attempts to understand whether and how capital expenditures can improve education quality in the long run by focusing on debt-laden school districts.

To this end, a naïve OLS approach would be to regress actual capital spending on educational outcomes h period later. However, the regression fails to establish causality if unobservable district characteristics drive both capital expenditures and measures of educational improvement. For example, school districts with better economic conditions can offer more educational resources to their students. On the other hand, their strong local economies allow them to easily finance infrastructure project costs to properly maintain their facilities. In this case, they would still exhibit considerable enhancement in academic performance in the absence of debt support, which would result in an underestimation of the OLS coefficients.

I take several steps to alleviate the endogeneity concerns. School district and year fixed effects are included to capture time-invariant school district characteristics and aggregate shocks. Importantly, school district fixed effects eliminate any level differences in school district economic conditions, which limits the sources of the endogeneity to time-varying conditions. To control for the remaining time-varying local economic conditions, I also add various observable district characteristics. I include an enrollment size quartile dummy to proxy for the school district size, which could be correlated with the growth in local economic activities. I add a log of per pupil current expenditures as wealthy school districts spend more on instructional spending. I use cash holdings scaled by current expenditures in the regression, as districts can utilize unrestricted cash holdings at their discretion to boost educational spending. Finally, I control for the local share of total revenue per pupil to factor in the district's dependence on state funding.

To further strengthen the causal interpretation of the results, I employ an instrumental variable (IV) approach. The instrument takes advantage of school districts' heterogeneous responses to the introduction of state debt assistance programs in Texas based on their pre-existing debt burdens.[17] Conceptually, the instrument stems from the idea that districts with higher existing debt burdens are more incentivized to apply for IFA funding or to

[17] I utilize pre-existing debt burdens instead of the kink regression discontinuity around the threshold or the allocation formula for the following reasons. A bulk of school districts have property wealth well below the cutoff, which leaves very few districts around the kink to reliably test the hypothesis. Also, the allocation formula is a function of per pupil taxable property value. If property wealth captures the extent of educational resources available in a district, the resulting effects may be confounded.

receive larger EDA support, holding per-pupil property wealth constant. Although property wealth determines eligibility through the allocation formula, its level alone is not sufficient to guarantee debt support. At a given level of per-pupil property value, a district must apply for IFA funding or have previously issued debt to be granted EDA assistance. To the extent that heavy outstanding indebtedness constrains a district from initiating new capital projects, debt-laden districts have greater incentives to receive debt support on new debt. On the other hand, the extent of debt-financing cost reductions for existing debt escalates with the size of the current debt load.

Specifically, I define the instrument as the interaction term between a cross-sectional group indicator and a post-policy period indicator variable, expressed as:

$$DTL\ High_i \times Post_t, \tag{1}$$

where i denotes the district and t the year. This difference-in-differences estimator captures identifying variation arising from heterogeneous responses in capital expenditures across districts with varying levels of pre-existing debt burdens to the debt assistance programs. To construct the cross-sectional indicator, denoted as $DTL\ High_i$, I divide school districts into two groups based on the median value of their average net long-term debt-to-property tax levy (DTL) ratio from 1987 to 1991—a period well before the onset of the first debt assistance cycle in 1998—as a proxy for program exposure.[18] Similar to a corporate leverage ratio, this measure reflects a district's outstanding debt relative to cash flows from property tax revenues. The indicator equals 1 if the district has this ratio above the median and 0 otherwise. $Post_t$ is set to 1 for the years 1998 and onward and 0 otherwise. I choose 1998 as an event date because it is when the initial IFA funding round took place. Lastly, the interaction of these two indicators serves as the instrument for capital spending.

The historical DTL ratio captures a district's debt burden without reflecting its con-

[18] This ratio mechanically drops districts with zero or missing property tax revenues in the 1987-1991 period because their debt-to-property tax levy ratios are undefined.

temporaneous economic conditions. Anecdotal evidence suggests that debt financing decisions do not reflect the economic outlook too far ahead. In general, Texas restricts school districts from excessively relying on projected future property taxes when they demonstrate their ability to pay off the bonds. Texas Education Code, Section 45.0031 allows school districts to use projected property tax revenues anticipated for the earlier of the tax year five years after the current tax year or the tax year in which the final payment is due for the bonds. This effectively limits school districts from incorporating the information on future property tax bases more than five years ahead when considering debt financing. Therefore, bond issuance decisions made prior to 1991 may not reflect the economic outlook at least seven years ahead, which supports the validity of the instrument.

Furthermore, the historical DTL ratio tends to persist and has a high correlation with a district's debt burden around policy implementation. As the average maturity of newly issued bonds has been roughly 10 years since the 1980s (Cortes et al. (2022)), school districts with higher bonded indebtedness around the late 1980s continue to bear sizeable debt service costs as their prior debt obligations extend into subsequent years. Figure A1 shows an example of a debt payment schedule in Elgin ISD in 1997. Over 70% of the incremental debt servicing costs in 1998 are projected to remain in the district's balance sheet for more than 14 years after the issuance in 1997. This feature allows $DTL\ High_i$ to be highly predictive of the level of debt burden around 1998.

This instrument motivates the following two-stage least squares (2SLS) regression model:

$$Cap_{i,t} = \pi(DTL\ High_i \times Post_t) + \Pi C_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t} \tag{2}$$

$$\bar{Y}_{i,t} = \beta \widehat{Cap}_{i,t} + \Gamma C_{i,t} + \delta_i + \delta_t + u_{i,t}, \tag{3}$$

where i denotes district, t denotes year, and $\bar{Y}_{i,t}$ represents the average of Y over a specified period. In what follows, I focus on the average from t to $t+4$, which I refer to as short-term, and the average from $t+5$ to $t+9$ as long-term.

In the first stage, I instrument the endogenous variable, *Cap,* using *DTL High* × *Post*. *Cap* is cumulative per pupil capital spending from t to $t+2$. $C_{i,t}$ is a vector of control variables, including the imputed eligibility using the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t denote district and year fixed effects, respectively. Standard errors are clustered at the district level.

In the second stage, I regress the predicted capital spending on various district-level outcomes, $\bar{Y}_{i,t}$. The parameter of interest is β, representing the average cumulative improvement in outcome variables in the short or long run.

A causal interpretation rests on the relevance condition and exclusion restriction. A formal test of this relevance condition in the regression framework confirms a strong and positive relation between the instrument and the endogenous variable. Table 2 shows that school districts with previously high indebtedness spend around $570 per student more on capital projects than those with low indebtedness. In addition, Figure 5 plots the yearly estimates of equation 2 using annual capital expenditure per pupil instead of three-year cumulative spending. Trends in capital spending between high- and low-DTL districts only begin to diverge after the state introduced the debt assistance programs. Importantly, high F-statistics in excess of 10 ensure that the instrument strongly predicts the endogenous variable.

I also investigate the exclusion restriction in several ways to evaluate the instrument's validity. While the instrument conditional on various controls including school district fixed effects can handle most of the time-invariant unobservable district characteristics or relatively short-lived economic growth, there may still exist some endogeneity concerns. I test if school districts with high *DTL* exhibit higher growth in several proxies of local economic conditions: a log of per capita income, a log of median household income, a log of total labor force, and unemployment rates. Due to a lack of school district-level measures during the sample period, I rely on the 1990 and 2000 Decennial Census. This approach effectively leaves a single observation for each school district around the first debt assistance program in 1998.

Table 3 indicates that most of the local economic conditions are not strongly predicted by the instrument. Income measures and unemployment rates show no statistically significant relationship with the instrument, whereas the total employment growth is strongly correlated with *DTL High*. This may not come as a surprise given that high *DTL* school districts are often located next to or within metropolitan areas. Figure 6 shows the geographical distribution of school districts by indebtedness, with districts shaded in dark blue concentrated around some of the most populous cities in Texas. In this respect, column 4 of Table 3 raises a reasonable concern that the instrument may affect outcome variables through changes in local employment rather than debt subsidies.

I take several steps to address this concern. First, I show that parametrically controlling for the population size does not alter the results in this paper. I rerun the main analysis after incorporating the interaction term between the log of employment in 1990 and linear trends. The results remain robust to the inclusion of the interaction terms.In addition, I include the log of enrollment size, which is available at an annual frequency and highly correlated with the total employment in the regression equation.This approach also does not change the results. Finally, I show that the results are robust to dropping the school districts in the top enrollment size quartile as of 1997 and reassigning *DTL High* among the remaining school districts. Since fast-growing districts are around metropolitan areas and tend to exhibit a larger number of enrolled students, this exercise ensures that the results are not driven by the school districts with high employment growth.

Concurrent events around the policy implementation might influence the outcome variables as well. A couple of notable changes coincided with the debt assistance programs, including the exclusion of I&S tax rates from the recapture and fracking booms. Changes to recapture rules were made, where excess revenues from I&S rates were retained since

1997, potentially incentivizing highly wealthy districts previously subject to recapture to issue debt. This change implies that highly wealthy districts previously subject to recapture may become more incentivized to issue debt, perhaps to offset the recaptured surplus from M&O taxes. To mitigate the confounding effects from such concurrent events, I eliminate districts that has no change of receiving debt subsidies in the pre-policy period.[19] Furthermore, the significant fracking booms in the early 2000s, affecting available school resources and local labor market conditions, especially around districts with large shale oil and gas reserves, are considered. The extraction booms had impacts on students from those areas as well, resulting in lower graduation rates (Kovalenko (2023)). Results are robust to excluding districts with high exposure to the oil and gas industries, proxied by the percentage of taxable property values derived from oil and gas production sites.

School districts with below- and above-median debt-to-property tax levy ratios might also be different along unobservable dimensions. If this is the case, I may observe the same results in the absence of the debt relief programs. For example, one might be concerned that highly indebted school districts have already spent a substantial sum of money on ongoing or recently finished capital projects before the sample period, possibly showing improvements in educational outcomes in the following years.

Measuring the school district's indebtedness relative to property tax levies before 1991 alleviates this concern. The typical facilities improvement projects take around 3 years to complete. Figure A2 presents a recent construction schedule from the Austin ISD's bond proposal. As shown in Figure A2, most constructions are planned to take less than 5 years. At the beginning of the pre-policy period, 1994, it is plausible that most of the projects funded by the pre-1991 debt were already finished. Given that it may take several years for enhanced facilities conditions to pay off, one would be able to observe the effects of those projects by 1998. To the extent that these effects stabilize over time, district fixed effects

[19] While $350,000 per pupil was the cutoff for the IFA and EDA, dropping these districts still leaves around 90% of all school districts in Texas. I prefer this sample over the full sample because the highly wealthy districts may exhibit improvements in educational outcomes through any events unrelated to the debt programs. The results remain qualitatively similar using the full sample.

should capture the permanent increase in outcomes due to the previous projects.

Furthermore, it is unlikely that school districts keep the proceeds over an extended period to spend on capital projects in the distant future. Rather, they tend to use bond proceeds within a few years. Note that the IRS prohibits tax arbitrage where districts borrow at the tax-exempt yield and invest at the taxable interest rate. The maximum yield the bond proceeds can earn is often much lower than the prevailing interest rate for that reason. Since most school bonds are tax-exempt, saving the bond proceeds in the investment account for a long time may result in negative returns or negative tax arbitrage.

5. Results

5.1. Capital Investment

Most of the incremental capital spending goes to major construction or renovation projects. Table 4 reports the estimation results for equation 2, where the dependent variables are the three-year cumulative expenditures on construction, equipment, and land and existing structures. Column 1 shows that treated school districts direct around $486 per pupil to construction expenditures over the three-year period, including replacements and major facility alterations. This accounts for roughly 85% of the total state-sponsored capital investments reported in Table 2 (i.e., $486/$569=85.4%). Columns 2 and 3 suggest that the remaining fund goes to costs associated with instructional equipment purchases, land acquisition, and site improvements.

Although data on a more granular breakdown of capital outlays or on maintenance at the facility level is unavailable, these findings suggest that debt relief allows school districts with high debt burdens to finance critical infrastructure projects within their facilities. This allocation likely reflects districts' prioritization of long-term, capital-intensive improvements that contribute directly to the quality of physical learning environments. Therefore, by alleviating existing debt obligations, state-sponsored support facilitates these debt-laden districts' investment in essential structural resources, fostering an improved student learning environment.

5.2. Academic Achievement

The results in the previous section document that an increase in state debt support leads to a substantial rise in the school district's capital expenditures, particularly for major infrastructure improvement projects. To measure potential gains from the reduction in debt financing costs, I next investigate how the quality of public goods changes after receiving debt relief.

I first examine the effects of capital spending on standardized 8th-grade reading and math test scores from the statewide assessment. To the extent that debt relief brings material benefits to students in the treated school districts, test scores can be used to measure improvements in the average student's academic performance.

I find that incremental capital spending leads to long-term improvement in academic performance. Table 5 presents the estimation results of equation 3 using 8th-grade standardized reading and math test scores as dependent variables. To construct the dependent variables, I standardize individual 8th-grade test scores each year, converting them to z-scores based on the statewide distribution, and then calculate the district-level average of these standardized scores. These district-level averages are then smoothed as five-year rolling averages. In columns 1 and 2, capital spending increases average reading scores in the long run, with no short-term effect. The coefficient estimate in column 2 is both economically and statistically significant. The estimate implies that a $1,000 increase in per pupil capital spending results in roughly a 0.057 standard deviation increase in reading scores on average five years later.

The same increase in capital spending enhances average math scores as well. Columns 3 and 4 in Table 5 present the estimation results using 8th-grade standardized math test scores as dependent variables. The results for math scores also exhibit long-lasting improvements. The estimates imply that a \$1,000 increase in per pupil capital spending leads to approximately a 0.12 standard deviation increase in math scores on average five years later.

Graphical representation of the coefficient estimates briefly summarizes the results, characterized by long-term improvements in test scores following the initial dip. Each panel in Figure 7 graphically depicts the estimates from the dynamic version of equation 3 , where I rerun equation 3 using $Y_{i,t+h}$ for each $h = 0, 1, \ldots, 9$ instead of the rolling average. The evolution of the estimates is in line with prior studies documenting the positive effects of capital spending on educational outcomes(e.g. Cellini et al. (2010)). Test scores are negatively affected by debt assistance during the initial periods as a major renovation of the existing facilities or construction of new buildings may disrupt student learning. For example, loud noise from the construction sites or temporary portable classrooms due to facility upgrades can adversely impact students' motivation and result in muted or even negative effects during the first few years. Several years after these projects, the coefficient estimates gradually increase and stabilize. This is consistent with the benefits of school infrastructure improvements, which can take years to materialize(Jackson and Mackevicius (2021)).

The magnitude of the effect in this study is large compared to existing studies on the impact of capital spending on academic achievement. Much of the literature finds little to no improvement from additional capital expenditures (e.g. Martorell et al. (2016), Baron (2022)).Among the studies that do document positive effects, Cellini et al. (2010) find that bond measures that are narrowly passed result in a capital spending increase of about \$5,000 per pupil over the next five years, raising the year-six test scores by 0.16 standard deviations. Their findings imply that the effect is 0.03 standard deviations per \$1,000 per pupil capital spending (i.e., $0.16 \div 5 = 0.03$), representing around 28% to 52% of the effect size found in this paper. More recently, Biasi et al. (2023) show that closely winning bond elections leads to substantial improvements in test scores. Their estimates suggest roughly

0.02 to 0.03 standard deviations per $1,000 per pupil in capital expenditures, with a more pronounced impact in districts serving a higher share of students from low socioeconomic backgrounds and minority groups.

The difference in magnitudes between this paper and existing studies can be attributed to the type of marginal infrastructure projects considered. A significant portion of the literature exploits close bond elections as the main identification strategy (e.g., Biasi et al. (2023), Boyson and Liu (2022), Martorell et al. (2016)). While the random bond passage provides a clean setting to establish causality, the randomness may come at the expense of focusing on a limited set of capital projects that are narrowly passed or failed. To the extent that individual voting decisions depend on evaluating a proposed project's potential gains, the marginal capital projects in close bond elections might have minimal or negligible expected returns. Furthermore, this setting excludes school districts that cannot frequently make it to the bond election. Most likely, candidates are those with a substantial amount of outstanding debt burdens as these districts cannot issue more debt for various reasons[20]. Their proposed projects may create much greater impacts if these districts are relieved of their debt burdens, allowing them to undertake projects with significant potential for educational improvements. As a result, studies using narrowly passed bond elections may find smaller or no effects compared to this paper, as they miss the significant gains that could be achieved by addressing the constraints faced by heavily indebted districts.

Treated school districts in this paper are unable to undertake additional projects due to the outstanding debt burden. This might be a huge loss to those school districts if these projects can generate substantial educational gains. Hence, reducing the debt burden generates much larger gains than narrowly winning the bond election. This is because alleviating the debt burden enables school districts to initiate projects that may have significant educational returns, thus maximizing the potential benefits of infrastructure

[20] State-imposed debt ceiling can limit them from participating in bond elections. Alternatively, they may not attempt elections at all if they believe residents would not approve bond measures due to high current property tax rates.

investments. By focusing on reducing debt constraints, this study highlights the importance of financial flexibility in allowing districts to pursue projects that can meaningfully enhance student outcomes.

The effect on test scores is also comparable to findings in the literature regarding the impacts of operational spending on student outcomes. For instance, the Tennessee Student/Teacher Achievement Ratio experiment (STAR) reduced the number of students per class by roughly 30% to 40% and improved standardized test scores by 0.15 standard deviations (e.g. Chetty et al. (2011), Schanzenbach (2006)). Since STAR cost roughly 47% of operating expenditures, this estimate implies that $1,000 spent on the class size reduction leads to a 0.051 standard deviation increase in test scores.[21] As the literature often finds the impact of non-capital spending on educational outcomes exceeds that of capital spending (Jackson and Mackevicius (2021)), the estimates in this section suggest that debt assistance generates substantial returns to educational achievement. However, given the differences in purpose and characteristics between capital and operational spending, these comparisons should be interpreted with caution, particularly as each category affects students through distinct channels.

The results for both academic achievement measures consistently find the positive and long-lasting effects of capital spending. This finding suggests that incremental capital spending from lower debt financing costs yields long-term positive gains for students, as value-adding capital projects become affordable for school districts.

5.3. Non-test Outcomes

While capital expenditure leads to long-term improvements in academic outcomes, test scores alone do not fully capture its benefits to student learning. For example, students on the margin can complete public education and pursue higher degrees if they can stay comfortable during hot weather thanks to the updated air-conditioning system. To evaluate

[21] Since the average current spending per pupil is $6,280, this approximately results in an effect of 0.051 standard deviations in test scores per $1,000 operating spending per pupil(i.e., 0.152÷($6,280×0.47÷$1,000)=0.051).

the overall impact on students, I examine a set of non-test outcomes.

I find that capital projects lead to long-term improvements in attendance, suggesting that enhanced facility conditions encourage students to stay engaged in school. Columns 1 and 2 of Table 6 present results for attendance rates, defined as the percentage of instructional school days that students attended each academic year. The estimates show that an additional $1,000 invested in infrastructure projects corresponds to an increase of approximately 0.12 percentage points in attendance rates several years later, with no statistically significant effects observed initially. This effect size represents 15% of the standard deviation (i.e., 0.12/0.8 = 15%), indicating a reasonably large impact. Although the average attendance rate is slightly below 96%, it varies little across districts, with a standard deviation of 0.8% in the estimation sample. Panel A in Figure 8 illustrates this gradual improvement, showing that attendance rates initially remain stable but rise sharply around the sixth year and stay elevated through the ninth year.

Graduation outcomes improve following an increase in capital spending, aligning with the previous results on academic achievement. In columns 3 and 4 of Table 6, the coefficient estimates suggest evidence supporting the long-term positive effects of capital expenditures. The coefficient estimate is statistically and economically significant in column 4 only. The results indicate that a $1,000 increase in capital expenditure correlates with a roughly 1.9 percentage point increase in graduation rates after five years. Similar to the findings for test scores, the patterns observed in columns 3 and 4 indicate that improvements in school facilities drive these effects; graduation rates initially show muted or negative effects in the short term but increase after five years. Panel B in Figure 8 illustrates the findings, showing the lasting influence of capital spending on high school completion rates. The coefficient estimates hover near zero in the early years but increase significantly around the sixth year, staying elevated through the ninth year.

The analysis also reveals that students become more motivated to pursue higher education, though the estimates show positive but statistically insignificant effects. Columns

5 and 6 of Table 6 present the estimation results for college entrance exam participation rates, while columns 7 and 8 focus on college enrollment rates. A $1,000 increase in capital spending is associated with an approximate 1.3 percentage point rise in college exam participation rates after five years. Similarly, the effects on college enrollment rates are positive, suggesting that the same increase in capital spending corresponds to an approximate 0.9 percentage point rise in college enrollment after five years. Although most estimates are not statistically significant at the 10% level, the overall pattern remains consistent with previous findings. Panels A and B in Figure 9 indicate a long-term improvement in college exam participation and enrollment rates following increased capital spending, though these effects remain statistically insignificant. This pattern suggests a positive but not definitive trend in higher education engagement over time.

Several factors can explain relatively weak responses on non-test outcomes. First, both college entrance exam participation rates and college enrollment rates could be imprecisely measured. For example, if better educational facilities increase the likelihood of pursuing higher education throughout one's life, these measures fail to identify individuals who change their minds about attending college after working for a few years. In addition, the TEA and THECB do not report students who leave the state before they graduate and attend higher education institutions elsewhere. This could either bias the coefficient estimates toward zero due to measurement errors or downward if the attrition rate is systematically higher among the treated school districts.

5.4. Labor Market Outcomes

The positive effects of infrastructure improvement through debt assistance are also evident in labor market outcomes. Table 7 presents estimates from equation 3 on log annual earnings between ages 24 and 26 for students working in Texas. Columns 1 and 2 show results for all students working in Texas, indicating that initial cohorts—those in the early period of increased capital spending—experience a decline in annual income. In contrast, later cohorts see boosts in their annual earnings. Specifically, initial cohorts experience a decline of approximately 3% per year for every $1,000 in capital spending, whereas later cohorts earn additional income by around 2% annually per $1,000 invested.

Subsample analyses reveal that the positive earnings effect is primarily driven by high school graduates who did not pursue higher education. Columns 3 and 4 focus on students who enrolled in college, showing less consistent effects on earnings. The effect is most pronounced among high school graduates who did not pursue higher education, as shown in columns 5 and 6. At a minimum, this pattern suggests that infrastructure investments benefit these graduates in their early careers, possibly due to improved academic performance or skill development during their school years that translates into better initial job placements. In contrast, college-enrolled students aged 24 to 26 may still be completing their studies or starting jobs with high growth potential, where immediate income gains are less evident but could increase in the long term as they advance in their careers.

While I find positive gains in annual income, the magnitude is, at best, modest to small. Several factors may explain this limited effect. A key limitation is that labor market outcomes often take a long time to fully materialize, and here, I measure annual income only for students employed in Texas between ages 24 and 26 due to data availability. If high-potential earners move out of state, these estimates likely underestimate the true effects of infrastructure improvements. Additionally, the positive impact on income could become more pronounced if measured later in students' careers, once they are more seasoned employees. Infrastructure investments in schools might initially contribute more to non-income-related benefits, such as job readiness or stability, which do not directly translate to higher earnings in the early career years.

In sum, the set of findings so far strongly suggests positive gains from infrastructure improvements, with the effects mainly arising from heavily indebted school districts. This study documents consistent evidence that capital expenditures in these districts lead to enhanced in-school outcomes—such as higher test scores and graduation rates— and early career outcomes, indicating that improvements in facilities may contribute to a more conducive learning environment. By tracing the impact of capital spending on both educational quality and initial labor market engagement, this analysis highlights how strategic investments in school infrastructure can produce both immediate educational benefits and incremental economic gains.

6. Alternative Explanations

The proposed mechanism through which incremental capital investment affects educational outcomes in this paper is the improvement of educational infrastructure. To further explore other channels that could generate observably similar effects, I turn to operational spending and teacher quality.

6.1. Operational Spending

Prior research has shown that additional current expenditures improve academic performance because they influence student learning directly compared to capital projects (e.g., Jackson et al. (2016), Jackson and Mackevicius (2021), and Baron (2022)). Debt-laden school districts may seek to increase operational spending by capitalizing on lower debt service costs following the implementation of debt assistance programs. This raises the possibility that a positive spillover into operational funding (i.e., an increase in current spending) could account for the findings discussed in the previous section.

To examine this, I modify the dependent variables to reflect current spending and its components in equation 2. Table 8 suggests a negative spillover, rather than positive, effect on current expenditures, which at least rules out the operational spending channel. Column 1 shows that three-year operational spending per pupil decreases by \$319. This represents about 1.6% of the average current expenditures over the three-year period (i.e., $\$319/(\$6654\times3)=1.6\%$). Roughly 70% of this reduction is attributable to instructional costs, which is not surprising given that most current expenditures cover teacher wages.

6.2. Teachers

Any positive changes in teacher characteristics could also explain the previous findings, even without incurring extra expenditures. For instance, districts can enhance teaching quality by replacing existing teachers with more experienced ones.

I show that changes in teacher-related outcomes do not drive the main findings. Table 9 reports the estimation results on various instructional teacher characteristics. Columns 1 through 3 indicate that highly leveraged districts hire more teachers, possibly in anticipation of enrollment growth. These districts increase the total number of teachers by 0.5 p.p. without meaningfully losing the existing teachers.

In addition, these newly hired teachers do not appear to be more experienced. Column 4 indicates that teachers in treated districts receive, on average, around $1,890 more in salary. Since these districts are more likely to anticipate rapid enrollment growth, as reported in Table 3, the relatively inelastic short-term supply of teachers may necessitate a salary increase. On the other hand, in columns 5 and 6, teachers in debt-constrained districts have lower experience both in total and within the district. This likely stems from hiring more inexperienced teachers to manage the growth in student population. Consistent with this view, the proportion of teachers with advanced degrees does not differ significantly between highly indebted and less constrained districts, as shown in column 7.

In sum, the findings in this section provide supporting evidence that the observed educational gains are unlikely to be driven by operational spending increases or teacher quality improvements. Instead, these results reinforce the view that capital investment directly contributes to long-term improvements in educational outcomes.

7. Conclusion

As a school district's debt capacity is linked to its local property tax base, this creates stark disparities in the ability to fund improvements to outdated educational facilities. For highly indebted districts, existing financial burdens further compound these challenges, making it nearly impossible to undertake capital improvements without external assistance. As a result, students in these districts are forced to learn in disadvantaged environments, with deteriorating buildings and limited access to modern technology—conditions that hinder educational outcomes and exacerbate existing inequities.

In this paper, I document the critical role of capital investments in enhancing educational outcomes through state debt support. Using the introduction of a series of state-level debt assistance programs, I first demonstrate that additional debt support helps heavily indebted school districts raise capital spending. The state intervention substantially impacts capital investment, with these districts raising their three-year cumulative capital expenditures by 22% relative to less-leveraged counterparts. Moreover, the incremental capital outlays are allocated primarily to construction expenditures rather than equipment purchases, indicating a focus on large-scale infrastructure improvement projects aimed at addressing poor building conditions.

I also document that students benefit in the long run from additional infrastructure projects with state-sponsored capital investment. Despite an initial drop, standardized reading and math scores reveal that improved building conditions have long-term positive impacts on students. The magnitude vastly exceeds what the existing studies relying on close bond elections find and corresponds with what has been observed from the well-known results on current spending. Similarly, incremental capital outlays lead to higher graduation and attendance rates. These positive effects extend to labor market outcomes, where early cohorts experience a temporary decline in earnings, but later cohorts benefit from substantial income gains.

The findings of this study shed light on how lowering the local debt burden can contribute to narrowing the education gap due to poor educational infrastructure. The examples of the IFA and EDA in Texas illustrate how strategic policy interventions can enable highly indebted districts to overcome previous borrowing limitations, resulting in enhanced educational facilities and improved student outcomes. Importantly, this has broader implications beyond school district financing as public goods provision by other types of local governments also hinges on their debt positions. This study underscores the significance of municipal finance policies in shaping residents' well-being and local communities' sustainability.

References

Adelino, M., I. Cunha, and M. A. Ferreira. 2017. "The economic effects of public financing: Evidence from municipal bond ratings recalibration." *The Review of Financial Studies* 30 (9): 3223–3268.

Agrawal, A. K., and D. Kim. 2022. "Municipal bond insurance and public infrastructure: Evidence from drinking water." *Available at SSRN 3813348*.

Alexander, D., and L. Lewis. 2014. "Condition of America's Public School Facilities: 2012-13. First Look. NCES 2014-022.." *National Center for Education Statistics*.

Baron, E. J. 2022. "School spending and student outcomes: Evidence from revenue limit elections in Wisconsin." *American Economic Journal: Economic Policy* 14 (1): 1–39.

Biasi, B., J. Lafortune, and D. Schönholzer. 2023. "Efficiency and Effectiveness of School Capital Investments Across The U.S.."

Boyson, N. M., and W. Liu. 2022. "Public bond issuance and education inequality." *Northeastern U. D'Amore-McKim School of Business Research Paper* (4099121).

Cabral, M., B. Kim, M. Rossin-Slater, M. Schnell, and H. Schwandt. 2021. "Trauma at School: The Impacts of Shootings on Students' Human Capital and Economic Outcomes.", National Bureau of Economic Research.

Card, D., C. Domnisoru, and L. Taylor. 2022. "The intergenerational transmission of human capital: Evidence from the golden age of upward mobility." *Journal of Labor Economics* 40 (S1): S39–S95.

Cellini, S. R., F. Ferreira, and J. Rothstein. 2010. "The value of school facility investments: Evidence from a dynamic regression discontinuity design." *The Quarterly Journal of Economics* 125 (1): 215–261.

Chetty, R., J. N. Friedman, N. Hilger, E. Saez, D. W. Schanzenbach, and D. Yagan. 2011. "How does your kindergarten classroom affect your earnings? Evidence from Project STAR." *The Quarterly journal of economics* 126 (4): 1593–1660.

Chetty, R., N. Hendren, P. Kline, and E. Saez. 2014. "Where is the land of opportunity? The geography of intergenerational mobility in the United States." *The quarterly journal of economics* 129 (4): 1553–1623.

Clark, C. 2001. "Texas state support for school facilities, 1971 to 2001." *Journal of Education Finance* 27 (2): 683–699.

Conlin, M., and P. N. Thompson. 2017. "Impacts of new school facility construction: An analysis of a state-financed capital subsidy program in Ohio." *Economics of Education Review* 59: 13–28.

Cortes, G., I. Cunha, and K. Barbosa. 2022. "A Century of Municipal Bond Financing." *Available at SSRN 4061043*.

Dagostino, R. 2018. "The impact of bank financing on municipalities' bond issuance and the real economy." *Work. Pap., Univ. Rochester, Rochester, NY Google Scholar Article Location*.

Filardo, M. 2021. "State of our schools: America's PK–12 public school facilities." 21st Century School Fund.

Goncalves, F. 2015. "The effects of school construction on student and district outcomes: Evidence from a state-funded program in Ohio." *Available at SSRN 2686828*.

Huggett, M., G. Ventura, and A. Yaron. 2011. "Sources of lifetime inequality." *American Economic Review* 101 (7): 2923–2954.

Jackson, C. K., R. C. Johnson, and C. Persico. 2016. "THE EFFECTS OF SCHOOL SPENDING ON EDUCATIONAL AND ECONOMIC OUTCOMES: EVIDENCE FROM SCHOOL FINANCE REFORMS." *The Quarterly Journal of Economics* 131 (1): 157–218.

Jackson, C. K., and C. Mackevicius. 2021. "The distribution of school spending impacts.", National Bureau of Economic Research.

Kovalenko, A. 2023. "Natural resource booms, human capital, and earnings: Evidence from linked education and employment records." *American Economic Journal: Applied Economics* 15 (2): 184–217.

Lafortune, J., and D. Schönholzer. 2022. "The impact of school facility investments on students and homeowners: Evidence from los angeles." *American Economic Journal: Applied Economics* 14 (3): 254–289.

Martorell, P., K. Stange, and I. McFarlin Jr. 2016. "Investing in schools: capital spending, facility conditions, and student achievement." *Journal of Public Economics* 140: 13–29.

Neilson, C. A., and S. D. Zimmerman. 2014. "The effect of school construction on test scores, school enrollment, and home prices." *Journal of Public Economics* 120: 18–31.

Plummer, E. 2006. "The effects of state funding on property tax rates and school construction." *Economics of Education Review* 25 (5): 532–542.

Posenau, K. 2022. "Debt and water: Effects of bondholder protections on public goods."

Rauscher, E. 2020. "Delayed benefits: Effects of California school district bond elections on achievement by socioeconomic status." *Sociology of Education* 93 (2): 110–131.

Schanzenbach, D. W. 2006. "What have researchers learned from Project STAR?" *Brookings papers on education policy* (9): 205–228.

Tiebout, C. M. 1956. "A pure theory of local expenditures." *Journal of political economy* 64 (5): 416–424.

Yi, H. L. 2021. "Financing public goods." *Available at SSRN 3907391*.

FIGURE 1. Average I&S Tax Rates in the 1994-2006 period.
This figure plots the average I&S tax rates, a part of property tax rates dedicated to debt service, from 1994 to 2006.

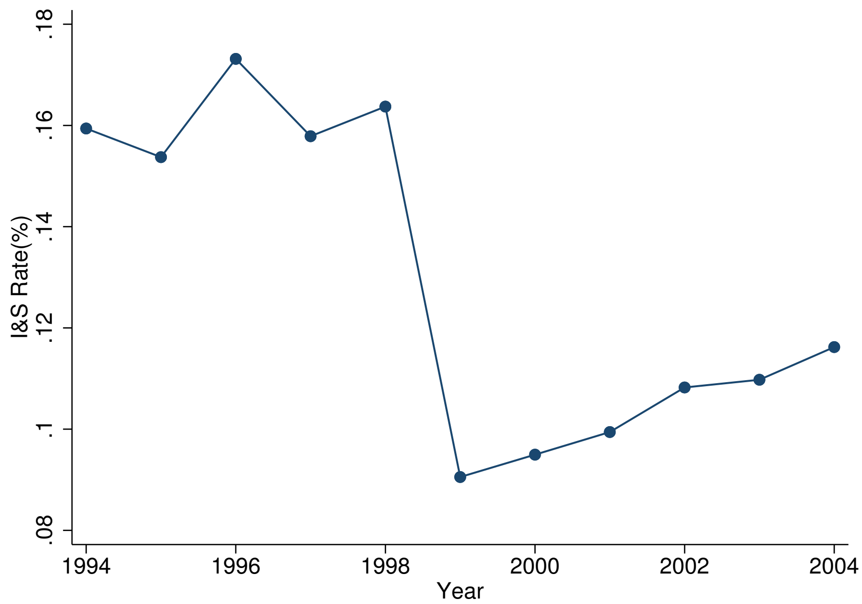


FIGURE 2. Average State Debt Assistance in the 1996-2004 period.
This figure plots the average state debt assistance as a fraction of annual debt service payments between 1996 and 2004. Debt assistance includes debt subsidies from both IFA and EDA. Annual debt service payments are defined as the sum of the amount of long-term debt retired and interest payments, subtracted by the changes in the sinking fund balance.

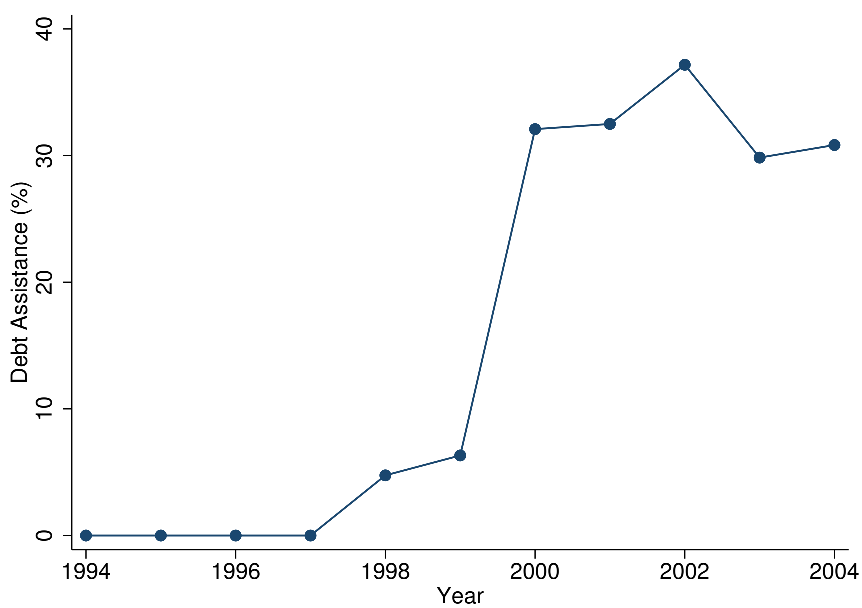


FIGURE 3. Average per pupil Capital Spending Relative to Issuance Year.
This figure shows the average per pupil capital spending relative to the issuance year. Year 0 represents the year of bond issuance.

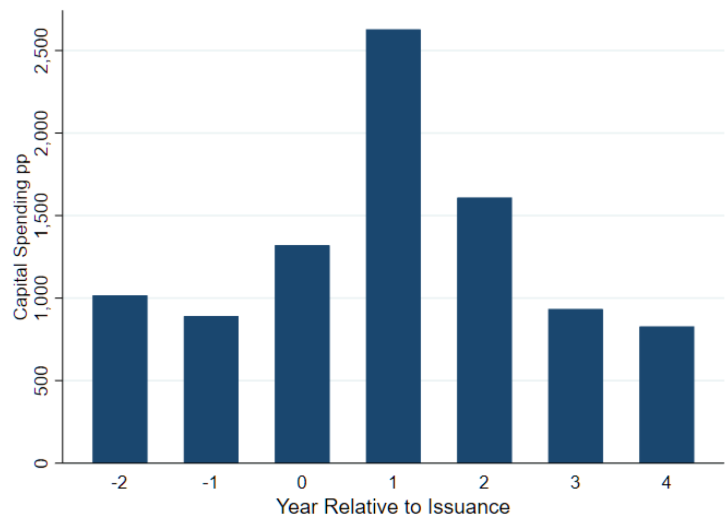


FIGURE 4. IFA Funding Recipients in the 1996-2006 period.
This figure plots the districts receiving IFA assistance as a fraction of the total number of school districts in each group defined by *DTL* $High_i$ between 1996 and 2006. The blue line indicates the average percentage of IFA funding approval among districts with low ex-ante borrowing constraints (*DTL* $High_i = 0$). The red line indicates the average percentage of IFA funding approval among districts with high ex-ante borrowing constraints (*DTL* $High_i = 1$).

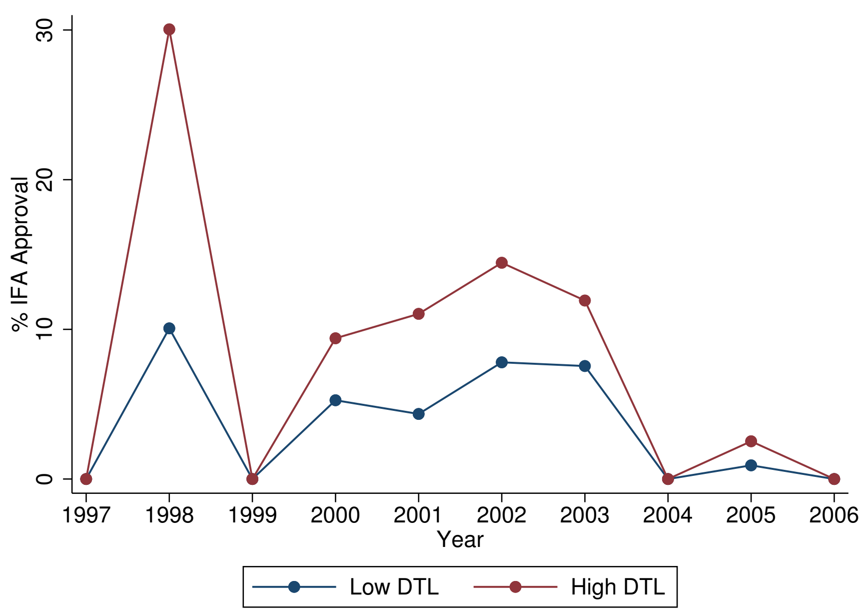


FIGURE 5. First Stage Estimation Results.
This figure plots coefficient estimates and 95% confidence intervals from the following first stage of the IV approach: $Annual\_Cap_{i,t} = \sum_{j \neq 1997} \pi_j (DTL\ High_i \times \mathbf{1}_{t=j}) + \Pi C_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t}$. The dependent variable is annual per pupil capital spending. The coefficient estimate is allowed to vary by year where the reference point is the year 1997. $DTL\ High_i$ takes a value of 1 if the district has an average outstanding net long-term debt-to-property tax levy ratio in the 1987-1991 period that is above the median and 0 otherwise. Control variables in $C_{i,t}$ include the imputed eligibility using the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. α_i and α_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors clustered at the district level.

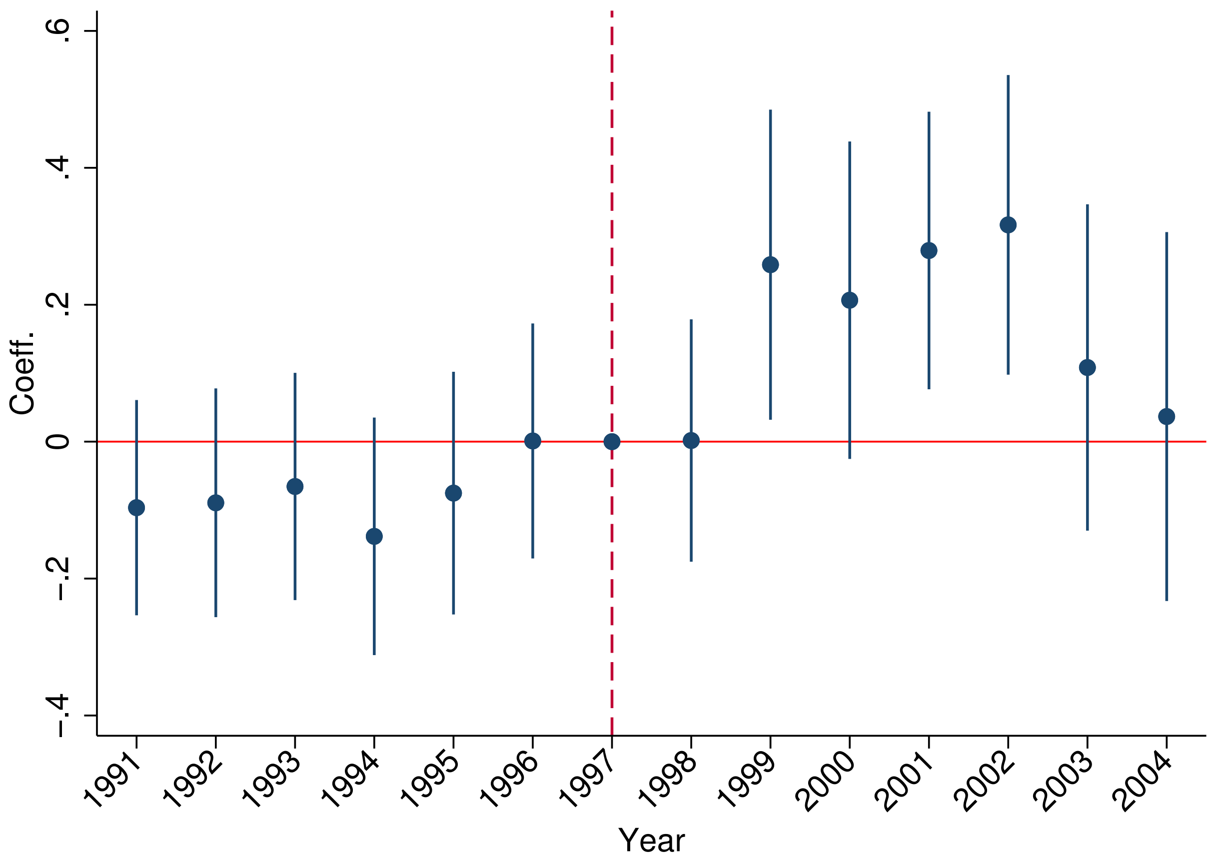


FIGURE 6. Geographical Distribution of School Districts by Indebtedness.
This figure shows the geographical distribution of school districts by *DTL High*, which takes a value of 1 if the district has an average outstanding net long-term debt-to-property tax levy ratio in the 1987-1991 period that is above the median and 0 otherwise. White indicates districts that are not included in the sample.

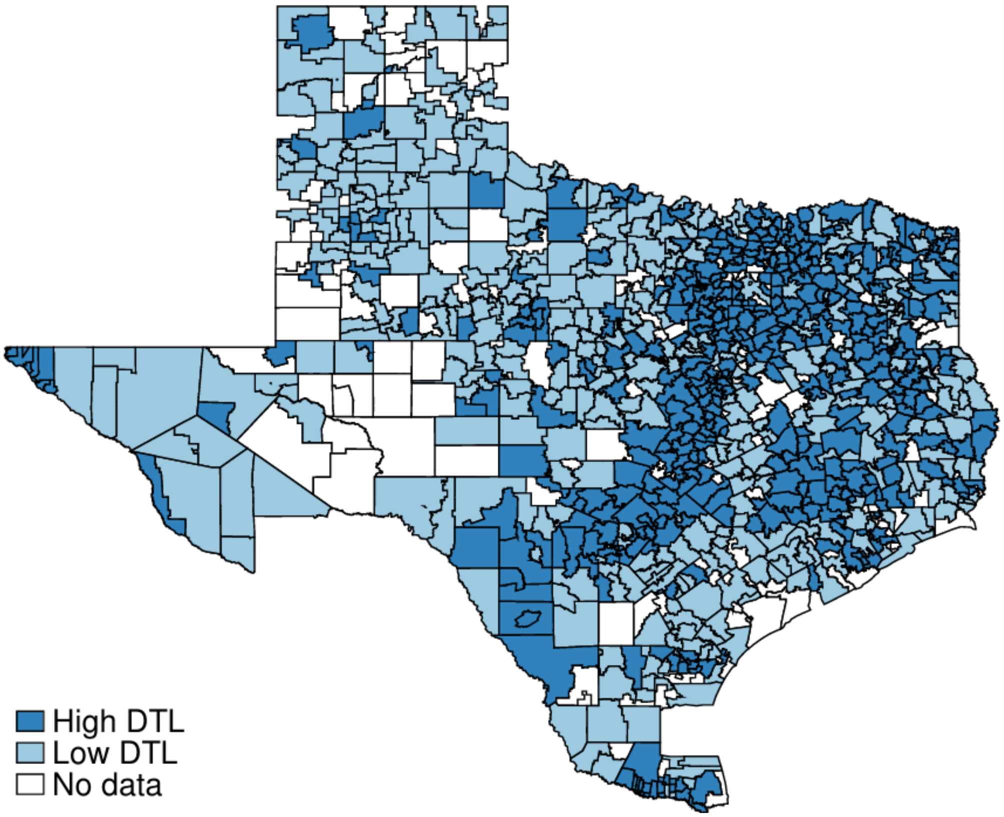
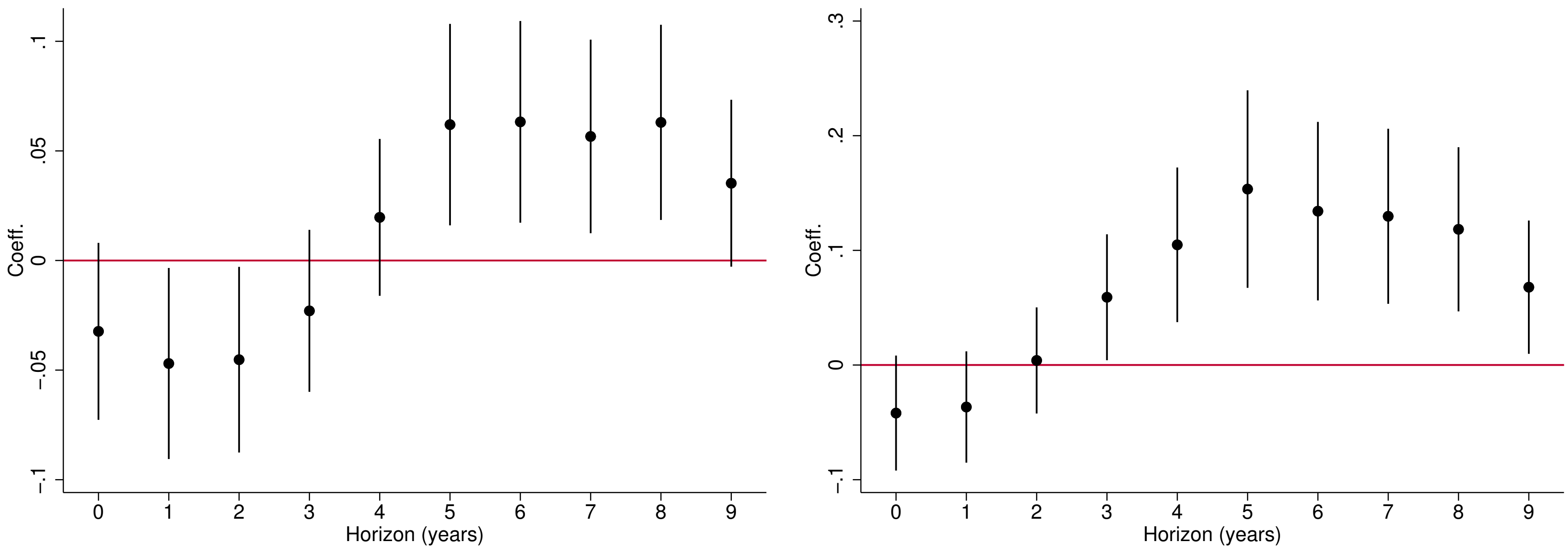


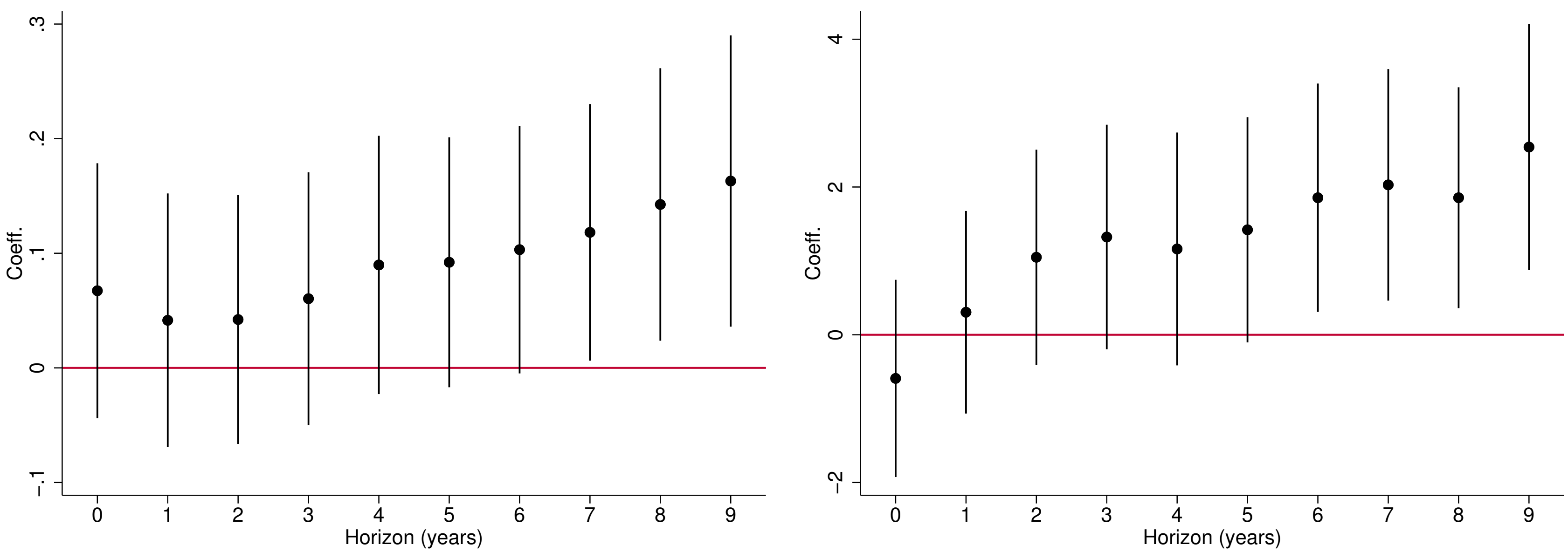
FIGURE 7. Effect of Debt Relief on Standardized Test Scores.
This figure plots coefficient estimates and 95% confidence intervals from the following second stage of the IV approach: $Y_{i,t+h} = \beta^h \widehat{Cap_{i,t}} + \Gamma^h C_{i,t} + \delta_i^h + \delta_t^h + u_{i,t+h}$, across horizons h=0,1,...,9. The dependent variables are standardized 8th-grade reading scores in panel A and math scores in panel B. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility using the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are clustered at the district level.



a. Reading Scores

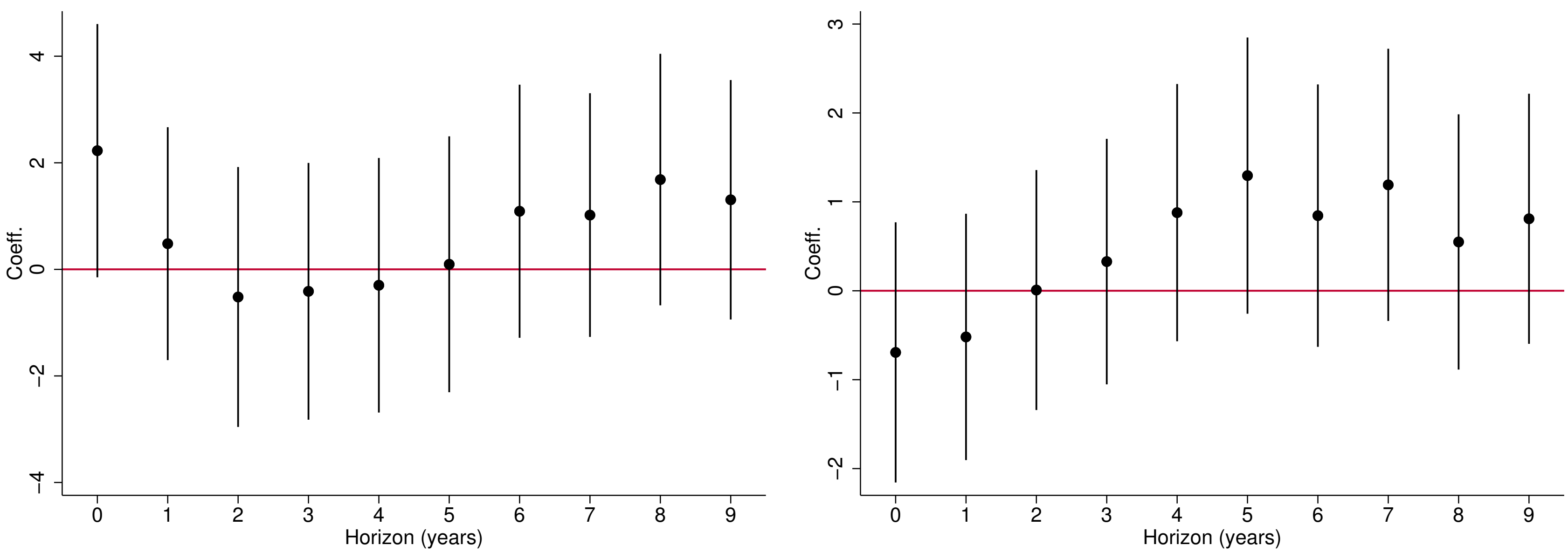
b. Math Scores

FIGURE 8. Effect of Debt Relief on Non-test Outcomes: Attendance and Graduation.
This figure plots coefficient estimates and 95% confidence intervals from the following second stage of the IV approach: $Y_{i,t+h} = \beta^h \widehat{Cap_{i,t}} + \Gamma^h C_{i,t} + \delta_i^h + \delta_t^h + u_{i,t+h}$, across horizons h=0,1,...,9. The dependent variables are attendance rates in panel A and graduation rates in panel B. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility using the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are clustered at the district level.



a. Attendance (%) b. Graduation (%)

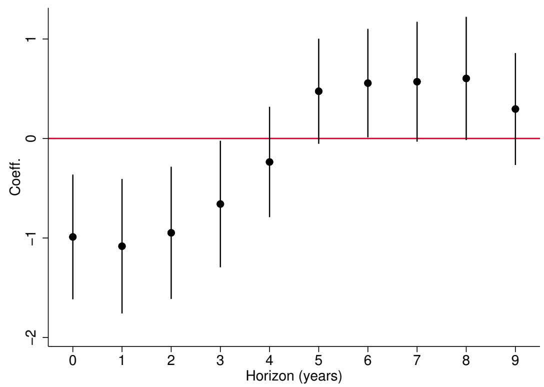
FIGURE 9. Effect of Debt Relief on Non-test Outcomes: College Exam Participation and Enrollment. This figure plots coefficient estimates and 95% confidence intervals from the following second stage of the IV approach: $Y_{i,t+h} = \beta^h \widehat{Cap_{i,t}} + \Gamma^h C_{i,t} + \delta_i^h + \delta_t^h + u_{i,t+h}$, across horizons h=0,1,...,9. The dependent variables are college entrance exam participation rates in panel A, and college enrollment rates in panel B. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility using the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are clustered at the district level.



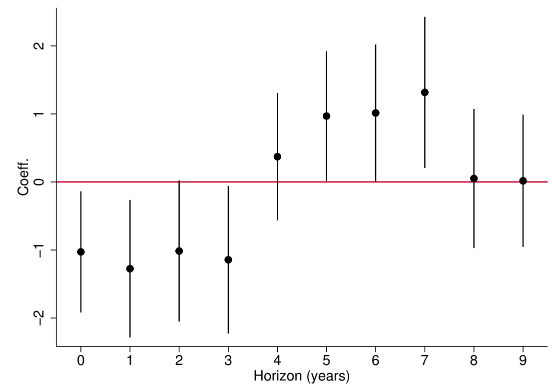
a. College Exam Participation (%)

b. College Enrollment (%)

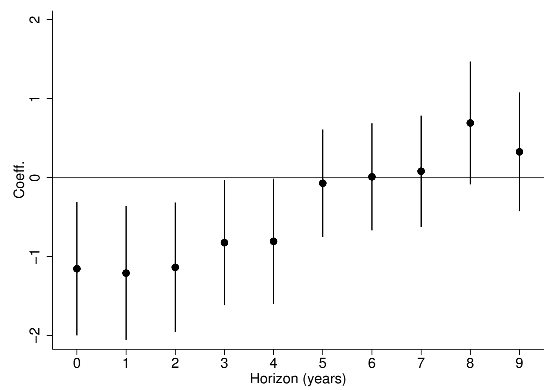
FIGURE 10. Effect of Debt Relief on Labor Market Outcomes.
This figure plots coefficient estimates and 95% confidence intervals from the following second stage of the IV approach: $Y_{i,t+h} = \beta^h \widehat{Cap_{i,t}} + \Gamma^h C_{i,t} + \delta_i^h + \delta_t^h + u_{i,t+h}$, across horizons h=0,1,...,9. The dependent variables are, measured in thousands of dollars, the average annual income at ages 24-26 in Panel A, the average annual income at ages 24-26 among students enrolled in college in Panel B, and the average annual income at ages 24-26 among high school graduates who did not enroll in college in Panel C. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility using the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are clustered at the district level.



a. Age 24-26 Wage ($1,000)



b. Age 24-26 Wage ($1,000) - HS



c. Age 24-26 Wage ($1,000) - Coll

TABLE 1. Summary Statistics

This table provides descriptive statistics at the district-year level. The sample consists of independent school districts in Texas from 1994 to 2004. *DTL* is the ratio of the outstanding long-term debt to property tax revenues. *DTL 1987-1991* is defined as the average *DTL* in the 1987-1991 period. *Subsidy-to-Debt Payment* is calculated as the sum of state debt funding divided by the annual debt service payment. *Property Wealth* is the taxable property value per pupil. *% Eligible* is the imputed eligibility based on the allocation formula. *% Local Rev* is local revenues as a fraction of total revenues. *Capital* and *Current* are capital and current expenditures, respectively. *Reading* and *Math* are the district averages of standardized 8th-grade reading and math scores, respectively. *LT Debt* is defined as outstanding long-term debt. *Cash-to-Current Exp.* represents cash holdings scaled by current expenditures. *Attendance* is the district-average attendance rate. *Graduation* is the high school graduation rate among 12th-grade cohorts. *College Exam Participation* is the college entrance exam participation rate. *College Enrollment* is calculated as a fraction of 12th-grade students who enroll in any two-year or four-year institutions within three years of graduation. *Age 24-26 Wage* is the average annual income at ages 24-26. All spending variables are in 2000 dollars.

	Mean	SD	p25	p50	p75
DTL 1987-1991	1.20	1.3	0.16	0.88	1.89
Subsidy-to-Debt Payment	0.16	0.3	0	0	0.25
Property Wealth ($ K/pp)	229	290	107	155	237
% Eligible	53.8	26.6	39.4	60.8	74.2
Total Revenue ($/pp)	8100.1	3469.7	6598.3	7350.3	8400.6
% Local Rev	42.2	21.3	26.2	36.5	53.4
Total Expenditure ($/pp)	8151.6	3397.7	6452.3	7363.8	8764.7
Current ($/pp)	6654.0	1664.6	5639.7	6309.7	7188.5
Capital ($/pp)	974.8	1394.8	246.9	495.9	1132.9
LT Debt ($/pp)	3107.7	3966.1	0	1949.9	4708.9
Cash-to-Current Exp.	0.37	0.4	0.19	0.29	0.44
Reading (σ)	0.061	0.3	-0.11	0.089	0.26
Math (σ)	0.063	0.3	-0.14	0.081	0.28
Attendance (%)	95.9	0.8	95.4	95.9	96.5
Graduation (%)	74.4	12.6	66.7	74.4	82.5
College Exam Tested (%)	62.7	15.9	52.1	62.2	73.5
College Enroll (%)	45.6	12.0	37.5	45.0	53.1
Age 24-26 Wage ($)	24299.6	4709.2	21117.2	23948.7	27001.7

TABLE 2. First Stage Estimation Results.
This table reports coefficient estimates from the following first stage of the IV approach: $Cap_{i,t} = \pi(DTL\ High_i \times Post_t) + \Pi C_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t}$. The dependent variable is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. Columns 1 and 2 estimate the first stage without and with control variables, respectively. $DTL\ High_i$ takes a value of 1 if the district has an average outstanding net long-term debt-to-property tax levy ratio in the 1987-1991 period that is above the median and 0 otherwise. $Post_t$ is an indicator denoting if t is greater than or equal to 1998. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. α_i and α_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	(1)	(2)
Dep. Var.: Capital Spending($1,000)		
DTL High × Post	0.610***	0.569***
	(0.143)	(0.138)
% Eligible		-0.011**
		(0.005)
Cash-to-Current Exp.		3.115***
		(0.287)
Log Current Exp. pp		-0.852*
		(0.506)
Size FE	Yes	Yes
District FE	Yes	Yes
Year FE	Yes	Yes
Adj R^2	0.32	0.35
Obs	9590	9590
F-stats	18	17

TABLE 3. Correlations between Local Economy Growth Measures and Treatment Assignment.

This table reports coefficient estimates from the following cross-sectional regression equation: $\Delta Y_i = \rho\ DTL\ High_i + \Gamma \Delta C_i + \epsilon_i$. The dependent variables are a log of per capita income growth, a log of median household income growth, unemployment rate growth, and a log of total employment growth between 1990 and 2000. $DTL\ High_i$ takes a value of 1 if the district has an average outstanding net long-term debt-to-property tax levy ratio in the 1987-1991 period that is above the median and 0 otherwise. Control variables in $C_{i,t}$ include changes in the enrollment size quartile, growth rates of the local share of total revenue per pupil, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. Heteroskedasticity-consistent standard errors are presented in parentheses. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

Dep. Var.:	(1) Log Per Capita Income90_00	(2) Log HH Med Income90_00	(3) Unemployment Rate90_00	(4) Log Employment90_00
DTL High	0.002	0.003	-0.003	0.150***
	(0.011)	(0.009)	(0.002)	(0.013)
Controls	Yes	Yes	Yes	Yes
Adj. R^2	0.00	0.01	-0.00	0.21
Obs.	860	861	856	856

TABLE 4. First Stage Estimation Results by Each Category.

This table reports coefficient estimates from the following first stage of the IV approach: $Cap_{i,t} = \pi(DTL\ High_i \times Post_t) + \Pi C_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t}$. The dependent variables are the three-year cumulative spending on construction, equipment, and land and existing structures in thousands of 2000 dollars.. $DTL\ High_i$ takes a value of 1 if the district has an average outstanding net long-term debt-to-property tax levy ratio in the 1987-1991 period that is above the median and 0 otherwise. $Post_t$ is an indicator denoting if t is greater than or equal to 1998. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. α_i and α_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	(1) Construction	(2) Equipment	(3) Land and Existing Structures
DTL High × Post	0.486***	0.036*	0.014*
	(0.132)	(0.020)	(0.008)
Controls	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adj R^2	0.33	0.55	0.37
Obs.	9590	9590	9590

TABLE 5. Effect of Debt Relief on Test Scores.

This table reports coefficient estimates from the following second stage of the IV approach: $\bar{Y}_{i,t} = \beta\widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are standardized 8th-grade reading scores in columns 1 and 2 and math scores in columns 3 and 4. In particular, the dependent variables are the average between t and $t+4$ in columns 1 and 3, and between $t+5$ and $t+9$ in columns 2 and 4. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Reading (σ)		Math (σ)	
	(1)	(2)	(3)	(4)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending($1,000)	-0.025	0.057***	0.018	0.121***
	(0.015)	(0.020)	(0.019)	(0.034)
Controls	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	9590	9589	9590	9589
F-stat	17	17	17	17

TABLE 6. Effect of Debt Relief on Non-test Outcomes.
This table reports coefficient estimates from the following second stage of the IV approach: $\bar{Y}_{i,t} = \beta\widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are attendance rates in columns 1 and 2, graduation rates in columns 3 and 4, college entrance exam participation rates in columns 5 and 6, and college enrollment rates in columns 7 and 8. In particular, the dependent variables represent the average values from t to $t+4$ in odd columns and from $t+5$ to $t+9$ in even columns. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Attendance (%)		Graduation (%)		College Exam Tested (%)		College Enrollment (%)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending($1,000)	0.060	0.123**	0.553	1.938***	0.248	1.290	-0.042	0.942
	(0.048)	(0.052)	(0.536)	(0.686)	(0.916)	(1.011)	(0.551)	(0.625)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	9590	9590	9590	9590	9557	9575	9590	9590
F-stat	17	17	17	17	19	18	17	17

TABLE 7. Effect of Debt Relief on Labor Market Outcomes.
This table reports coefficient estimates from the following second stage of the IV approach: $\bar{Y}_{i,t} = \beta\widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are the log of the average annual income for individuals aged 24–26 working in Texas. These include all individuals (columns 1 and 2), high school dropouts (columns 3 and 4), high school graduates not enrolled in college (columns 5 and 6), and college enrollees (columns 7 and 8), with averages calculated over t to $t+4$ in odd columns and $t+5$ to $t+9$ in even columns. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Age 24-26 Wage		Age 24-26 Wage - DO		Age 24-26 Wage - HS		Age 24-26 Wage - Coll	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending($1,000)	-0.030***	0.020**	0.010	0.041	-0.028*	0.029*	-0.035***	0.008
	(0.010)	(0.009)	(0.022)	(0.027)	(0.015)	(0.016)	(0.011)	(0.008)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	6974	6974	6967	6970	6974	6974	6974	6974
F-stat	22	22	22	21	22	22	22	22

TABLE 8. First Stage Estimation Results: Operational Spending.
This table reports coefficient estimates from the following first stage of the IV approach: $Cur_{i,t} = \pi(DTL\ High_i \times Post_t) + \Pi C_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t}$. The dependent variable is the three-year cumulative total operating, instructional, support services, and other spending per pupil in thousands of 2000 dollars. $DTL\ High_i$ takes a value of 1 if the district has an average outstanding net long-term debt-to-property tax levy ratio in the 1987-1991 period that is above the median and 0 otherwise. $Post_t$ is an indicator denoting if t is greater than or equal to 1998. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. α_i and α_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	(1) Current	(2) Instruction	(3) Support Services	(4) Other
DTL High × Post	-0.319***	-0.223***	-0.089***	0.000
	(0.047)	(0.030)	(0.022)	(0.004)
Controls	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj R^2	0.92	0.91	0.90	0.88
Obs.	9590	9590	9590	9590

TABLE 9. First Stage Estimation Results: Teacher Quality.
This table reports coefficient estimates from the following first stage of the IV approach:
$Tch_{i,t} = \pi(DTL\ High_i \times Post_t) + \Pi C_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t}$. The dependent variables include the student-teacher ratio, the percentage change in the number of teachers, the turnover ratio, the average teacher salary in thousands of 2000 dollars, total years of teacher experience, years of experience within the district, and the proportions of teachers holding bachelor's, master's, or doctoral degrees. $DTL\ High_i$ takes a value of 1 if the district has an average outstanding net long-term debt-to-property tax levy ratio in the 1987-1991 period that is above the median and 0 otherwise. $Post_t$ is an indicator denoting if t is greater than or equal to 1998. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. α_i and α_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	(1) Student-Teacher Ratio	(2) Δ% Teacher	(3) Teacher Turnover (%)	(4) Salary ($1,000)	(5) Experience (Yr)	(6) Experience in District (Yr)	(7) Higher Degree (%)
DTL High × Post	0.019	0.531**	0.312	0.186***	-0.202***	-0.202***	0.089
	(0.030)	(0.228)	(0.252)	(0.044)	(0.047)	(0.037)	(0.193)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj R^2	0.90	0.19	0.37	0.84	0.74	0.82	0.78
Obs.	9590	8726	9590	9585	9590	9590	9590

Appendix A. Tables and Figures

FIGURE A1. 1997 Elgin ISD Debt Payment Schedule
This figure is an example of a debt payment schedule from the Elgin ISD in 1997.

Fiscal Year Ending 8/31	Outstanding Debt(a)			The Bonds				% of Principal Retired
	Principal	Interest	Total	Principal	Interest	Total	Total	
1998	$ 53,000	$ 212,000	$ 265,000	$ -	$ 300,290	$ 300,290	$ 565,290	
1999	46,202	223,796	269,998	-	794,885	794,885	1,064,883	
2000	40,263	234,739	275,002	-	794,885	794,885	1,069,887	
2001	34,449	240,549	274,998	-	794,885	794,885	1,069,883	
2002	39,121	325,882	365,003	-	794,885	794,885	1,159,888	1.34%
2003				-	794,885	794,885	794,885	
2004				375,000	786,729	1,161,729	1,161,729	
2005				395,000	769,784	1,164,784	1,164,784	
2006				440,000	750,985	1,190,985	1,190,985	
2007				465,000	730,164	1,195,164	1,195,164	11.89%
2008				485,000	707,955	1,192,955	1,192,955	
2009				510,000	684,318	1,194,318	1,194,318	
2010				535,000	659,238	1,194,238	1,194,238	
2011				560,000	632,398	1,192,398	1,192,398	
2012				590,000	603,648	1,193,648	1,193,648	28.76%
2013				620,000	573,398	1,193,398	1,193,398	
2014				655,000	541,195	1,196,195	1,196,195	
2015				690,000	506,898	1,196,898	1,196,898	
2016				725,000	470,453	1,195,453	1,195,453	
2017				765,000	431,713	1,196,713	1,196,713	50.51%
2018				805,000	390,893	1,195,893	1,195,893	
2019				850,000	347,863	1,197,863	1,197,863	
2020				900,000	302,138	1,202,138	1,202,138	
2021				950,000	253,575	1,203,575	1,203,575	
2022				1,000,000	202,388	1,202,388	1,202,388	
2023				1,060,000	148,313	1,208,313	1,208,313	
2024				1,115,000	91,219	1,206,219	1,206,219	
2025				1,180,000	30,975	1,210,975	1,210,975	100.00%
	$ 213,035	$ 1,236,965	$ 1,450,000	$ 15,670,000	$ 14,890,947	$ 30,560,947	$ 32,010,948	

FIGURE A2. 2022 AISD Bond Proposal Construction Schedule
This figure is an example of a construction schedule from the Austin ISD's 2022 bond proposal.

BOND PROGRAM AUSTIN ISD 2022

2022 Bond Schedule: Campus Architectural Team Projects

TABLE KEY
ST: Design Start
OP: Estimated School Opening

SCHOOL	PROJECT TYPE	2023				2024				2025				2026				2027				2028			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
COOK ELEMENTARY SCHOOL	OPEN CONCEPT		ST									OP													
OAK HILL ELEMENTARY SCHOOL	OPEN CONCEPT		ST									OP													
ODOM ELEMENTARY SCHOOL	OPEN CONCEPT		ST							OP															
WILLIAMS ELEMENTARY SCHOOL	OPEN CONCEPT		ST									OP													
ALLISON ELEMENTARY SCHOOL	FULL MODERNIZATION		ST											OP											
BURNET MIDDLE SCHOOL	FULL MODERNIZATION		ST															OP							
HARRIS ELEMENTARY SCHOOL	FULL MODERNIZATION		ST											OP											
HOUSTON ELEMENTARY SCHOOL	FULL MODERNIZATION		ST											OP											
LINDER ELEMENTARY SCHOOL	FULL MODERNIZATION		ST											OP											
PECAN SPRINGS ELEMENTARY SCHOOL	FULL MODERNIZATION		ST											OP											
SADLER MEANS YOUNG WOMEN'S LEADERSHIP ACADEMY	FULL MODERNIZATION		ST															OP							
TRAVIS EARLY COLLEGE HIGH SCHOOL	FULL MODERNIZATION		ST																					OP	
WOOTEN ELEMENTARY SCHOOL	FULL MODERNIZATION		ST											OP											
ANDERSON HIGH SCHOOL	PHASED MODERNIZATION			ST										OP											
CROCKETT EARLY COLLEGE HIGH SCHOOL	PHASED MODERNIZATION			ST														OP							
LANGFORD ELEMENTARY SCHOOL	FULL MODERNIZATION			ST												OP									
LBJ EARLY COLLEGE HIGH SCHOOL	PHASED MODERNIZATION			ST																		OP			
MCCALLUM HIGH SCHOOL	PHASED MODERNIZATION			ST														OP							
NORTHEAST EARLY COLLEGE HIGH SCHOOL	PHASED MODERNIZATION			ST																		OP			
BARRINGTON ELEMENTARY SCHOOL	FULL MODERNIZATION				ST											OP									
CLIFTON CAREER DEVELOPMENT SCHOOL	COMPREHENSIVE				ST									OP											
DOBIE MIDDLE SCHOOL	PHASED MODERNIZATION				ST									OP											
MARTIN MIDDLE SCHOOL	PHASED MODERNIZATION				ST															OP					
OAK SPRINGS ELEMENTARY SCHOOL	FULL MODERNIZATION				ST											OP									
NELSON FIELD	COMPREHENSIVE					ST									OP										
AKINS EARLY COLLEGE HIGH SCHOOL	COMPREHENSIVE						ST								OP										
NAVARRO EARLY COLLEGE HIGH SCHOOL	PHASED MODERNIZATION						ST													OP					
WOOLDRIDGE ELEMENTARY SCHOOL	FULL MODERNIZATION						ST											OP							
AUSTIN HIGH SCHOOL	PHASED MODERNIZATION							ST										OP							
YELLOW JACKET STADIUM	COMPREHENSIVE								ST						OP										
ANDREWS ELEMENTARY SCHOOL	FULL MODERNIZATION								ST													OP			
NELSON BUS TERMINAL	COMPREHENSIVE									ST									OP						
O. HENRY MIDDLE SCHOOL	PHASED MODERNIZATION									ST														OP	
HILL ELEMENTARY SCHOOL	PHASED MODERNIZATION										ST											OP			
DELCO ACTIVITY CENTER	COMPREHENSIVE												ST									OP			

Project timelines were determined by prioritizing safety and security, historically underserved communities, construction timelines and cost savings. The design start and estimated open dates are subject to change based on factors such as supply chain, weather, site development permitting, unforeseen construction conditions, etc.

In addition to the projects listed, there are **300+ targeted projects** which will be implemented as part of the 2022 Bond. For more information, visit **AISDFuture.com** and the **FAQ**.

Revised September 2023 - Design start and estimated opening dates are subject to change.

FIGURE A3. Potential Debt Assistance and Taxable Property Value per pupil.
This figure shows the relationship between the potential state contribution as a fraction of the debt service payments on the approved bond and the taxable property value per pupil in 1997. The sample is the universe of school districts in Texas.

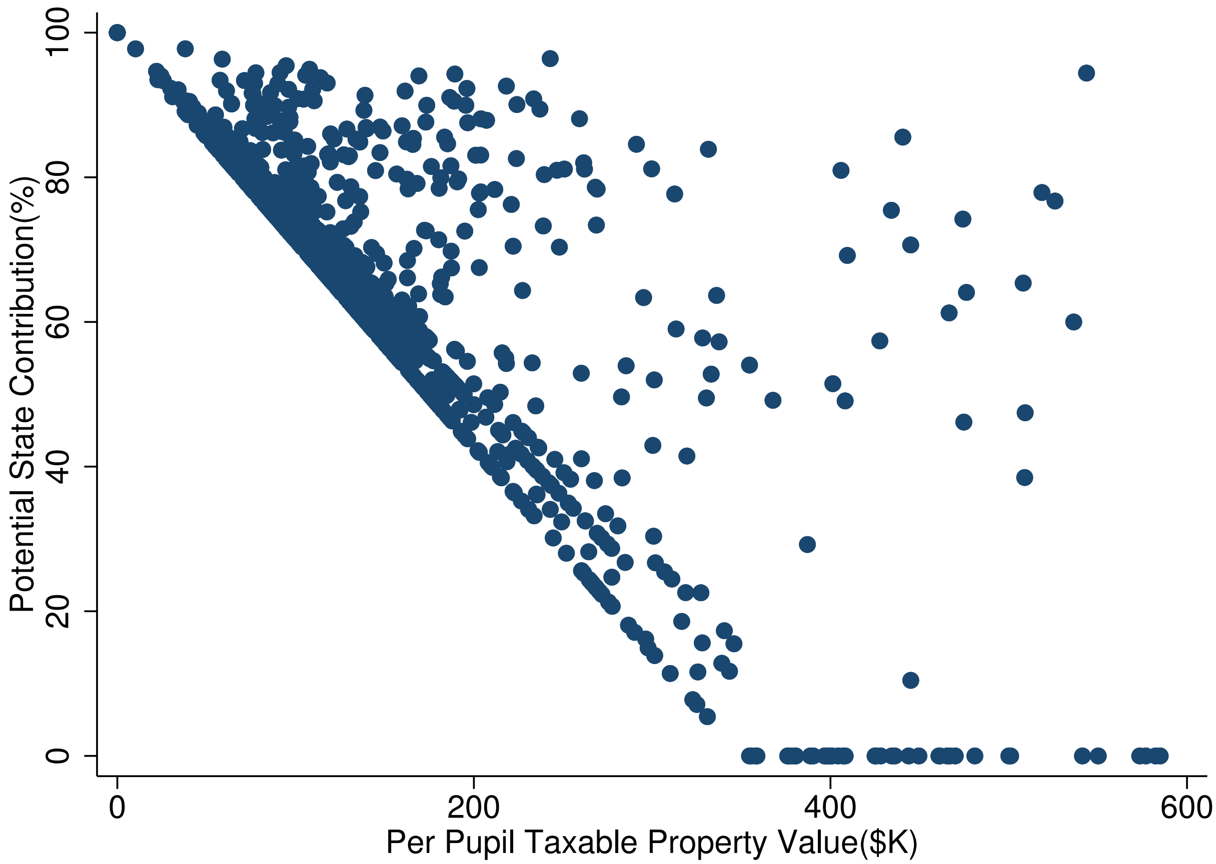


FIGURE A4. First Stage Estimation Results Using State Debt Support.
This figure plots coefficient estimates and 95% confidence intervals from the following first stage of the IV approach: $DA_{i,t} = \sum_{j \neq 1997} \pi_j (DTL\ High_i \times \mathbf{1}_{t=j}) + \Pi C_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t}$. The dependent variable is the fraction of annual debt service payments supported by the state. The coefficient estimate is allowed to vary by year where the reference point is the year 1997. $DTL\ High_i$ takes a value of 1 if the district has an average outstanding net long-term debt-to-property tax levy ratio in the 1987-1991 period that is above the median and 0 otherwise. Control variables in $C_{i,t}$ include the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures.α_i and α_t are district dummies and year dummies, respectively. Diamond plots indicate that heteroskedasticity-consistent standard errors are used. Square plots indicate that standard errors are clustered at the school district level. All variables are winsorized at the 1st and 99th percentile.

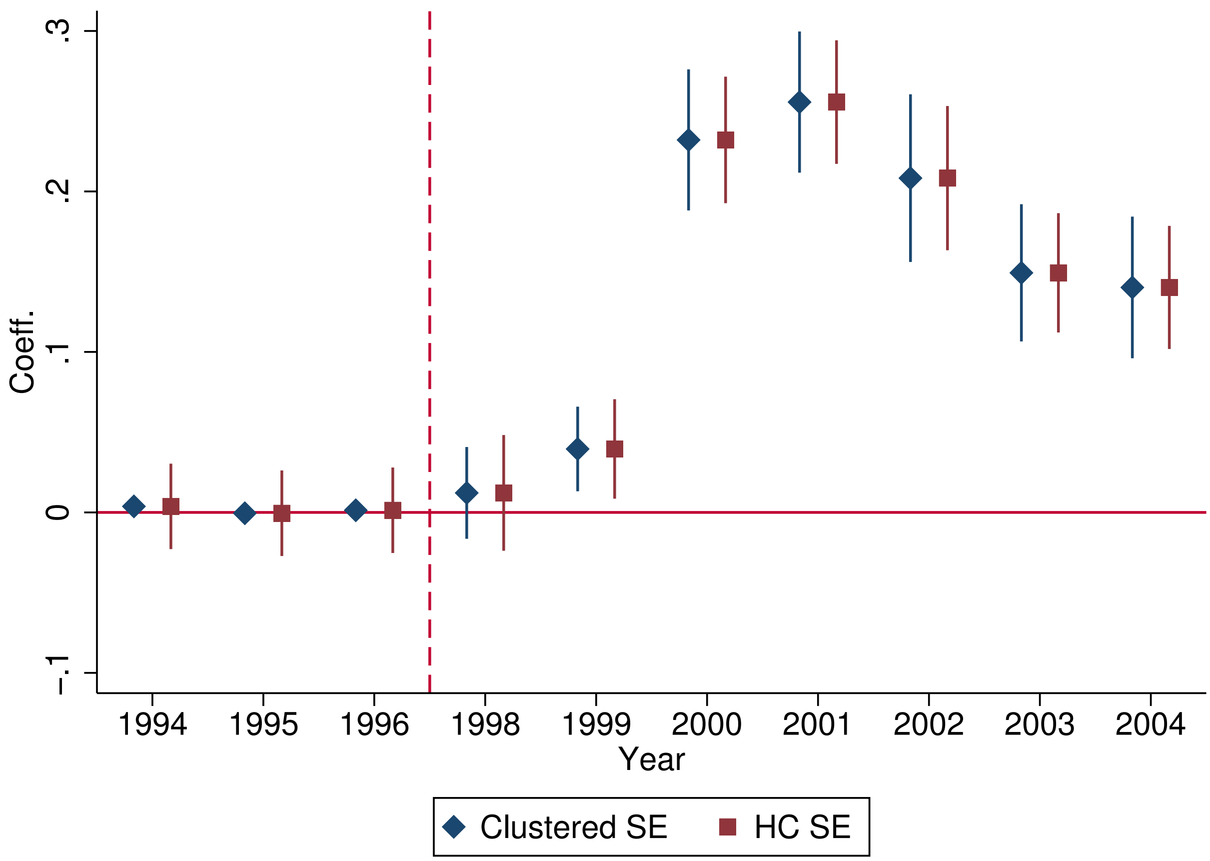


FIGURE A5. Geographical Distribution of School Districts by Oil Property Value per pupil.
This figure shows the geographical distribution of school districts by taxable oil and gas property values per pupil as of 1994.

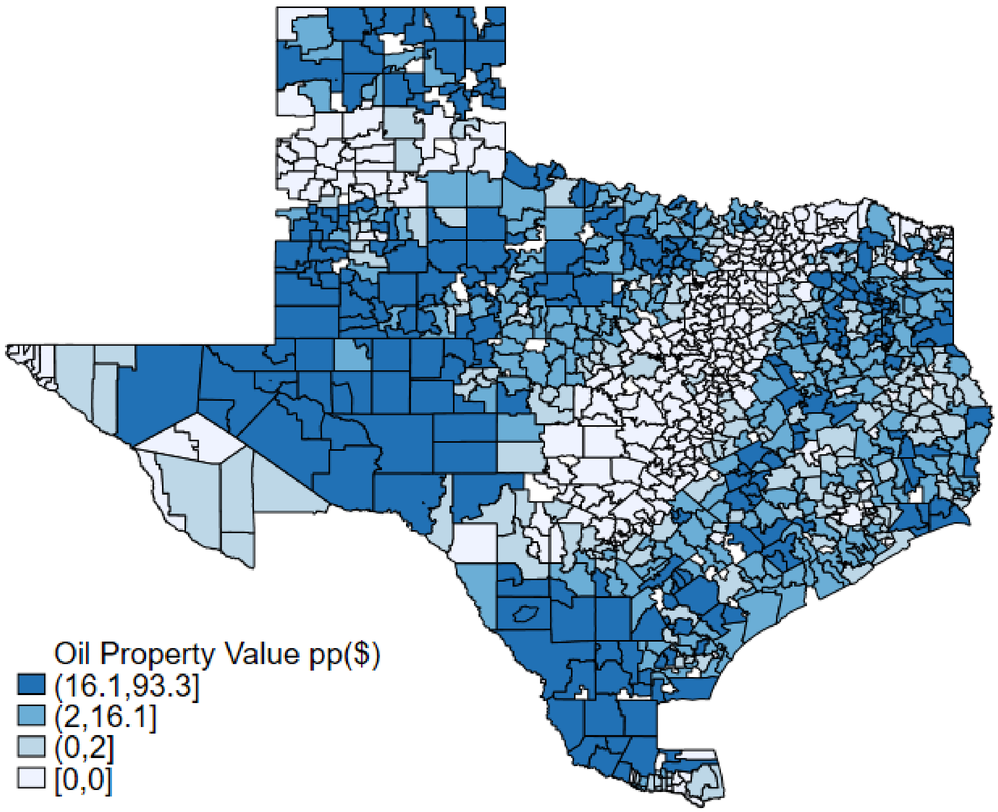


TABLE A1. Effect of Debt Relief on Test Scores - Robustness Checks Controlling for the 1990 Employment × Linear Trends.
This table reports coefficient estimates from the following second stage of the IV approach: $\bar{Y}_{i,t} = \beta\widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are standardized 8th-grade reading scores in columns 1 and 2 and math scores in columns 3 and 4. In particular, the dependent variables are the average between t and $t+4$ in columns 1, 3, and 5, and between $t+5$ and $t+9$ in columns 2, 4, and 6. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, cash holdings scaled by current expenditures, and the interaction term between the log of 1990 employment and linear trends. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Reading		Math	
	(1)	(2)	(3)	(4)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending($1,000)	-0.019	0.069***	-0.012	0.135***
	(0.019)	(0.026)	(0.024)	(0.046)
Controls	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	9524	9523	9524	9523
F-stat	11.41	11.39	11.41	11.39

TABLE A2. Effect of Debt Relief on Non-test Outcomes - Robustness Checks Controlling for the 1990 Employment × Linear Trends.

This table reports coefficient estimates from the following second stage of the IV approach: $\bar{Y}_{i,t} = \beta\widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are graduation rates in columns 1 and 2, college entrance exam participation rates in columns 3 and 4, and college enrollment rates in columns 5 and 6. In particular, the dependent variables are the average between t and $t+4$ in columns 1, 3, and 5, and between $t+5$ and $t+9$ in columns 2, 4, and 6. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, cash holdings scaled by current expenditures, and the interaction term between the log of 1990 employment and linear trends. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Graduation (%)		College Exam Tested (%)		College Enroll (%)	
	(1)	(2)	(3)	(4)	(5)	(6)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending($1,000)	0.033	1.707**	0.420	2.077	0.593	1.995**
	(0.603)	(0.772)	(1.091)	(1.322)	(0.655)	(0.912)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	9524	9524	9491	9509	9524	9524
F-stat	11.41	11.41	12.63	12.03	11.41	11.41

TABLE A3. Effect of Debt Relief on Test Scores - Robustness Checks Controlling for the Enrollment Size Directly.

This table reports coefficient estimates from the following second stage of the IV approach: $\bar{Y}_{i,t} = \beta\widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are standardized 8th-grade reading scores in columns 1 and 2 and math scores in columns 3 and 4. In particular, the dependent variables are the average between t and $t+4$ in columns 1, 3, and 5, and between $t+5$ and $t+9$ in columns 2, 4, and 6. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the log of enrollment size, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Reading		Math	
	(1)	(2)	(3)	(4)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending($1,000)	-0.029	0.037*	-0.015	0.073**
	(0.019)	(0.020)	(0.022)	(0.031)
Controls	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	8666	8666	8666	8666
F-stat	12.65	12.65	12.65	12.65

TABLE A4. Effect of Debt Relief on Non-test Outcomes - Robustness Checks Controlling for the Enrollment Size Directly.

This table reports coefficient estimates from the following second stage of the IV approach: $\bar{Y}_{i,t} = \beta \widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are graduation rates in columns 1 and 2, college entrance exam participation rates in columns 3 and 4, and college enrollment rates in columns 5 and 6. In particular, the dependent variables are the average between t and $t+4$ in columns 1, 3, and 5, and between $t+5$ and $t+9$ in columns 2, 4, and 6. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the log of enrollment size, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Graduation (%)		College Exam Tested (%)		College Enroll (%)	
	(1)	(2)	(3)	(4)	(5)	(6)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending(3-Yr)	-0.358	1.154*	-0.757	1.502	-0.829	0.465
	(0.561)	(0.650)	(1.143)	(1.235)	(0.651)	(0.652)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8666	8666	8664	8664	8666	8666
F-stat	12.65	12.65	12.57	12.66	12.65	12.65

TABLE A5. Effect of Debt Relief on Test Scores - Robustness Checks Dropping the Top Enrollment Size Quartile.

This table reports coefficient estimates from the following second stage of the IV approach after dropping the school districts in the top enrollment size quartile as of 1997:
$\bar{Y}_{i,t} = \beta\widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are standardized 8th-grade reading scores in columns 1 and 2 and math scores in columns 3 and 4. In particular, the dependent variables are the average between t and $t+4$ in columns 1, 3, and 5, and between $t+5$ and $t+9$ in columns 2, 4, and 6. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Reading		Math	
	(1)	(2)	(3)	(4)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending($1,000)	-0.038	0.071**	0.003	0.122**
	(0.026)	(0.033)	(0.028)	(0.052)
Controls	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	7113	7112	7113	7112
F-stat	7.85	7.83	7.85	7.83

TABLE A6. Effect of Debt Relief on Non-test Outcomes - Robustness Checks Dropping the Top Enrollment Size Quartile.

This table reports coefficient estimates from the following second stage of the IV approach after dropping the school districts in the top enrollment size quartile as of 1997: $\bar{Y}_{i,t} = \beta\widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are graduation rates in columns 1 and 2, college entrance exam participation rates in columns 3 and 4, and college enrollment rates in columns 5 and 6. In particular, the dependent variables are the average between t and $t+4$ in columns 1, 3, and 5, and between $t+5$ and $t+9$ in columns 2, 4, and 6. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies,the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Graduation (%)		College Exam Tested (%)		College Enroll (%)	
	(1)	(2)	(3)	(4)	(5)	(6)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending($1,000)	-0.249	2.619**	0.653	1.980	-0.126	1.347
	(0.800)	(1.228)	(1.436)	(1.633)	(0.860)	(1.041)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	7113	7113	7107	7105	7113	7113
F-stat	7.85	7.85	8.45	7.98	7.85	7.85

TABLE A7. Effect of Debt Relief on Test Scores - Robustness Checks Dropping the Top Oil Revenue Quartile.

This table reports coefficient estimates from the following second stage of the IV approach after dropping the school districts in the top oil revenue quartile as of 1997:
$\bar{Y}_{i,t} = \beta \widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are standardized 8th-grade reading scores in columns 1 and 2 and math scores in columns 3 and 4. In particular, the dependent variables are the average between t and $t+4$ in columns 1, 3, and 5, and between $t+5$ and $t+9$ in columns 2, 4, and 6. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Reading		Math	
	(1)	(2)	(3)	(4)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending($1,000)	-0.014	0.051**	0.024	0.096***
	(0.016)	(0.020)	(0.021)	(0.033)
Controls	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	7115	7115	7115	7115
F-stat	14.32	14.32	14.32	14.32

TABLE A8. Effect of Debt Relief on Non-test Outcomes - Robustness Checks Dropping the Top Oil Revenue Quartile.

This table reports coefficient estimates from the following second stage of the IV approach after dropping the school districts in the top oil revenue quartile as of 1997: $\bar{Y}_{i,t} = \beta\widehat{Cap_{i,t}} + \Gamma C_{i,t} + \delta_i + \delta_t + \bar{u}_{i,t}$, where $\bar{Y}_{i,t}$ denotes the average of Y over a specified period. The dependent variables are graduation rates in columns 1 and 2, college entrance exam participation rates in columns 3 and 4, and college enrollment rates in columns 5 and 6. In particular, the dependent variables are the average between t and $t+4$ in columns 1, 3, and 5, and between $t+5$ and $t+9$ in columns 2, 4, and 6. $Cap_{i,t}$ is the three-year cumulative capital spending per pupil in thousands of 2000 dollars. $\widehat{Cap_{i,t}}$ is the predicted value of $Cap_{i,t}$ from the first stage. Control variables in $C_{i,t}$ include the enrollment size quartile dummies, the imputed eligibility based on the allocation formula, a log of current expenditures per pupil, and cash holdings scaled by current expenditures. δ_i and δ_t are district dummies and year dummies, respectively. All variables are winsorized at the 1st and 99th percentile. Standard errors are presented in parentheses and are clustered at the district level. Significance levels are denoted by *, **, ***, which correspond to 10%, 5%, and 1% levels, respectively.

	Graduation (%)		College Exam Tested (%)		College Enroll (%)	
	(1)	(2)	(3)	(4)	(5)	(6)
	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9	Yr 0-4	Yr 5-9
Capital Spending($1,000)	0.803	1.000*	0.412	0.266	0.682	0.657
	(0.579)	(0.589)	(0.983)	(1.041)	(0.599)	(0.623)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	7115	7115	7108	7105	7115	7115
F-stat	14.32	14.32	15.19	14.61	14.32	14.32