

# Public School Funding and Performance

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## Abstract

I use recent state-level data to test three (null) hypotheses: (1) the performances of public schools, as gauged by the National Assessment of Educational Progress (NAEP), are unrelated to overall per-pupil funding levels; (2) the performances of public schools are unrelated to the mix of local versus state funding; and (3) local school taxes depress property values. These hypotheses are all convincingly rejected. There is a significant positive relationship between overall per-pupil funding and average NAEP scores; there is a significant positive relationship between the proportion of school funding from local sources and average NAEP scores; and there is a significant positive relationship between local tax rates and property values. These results imply that school quality and local property values are both enhanced by increased local funding of public schools.

## Introduction

It is a common belief that “throwing more money” at public schools will do little or nothing to improve them. Another common belief is that high property taxes depress real estate values, and the only beneficiaries of school taxes are families with children attending public schools. These attitudes motivate voter resistance to local tax increases, which helps explain why many states are assuming larger shares of the funding burden for public schools over time. This paper specifies these beliefs as formal hypotheses, and uses 2002-03 state-level public education finance and performance data to test these hypotheses.

My maintained hypotheses are that better funding does improve school performance, that dollar for dollar, local funding is more efficient at driving school performance than state or federal funding, and that the costs of property taxes capitalized out of local property values are more than offset by the capitalized benefits of school quality that enhance property values. I suggest that the transfer of school financing from the local level to the state level creates a harmful political disconnect between local communities and their schools. As a community’s sense of ownership of its public schools diminishes, the willingness of local voters to support those schools will also diminish. And as school districts accommodate more state and federal accountability standards and regulations that come with state and federal funding, the perceived responsiveness of local schools to local demands is likely to decline.

Economic theory holds that the value of housing is the capitalized stream of values of housing services it provides annually, including the values of the neighborhood amenities such as parks, public schools and local services. Likewise, the annual stream of property taxes that pay for those amenities should be capitalized *out* of the market value of each property. But this theory

says nothing about the net effect of a local tax increase on property values. If the extra tax revenues are simply wasted, then the tax increase will certainly depress property values. On the other hand, if the extra taxes cost less than the value of the extra amenities provided via those taxes, then local property values will increase.

Most local services exhibit scale economies: it is cheaper for the community to provide them collectively than for each individual to provide them for herself. If a property tax supports local services that exhibit scale economies, so that the aggregate benefits of the services exceed their aggregate tax cost, the net benefits should be capitalized into higher property values.

In most states the large majority of local property tax revenues are allocated to the support of public schools. There are obvious scale economies in educating children in schools rather than at home, and it is widely recognized that the quality of a community's public schools increases local property values, as evidenced by real estate advertisements that tout the quality of the public schools in some communities. Nevertheless, voters that do not have children in the public school system, and do not expect to have children in the system, will often oppose an increase in school taxes because they see no direct benefit to themselves from public schools.

There are three common arguments for opposing local school taxes:

- (1) Just throwing more money at public schools does little or nothing to improve them.
- (2) It places an unfair burden on property owners; public education should be paid for with state income tax revenues.
- (3) Public schools only benefit households with children attending them.

This study uses state-level data to examine the interplay between state and local tax support of public education, school performance, and housing values. It specifies each of these arguments as testable hypotheses, and uses simple linear regression methods to gauge the effects of funding levels on school quality and property values.

In the last couple of decades US states have created a diversity of funding mechanisms for public education, and the US Department of Education has implemented a system of standardized tests, the National Assessment of Educational Progress (NAEP), that permit direct comparisons of education performance across states. Property valuation analyses are rarely done at the state level, but as Oates (1969) demonstrated, the effects of school taxes and school quality on median property values are large, and they are now discernible even at a coarse, state-level scale of analysis.

### **“More money won't fix public schools” – the SAT myth**

There is a widespread belief that public school systems are wasteful and inefficient, and that an increase in per-student funding will do little or nothing to improve student performance. Every year the College Board releases average SAT scores for college-bound high-school students by state, and critics of public education regularly point out that some states with low per-pupil spending on schools such as North Dakota, Iowa, South Dakota, Oklahoma and Tennessee deliver consistently higher average SAT scores than high-spending states such as New York,

New Jersey, Connecticut, Massachusetts and Delaware. A naïve scatter-plot of states' mean SAT scores versus per-pupil funding of public education (Figure 1) suggests a negative correlation, and a linear regression of the sum of mean of states' 2003 verbal and math scores versus 2003 total per-pupil funding suggests this correlation is statistically significant, although the model only explains nine percent of the overall variation in states' average SAT I scores:

$$\text{meanSATverbal+math} = 1158.9 - 0.00683(\$/\text{pupil})$$

$$\begin{matrix} [29.39] & [-2.23] \\ \text{(t-statistics in brackets; N = 50 states; R}^2 = 0.093) \end{matrix}$$

The College Board publishes its state average SAT I scores with an emphatic caution: "The College Board strongly discourages the comparison or ranking of states on the basis of SAT I scores alone." The principal reason for this is that SAT I participation rates vary widely across states. Figure 2 shows that high-scoring states typically have much lower test participation rates. The trick to getting a high state average on the SAT I is simple: limit it to high-performing students.

Figure 3 shows that, after accounting for differences in test participation rates, per-pupil spending has a statistically significant positive correlation with mean SAT I scores. A simple linear regression of the sum of mean 2003 verbal and math scores versus percent participation and 2003 per-pupil funding proves a positive and correlation with stronger statistical significance, and this model explains 80 percent of the overall variation in states' average SAT I scores:

$$\text{meanSATverbal+math} = 1079.3 - 2.313(\% \text{Participation}) + 0.00928(\$/\text{pupil})$$

$$\begin{matrix} [44.98] & [-12.64] & [3.06] \\ \text{(N = 50 states; R}^2 = 0.801) \end{matrix}$$

So the data indicate that a \$1,000 increase in per-pupil funding would yield a 9.28-point increase in combined SAT I scores.

### **The NAEP reality**

A better measure of state-level academic performance that is not biased by varying participation rates is the National Assessment of Educational Progress (NAEP), a series of standardized tests administered periodically by the US Department of Education to students in both public and private schools all across the US. In 2003, the NAEP involved nationwide testing of 4<sup>th</sup> and 8<sup>th</sup> grade students in reading and mathematics. These test data are tabulated and disseminated by the National Center for Education Statistics (NCES).

Most NAEP tests are specifically designed to support state-by-state comparisons of academic performance. I summed 4<sup>th</sup> and 8<sup>th</sup> grade statewide average reading and math scores to index the overall public education performances of states. To test the relationship between academic performance and per-pupil funding, I regressed states' summed 2003 NAEP averages against 2003 per-pupil funding, as reported in the Census Bureau's Public Elementary-Secondary Education Finance Data:

$$\text{NAEPsum} = 936.03 + 0.0075(\$/\text{Pupil})$$

[57.11] [3.53]

(N = 50 states; R<sup>2</sup> = 0.2059)

Figure 4 shows the positive relationship between funding and student performance. Figure 5 shows that per-pupil funding is positively and significantly correlated with the state averages for each of the individual NAEP tests as well. The (null) hypothesis that NAEP performance is not improved by additional per-pupil funding of public schools is clearly rejected.

### **“Let the state pay for public schools” -- NAEP performance and funding by source**

In most states the funding burden for public schools has been shifting from local property taxes to state and federal sources. This is typically accompanied by increasing state and federal regulation of public education, with a consequent loss of local control. The traditional local governance and funding of public schools insures a high degree of mutual accountability between communities and their schools. Local funding fosters a community’s sense of ownership and responsibility for its schools, and motivates schools to deliver the quality of education the community demands. Hoxby (1997) and others have argued that the replacement of local funding with state and federal funding, and the consequent surrender of local control, creates a detrimental economic and political disconnect between public schools and their communities.

To gauge the effects of different sources of school funding on school performance, I regressed the sum of 2003 NAEP average scores against 2003 per-pupil funding, disaggregated by source--federal, state, local property tax and other local sources--by state. The regression model shows that federal and state funding per pupil are not significantly correlated with NAEP performance, while local funding per pupil has a strong positive correlation with NAEP performance.

$$\text{NAEPsum} = 962.83 - 0.01667(\text{Fed}\$/\text{pupil}) + 0.00277(\text{State}\$/\text{pupil})$$

[52.08] [-1.31] [1.26]

$$+ 0.00922(\text{PropTax}\$/\text{pupil}) + 0.00754(\text{OthrLocal}\$/\text{pupil})$$

[3.59] [3.38]

(N = 50 states; R<sup>2</sup> = 0.3155)

The negative sign on the federal funding coefficient reflects the fact that most school revenues from federal sources are allocated to programs for children of poverty and children with disabilities who would tend to score lower on the NAEP. The state funding coefficient is positive but statistically insignificant and small relative to the local funding coefficients. The property tax funding coefficient has the largest positive and statistically significant influence on NAEP performance. Other local taxes have almost as large a positive effect, and equivalent statistical significance.

These results clearly support the hypothesis that school systems with greater reliance on local funding tend to perform better. Dollar for dollar, this analysis indicates that additional local funds yield far larger gains in school system performance than additional state funds. This result supports the hypotheses that more local funding goes hand in hand with better local accountability for school quality and better community support for public schools.

## **“School taxes only benefit households with children in public schools”**

Beginning with Tiebout (1956), a sizeable body of economic literature demonstrates that the quality of public schools is capitalized into local property values. Tiebout hypothesized that families and other households choose where to live by comparing the benefits of the local public amenities and services versus the costs of homes (including property taxes) in alternative communities, and choosing the community with the largest benefit net of costs. Each individual location choice reflects the household’s current and anticipated future demands for amenities and service. Households that have children or anticipate having children will want good schools; households that neither have nor anticipate having children will demand other things such as well-maintained parks and effective policing. Tiebout’s theory implies that communities that are most efficient at satisfying these diverse demands for local amenities will have the highest property values.

Every current homeowner (or the executor of her estate) is a future seller, and every housing unit gets sold and resold over time. Whether a property currently houses school-age children or not is irrelevant to its market value. Local property values reflect the aggregate demand of buyers, including buyers with children needing schooling and buyers who intend to have children. So an implicit demand for schools is reflected in the market value of every residential property.

People who care about schools represent a significant proportion of all prospective householders, and they will offer higher prices or rents for housing in communities with good schools than for the equivalent housing in communities with bad schools. The communities with good schools will have significantly higher property values than the communities with bad schools. Thus good schools benefit homeowners without children too. In fact, Brueckner and Joo (1979) and others have noted that elderly voters are sometimes observed to be more supportive of school spending than younger voters, which suggests they are voting for the capitalization benefit (perhaps encouraged by property lower tax rates for seniors as well).

A related objection to property taxes is that they are unfair because they are levied on property owners but not renters. But this argument depends on the assumption that property taxes are not accounted for in the rents owners charge tenants, which is demonstrably false.

Figure 6 shows the clear positive relationship between NAEP performance and property values. The two outlier states with anomalous real estate markets are Hawaii and California. Even at this coarse level of analysis, school performance is shown to increase property values generally. So if school performance is driven by funding, as demonstrated above, we should consider an alternative question: are we investing enough local dollars in public schools?

Just as the value of local services and amenities is capitalized into property values, the annual property taxes required to finance these services and amenities are capitalized out of property values. In fact, the Tiebout hypothesis suggests that, in equilibrium, the efficient community will tax property and provide services to the point where the marginal benefit of services equals the marginal tax costs of those extra services. Therefore, in theory at least, the marginal effect of property taxes on property values should be zero.

Oates (1969) tested the relationship between housing values, tax rates and school quality across 53 New Jersey communities. Lacking a direct measure of school quality, he used expenditure per pupil as a proxy for quality. His regression model predicted median property values as a function of the logarithm of effective property tax rates, the logarithm of per-pupil spending, and various housing and location characteristics. His model verified both the school quality and tax rate capitalization hypotheses, and implied that the property value benefits of an increase in school spending (and presumably quality) would be about double the property value costs of the tax increase to fund such an increase. In other words, the New Jersey communities he examined in the 1960's were under-investing in schools.

If anything, this underinvestment is perhaps worse today. The US has seen growing political opposition to property taxes (and taxes generally) over the past decades. Property taxes have been challenged in courts on various constitutional grounds. In *Serrano v. Priest* (1971; 1976) the California Supreme Court ruled that a property-tax based finance system for schools was unconstitutional because of the funding inequities it created. The forced redistribution of property tax revenues from rich to poor school districts to equalize school funding created a voter revolt against property taxes, and California's Proposition 13 capped property taxes at 1% of assessed value until resale, and capped annual increases in assessments at 2%. So *Serrano* and Proposition 13 shifted the funding burden for public education in California from local communities to the state. Proposition 2½ accomplished the same thing in Massachusetts.

While many other states have made similar shifts from local to state funding for public education and reduced local property tax burdens, some states—notably New Jersey, Pennsylvania, Illinois and New Hampshire—have continued to rely on local property taxes as the primary source of funding for public schools. These states with school systems largely driven by local property taxes generally have higher NAEP scores.

Figure 6 shows that states with higher effective property tax rates (which mostly support schools) generally have higher median housing values. The three outlier states are California, Hawaii and Massachusetts. These results support the under-investment hypothesis. Higher school taxes clearly do not depress property values; in fact, a simple regression analysis suggests that, *ceteris paribus*, each additional dollar of local property tax increases property values by an estimated average of \$34.27.

$$\begin{aligned} \text{Median Home Value} &= \$71,450 + \$34.27 \text{ per } \$ \text{ Local Tax} \\ &\quad [97.11] \quad [4.27] \\ &\quad (N = 50 \text{ states}; R^2 = 0.2633) \end{aligned}$$

Figure 7 shows states ranked by total per-student spending, with spending broken down by federal, state, property tax and other local (e.g., county) sources.

## Conclusions

This analysis is entirely based on highly aggregated state-level data, and necessarily overlooks all the details of individual states' tax policies, school funding mechanisms, etc. It also omits all the broader socioeconomic factors that certainly affect NAEP performances and real estate values. But even this simple, coarse state-level analysis yields some clear findings.

First, America's public school systems are frequently criticized as wasteful and inefficient, and the high average SAT scores of some low-spending states are commonly cited as evidence that public schools cannot be improved with more funding. But states' average SAT scores are largely driven by their participation rates, and correcting for participation, high-spending states do outscore low-spending states. States with high per-pupil spending generally outscore states with low per-pupil spending on the NAEP as well.

Second, how states fund public education makes a difference. When funding is decomposed into federal, state, local property tax and other local (e.g., county) components, the dominant driver of NAEP performance is shown to be local funding. This finding supports the contention that local funding goes hand in hand with local accountability: communities that own and control their own schools tend to demand higher performance from them, and are likely to be more supportive of them in turn. Public school systems that are primarily dependent on state funding generally have lower average NAEP performances.

Third, school system quality, indexed by NAEP performance, is correlated with higher property values generally; therefore all residents in a community benefit from strong schools. The direct positive correlation between school taxes and property values is also proved. This positive correlation between local tax per housing unit and property values suggests that most of America is under-investing in public education.

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Figure 1:

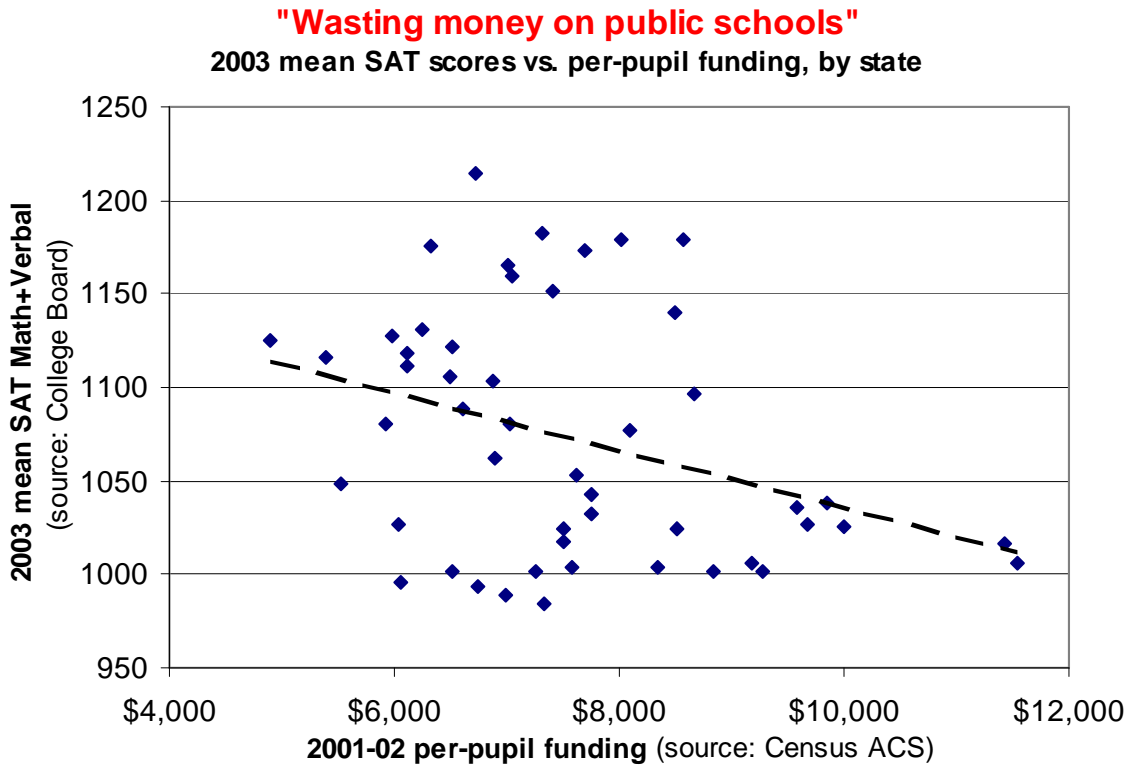


Figure 2:

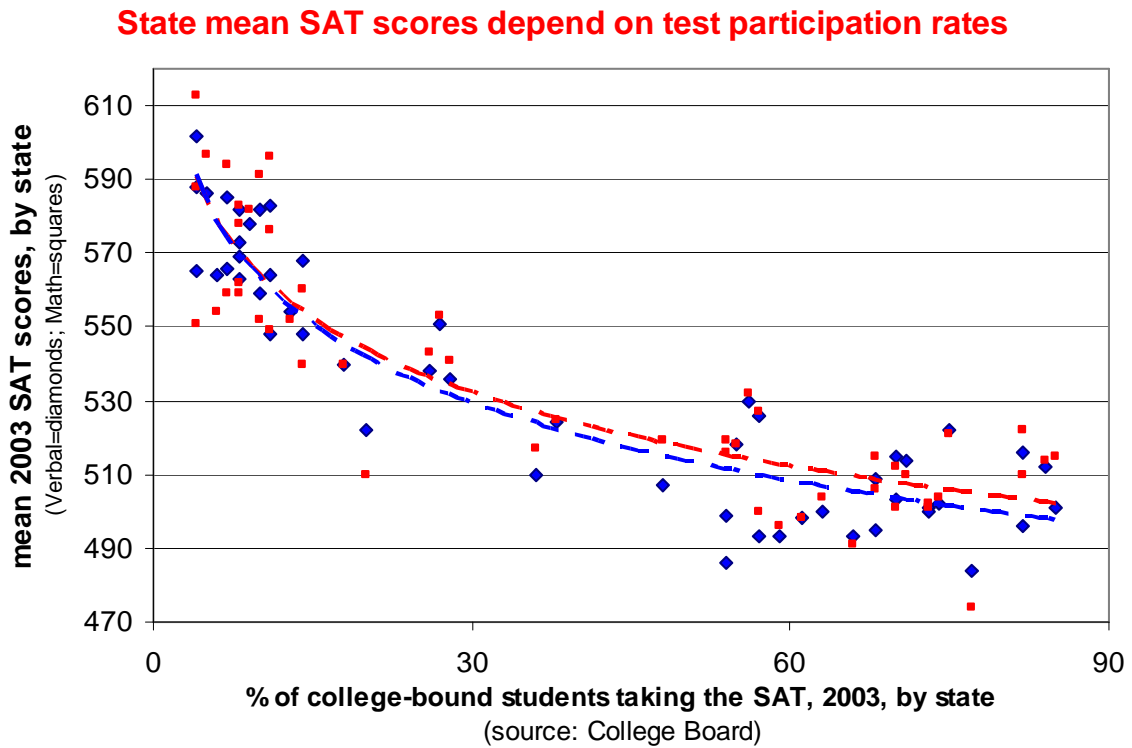




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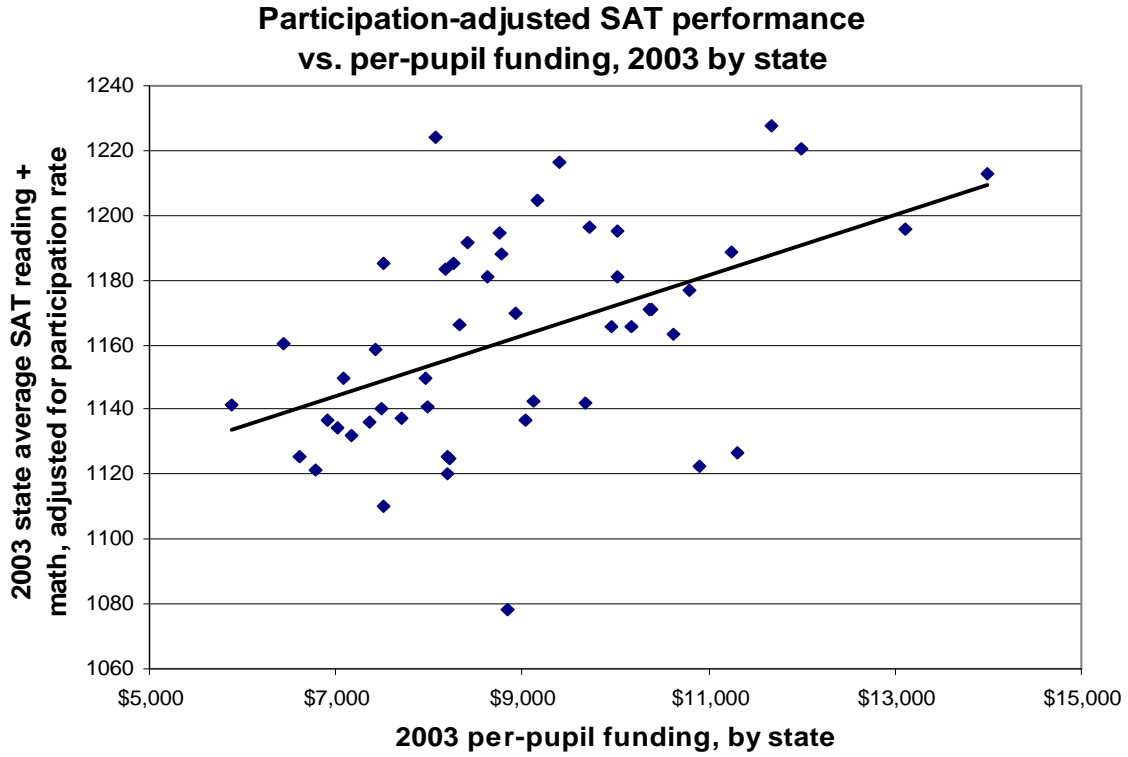


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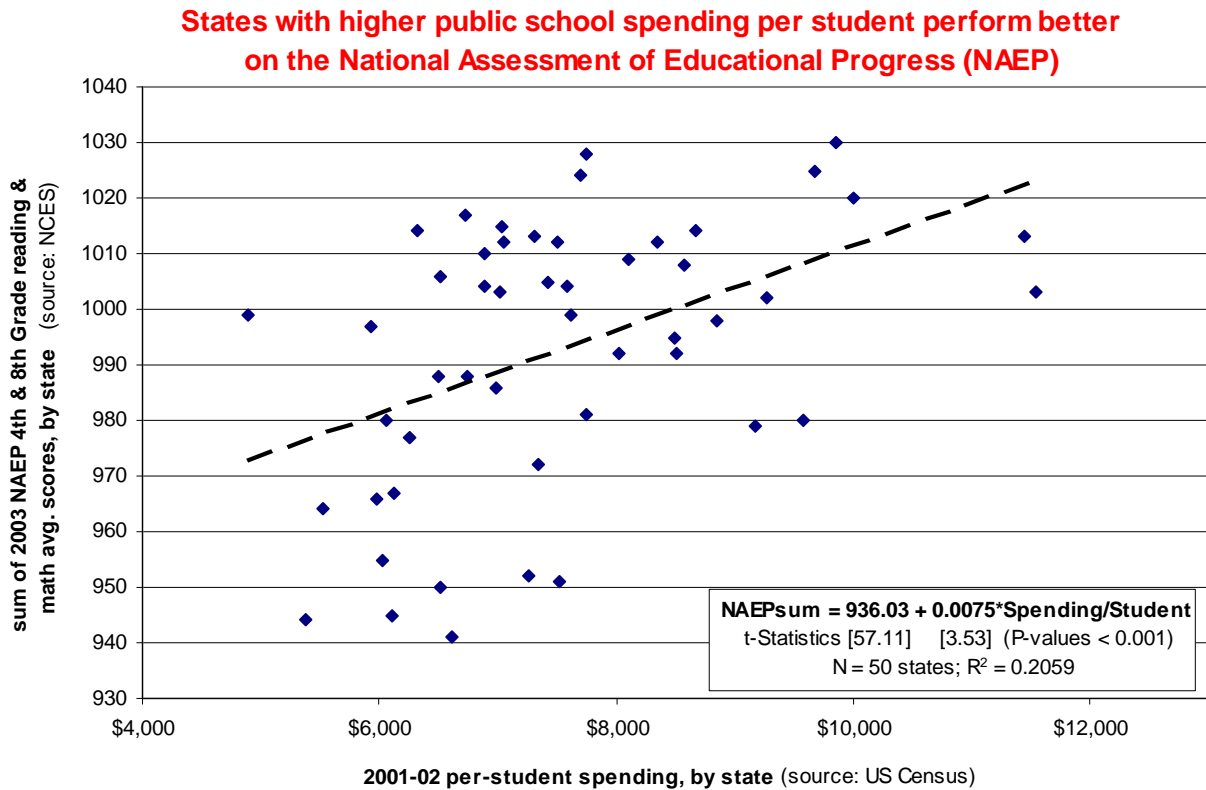


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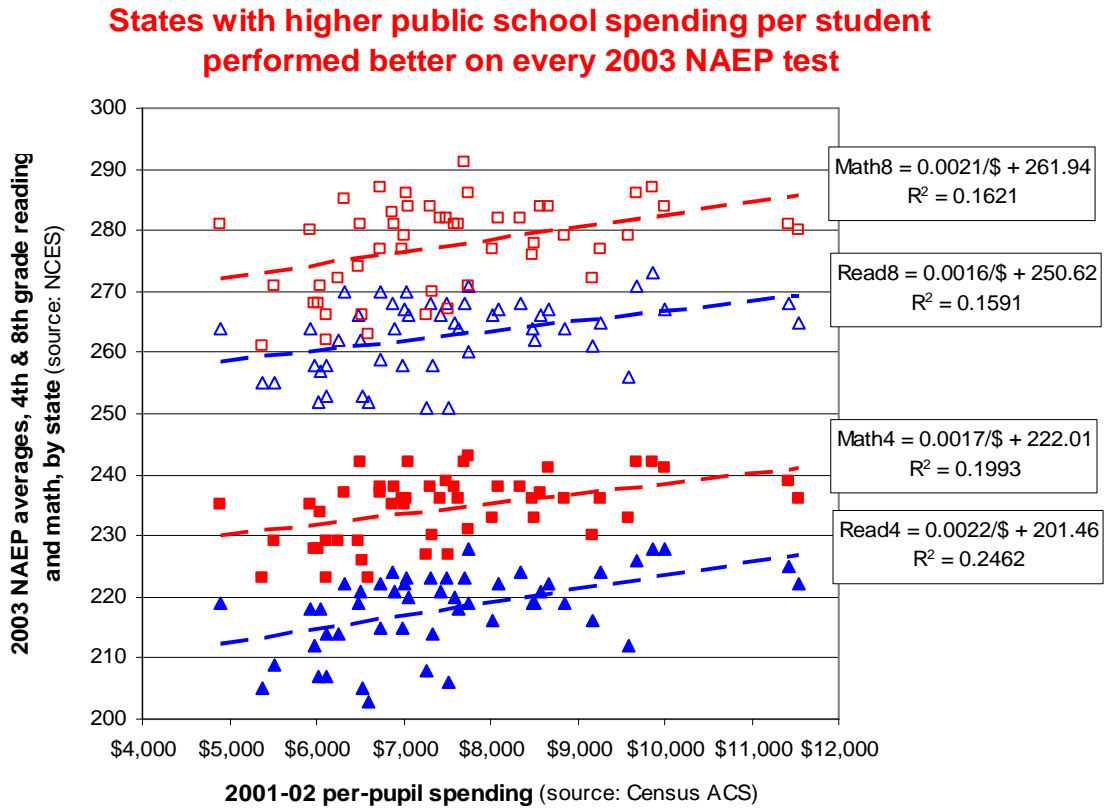


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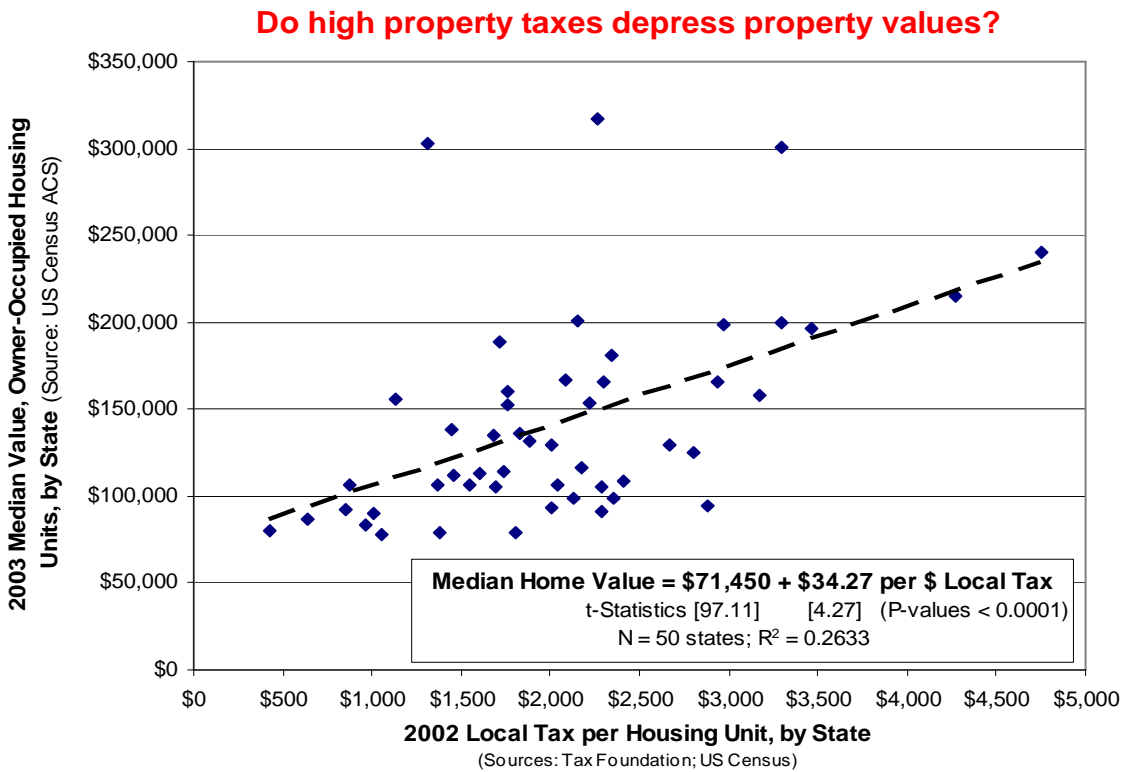


Figure 7:

### 2003 Per-Pupil K-12 public education spending, by source and state

source: US Census Public Elementary-Secondary Education Finance Data

