The Relationship Between Funding and Achievement:

An Exploratory Study in the Los Angeles Unified School District

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Educational researchers have long tried to identify a link between funding and student outcomes. This work, at the request of the Fiscal Services Branch, is an exploratory analysis using school level fiscal and academic achievement data in an attempt to reveal such a relationship in Los Angeles Unified School District Schools.

Data File Preparation and Analyses

Multiple data sources were combined for these analyses. Matched individual student SAT/9 data for 2000 and 2001 were supplemented with School Characteristics Index scores and Academic Performance Index growth scores from the California Department of Education. These data were then combined with enrollment and fiscal services data for the 2001-2002 school year provided by the Compensatory Education Fiscal Services Branch. All data sources used the school as the unit of analysis.

Matched individual student SAT/9 gains in reading, math, and language served as the primary measure of student achievement. Consistent with prior analysis conducted by the Program Evaluation and Research Branch, lower scoring schools tend to show larger gains than higher scoring schools. In these analyses, a residual score has been calculated which takes into account schools' initial performance level. A residual score is the difference between a school's actual 2001 NCE score and what we would have expected that school to score given the initial 2000 score. Residual scores in these analyses will be referred to as adjusted gain scores. A secondary measure of student achievement used in these analyses is the Academic Performance Index growth. The Academic Performance Index is a composite measure of the 6 primary SAT/9 subtest scores (Reading, Math, and Language for sll schooling levels, Spelling at the elementary and middle school level, and Science, Social Science at the senior high school level). Growth represents the difference between a school's 2001 and 2000 API score.

Two primary measures of fiscal data, per pupil general funds and per pupil special funds, were used in these analyses. General funds are associated with the

core educational program. These funds include salaries for administrative, instructional, and support staff (e.g., principals, teachers, nurses, counselors, custodians) and expenditures for maintenance, utilities, and instructional materials among others. Special funds primarily include major grants, such as Title I, School Improvement, and Economic Impact Aid (comprised of Limited English Proficiency and State Compensatory Education allocations).

Because the actual per pupil funding is not tracked on an individual student basis, it was necessary to estimate average school level per pupil funding. Per pupil special education spending is a major expense and the number of special day class students across schools is not consistent. If included, a school's average per pupil general fund amounts could be artificially inflated by the number of special day class students in a school. For this reason, neither special education funds nor special day class students were included in the estimates. Estimated per pupil general funds were calculated by dividing a school's general fund dollars (minus special education dollars) by the total school enrollment (minus special day class students). Estimated per pupil special funds were calculated by dividing a school's special fund dollars by the total enrollment (minus special day class students).

To reduce potential bias in our analyses, we limited our schools to those with standard grade level configurations (i.e., span/multi-level schools and primary centers were excluded). We also excluded fiscally independent charter, special education, continuation, and opportunity schools. Analyses were first done for each schooling level (Elementary, Middle, and Senior High) and repeated for Non-Title I, Title I Targeted Assistance, and Title I Schoolwide Program schools. Table 1 details the average per pupil data for each schooling level and level of Title I participation (see Table 1).

Table 1.

Mean Per Student Funds and Enrollment by Schooling Level and Title I Participation

Title I Participation	Mean Per Student General Funds			Mean Per Student Special Funds			Mean Per Student Total Funds			Mean Enrollment		
	Elem-entary	Middle	Senior High	Elem-entary	Middle	Senior High	Elem-entary	Middle	Senior High	Elem-entary	Middle	Senior High
All Schools	$4,216	$3,998	$4,018	$680	$525	$685	$4,896	$4,523	$4,703	819	1783	2754
Non-Title I	$4,152	$4,000	$3,924	$278	$232	$437	$4,430	$4,232	$4,361	534	1424	2449
Targeted Assistance	$4,320	$4,032	$4,105	$788	$572	$890	$5,108	$4,604	$4,995	803	1696	2866
Schoolwide Program	$4,174	$3,979	$4,064	$794	$630	$813	$4,968	$4,609	$4,877	965	1988	2986

Results

Overall, the results do not indicate strong relationships between per pupil funds and student achievement. All first order correlations for elementary, middle, and senior high school levels are small in magnitude and most are not statistically significant (see Table 2). Per pupil general funds were not related to any measure of student achievement. Per pupil special funds were related to adjusted reading and language gains and API growth, but only in elementary schools (Reading: $r = 0.16$, $p < 0.01$; Language: $r = 0.31$, $p < 0.01$; API Growth: $r = 0.30$, $p < 0.01$). These relationships indicate that as per pupil special funds increase achievement gains increase as well. Although not directly associated with per pupil funds, we analyzed the relationship of student achievement measures and school enrollment and SCI. In elementary schools, significant relationships in similar magnitudes as per pupil special funds were exhibited between student enrollment (Reading: $r = 0.11$, $p < 0.05$; Language: $r = 0.26$, $p < 0.01$; API Growth: $r = 0.20$, $p < 0.01$) and achievement and SCI (Reading: $r = -0.13$, $p < 0.01$; Language: $r = -0.37$, $p < 0.01$; API Growth: $r = -0.38$, $p < 0.01$) and achievement. These relationships indicate that schools with higher enrollment and characteristically lower socioeconomic status exhibit higher gains. The only other significant relationship was between SCI and adjusted math gain in middle schools ($r = 0.24$,

$p < 0.05$). This relationship indicates that middle schools with characteristically higher socioeconomic status exhibit higher gains.

Table 2.

Correlation between Academic Achievement and Fiscal Service Variables by Schooling Level

Schooling Level	Achievement Measure	Statistic	Per Student General Funds	Per Student Special Funds	Enrollment w/o SDC students	School Character-istic Index
Elementary Schools	Adjusted Reading Gain	Pearson Correlation	-0.06	0.16 **	0.11 *	-0.13 **
		# of Schools	429	429	429	427
	Adjusted Math Gain	Pearson Correlation	0.01	0.00	0.00	0.05
		# of Schools	429	429	429	427
	Adjusted Language Gain	Pearson Correlation	0.02	0.31 **	0.26 **	-0.37 **
		# of Schools	429	429	429	427
	API Growth	Pearson Correlation	0.02	0.30 **	0.20 **	-0.38 **
		# of Schools	377	377	377	376
Middle Schools	Adjusted Reading Gain	Pearson Correlation	0.05	0.05	-0.09	0.11
		# of Schools	72	71	72	71
	Adjusted Math Gain	Pearson Correlation	0.02	-0.06	-0.13	0.24 *
		# of Schools	72	71	72	71
	Adjusted Language Gain	Pearson Correlation	-0.08	-0.08	0.14	0.19
		# of Schools	72	71	72	71
	API Growth	Pearson Correlation	0.03	0.08	0.08	0.00
		# of Schools	70	70	70	70
Senior High Schools	Adjusted Reading Gain	Pearson Correlation	-0.27	-0.13	0.02	0.23
		# of Schools	52	52	52	52
	Adjusted Math Gain	Pearson Correlation	-0.11	-0.10	-0.01	0.12
		# of Schools	52	52	52	52
	Adjusted Language Gain	Pearson Correlation	-0.01	0.10	-0.07	-0.07
		# of Schools	52	52	52	52
	API Growth	Pearson Correlation	-0.14	-0.09	0.10	-0.03
		# of Schools	51	51	51	51

Because special funds are largely made up of Title I funds, we further examined these relationships within levels of Title I participation (See Table 3). The only significant relationship between academic achievement and per pupil special funds was in Title I Schoolwide Program schools. Ordinarily, this might suggest that greater allocation of special funds within these schools would lead to improved student achievement. Were this the case, we would expect to see an increase in the magnitude of the relationship with Schoolwide Program schools and a decrease in the magnitude for other schools. When disaggregated by Title I

participation, the special fund-student achievement relationship in fact decreases to half the magnitude for Schoolwide Program schools (Reading: $r = 0.14$, $p < 0.05$; Language: $r = 0.15$, $p < 0.05$; API Growth: $r = 0.16$, $p < 0.05$), while the relationship disappears in Non-Title I (Reading: $r = 0.06$, $p > 0.05$; Language: $r = 0.03$, $p > 0.05$; API Growth: $r = 0.05$, $p > 0.05$) and Targeted Assistance schools (Reading: $r = 0.08$, $p > 0.05$; Language: $r = 0.00$, $p > 0.05$; API Growth: $r = -0.03$, $p > 0.05$). These findings suggest that the original relationship may have been spurious and attributable to the influence of other unmeasured variables.

Table 3.

Correlation between Academic Achievement and Fiscal Service Variables

School Type	Title I Participation	Achievement Measure	Statistic	Per Pupil General Funds	Per Pupil Special Funds	Enrollment (No SDC students)	School Character-istic Index
Elem-entary Schools	Non Title I	Reading Residual Gain	Pearson Correlation	0.05	0.06	-0.07	-0.09
			# of Schools	93	93	93	93
		Math Residual Gain	Pearson Correlation	0.13	0.04	-0.14	0.13
			# of Schools	93	93	93	93
		Language Residual Gain	Pearson Correlation	0.13	0.03	-0.06	-0.22*
			# of Schools	93	93	93	93
		API Growth	Pearson Correlation	0.03	0.05	-0.14	-0.37**
			# of Schools	74	74	74	74
	Title I - Targeted Assistance	Reading Residual Gain	Pearson Correlation	-0.22**	0.08	0.12	-0.07
			# of Schools	137	137	137	136
		Math Residual Gain	Pearson Correlation	-0.13	-0.10	0.02	0.11
			# of Schools	137	137	137	136
		Language Residual Gain	Pearson Correlation	-0.12	0.00	0.10	-0.11
			# of Schools	137	137	137	136
		API Growth	Pearson Correlation	-0.15	-0.03	0.09	-0.07
			# of Schools	124	124	124	123
	Title I - School Wide Program	Reading Residual Gain	Pearson Correlation	0.06	0.14*	0.04	-0.02
			# of Schools	199	199	199	198
		Math Residual Gain	Pearson Correlation	0.10	0.10	0.01	-0.01
			# of Schools	199	199	199	198
		Language Residual Gain	Pearson Correlation	0.04	0.15*	0.20**	-0.14*
			# of Schools	199	199	199	198
		API Growth	Pearson Correlation	0.12	0.16*	0.12	-0.21**
			# of Schools	179	179	179	179

Table 3. (Continued)

Correlation between Academic Achievement and Fiscal Service Variables

School Type	Title I Participation	Achievement Measure	Statistic	Per Pupil General Funds	Per Pupil Special Funds	Enrollment (No SDC students)	School Character-istic Index
Middle Schools	Non Title I	Reading Residual Gain	Pearson Correlation	-0.33	-0.24	0.25	0.15
			# of Schools	16	16	16	16
		Math Residual Gain	Pearson Correlation	-0.07	0.43	-0.08	0.05
			# of Schools	16	16	16	16
		Language Residual Gain	Pearson Correlation	-0.22	0.33	0.29	-0.16
			# of Schools	16	16	16	16
		API Growth	Pearson Correlation	-0.02	0.25	-0.02	0.18
			# of Schools	16	16	16	16
	Title I - Targeted Assistance	Reading Residual Gain	Pearson Correlation	0.09	0.04	-0.40	0.44
			# of Schools	19	19	19	19
		Math Residual Gain	Pearson Correlation	-0.04	0.05	-0.39	0.18
			# of Schools	19	19	19	19
		Language Residual Gain	Pearson Correlation	-0.01	0.11	-0.34	0.26
			# of Schools	19	19	19	19
		API Growth	Pearson Correlation	0.00	-0.10	-0.42	0.04
			# of Schools	18	18	18	18
	Title I - School Wide Program	Reading Residual Gain	Pearson Correlation	0.27	0.16	-0.02	0.01
			# of Schools	37	36	37	36
		Math Residual Gain	Pearson Correlation	0.16	0.12	0.09	-0.05
			# of Schools	37	36	37	36
		Language Residual Gain	Pearson Correlation	-0.09	-0.01	0.45 **	0.07
			# of Schools	37	36	37	36
		API Growth	Pearson Correlation	0.10	0.08	0.18	-0.04
			# of Schools	36	36	36	36
Senior High Schools	Non Title I	Reading Residual Gain	Pearson Correlation	-0.19	-0.20	-0.04	0.14
			# of Schools	20	20	20	20
		Math Residual Gain	Pearson Correlation	-0.12	0.23	0.13	0.13
			# of Schools	20	20	20	20
		Language Residual Gain	Pearson Correlation	0.17	0.26	-0.04	-0.08
			# of Schools	20	20	20	20
		API Growth	Pearson Correlation	0.12	-0.12	-0.26	-0.03
			# of Schools	20	20	20	20
	Title I - Targeted Assistance	Reading Residual Gain	Pearson Correlation	-0.34	-0.07	0.26	0.16
			# of Schools	11	11	11	11
		Math Residual Gain	Pearson Correlation	-0.07	-0.21	0.09	0.09
			# of Schools	11	11	11	11
		Language Residual Gain	Pearson Correlation	-0.09	-0.22	-0.16	0.03
			# of Schools	11	11	11	11
		API Growth	Pearson Correlation	-0.19	0.36	0.26	-0.19
			# of Schools	10	10	10	10
	Title I - School Wide Program	Reading Residual Gain	Pearson Correlation	-0.23	0.06	0.02	0.24
			# of Schools	21	21	21	21
		Math Residual Gain	Pearson Correlation	-0.11	-0.33	-0.13	0.28
			# of Schools	21	21	21	21
		Language Residual Gain	Pearson Correlation	-0.18	0.19	-0.12	-0.05
			# of Schools	21	21	21	21
		API Growth	Pearson Correlation	-0.34	-0.33	0.22	0.02
			# of Schools	21	21	21	21

To further examine the relationship between per pupil special funds and student achievement we examined the effect of the fiscal variables on student achievement using a more complex multiple regression model. The results of these analyses indicate that enrollment or School Characteristics are a better predictor of student achievement than per pupil special funds (see Appendix A).

Regardless of the significance of any of the relationships discussed in this paper, it is important to consider its magnitude. In regression analyses, we use a squared correlation coefficient (R^2) to determine the proportion of variation in the dependent variable explained by the regression model. In these analyses we seek to determine how much of the variation in student achievement can be explained by per pupil funding, enrollment size, and school characteristic index score. The values of R^2 range from 0 to 1. Small values indicate that the model does not fit the data well. Typical R^2 values in this study range from a low of R^2=0.01 to 0.15 with most scores in the lower range. This indicates that even the better fiscal predictors of student achievement only account for 15 percent of the variance in student achievement with other unidentified factors accountable for the rest.

Conclusions and Limitations

This study represents an exploratory analysis of the relationship among fiscal variables and student achievement. Based on our findings, we cannot report a relationship between fiscal variables and student achievement. There are a number of potential reasons that relationships were not found. First, fiscal data came from a different time period than the student achievement data. Fiscal data came from the 2001-2002 school year whereas SAT/9 adjusted gains and API growth data were derived from the 2000 to 2001 school years. Any relationship of fiscal data and student achievement data is dependent upon the stability of fiscal allocations across school years. Second, the data available from the fiscal services only represents the dollar amounts budgeted, not those actually spent. Attempts to relate student achievement to per pupil spending using these analyses would be dependent upon the likelihood that every school spent most, if not their entire

budget. Finally, the greatest limitation of this study lies in the lack of specificity in the budgeted funds themselves. The general fund category pays for the bulk of the core educational program. This includes aspects that are very far removed from student instructional expenditure. Special funds, although more directly associated with expenditures aimed at student impact, include funds from many different sources, each with its own set of expectations and spending requirements.

It is clear that this exploratory analysis is not sufficient to definitively answer the question, "How is spending linked to student achievement outcomes." If further analyses are to be conducted at the school level of analysis, certain limitations in the fiscal data should be addressed. The timeframe of fiscal and student achievement data should be matched; data on spending, not allocation should be used; and further disaggregation of fund categories should be done.

In their article, *The Collection and Use of Student-Level Data: Implications for School Finance Research*[1], Picus and Robillard (2000) make the argument that "if we are ever to truly understand how money matters…we need to have a better picture of the resources available to each student." They discuss an approach where one school's spending was divided into categories of direct individual student spending, costs associated with each class offering, and indirect costs allocated evenly on a per pupil basis. This approach provides more student-level variability than per pupil estimates based upon total school general funds and allows individual differences in per pupil spending be linked to individual differences in student achievement. Without the use of a more detailed and specific fiscal tracking and data collection system, at either the school or student level, it is unlikely that we will be able to draw any definitive conclusions on the relationship between spending and student achievement[2].

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[1] Picus, L. O. & Robillard, E (2000). The collection and use of student level data: Implications for school finance research. *Educational Considerations, 28(1)*, 26-31.
[2] The Financial Reporting Database (FRDB) may provide the necessary detail at the individual school level.

Appendix A

Regression Tables