School Capital Spending

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Introduction

In the 2021–2022 school year, state, local, and federal capital expenditures on public K-12 schools totaled $81.7 billion, i.e., $1,660 per student.[1] Capital expenditures represent over 9% of all K-12 public school spending. As of 2019, local school districts held outstanding debt amounting to $486 billion (i.e., $11,000 per student), used to finance capital spending.[2]

Capital spending funds a wide range of school facility investments as well as spending on educational equipment, school buses, land purchases, and interest payments. Spending on facility improvements includes renovations and additions to existing buildings as well as the construction of entirely new facilities. Some capital investments directly target instructional environments by, for example, improving temperature control, adding instructional space, and addressing safety and health hazards. Other investments less closely linked with academic spaces include improvements to athletic facilities and land purchases. Capital investments help schools make space to accommodate population growth; they also help schools repair and replace out-of-date equipment.

Despite the large sums spent on school facilities, many students still attend schools in dire need of repair. According to a U.S. Government Accountability Office (GAO) study, more than half of U.S. school districts need major repair to their schools.[3] As of 2020, there was an annual spending and investment gap between educational facility standards for good stewardship and what districts actually spent amounting to $85 billion.[4] This gap is especially prevalent for socioeconomically disadvantaged students, who disproportionately attend schools with poor building conditions and lower capital expenditures on school facilities.[5] The inequitable access to schools in good condition has led to lawsuits challenging the legality of the funding systems for school facilities.[6]

The prevalence of schools in poor condition is worrisome because it could threaten student safety, health, and academic outcomes. Overcrowded classrooms with poor lighting and inadequate temperature control could make it difficult for students to pay attention and for teachers to teach effectively and maintain an orderly learning environment. Schools with limited and out-of-date laboratory facilities might put students at a disadvantage in science, technology, engineering, and mathematics (STEM) fields that require specialized and high-quality instructional spaces. Students attending older school buildings in disrepair could be exposed to health hazards such as lead paint, asbestos, and asthma-inducing dust and other airborne pollutants. Because lower-income and racial minority students are more likely to attend schools in poor condition, unequal facility investments can contribute to disparities in educational outcomes. School capital investments might also affect the broader community through their impacts on local housing markets. For example, families deciding where to live might be dissuaded from moving to communities with school facilities in very poor condition, leading to stagnant housing prices.

Alternatively, it may be the case that school capital spending is too high, especially from the perspective of improving student academic outcomes. As noted above, large sums are spent nationwide on capital investments. Investments in things such as athletic facilities, landscaping, and transportation equipment might be expected to generate minimal, if any, increase in academic performance. Even investments that improve physical educational environments might be a less cost-effective way to produce educational gains than spending on instruction (e.g., hiring more teachers). Additionally, from the perspective of maximizing the well-being of school district residents, families might be deterred from moving to areas with the tax rates necessary to maintain capital spending levels beyond what residents desire.

Key findings

The research addressing these questions has generated the following key findings:

Key finding #1: *Local school districts fund most capital spending, with funding from pandemic relief programs representing a large, one-time federal investment.*

Over 75% of capital spending is financed by local school districts, with almost all of the remainder being funded by state governments. School districts raise these funds primarily by issuing school construction bonds. In most states, these bonds must be approved by local residents in school bond referendum elections. However, a sizable, one-time federal investment in school capital resulted from the federal response to the COVID-19 pandemic.

Key finding #2: *Capital spending is unevenly distributed and is higher in more affluent school districts, although these gaps have narrowed since the Great Recession*.

Historically, higher-income districts have had higher capital expenditures, which has contributed to gaps in access to up-to-date school facilities. Subsequent to the Great Recession, however, capital spending in higher-income districts fell sharply, completely eliminating the gap in annual capital spending by income (although gaps in the quality of the capital stock may be slower to narrow).

Key finding #3: *School capital investments improve student outcomes and housing prices, with these investments having larger effects when they are directed toward students facing socioeconomic disadvantage.*

Recent evidence suggests that school districts can improve academic performance by increasing capital spending. One estimate based on an analysis of data from 29 states found that, on average, a $1,000 increase in capital spending raises test performance by 0.05 standard deviations (s.d.). The same study found that the passage of a school bond increases housing prices by 9% eight years after bond passage. Studies examining the authorization of school capital spending bonds and of large-scale school building campaigns in low-income school districts find large effects on student outcomes. Increases in capital spending in more affluent areas have been found to have smaller effects.

Key finding #4: *The effects of school capital spending differ by project type, and the projects that improve academic outcomes are not always the ones that increase housing prices*.

Spending on building projects that improve the instructional environment appears to have the largest effects on academic outcomes. Examples include improvements to HVAC systems and new or renovated classroom space, while investments in athletic facilities and transportation as well as land purchases have limited effects. In contrast, housing prices appear to respond most strongly to investments in

athletic facilities, whereas some projects that improve academic outcomes do not increase housing prices.

Understudied topics:

The finding of differential effects of some types of projects on housing prices and academics is intriguing, but the reasons why this pattern arises remain unclear. Similarly, the mechanisms through which improved school facilities lead to better academic outcomes are not always clear. A better understanding of these mechanisms could help policymakers allocate funds for school facilities more efficiently.

Evidence

Key finding #1: *Local school districts fund most capital spending, with funding from pandemic relief programs representing a large, one-time federal investment.*

During the 2009–2019 period, over three-fourths of capital spending on K-12 public schools was financed by local school districts. Almost all remaining funding came from state governments (22%). Over this period, state funding declined by 40%,7 indicating a greater reliance on local funding for school capital spending. The federal role in capital spending has typically been very small, accounting for only approximately 1% of total capital spending.[8]

The primary way school districts raise revenue for capital spending is by issuing school construction bonds. In most states, school district residents decide on whether to issue these bonds by voting in bond referendum elections.[9] The ballot measures on which voters decide indicate the purpose of the proposed funding (i.e., the projects or type of projects that would be financed by the proposed funds) as well as the amount of debt that would be issued. If voters approve the measure, the school district borrows money to pay for the capital investments, and property tax revenue is used to pay interest and principal on the debt. Most states (i.e., 37) require only a simple majority to approve school construction bond measures, while some states require supermajorities.[10]

States also differ in the degree to which they support school capital investments. State funding for capital spending is negligible (i.e., less than 10%) in 19 states, while it accounts for more than half of capital spending in 8 states.[11] States often fund capital spending via grants to districts, and 27 states have matching grant programs that require local districts to raise funds for capital projects.[12] Because it is easier for wealthy districts to fund capital spending, these matching grant programs tend to be regressive and contribute to the disparities in capital spending discussed below.[13] Some grant programs, however, are progressive. For example, Ohio's grant program targets funding toward the poorest districts in the state.[14]

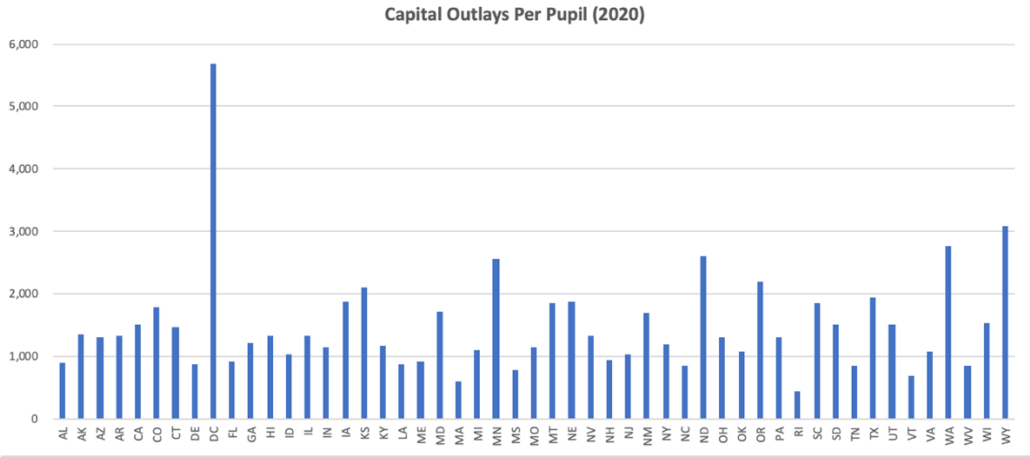
Despite the federal government's historically small role in funding capital investments, a sizable, one-time federal investment in school capital resulted from the federal response to the COVID-19 pandemic. Across three rounds of the Elementary and Secondary School Emergency Relief (ESSER) program, $190 billion was allocated to K-12 schools. School districts were allowed to use some of these funds for capital outlays, and a recent analysis indicates that 23% of funds from the third and largest round of ESSER funding went to school capital expenditures.[15] These investments may narrow gaps in building conditions by socioeconomic status, although data for ascertaining whether this narrowing has occurred do not yet exist.

Key finding #2: *Capital spending is unevenly distributed and is higher in more affluent school districts, although these gaps have narrowed since the Great Recession.*

During the 2021–2022 academic year alone, over $80 billion, i.e., $1,660 per student, was spent on K-12 capital expenditures.[16] In comparison, current expenditures (e.g., for instructional salaries) during this period were $767 billion, and total expenditures were $880 billion. Hence, annual capital outlays for public school facilities currently represent 9.2% of total expenditures and constitute approximately one-tenth of current expenditures.

Capital expenditures are not distributed evenly. Figure 1 shows that per-pupil capital spending levels by state vary considerably across states.[17] For the 10 states with the highest levels of school facility spending, the average capital outlays per student were almost $1,700 in 2000, while the 10 states with the lowest capital spending averaged merely $600 (2020 dollars). These disparities in capital spending across states grew in 2010 and in 2020.

Figure 1: Per-pupil capital spending by state (averaged over 2016–2020)



Notes: Data are from the National Center for Education Statistics' *Digest of Education Statistics*. All figures are reported in 2020 dollars. Capital outlays are often highly variable across years; to smooth out some of this variation, the figure reports average capital spending over a five-year period.

There are also large disparities in capital spending within states. Historically, capital spending levels have been higher in wealthier school districts, with the gap in per-pupil spending between the districts in the highest and lowest average income quintiles amounting to approximately $400.[18] This pattern can also be seen by examining the gap in school construction spending. Over the 2009–2018 period, low-poverty districts spent $1.4 million (i.e., 37%) per school more than high-poverty districts spent.[19] These differences in spending are reflected in disparities in the conditions of schools attended by students. Compared to schools in low-poverty neighborhoods, schools in high-poverty neighborhoods were, on average, 7 years older and were less likely to have dedicated library space or STEM labs.[20]

One important recent change to capital spending patterns is the sharp reduction in capital spending that occurred during the Great Recession. Capital spending as a percentage of total spending fell from 11% at the turn of the 21st century to 7.5% in 2013.[21] While capital spending has recovered, as of 2019, it had not recovered to prerecession levels.[22] This decline was largest in higher-income school districts. In fact, by 2017, the gap in capital spending between the highest- and lowest-income districts had reversed, with capital spending being slightly higher in districts in the bottom quintile of average income.[23]

Key finding #3: *School capital investments improve student outcomes and housing prices, with these investments having larger effects when they are directed toward students facing socioeconomic disadvantage.*

Numerous studies have examined the relationship between outcomes (e.g., student test scores and home prices) and capital investments and school facility conditions. However, until recently, there had not been clear evidence on the causal effect of capital investments and school building conditions. In fact, as recently as 2009, a U.S. GAO report indicated that none of the studies included in its review of the literature could "conclusively determine how much school facility conditions contribute to student outcomes."24

A key challenge has been disentangling the effect of school capital investments from the influence of factors correlated with these investments. As discussed above, wealthier areas tend to have higher levels of school capital spending and better school building conditions. At the same time, some school renovation and construction campaigns have targeted schools in low-income areas. For example, the Los Angeles Unified School District completed a highly publicized school facility improvement campaign in 2017 in which 196 schools, many serving low-income students, were rebuilt or renovated.[25]

Arguably, the first credible estimates in this literature were reported in a seminal study of the effect of school capital investments in California.[26] The study's innovation was to compare outcomes in school districts where voters narrowly approved bond measures to raise financing for school capital expenditures to those in school districts where voters narrowly rejected such measures. While districts that reject and approve bond measures may be very different on average, these differences might be negligible among districts where the vote share in favor of the measure is close to the margin needed for approval. The study also developed a statistical framework that accounts for the fact that, compared to districts that narrowly pass a bond measure, districts that narrowly reject one are more likely to propose and pass a measure in subsequent years. In effect, as a result of these dynamics, the comparison between districts where bond measures narrowly pass and fail would understate the total effect of bond passage on total spending and other outcomes of interest.

The main finding reported in the study above is that homebuyers are willing to pay $1.50 for each additional dollar of district capital spending.[27] From this result, the authors of the study conclude that school districts on the margin of approving school bonds are spending below the level desired by district residents. However, their results on the impact of K-12 school facility investments on student achievement are less conclusive, and they obtain only suggestive evidence that capital spending increases third-grade test scores 6 years after bond passage.

Several studies have applied a similar strategy in other states. Studies in Texas[28] and Wisconsin[29] find little evidence that school capital investments improve student outcomes. In contrast, one study finds a positive effect on test scores in Michigan,[30] and other studies find that school capital investments increase the test scores of low-income students in California and Ohio.[31] Using an alternative research design based on cutoffs for eligibility for a state school construction subsidy in Ohio, one study[32] finds

positive effects on test scores several years after building projects are completed, while another[33] does not find that investments improved student achievement. Additionally, using national data and student-level data from Texas, a study finds no evidence of improvements in test scores resulting from increases in capital outlays funded by revenue generated from wind energy installations.[34]

A parallel literature examines case studies of large building campaigns that significantly improved the capital stock in low-income school districts. One study considers a $1.4 billion school construction project in the city of New Haven, Connecticut, in which most of the district's schools were rebuilt or substantially renovated.[35] Two studies examine the effects of the school reconstruction and renovation initiative in Los Angeles described above.[36] In contrast to the single-state studies of the effect of passing school construction bonds, these studies find that attending new or renovated schools led to improvements in student achievement and increases in housing prices in the surrounding neighborhoods. In New Haven, attending a newly-built (or renovated) school raised reading test scores by 0.15 s.d. and housing prices by 10% (effects on mathematics test scores were smaller and not statistically significant).[37] In Los Angeles, attending a newly constructed school increased reading and mathematics scores by 0.05 and 0.10 s.d., respectively, and each $1 of spending generated $1.62 in benefits (in the form of higher housing prices and lifetime earnings projected from the test score increases).[38]

Two recent studies try to synthesize the results of this literature. One uses meta-analytic methods to produce an estimate of the effect of $1,000 of additional capital spending implied by estimates reported in the literature.[39] It finds that $1,000 of additional capital spending sustained over four years would increase test scores by 0.027 s.d. (Table 3). This estimated effect size is smaller than what is found for noncapital spending, although it is not possible to reject the hypothesis of equal effect size.[40] It also may be smaller than the effect of the same level of spending on other educational inputs. The study also notes that one reason for the disparate findings in the literature is that most individual studies do not have enough statistical power to detect the effect size produced by its meta-analysis. Another meta-analysis notes that it is very difficult to aggregate estimates across studies since the capital spending projects differ substantially across studies. Instead, the authors of this study discuss the range of estimates across studies. They note that many of the estimates reported in the literature are statistically insignificant and conclude that this literature reinforces the idea that "how funds are used is very important" (p. 198).[41]

To date, the most comprehensive study on this topic is a recent paper that uses a variant of the research design based on close school bond elections.[42] This study makes two key advances over earlier work. First, it assembles a national dataset, and the main estimates are based on data that cover 29 states. Such coverage makes the findings more generalizable, enables analysis of how the effects differ by school district characteristics (e.g., by capital stock levels), and addresses the lack of statistical power of narrower studies noted above.[43] Second, it uses text analysis methods applied to bond measure text to categorize the type of building project funded by the bond. This innovation is crucial because it allows an analysis of how the effects vary across different types of capital investment projects. In turn, this analysis helps address the challenge in synthesizing the findings from the earlier literature noted above.[44]

This study finds that capital spending increases both student test scores and local housing prices, on average.[45] The estimates suggest that a $1,000 increase in capital spending over five years increases district-level test scores by 0.05 s.d. The study also finds that home prices increase by 9% eight years following school bond passage. Part of the increase in housing prices reflects that, in some cases, the passage of school bonds triggers matching federal and state funds for school construction. Consequently, $1 of additional capital spending costs local residents less than $1. When this fiscal

externality is accounted for, this finding suggests the average effect of local spending on housing prices is close to zero. From these results, the authors of this study infer that the level of school facility spending in the average district passing a school bond is efficient (in the sense that it aligns with the preferences of local residents).

This study also finds that the effects on housing prices and student achievement are substantially larger in low-income districts. In particular, the housing price effects in low-income school districts suggest that spending on school facility levels is inefficiently low. The authors of the study conclude that eliminating the gap in spending between high- and low-spending districts by increasing spending on projects that improve student achievement could cut one-fourth of the difference in average test scores between these districts.

Key finding #4: *The effects of school capital spending differ by project type, and the projects that improve academic outcomes are not always the ones that increase housing prices.*

When disaggregating by type of spending project, one study finds that bonds that fund improvements to the instructional environment, such as increases in classroom space, the replacement of HVAC systems, and the removal of pollutants, generate sizable improvements in test scores.[46] The importance of HVAC systems is consistent with the findings of another study reporting that high temperatures worsen test scores but that schools' air conditioning systems offset these effects.[47] Furthermore, projects that improve the instructional environment generate relatively small changes in housing prices.[48] In contrast, investments in athletic facilities and transportation as well as land purchases have limited effects on student achievement but larger effects on housing prices.[49] This pattern suggests an interesting divergence between the investments that homeowners value and those that improve educational outcomes.

Understudied topics

There are at least three avenues for future research suggested by existing work on school facility spending. The first involves research to better understand the mechanisms underlying the effects on academic outcomes resulting from improved school building conditions. While some recent work highlights the role of temperature control in mitigating the deleterious effects of overheated classrooms,[50] how other building improvements affect student performance is less clear. While increased teacher retention, improved staff and student morale, and fewer distractions in more comfortable learning environments have all been proposed as important reasons to invest in school facilities, the relative magnitude of these (and possibly other factors) requires more study.

Second, research should address how policies should be designed to improve the efficiency of school capital investments. Currently, facility spending is funded through mechanisms (e.g., local school bonds and state matching grant programs) that contribute to spending gaps in richer and poorer districts. At the same time, a key finding from the recent literature is that the marginal dollar of spending has much larger effects on student outcomes in more disadvantaged settings and in settings with low levels of facility spending. Taken together, these facts suggest that considerable efficiency gains might be achieved by increasing the progressivity of school facility funding.

Third, research that helps us better understand why the types of spending that improve academic outcomes are not always the ones that affect housing prices would be valuable. This pattern suggests that an important share of the value that schools generate for local communities extends beyond student academic outcomes, which in turn has important implications for what parents prioritize when choosing schools and the social value of school investments. For example, this pattern is consistent with the evidence from studies showing that, even when geographic distance is accounted for, parents sometimes choose schools that do not deliver the largest test score gains for their children.[51] On the other hand, the absence of effects of facility investments that improve academic outcomes on housing prices could reflect local residents being unaware of these investments and potentially undervaluing them.

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