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The Allocation of Public School Expenditures

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Abstract

While the *Serrano v Priest* decisions and *Proposition 13* effectively rendered California school district budgets exogenous, intra-district resource allocation remains largely at the discretion of school district administrations. As a result, *Serrano v Priest* and *Proposition 13* alleviate concerns about the potentially endogenous relationship between student body composition and inter-district resource disparity and allow us to focus on consistently estimating the effect of classroom versus non-classroom spending. We find that teaching expenditures have a positive effect on student performance while non-teaching expenditures have a negative effect. Either the reallocation of $100 from administrative to classroom spending, with no change in overall expenditures, or an $100 increase aimed directly at the classroom moves the average California high school approximately 5 percentage points higher in the state test score rankings. These results are similar across grade levels (elementary, middle and high schools) and subject areas (mathematics, reading, language, spelling, social studies, and science). Our results suggest that both current and future educational expenditures should be targeted towards the classroom.

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I. Introduction

Hanushek and Rivkin (1997) document the extraordinary rise in American educational expenditures over the past century that have resulted from falling student-teacher ratios, rising teacher salaries, and growing non-instructional costs. Increased educational spending is the most visible outcome of educational reform during the recent decades. For example, the average California school district increased nominal per pupil expenditures from $4,126 in 1992-93 to $5,436 in 1998-99.[1] Have these additional expenditures improved student outcomes?

Despite considerable research effort by many individuals, a widely agreed upon answer has not yet emerged.[2] Looking at school quality and wages, Card and Krueger (1992) find that men educated in states with higher quality schools earn higher wages later in life while Betts (1996), Heckman et al. (1996), and Grogger (1996) find no such impact. In a similar vein, Ehrenberg and Brewer (1995) find little evidence that measurable school inputs have an impact on student achievement and Hoxby (1998b) finds no evidence that smaller classes have a positive effect on test scores. On the other hand, Betts (1995), Brewer (1996), Goldhaber and Brewer (1997), Figlio (1997) and Eide and Showalter (1998) find some evidence that spending on computers, teachers, teacher qualifications, smaller classes, and school year length respectively, have a positive impact on student achievement.

Disentangling the relationship between school inputs and student outcomes is generally complicated by data limitations and endogeneity problems. While most studies are interested in all educational inputs, data limitations force the use of proxies such as

[1] See the California Department of Education website, www.cde.ca.gov. These numbers represent the average per pupil expenditure based on average daily attendance.

the pupil-teacher ratio or broad aggregates like expenditures per student. While class size is an important issue, one would ideally separate its influence from other unmeasured educational inputs. One way to get at this issue is to use a simple reduced form including expenditures per student broken into instructional and non-instructional spending. In this way, teacher characteristics such as experience and ability, as measured by higher salaries, as well as class size are separated from non-instructional, administrative and maintenance costs.

Critics of public education, including teachers, argue that U.S. schools involve unnecessary paperwork and bureaucracy. This results in administrative services receiving too large a share of educational resources. Brewer (1996) finds weak evidence that higher administrative allocations lead to lower student performance for a sample of New York state districts. Ferguson and Ladd (1996) find that instructional spending is positively and significantly related to student performance in Alabama. Using a national sample of unified school districts, Dee (1998b) finds that increased instructional spending is associated with higher graduation rates.

The question of why school districts would choose to allocate resources to less productive inputs remains. Hanushek (1986) suggests that such behavior is not surprising because educational decision-makers may neither have the incentive to operate efficiently nor the ability to determine the efficient allocation of inputs. An alternative explanation is that administrators make conscious choices to misallocate resources because they have a preference for increased administrative expenditures (Willamson (1963), Dee (1998b)). Supporters of voucher education often stress the benefits of competition in forcing schools to reduce unproductive resource allocation. For example, Dee (1998a) finds that

[2] See Hanushek (1986) and Burtless (1996) for reviews of the literature.

school districts facing high levels of competition from private schools devote a higher fraction of resources to instructional spending.

This paper examines the relationship between district expenditure patterns and student outcomes using data from California. There are several reasons to focus on the California. First, all California school districts are required to make detailed revenue and expenditure breakdowns publicly available. Second, the size and number of districts provide large sample sizes even at the high school level. Third, subject-specific standardized tests are required for most students in grades two through eleven providing consistent performance measures across districts. Fourth, the *Serrano v Priest* decisions and *Proposition 13* have effectively rendered revenue per district exogenous allowing us to focus on the allocation of resources within districts.

The *Serrano v Priest* rulings of the 1970s resulted in a system that largely eliminated wealth related differences in spending per student across school districts. More specifically, the court ruled that unequal property values across school districts make local property tax an unconstitutional method of funding public schools. The decision limited per pupil expenditure differences to an insignificant amount, and further defined insignificant differences to be those of less than $100. The underlying system adopted to conform to the decision remains today and while some differences remain most districts have wealth related spending differences of less than $100 per student.

The decision does, however, allow for spending differences across school districts based on categorical needs spending programs that are unrelated to district wealth. As a result of these two factors, total per-pupil expenditures continue to vary across California school districts, but by much less than in other states. In this sense, California is typical of states that have implemented finance reform. Murray, Evans and Schwab (1998) find that intra-state funding inequality decreased by 19%-34% in states implementing school finance reform programs.

In addition to court ordered school finance reform, the implementation of *Proposition 13* in 1979 effectively converted the local property tax system into a statewide tax system with the state having the authority to allocate property tax revenue among local governments. The proposition also eliminated the remaining loopholes and overrides that would have allowed individual districts to spend more money.[3] *Proposition 13* also imposes a property tax rate maximum of 1% of market valuation. According to Sonstelie et al. (2000), the effective rate at the time of *Proposition 13* was close to 2.5%. The proposition therefore reduced statewide property tax revenue by 57%.[4]

California's experience is not atypical, school finance reform is generally followed by reductions in expenditures per student and larger classes (Figlio, 1997 and Sonstelie et al.,2000) with no commensurate drop in administrative spending (Figlio, 1997). However, Figlio (1997) and Hoxby (1998a) argue that educational reform in California has been at the extreme end of the national distribution. Figlio (1997) finds that the presence of statewide finance reform limiting expenditures is associated with lower levels of student performance**.** In the wake of reform, California schools have dropped from among the nation's top performers to among the worst. Softening the

[3] Voluntary contributions of time and money to increase school expenditures are the sole exception. Brunner and Sonstelie (1999) provide an interesting discussion and analysis of the impact of such behavior as a tool to undermine school finance reform in California.
[4] For more complete details of *Serrano v Priest, Proposition 13* and educational finance reform in California see Silva and Sonstelie (1995) and Sonstelie et al. (2000).

picture somewhat, Sonstelie et al. (2000) point out that that some of the performance decline is the result of demographic and socioeconomic trends in California.

The exogeneity of current school district expenditure levels in California makes it easier to separate the impact of expenditure level from expenditure allocation. Stated somewhat differently, *Serrano v Priest* and *Proposition 13* alleviate concerns about the potential endogeneity of student quality and inter-district resource disparity and allow us to focus on consistently estimating the effect of classroom versus non-classroom spending. It is important to point out that the equalizing effects of *Serrano v Priest* and *Proposition 13* on inter-district expenditure levels does not carry-over to intra-district expenditure allocations. School districts continue to maintain a great deal of discretion over intra-district allocation. They may choose to allocate more resources to teachers, textbooks, or administrative tasks. As a result, similar expenditure levels do not necessarily imply that students receive similar amounts of education. Interestingly, 54.5% of California voters rejected an initiative limiting the percentage of funds that school districts could devote to administrative costs on a state-wide ballot in June, 1998.

We find a positive and statistically significant relationship between total expenditures and student outcomes. However, this relationship is driven by funds going directly to instruction. In contrast to many other studies, our results are robust to specification and the possible endogeneity of resource allocation, as well as being consistent across grade levels and subject areas. More importantly, our estimates suggest that the relationship between educational spending and student outcomes is not only statistically significant but also relatively large. Our instrumental variables estimates indicate that reallocating $100 from administrative to classroom purposes would increase the average district's mean test score by 0.4-2.7 points and their ranking within the state by 2.3-7.8 percentiles depending on the subject area and grade level. This is a particularly positive finding in light of the fact that it entails no additional resources, only the reallocation of existing support.

The remainder of the paper is as follows. Section II describes the STAR test and school expenditure data. Section III describes the empirical approach and results. Section IV concludes.

II. The Data

The California Department of Education (CDE) requires each school district to make detailed revenue and expenditure information publicly available. The *J200 School Expenditure and Revenue Report* provides line item expenditure data for object codes (teacher salaries, aides salaries, utilities and housekeeping services, etc.) within different fund codes (General Education, Adult Education, Pupil Transportation, Building, etc.). We break expenditures into instructional and non-instructional spending. Instructional expenditures include teacher's salaries, teacher's retirement and other benefits, teacher aide's salaries, teacher aide's retirement and other benefits, librarian's salaries, librarian's retirement and other benefits, textbooks, instructional materials and supplies. Non-instructional expenditures include all other expenditures with the exception of capital expenditures and the other outgo category of expenditures.[5] We include expenditures from all fund codes except adult education expenditures.[6] This approach is consistent with that used by the State to determine per pupil expenditures. Given our definition,

[5] Including these expenditures does not appreciably affect the results.

teaching expenditures account for 56.7% of total expenditures at the tenth grade level (all unified and high school districts) and 59% of total expenditures at the third and sixth grade level (all unified and elementary school districts).

Notice that teaching expenditures are restricted to items directly related to classroom instruction. By design, the instructional category encompasses all fund categories that impact classroom experience and excludes school and district level administration. This is not to imply that basic administrative expenses, construction, maintenance, or general overhead costs are unnecessary for the provision of education.

California's Standardized Testing and Reporting (STAR) program was authorized by Senate Bill (SB) 376 in October 1997. The statute requires the California State Board of Education to designate a standardized exam for use by all school districts. The Stanford Achievement Test Series, 9th Edition, Form T (Stanford 9), a multiple-choice test that allows comparisons to be made to a national sample of students, was chosen.[7] California school districts are required to test all students in grades two through eleven. The only exemptions are for special education students and those students whose parent or guardian submit a written request for exemption.

Students in grades two through eight are tested in reading, mathematics, written expression, and spelling. Students in grades nine through eleven are tested in reading, writing, mathematics, science, and social science. The CDE data excludes districts with fewer than 10 students writing a specific exam for confidentiality reasons. Rather than report ten sets of results, one for each grade, we focus on grades three, six, and ten at elementary, middle, and high schools respectively.

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[6] We have also estimated all models using only the General Education fund code, which accounts for 80% of the total expenditures from all fund codes, and obtain similar results.

Both the expenditure data and the STAR exam results are for the 1997-98 academic year. The sample includes 709 districts at the third grade level, 710 districts at the sixth grade level, and 374 school districts at the tenth grade level. Of these 298, 296 and 292 are unified school districts at the third, sixth, and tenth grade levels respectively.

The CDE also provides information regarding several socioeconomic characteristics of each school district. These data include the percentage of students with limited English proficiency, the representation of major ethnic groups, the percentage of students receiving Aid to Dependent Families with Children (AFDC), and the percentage of students eligible for free lunch. Districts are also labeled as urban, suburban, or rural and either unified or not unified. Table 1 presents summary statistics by grade level.

III. Empirical Approach and Results

Using a standard production function approach, grade and subject specific student outcomes are modeled as:

$$TS_d = a + bD_d + dTE_d + fPT_d + e_d \qquad (1)$$

where *d* denotes district, *TS* denotes average test score, *D* is a vector of district level socioeconomic characteristics, *TE* is total per capita expenditures, and *PT* is the percentage of per capita expenditures that are devoted to teaching. District characteristics include the percentage of limited English proficient students, students from major ethnic groups, students receiving free lunch and students from households receiving AFDC, as well as dummy variables identifying districts as urban, suburban or rural.

[7] For more information about the STAR exam see California Department of Education (1998).

Table 2 presents the OLS estimates for grades three, six, and ten. The socioeconomic factors generally have the expected signs and exhibit a similar relationship with average test scores across grades and subjects. Districts with greater percentages of Native American, African American, or Hispanic students have lower average test scores, while districts with more Asian students have higher average test scores. Also as expected, districts with more students who qualify for free lunch programs and receive AFDC have lower average test scores. While there is no difference between urban and suburban average test scores, rural districts do have lower test scores. Finally, at the third and sixth grade levels districts with more students with limited English proficiency have lower average test scores among non-limited English proficiency students. However, at the tenth grade level districts with more limited English proficiency students have higher average test scores. This may result because districts with a higher proportion of limited English proficient students experience higher drop-out rates leaving a non-random selection of students at advanced grade levels.

Higher expenditures have a positive and statistically significant impact on average test scores. An increase in total expenditures of $100 per student, with constant instructional versus non-instructional proportions, increases average test scores 0.2-0.3 points depending on grade level and subject.[8] The impact of devoting a greater share of expenditures to teaching purposes is even more dramatic. Holding total expenditures constant, but reallocating $100 to teaching increases the mean test score by 0.3-0.7 points. Similarly, an $100 increase in total expenditures that is completely directed towards instructional spending is associated with a 0.3-0.6 point mean test score rise.

[8] The results are not sensitive to the inclusion of class size or computers per student and are therefore not reported. Results including these additional variables are available upon request.

While a 0.3-0.7 point rise on an exam with an average score of 600-650 may seem small, it is important to remember that district level average test scores generally have a range of only 80 points. To put the aforementioned results in context, reallocating $100 from non-teaching to teaching increases the average tenth grade math score by 0.4 points. This increase moves the average district 3 percentiles higher in the distribution of average district-level test scores in the state of California. Most parents, teachers, and administrators would agree that this is a meaningful increase in a school's ranking.

Table 3 reports the percentile increase for the mean school associated with an $100 reallocation towards instructional spending holding total expenditures constant, an $100 increase in total spending holding the expenditure mix constant, and an $100 increase in spending allocated entirely to the classroom. To give an example, the average scoring third grade district will rise by 1.7, 0.8, and 1.5 percentiles in the state average language test score distribution as a result of an $100 reallocation, holding total expenditures constant, $100 increase at current proportions, and $100 increase in teaching expenditures respectively. The results presented in Table 3 clearly suggest that while money matters, it is how money is spent that matters most.

One problem with estimating the relationship between expenditures and school performance is the potentially endogenous relationship between student characteristics and expenditure decisions. For example, less able students may require more administrative assistance. As a result, some school districts may be forced to devote more resources to counseling and discipline than others. However, it is not obvious that less instructional spending is the optimal solution for less able students. For example, Lazear (1999) argues that less able and less well behaved students benefit more from smaller classes. Hence, the optimal response to lower ability, unprepared, or poorly behaved students may be higher rather than lower instructional expenditures.

For our purposes, the important question is how districts actually respond to student characteristics. It is unlikely that school expenditure patterns are randomly determined. It is more likely that expenditure choices are related to student body characteristics and socioeconomic factors, some of which we have measures for and some of which we do not. Stated somewhat differently, school expenditure patterns may be correlated with the error term due to an omitted variable problem. This reality is evidenced by the fact that a Hausman (1978) test rejects the exogeneity of expenditure choices for approximately half of the models estimated by OLS.

To address this issue we re-estimate the model instrumenting for the percentage of expenditures allocated to instruction using the exogenous components of district characteristics and revenue. The detailed accounting of funding sources allows us to identify the funding/expenditure components that are not at the discretion of school district administrators, but rather allocated by state or federal governments for specific, non-transferable purposes. Exogenous funding components include: transportation, special education transportation, school improvement, technology assistance, and EESA math and science. Home-to-School Transportation is a California program that reimburses each district for a portion of their transportation costs. In addition, the Special Education Transportation program reimburses districts for a portion of the costs incurred transporting students with disabilities. The School Improvement Program is a voluntary statewide program that encourages each district to assess special needs. Each district must create a council of administrators, parents and teachers to identify needs and create a plan to address these needs. The State Department of Education reviews the plans and determines if the plans are suitable for funding. After initial funding, the plans are reviewed annually but essentially become an annual entitlement. Common uses of the plan include hiring teachers' aids and creating special academic programs. The Educational Technology Assistance program is a similar statewide program that funds projects that integrate technology into schools and classrooms. Finally, we also include district revenues that are obtained from the federal government under the terms of the 1984 Education for Economic Security Act (EESA) that provides funds specifically targeted for math and science education.

Table 4 reports the estimates for the first stage regressions. In addition to the variables listed above, the instrument list also includes district enrollment, district enrollment squared, and indicator variables for urban/suburban/rural and unified/non-unified districts.[9]

Table 5 presents the second stage results. The results are similar to the OLS results. Both total expenditures and the percentage of expenditures devoted to teaching are positive and significantly related to test scores for all subject areas and grade levels. The biggest difference is that the coefficient estimates for the percentage of expenditures devoted to instruction are three to four times larger than the OLS estimates. An $100 increase in total expenditures in the current proportions is still associated with a 0.2-0.3 point increase in average test scores depending on the subject while an $100 increase in instructional spending raises mean test scores by 0.7-1.2 points.

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[9] None of the second stage results, reported in Table 5, are significantly effected by the exclusion of any individual funding or district variables.

Table 6 replicates Table 3 using the IV estimates. Reallocating $100 from non-instructional to instructional purposes is associated upward movement of 5.0, 4.5 and 7.8 percentiles in the state average math test score distributions at the third, sixth, and tenth grade levels respectively for the average district. Similarly, a straight $100 increase in teaching expenditures leads to a 2.5, 2.7 and 5.1 percentile rise in the state average math test score distributions for the same groups. In contrast, an $100 increase in expenditures allocated in current proportions only leads to a 0.1, 0.6 and 1.7 percentile rise in the state average math test score distributions at the third, sixth, and tenth grade levels respectively for the average district. As with the OLS estimates, the results indicate that devoting more money to instructional purposes has a positive impact on student performance.

Thus far we have focussed on the contemporaneous relationship between educational inputs and student outcomes. However, current test scores are clearly a function of both current educational experiences as well as past school environments. The usual solution is to include past test scores on the right-hand side to capture the relationship between current achievement and past achievement. While we do not have individual test scores over time, we do have the scores for the previous grade which can be used to construct a 'quasi-gain score' model. This approach is reasonable since the distribution of families by socioeconomic class is relatively constant from year to year and revenue is similar between single years (Ferguson and Ladd, 1996).

Table 7 provides the coefficient estimates and standard errors for the total expenditures and percentage of resources devoted to teaching variables from these regressions. Not surprisingly, the previous grade's test score is positive and significantly related the year-ahead test scores. However, expenditures per student and the percentage of expenditures devoted to teaching continue to be positively related to test scores. Total expenditures remain statistically significant in nine of the thirteen OLS regressions. The percentage of resources allocated to instruction remains significant in eight of the thirteen OLS equations. Using instrumental variables with a model that includes the previous grade's scores has little effect on the original results. In all cases total expenditures and percentage teaching have the same signs. Total expenditures remains statistically significant for all but the sixth grade math and language score equations. The percentage of resources devoted to teaching is significant in all specifications. Overall, the results are robust to the inclusion of the proxy for gain scores.

IV. Conclusion

The results presented in this paper suggest that increased educational expenditures only matter if they make it to the classroom. Increased instructional expenditures have a positive effect on performance while higher non-teaching expenditures may actually be detrimental. Combined with the existing literature on administrative spending, the results presented in this paper suggest that policy makers should not only be concerned with the level of resources but also the allocation of resources. In addition, these results indicate that while school finance reform may successfully increase equality across districts in terms of total expenditures, it does not guarantee that funds will be equally devoted to teaching. Funding equalization across districts may therefore result in less convergence in performance than policy makers anticipate.

At first glance the public policy implications seem clear; school districts need to devote fewer resources to administration and any increase in educational expenditures should be targeted directly at the classroom. However, these policies may be more difficult to implement in practice. For example, even if the recently defeated proposal in California to limit administrative expenses at the district level to 5% of total expenditures had passed, districts could have reached this goal by simply moving centralized district administrative functions back to the individual schools. More generally, limiting total administrative costs, at the district and school level, would likely prompt administrators to hide administrative-spending under the teaching-umbrella.

It might also seem that the easiest way to decrease the percentage of spending devoted to administrative tasks is to exploit administrative economies of scale. This objective could be achieved by consolidating school districts and increasing school size. However, increasing district and school size may have other offsetting effects on performance. For example, in Bedard, Brown, and Helland (1999) we find that larger schools generally perform worse than smaller schools.

It is equally difficult to ensure that increased spending targeted broadly for the classroom would go to the desired use. In order to ensure increased teaching expenditures, policy makers may be forced to narrowly target funding for specific purposes. Recent California class size reduction initiatives are a good example of attempts to ensure that funds reach the classroom. However, the existing literature concerning class size effects is ambiguous at best; both Hoxby (1998b) and Lazear (1999) argue that the optimal allocation of resources varies across student characteristics.

While the results presented in this paper clearly suggest that greater classroom funding is beneficial, it is less clear how to redirect current and/or future funding in that direction. The results in both Lazear (1999) and Hoxby (1998b) certainly suggest that it is difficult to construct effective narrowly targeted funding systems. As such, there is a clear need for further thought into the design of school funding allocation mechanisms.

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Table 1: Summary Statistics						
	Grade 10 (n=374*)		Grade 6 (n=710**)		Grade 3 (n=709***)	
Variable	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Test Scores						
Math	695.1	13.0	659.5	19.4	593.6	20.1
Reading	691.6	14.2	660.2	17.6	605.7	23.1
Language	670.4	14.3	646.1	16.1	599.8	19.9
Social Science	654.4	9.9	na	na	na	na
Science	679.0	11.1	na	na	na	na
Spelling	na	na	645.5	17.8	591.5	16.7
District Chracteristics						
Limited English proficiency	16.3%	14.3%	18.2%	17.7%	18.3%	17.7%
Native American	1.7%	4.2%	1.4%	3.7%	1.4%	3.7%
Asian	5.8%	8.5%	5.0%	7.9%	5.0%	7.9%
Pacific Islander	0.5%	0.6%	0.5%	0.9%	0.5%	0.9%
Hispanic	33.4%	24.2%	33.8%	26.2%	33.9%	26.2%
African American	5.2%	8.2%	4.3%	7.4%	4.3%	7.4%
White	51.7%	25.3%	53.6%	27.5%	53.5%	27.5%
Students Receiving AFDC	13.8%	10.7%	14.4%	11.6%	14.5%	11.6%
Students Receiving Free Lunch	39.0%	22.2%	45.3%	25.9%	45.5%	25.9%
Rural District	0.492	0.501	0.544	0.498	0.546	0.498
Urban District	0.160	0.367	0.121	0.327	0.121	0.327
Suburban District	0.348	0.477	0.335	0.472	0.333	0.472
Unified School District	0.781	0.414	0.417	0.493	0.420	0.494
District Enrollment	11688	37204	7068	27460	7064	27479
Per Student Expenditures and Revenues						
Total Expenditures	$5,555	$908	$5,386	$904	$5,403	$928
Teaching Expenditures as Percentage of Total	56.7%	4.1%	59.0%	4.9%	59.0%	5.0%
Federal EESA/Math & Science Revenues	$4	$6	$5	$31	$5	$31
State Educational Technology Assistance Revenues	$12	$19	$12	$24	$12	$28
State Home to School Transportation Revenues	$142	$154	$208	$217	$213	$251
State Special Education Revenues	$245	$147	$223	$137	$225	$141
State School Improvement Revenues	$48	$34	$68	$48	$68	$45

* There are only 373 observations for the Language Scores Variable.
** There are only 707 and 709 observations for the Reading and Language Scores Variables.
*** There are only 708 observations for the Reading and Spelling Scores Variables.

Table 2: OLS Estimates of Performance Equations

Dependent Variable: Subject Test Scores

Independent Variable	Grade 10 Math	Grade 10 Lang.	Grade 10 Read.	Grade 10 Science	Grade 10 SocScie	Grade 6 Math	Grade 6 Lang.	Grade 6 Read.	Grade 6 Spell.	Grade3 Math	Grade3 Lang.	Grade3 Read.	Grade3 Spell.
Intercept	**688.2**	**671.8**	**698.0**	**674.6**	**647.0**	**649.9**	**643.5**	**660.4**	**642.8**	**588.9**	**593.9**	**605.0**	**589.9**
	(7.42)	(7.99)	(7.23)	(6.07)	(5.87)	(7.78)	(6.01)	(5.62)	(6.34)	(8.97)	(7.19)	(7.13)	(6.71)
% Limited English Prof.	**9.819**	7.757	3.148	**6.331**	**6.189**	-5.545	-4.359	**-7.260**	**-9.606**	0.407	-1.939	-4.809	**-15.671**
	(4.51)	(4.82)	(4.40)	(3.69)	(3.57)	(4.49)	(3.48)	(3.26)	(3.66)	(5.20)	(4.16)	(4.13)	(3.88)
% Native American	**-39.82**	**-46.34**	**-42.74**	**-39.58**	**-30.37**	**-40.52**	**-27.39**	**-37.49**	**-24.30**	**-38.38**	**-40.24**	**-40.98**	**-24.68**
	(8.82)	(9.42)	(8.59)	(7.22)	(6.98)	(11.7)	(9.04)	(8.41)	(9.53)	(13.4)	(10.7)	(10.6)	(10.0)
% Asian	**43.70**	**20.72**	3.05	**8.562**	**7.281**	**34.86**	**17.56**	**7.710**	**36.82**	**24.26**	**20.35**	4.93	**47.80**
	(4.62)	(4.94)	(4.51)	(3.79)	(3.66)	(5.86)	(4.52)	(4.23)	(4.77)	(6.78)	(5.43)	(5.38)	(5.07)
% Pacific Islander	**-205.9**	**-165.6**	**-173.8**	**-129.1**	**-180.4**	**-108.9**	**-82.59**	**-67.74**	-24.28	-82.10	-41.94	-59.62	43.87
	(55.9)	(62.6)	(54.4)	(45.7)	(44.2)	(44.6)	(34.4)	(32.1)	(36.3)	(52.7)	(42.2)	(41.8)	(39.4)
% Hispanic	**-23.47**	**-31.84**	**-35.29**	**-26.77**	**-23.23**	**-14.32**	**-11.07**	**-20.89**	**-11.35**	**-15.60**	**-19.79**	**-28.56**	**-8.110**
	(2.81)	(3.00)	(2.73)	(2.30)	(2.22)	(3.63)	(2.81)	(2.63)	(2.96)	(4.20)	(3.36)	(3.34)	(3.14)
% African American	**-26.42**	**-30.44**	**-33.05**	**-27.45**	**-18.83**	**-38.82**	**-21.80**	**-29.89**	**-21.76**	**-18.15**	**-18.36**	**-30.51**	**-6.4015**
	(5.15)	(5.50)	(5.02)	(4.22)	(4.07)	(6.54)	(5.06)	(4.71)	(5.33)	(7.59)	(6.07)	(6.02)	(5.67)
% of Students AFDC	**-16.30**	**-13.54**	**-11.95**	**-9.387**	**-8.913**	**-21.91**	**-17.03**	**-14.62**	**-17.35**	**-20.48**	**-23.06**	**-14.83**	**-18.03**
	(4.01)	(4.28)	(3.91)	(3.28)	(3.17)	(5.26)	(4.10)	(3.84)	(4.28)	(6.07)	(4.86)	(4.81)	(4.54)
% of Students with Free Lunch	**-18.02**	**-20.53**	**-18.69**	**-15.85**	**-13.89**	**-34.54**	**-32.53**	**-32.09**	**-34.63**	**-38.30**	**-37.40**	**-45.97**	**-27.96**
	(2.75)	(2.93)	(2.68)	(2.25)	(2.17)	(3.57)	(2.75)	(2.59)	(2.91)	(4.15)	(3.33)	(3.29)	(3.11)
Rural School	**-3.844**	**-4.761**	**-4.024**	**-1.832**	**-2.076**	**-3.857**	**-3.769**	**-2.964**	**-3.557**	**-3.408**	**-4.351**	**-3.169**	**-2.752**
	(0.89)	(0.96)	(0.87)	(0.73)	(0.71)	(1.04)	(0.80)	(0.75)	(0.85)	(1.21)	(0.97)	(0.96)	(0.90)
Urban School	-0.555	0.362	-0.352	-0.558	-0.867	0.771	0.696	0.551	0.734	-1.312	-0.771	-0.269	-0.809
	(1.07)	(1.15)	(1.05)	(0.88)	(0.85)	(1.37)	(1.05)	(0.98)	(1.11)	(1.58)	(1.27)	(1.25)	(1.18)
Expend per Student ($1000)	**2.128**	**1.772**	**1.656**	**1.901**	**1.954**	**2.592**	**1.55**	**2.068**	**1.787**	**2.585**	**2.643**	**2.838**	**1.781**
	(0.45)	(0.49)	(0.44)	(0.37)	(0.36)	(0.52)	(0.40)	(0.37)	(0.42)	(0.59)	(0.47)	(0.47)	(0.44)
% Teaching Expenditures	**0.231**	**0.217**	**0.174**	**0.221**	**0.232**	**0.395**	**0.319**	**0.287**	**0.309**	**0.319**	**0.374**	**0.384**	**0.214**
	(0.10)	(0.11)	(0.10)	(0.08)	(0.08)	(0.10)	(0.07)	(0.07)	(0.08)	(0.1)	(0.09)	(0.09)	(0.08)
R-Square	0.7766	0.7923	0.8228	0.7965	0.7599	0.7229	0.76	0.825	0.781	0.654	0.774	0.835	0.7215
Observations	374	373	374	374	374	710	709	707	710	709	709	708	708

Notes: Standard errors in parentheses. Bold coefficients significant at the 10% level.

Table 3: OLS Predicted Percentile Changes from $100 Changes in Per Pupil Expenditures			
	$100 Reallocation from Instructional to Instructional Spending	$100 Increase Spent In Current Proportions	$100 Increase in Teaching Expenditures
Grade 10			
Math	2.7	1.7	2.5
Language	1.6	0.8	1.1
Reading	1.1	0.8	1.1
Science	1.8	1.0	1.8
Social Science	1.0	0.8	1.0
Grade 6			
Math	1.5	0.6	1.4
Language	1.0	0.2	0.7
Reading	1.3	0.5	1.2
Spelling	1.6	0.2	1.0
Grade 3			
Math	1.1	0.1	0.8
Language	1.7	0.8	1.5
Reading	0.4	0.2	0.3
Spelling	0.8	0.3	0.8

Notes: All percentile changes are evaluated at the appropriate mean.

Table 4: First Stage Estimates for Math Scores			
Independent Variable	Grade 10 % Teaching	Grade 6 % Teaching	Grade 3 % Teaching
Intercept	**0.558726**	**0.630305**	**0.629883**
	(0.007)	(0.006)	(0.005)
Rural District	-0.000602	0.002905	0.000000
	(0.005)	(0.004)	(0.004)
Urban District	**-0.011950**	-0.005027	-0.005177
	(0.006)	(0.006)	(0.006)
District Enrollment	-0.000104	-0.000250	-0.000219
(1000s of students)	(0.000)	(0.000)	(0.000)
District Enrollment*District Enrollment	0.000000	0.000000	0.000000
(1000s of students)	(0.000)	(0.000)	(0.000)
Unified District	**0.037888**	**-0.035527**	**-0.035247**
	(0.005)	(0.004)	(0.004)
Federal EESA/Math & Science	**-0.636000**	-0.062818	-0.061772
Revenues per Student ($1000s)	(0.327)	(0.055)	(0.055)
State Educational Technology Assistance	0.039027	0.101000	0.114000
Revenues per Student ($1000s)	(0.097)	(0.070)	(0.064)
State Home to School Transportation	**-0.089435**	**-0.088788**	**-0.076706**
Revenues per Student ($1000s)	(0.015)	(0.010)	(0.008)
State Special Education Transportation	**-0.028374**	-0.011406	-0.014351
Revenues per Student ($1000s)	(0.014)	(0.013)	(0.013)
State School Improvement	0.048402	**-0.064336**	**-0.065178**
Revenues per Student ($1000s)	(0.066)	(0.036)	(0.039)
Observations	374	710	709
R-Square	0.2693	0.2045	0.2194

Notes: Standard errors in parentheses. Bold coefficients significant at the 10% level. The first stage estimates are the same for the other subjectwith the same number of observations and very similar for those subjects with fewer observations.

Table 5: Instrumental Variable Estimates of Performance Equations

Dependent Variable: Subject Test Scores

Independent	Grade 10					Grade 6				Grade3			
Variable	Math	Lang.	Read.	Scie.	Soc. Scie.	Math	Lang.	Read.	Spell.	Math	Lang.	Read.	Spell.
Intercept	**646.8**	**614.0**	**643.9**	**641.6**	**608.8**	**607.9**	**597.8**	**621.5**	**595.3**	**534.3**	**544.5**	**541.2**	**564.2**
	(14.0)	(15.5)	(14.3)	(11.5)	(11.4)	(13.5)	(10.8)	(10.1)	(11.4)	(15.2)	(12.5)	(13.1)	(11.0)
% Limited	7.102	3.711	-0.443	4.182	3.695	-7.431	-6.139	**-9.075**	**-11.78**	-1.680	-3.747	-7.258	**-16.60**
English Prof.	(5.01)	(5.62)	(5.13)	(4.10)	(4.09)	(4.81)	(3.88)	(3.60)	(4.08)	(5.57)	(4.57)	(4.74)	(4.02)
% Native	**-32.82**	**-36.50**	**-34.59**	**-33.71**	**-23.77**	**-34.99**	**-21.08**	**-32.89**	**-19.08**	**-34.65**	**-36.35**	**-36.41**	**-22.52**
American	(9.84)	(11.1)	(10.1)	(8.05)	(8.04)	(12.5)	(10.1)	(9.26)	(10.6)	(14.4)	(11.8)	(12.2)	(10.4)
% Asian	**43.01**	**19.86**	2.492	**7.912**	6.595	**32.67**	**16.35**	6.198	**35.11**	**22.53**	**18.29**	2.948	**46.62**
	(5.07)	(5.68)	(5.19)	(4.15)	(4.14)	(6.22)	(5.01)	(4.62)	(5.28)	(7.22)	(5.92)	(6.13)	(5.20)
% Pacific	**-188.3**	-164.5	**-153.5**	**-114.4**	**-163.8**	**-109.7**	**-82.40**	**-67.11**	-23.58	-87.12	-47.44	-66.37	40.94
Islander	(61.5)	(72.1)	(63.0)	(50.3)	(50.3)	(47.6)	(38.3)	(35.2)	(40.3)	(56.4)	(46.2)	(47.9)	(40.6)
% Hispanic	**-20.82**	**-28.02**	**-31.50**	**-24.77**	**-20.85**	**-13.46**	**-9.966**	**-19.98**	**-10.11**	**-14.65**	**-19.16**	**-27.42**	**-7.811**
	(3.14)	(3.50)	(3.22)	(2.57)	(2.56)	(3.88)	(3.12)	(2.88)	(3.29)	(4.48)	(3.67)	(3.81)	(3.23)
% African	**-30.18**	**-34.10**	**-36.28**	**-30.93**	**-22.54**	**-41.54**	**-23.68**	**-31.68**	**-23.56**	**-19.93**	**-20.81**	**-32.71**	-7.864
American	(5.51)	(6.18)	(5.65)	(4.51)	(4.50)	(6.90)	(5.56)	(5.11)	(5.85)	(8.00)	(6.56)	(6.80)	(5.77)
% of Students	**-13.02**	**-9.020**	**-8.086**	**-6.645**	-5.823	**-19.88**	**-15.46**	**-13.25**	**-15.71**	**-18.64**	**-20.96**	-12.59	**-16.82**
AFDC	(4.48)	(5.03)	(4.59)	(3.67)	(3.66)	(5.59)	(4.54)	(4.20)	(4.74)	(6.46)	(5.30)	(5.49)	(4.67)
% of Students	**-21.65**	**-25.31**	**-23.21**	**-18.80**	**-17.27**	**-36.58**	**-34.14**	**-33.58**	**-36.44**	**-39.99**	**-39.22**	**-48.01**	**-28.99**
with Free Lunch	(3.17)	(3.54)	(3.25)	(2.60)	(2.59)	(3.80)	(3.06)	(2.84)	(3.22)	(4.43)	(3.64)	(3.77)	(3.20)
Rural School	**-2.817**	**-3.482**	**-2.721**	-1.003	-1.124	**-3.105**	**-2.996**	**-2.299**	**-2.718**	**-2.392**	**-3.422**	-2.012	**-2.264**
	(1.02)	(1.14)	(1.05)	(0.84)	(0.83)	(1.13)	(0.91)	(0.84)	(0.96)	(1.31)	(1.08)	(1.11)	(0.95)
Urban School	1.100	2.457	1.562	0.832	0.693	1.914	1.705	1.493	1.825	-0.127	0.425	1.134	-0.161
	(1.25)	(1.39)	(1.28)	(1.02)	(1.02)	(1.47)	(1.18)	(1.09)	(1.24)	(1.70)	(1.39)	(1.45)	(1.23)
Expend per	**2.395**	**2.293**	**2.179**	**2.062**	**2.173**	**2.442**	**1.597**	**2.064**	**1.855**	**2.833**	**2.725**	**3.089**	**1.797**
Student ($1000)	(0.46)	(0.53)	(0.48)	(0.38)	(0.38)	(0.51)	(0.41)	(0.38)	(0.43)	(0.58)	(0.48)	(0.50)	(0.42)
% Teaching	**0.933**	**1.181**	**1.071**	**0.786**	**0.881**	**1.125**	**1.087**	**0.948**	**1.109**	**1.221**	**1.206**	**1.443**	**0.650**
Expenditures	(0.22)	(0.24)	(0.23)	(0.18)	(0.18)	(0.21)	(0.16)	(0.15)	(0.17)	(0.23)	(0.19)	(0.20)	(0.17)
R-Square	0.7448	0.7454	0.7796	0.766	0.7149	0.6981	0.722	0.798	0.745	0.627	0.744	0.796	0.71
Observations	374	373	374	374	374	710	709	707	710	709	709	708	708

Notes: Standard errors in parentheses. Bold coefficients significant at the 10% level.

Table 6: IV Predicted Percentile Changes from a $100 Changes in Per Pupil Expenditures			
	$100 Reallocation from Instructional to Instructional Spending	$100 Increase Spent In Current Proportions	$100 Increase in Teaching Expenditures
Grade 10			
Math	7.8	1.7	5.1
Language	5.6	1.0	3.2
Reading	3.0	1.1	1.8
Science	4.8	1.0	3.0
Social Science	5.9	0.8	3.2
Grade 6			
Math	4.5	0.6	2.7
Language	4.9	0.2	1.7
Reading	4.7	0.5	2.2
Spelling	2.6	0.2	2.0
Grade 3			
Math	5.0	0.1	2.5
Language	6.0	0.8	2.2
Reading	2.3	0.2	0.8
Spelling	3.4	0.3	1.8

Notes: Standard errors in parentheses. Bold coefficients are statistically significant at the 10% level.