PREDICTING ACADEMIC ACHIEVEMENT BY THE PHYSICAL CONDITION OF FACILITIES IN CALIFORNIA'S SCHOOLS

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PREDICTING ACADEMIC ACHIEVEMENT BY THE PHYSICAL CONDITION OF FACILITIES IN CALIFORNIA'S SCHOOLS

A Thesis

by

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Abstract

of

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The class-action lawsuit *Eliezer Williams, et al., v. State of California, et al.* was settled by Governor Arnold Schwarzenegger in 2004. Resulting from the settlement was an $800 million investment in the facilities of the lowest-achieving schools. Despite this influx of funds, empirical research connecting the condition of school facilities to academic achievement is lacking. This thesis uses two facility measures gathered from the School Facilities Needs Assessment data collected pursuant to SB 6—five-year maintenance and necessary repair costs—in a multiple regression statistical analysis to determine whether poor facilities make an independent contribution to lower test scores in Los Angeles County. This analysis found the five-year maintenance cost, defined to be the estimated costs to maintain functionality of the school buildings over five years, to exert a statistically significant influence (at the 99% confidence level) on the Academic Performance Index (API) score recorded for a school site. Specifically, a ten-percent increase in the five-year maintenance cost resulted in an API score lower by 0.12%. (The 90% confidence interval around this expected effect is -.017 to -.006). Though statistically significant, this influence is relatively small as compared to the much larger magnitude of influence found for student and family/social explanatory variables also included in the study. I suggest further research utilizing a statewide standardized data set is needed to better define the nature of the relationship between the condition of school facilities and academic achievement.

_______________________________, Committee Chair
Robert W. Wassmer, Ph.D.

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Thanks to my parents for instilling in me the importance of education and for providing me the tools to achieve my goals. I have the deepest gratitude for my husband Jeff for always believing in me. I couldn’t have done this without you and I can’t wait to start the next chapter of our lives together.

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CHAPTER 1: INTRODUCTION

The purpose of this thesis is to determine whether the condition of K-12 public school facilities in California affects academic achievement as measured by the Academic Performance Index (API). Since the implementation of California's Public Schools Accountability Act of 1999 (PSAA), the API has become the primary tool for measuring academic achievement at the school level. Despite increased accountability measures and a dedicated revenue stream backing K-12 education, allegations of widespread inequity in school facilities, instructional materials and highly-qualified teachers persist.[1] This inequity was manifested in the filing of *Eliezer Williams, et al., v. State of California, et al. (Williams)* in 2000. The case was settled four years later for nearly $1 billion.

Facilities certainly aren't the only problem facing California schools. As the popular PBS (Learning Matters Inc., 2004) documentary *First to Worst* illustrated, schools are frequently missing specialized staff such as psychologists and speech therapists and lacking materials and appropriate instruction in standard educational programs such as music, art and even physical education. Textbooks are aging and extracurricular programs are virtually non-existent. While each of these issues is worthy of attention, this thesis focuses only on the condition of school facilities and whether poor facilities make an independent contribution to lower test scores.

California invested heavily in education in the 1950s, dedicating five and a half cents of every dollar to educating a future generation of citizens (Learning Matters Inc.,

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[1] Minimum funding levels for education—now upwards of $40 billion annually—were established by the passage of Proposition 98 in 1988 (EdSource, Inc., 2006).

2004). This investment paid off, and California schools were among the best in the country. Since that time, districts have faced challenges that have dramatically changed the picture. Arguably a direct result of California's school-finance decision *Serrano v. Priest (1971 and 1976)*, in which the State Supreme Court declared the property-tax-based system to be an unconstitutional violation of equal protection laws, the passage of Proposition 13 in 1978 turned the responsibility of education finance over to the State, at the same time dramatically reducing the overall property tax revenue available for distribution (Fishel, 2003). To fill the gap for constructing, modernizing and maintaining schools, local districts have few options. Some are lucky enough to have constituencies amenable to passing local General Obligation bonds; other communities are able to institute parcel tax assessments.[2] Many new communities successfully establish School Facility Improvement Districts (SFIDs) and negotiate lucrative fee payments from residential developers. Yet too often established, mostly low-income communities see their schools falling behind.

Leaky roofs, missing tiles, broken windows and doors and dirty, non-functional restrooms have become the norm in some schools. In the *First to Worst* documentary, San Pablo area school principal Harriet MacLean testified that her school's water fountains had not been working for seventeen years. Student restrooms are missing doors and ceiling tiles are falling down. A filth seems to cover the whole school.

Increasing student enrollment is one of the primary contributors to dilapidated facilities. Overcrowding has sped up the wear and tear of all building components where

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[2] The passage of Proposition 39 (2000) lowered the threshold required for school districts to pass a local facilities bond from two-thirds to 55%; a two-thirds vote is still needed to approve a parcel tax.

schools frequently exceed their design capacity by 10% or more. Further, the 1996 implementation of K-3 Class Size Reduction (CSR) still has some schools reeling, their sites filled with portable classrooms brought on to accommodate the new maximum class size of 20 students. 28,000 classrooms were added in the first two years of CSR implementation (EdSource, Inc., 1998); the current phase-out of the State Relocatable Classroom Program (SRCP) shows many of these facilities are still in place today (Department of General Services (DGS), 2006c).

The fact is, buildings get old. Even the most innovative construction techniques from the 1950s have exceeded their usable lifespan, requiring modernization and reconstruction of facilities. Budget constraints have led many schools to defer routine maintenance, yet as years pass, deferred maintenance results in conditions that pose critical hardships to schools seeking to maintain the basic health and safety of their students and staff. With more and more school buildings reaching ages at which they are no longer effective or safe, the State's Deferred Maintenance Program (DMP) has never been more heavily subscribed.[3]

According to revised 2006-07 budget figures from the Legislative Analyst's Office (LAO, 2007), K-12 education is currently funded at $49.011 billion annually, with 83% coming from the General Fund and the remainder coming from property tax revenues. This equates to about $6,578 per pupil in General Fund expenditures, compared to $36,600 spent per adult correctional system lock up. Despite funding shifts, K-12 education remains the largest program area, claiming nearly one-third of General Fund

[3] The DMP allocated more than $282 million to school districts in the 2005-06 fiscal year (DGS, 2006a).

revenues (LAO, 2006).

Californians clearly feel that school facilities are important, passing four statewide facility bonds since 1998 totaling $44.95 billion; $25.69 billion has been apportioned to school districts as of March 28, 2007 (DGS, 2007c).[4] As the *Williams* settlement demonstrated, even this infusion of funds did little to ensure equality of opportunity to quality school facilities across districts.

Williams Case History

The *Williams* case was filed in 2000 as a class action suit charging that state education agencies had "failed to provide public school students with equal access to instructional materials, safe and decent school facilities, and qualified teachers" (California Department of Education (CDE), 2005b). To implement the settlement, five separate pieces of legislation were passed. From one of these, Senate Bill 6, arose the School Facilities Needs Assessment Grant Program (SFNAGP)[5] and the Emergency Repair Program (ERP), the basis for allocation of $800 million the settlement earmarked specifically for the critical repair of facilities for schools in deciles one through three of the 2003 API Base, the lowest performing schools in the State[6] (DGS, 2007b).

Needs Assessments prepared pursuant to the ensuing regulations were submitted to the Office of Public School Construction (OPSC) and approved by the State Allocation

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4 Bonds were approved in the following amounts: Proposition 1A (1998) - $9.2 billion; Proposition 47 (2002) - $13.05 billion; Proposition 55 (2004) - $12.3 billion; and Proposition 1D (2006) - $10.4 billion (League of Women Voters of California Education Fund, 2007).

5 Under the program, qualifying schools submitted to the Office of Public School Construction (OPSC) and State Allocation Board (SAB) a one-time School Facilities Needs Assessment estimating five-year maintenance and necessary repair costs.

6 Schools ranked in deciles one through three represent the lowest achieving 30% across the state (CDE, 2005a).

Board (SAB) on February 22, 2006. Local Educational Agencies (LEAs) were allocated $10 per pupil or a minimum of $7,500 for each decile one through three school to retain an individual qualified to assess the condition of school facilities. Qualified individuals were defined as licensed architects, engineers or general contractors in California, or other professionals having three years experience with cost estimation and life cycle analysis. A standard submittal form was provided on the OPSC website to ensure each LEA gathered the same minimal information[7]. Any grant funds remaining at the completion of the Needs Assessment were retained by the LEA to implement a portion of their necessary repairs (DGS, 2006b).

The Emergency Repair Program (ERP) was established as a reimbursement apportioned to LEAs for the completion of critical repairs of facilities posing a health and safety threat to students and staff. Due to the inability of districts to front the money needed to complete necessary repairs, the program was undersubscribed in its first year; as of April 26, 2007, only $59.2 million in reimbursements were reported on OPSC's workload list; only $25.7 million has been apportioned to Districts thus far (DGS, 2007b). Table 1 below summaries the *Williams* legislation, including recent changes to the ERP.

Will *Williams* Make a Difference?

When the *Williams* settlement was reached in 2004, the *Sacramento Bee* opinion and editorial pages were peppered with accounts of dilapidated facilities and insufficient learning materials, where headlines opined, “Intolerable conditions: tracking is first step

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[7] The four parts of the Needs Assessment are facility inventory, estimated cost of maintaining facilities over five years, remaining life of major building systems and estimated cost of necessary repairs.

Table 1: Legislating the *Williams* Settlement – Facilities Issues

Bill	Effect	Implementation
SB 6	Established the School Facilities Needs Assessment Grant Program (SFNAGP) to provide one-time funding for the evaluation of facilities at decile 1-3 schools as determined by the 2003 API Base. Established the Emergency Repair Program (ERP) to allocate the $800 million facilities portion of the settlement to decile 1-3 schools on a reimbursement basis.	Needs assessments due to OPSC by 1/1/06; certified at SAB 2/22/06. First ERP payments allocated at SAB 9/28/05; $25.7 million has been allocated as of 4/25/07.
AB 607	Adopted a permanent standard of good repair for school facilities.	Effective 1/1/07.
SB 550	Created the Interim Evaluation Instrument (IEI) to define the "good repair" of facilities and provide a mechanism for evaluation accessible to all levels of district staff. Mandated the establishment of a Facilities Inspection System (FIS) to ensure good repair is maintained. Added a facilities component to the School Accountability Report Card (SARC).	Revised IEI adopted by SAB 1/24/07; permanent instrument being developed. FIS certification required on OPSC funding applications.
AB 127	Contingent upon the passage of Proposition 1D in November 2006, changed the ERP from a reimbursement to a grant program. Created a moving cohort of *Williams* schools to reflect current achievement levels and facilities needs.	Regulations pending adoption by Office of Administrative Law (expected late spring 2007).

to improve schools" and "Small step for schools: settlement addresses appalling conditions." Also prevalent, however, were articles praising the new measures of accountability introduced by the settlement. A more recent *Bee* article (Rosenhall, 2005) noted that although districts would have to make repairs on their own dime and apply for reimbursement from the settlement funds, "about $100 million a year will flow to districts during the next eight years."

The pending implementation of AB 127 includes promising changes to the ERP. Most important is the restructuring of the program from a reimbursement-only basis to a grant program, logic standing to reason that the ERP will be more fully subscribed if LEAs are able to get funded for their repairs upfront. The other major change to the ERP is the creation of a moving cohort of *Williams* schools pursuant to AB 607. Beginning in 2007, school eligibility will be based on the 2006 API Base. The cohort will continue to move every three years until the disbursement of ERP funds is complete. With improving schools being cycled off the list, the program hopes to narrow its focus on chronically low-achieving schools.

This thesis does not attempt to address the normative arguments for or against an increase in funding for school facilities. Rather, my primary objective is to provide a preliminary assessment of whether the condition of school facilities targeted by the *Williams* settlement legislation affects educational outcomes in one area, Los Angeles County, where 28% of the first cohort of *Williams* schools are located.

Chapter 2 commences with a review of pertinent literature, summarizing the causal factors for educational achievement that comprise the education production function and demonstrating the relationship between socioeconomic characteristics and neighborhood choice. I then review empirical studies that have considered the relationship between school facilities and academic achievement; and finally, discuss the applicability of these findings for my study.

The techniques and findings of past empirical research shape the regression model and methodology, which are described in Chapter 3. Measures for short and long-term facilities needs are added to the traditional model as the explanatory variables of interest. After an overview of the research design and description of the causal model and anticipated directions of each explanatory variable, the data is characterized in Tables 3-5, which define the variables and provide descriptive statistics and bivariate correlations.

Chapter 4 presents a comparison of functional forms along with the regression result, both uncorrected and corrected for heteroskedasticity. I conclude with an interpretation of the regression results and recommendations for further research, including how better measurement of school facilities would provide a rich data source upon which to base future policy recommendations.

CHAPTER 2: LITERATURE REVIEW

A plethora of research attempting to quantify the concept of academic achievement by determining the causes of low achievement can be found in disciplines ranging from social work to economics to political science. In spite of the volume of research on this important issue, no consensus has yet been reached with respect to definitively identifying and classifying all key explanatory variables. This chapter first summarizes the causal factors for educational achievement that comprise the education production function as conceptualized by O'Sullivan (2006) and Fisher (2006) before demonstrating the relationship between socioeconomic characteristics and neighborhood choice. The study then turns to an analysis of empirical studies which consider the relationship between school facilities and achievement and lastly describes the implications for this study. Considering the lack of focus on how the condition of schools relates to academic performance, and given the $800 million allocation of the *Williams* settlement for critical school facility repairs as a potential (partial) remedy for low-achieving schools, this analysis is particularly urgent.

The Education Production Function

O'Sullivan (2006) explains that schools are for many an overriding factor in neighborhood choice, specifically because there is most often significant variation between the lowest and highest-achieving schools in a given urban area. In fact, the children in school communities are so strongly influenced by their adult counterparts that they generate similar types of positive and negative externalities, benefits received and costs incurred by individuals not party to a particular action. A student in a classroom full of relatively high-achieving students (whose parents are typically of high socioeconomic status and education) receives positive externalities, while a student in a classroom of low-achieving (low socioeconomic status) peers suffers negative externalities.

O'Sullivan presents educational achievement chiefly as a function of social and school inputs, a combination of influences from home, peers, teachers and class size. Primary emphasis is placed on the student's home environment, which is influenced strongly by the educational level and socioeconomic status of the parents. Wealthier parents are far better equipped to provide their children with supplemental instruction (e.g., tutoring) and enable their participation in extracurricular activities that can be important to development and overall self-esteem, such as music lessons and sports programs. When schools are failing, wealthy parents are able to make up the difference where middle or lower class parents are not. Schools with strong, well-funded Parent-Teacher Associations (PTAs) and Local Education Foundations (LEFs) supplement the programs the school is able to offer. Because of the willingness and ability of wealthy parents to pay more to supplement their children's education, public school spending may never truly be equalized.

Secondary influences include evidence linking a peer group with strong academic and social skills (as discussed above) and a productive teacher to higher achievement. Class size is also thought to play a role, particularly among historically low-achieving minority students. Tennessee's Project STAR found inner-city third graders, 97% of whom were minority students, were able to make greater reductions to the achievement gap when classes were small compared to their regular sizes.[8] Small classes consistently outperformed regular classes, even when the regular classes had the added benefit of a full-time teaching aide (Illig, 1996). Missing from the standard model summarized by O'Sullivan are student inputs including race and command of the English language, with data suggesting English Language Learner (ELL) students do not achieve at as high a rate as their English-proficient counterparts.

Fisher (2006) presents a more comprehensive model defining the education production function as an achievement output based on student, school and social inputs. Based on the work of Hanushek (1986), Fisher finds per pupil spending, class size, teachers with graduate degrees and teacher salary to be insignificant, focusing instead on the effects of teacher "skill" or adeptness and the rigor and inclusiveness of the school's academic curriculum.

As early as 1989, Monk identified the importance of the education production function in policy making, stressing the systematic nature of providing educational services as something to be influenced from the outside. The conceptual legitimization of the educational production function, whether or not scholars agree on the specific inputs, informs the methodology used in this analysis.

Schools Affect Neighborhood Choice

Schools and the neighborhoods they are located in are inextricably linked. Just as a school can be the pillar of the community, providing more and better choices for neighborhood youth, a school can conversely be limited by a lack of monetary and

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8 Small classes in the experiment were loaded at 13-17 students; "regular" class sizes were 22-25 students.

intellectual resources and a high incidence of violence that often characterize neighborhoods near low-achieving schools. This relationship can lead to income segregation because high-income families are willing (and able) to pay more for their children to attend high-performing schools. Income can be associated with many other factors, including education and race. A simple act of preference logically leads to an outcome that some would consider socially hazardous—one following Tiebout's (1956) self-segregation model of neighborhood choice.

In the Tiebout model, which weights efficiency as more important than equity, individuals are led to express their preferences for public goods and services by locating to neighborhoods which satisfy them. Given their particular budget constraint, rational individuals are willing to spend a given amount on supplementary education services. Individuals who desire the same levels of services and are willing and able to pay the same costs form natural (segregated) groups in which all are content with the level of services received and amount of taxes paid. If an individual is not content with either of these, the rational decision is to move. Predictably, these individual preferences are similar for people of the same socioeconomic status, yet a sociological perspective would remind that children stand much to gain from exposure to peers of different class and culture. For instance, two-way language immersion programs benefit both English learners and English speakers (CDE, 2006b).

Tiebout's model demonstrates that when individuals locate based on their preferences—in this case, their demand for good schools—income segregation is an inevitable result. Wealthy individuals are able to bid up the price of homes in neighborhoods with high-achieving schools. Thus, because of their higher income, the children of wealthy parents attend the best schools and benefit from more resources dedicated to supplemental education services, reinforcing the achievement gap between rich and poor, majority and minority.

Measuring the State of Our Schools: Causal Factors

Facilities and Building Components

In their multivariate regression analysis[9] of facilities at the Los Angeles Unified School District (LAUSD) Buckley, Schneider and Shang (2004) identify the constraints of district administration and oversight as it relates to student inputs, focusing on facilities instead and arguing that "improving school facilities offers a feasible opportunity for improving academic performance" (p. 2). The district-specific facility composite[10] was found significant in explaining school-level test scores at the 99% level, holding all other variables constant. Although socioeconomic indicators in the model have a larger effect on API—a one-standard deviation increase in the facility OCR is reported to increase API by 5.6 points whereas the same increase is expected to reduce the API by 31.9 points for % Black, 54.0 points for % Hispanic and 26.9 points for %

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9 Regression analysis is a powerful quantitative tool used to determine the significance of an independent variable (like school facilities) on a dependent one (like academic achievement). In a multivariate regression, several independent variables are included in the model to control for influences such as race and income. The analysis considers the significance of facilities when all other variables are held constant, producing a result much more meaningful than simple correlation.

10 The "Overall Compliance Rating (OCR)," the quantitative measure of facility conditions based on accident prevention, asbestos management, fire/life safety, campus security, chemical safety, pest management, lead management, restroom facilities (mold, supplies and ventilation), indoor environment/air quality, maintenance and repair, safe school plan, emergency preparedness, traffic and pedestrian safety and science lab safety, was found to be significant at the 99% level. Although the study controls for school size, school type (program level), SES (% of students free lunch eligible) and race, controls for family and student inputs could have been more thorough. Further, OCR indicators relate not only to the condition of facilities, but to the quality of their management, which is problematic for cross-sectional analysis.

free lunch eligible—the authors reason these factors are not subject to direct influence from school or district-level policies or conditions.

Schneider (n.d.) undertakes a more humanistic model than Buckley *et al*., paying particular attention to demographic impacts as they relate to the condition of school facilities as experienced by teachers in Washington, D.C. and Chicago.[11] Schneider found his facility score, determined by teachers' assessments of indoor air quality, noise levels and temperature, significant at the 95% level in both cities, indicating that the role of facilities in shaping academic achievement may be significant even when overarching socioeconomic disparities are taken into account (held constant by the regression).[12] These findings suggest that improving facilities may be part of the solution to raising achievement levels.

Earthman (2002) summarizes existing qualitative and correlation-driven research on the building components affecting student performance as those relating to classroom temperature, acoustic quality (ambient noise), and building age, which proxies for the technological quality of the facility's components. School overcrowding is also cited as a contributing factor to poor academic performance.

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[11] Schneider's analysis assessed the condition of school facilities based on surveys administered to teachers selected from a random sample of union roles. Paper surveys were mailed to participants in Washington, D.C. while phone interviews were completed for participants in Chicago. School-level demographic controls included % English Language Learners (ELL), % low income, school enrollment, % African American and % Hispanic.

[12] In Washington, DC, % ELL (-.51), % African American (-.86) and % Hispanic (-.41) were significant at a greater magnitude than the facility score (-.05) and school enrollment (-.01). Each of these explanatory variables was associated with a decrease in the facility score, indicating lower achievement levels based on standardized reading tests. Results for math followed a similar pattern. Chicago reading scores were associated with the following significant coefficients: % ELL (-.14), % low income (-.72), % African American (-.19), % Hispanic (-.06), school size (.38) and facility score (-.07). Results for math followed a similar pattern.

School and Class Size

Concluding that school size may be an indicator for the condition of school facilities, several studies (Giesen, 1998; Overbay, 2003) have used the economies of scale framework, theorizing that the per-unit cost of education is initially inversely related to enrollment, until an equilibrium is reached, whereby additional enrollment serves to increase average cost of educating, forming a U-shaped curve. Implicit in the results of this study is the notion that there may be an optimal medium-sized school that maximizes efficiency and student achievement.

Focusing discussion on the theories related to a facilities-based assessment, Hertling, Leonard, Lumsden and Stuart (2000) describe a comprehensive framework for quantifying the benefits of Class Size Reduction (CSR) programs, which have a direct impact on the quantity of facilities needed to adequately house students. As a result of rapid population growth and an influx of immigrants following the implementation of California’s CSR initiative in 1996, there has been a dramatic shortage of classrooms across the state. Because of the initiative, K-3 class sizes in California were reduced from an average of 28.8 (maximum 33) to a maximum of 20 students (Hertling et al., 2000). This policy shift, widely supported in the electorate and furthered by its link to federal categorical grants, has compounded the State’s challenge of providing adequate facilities for all of California’s schoolchildren.

Among the potential benefits of CSR programs cited by Hertling et al. are improved student behavior and a reduction in corrective measures such as Saturday school, lower grade retention rates and a reduction in the need for special education, as well as an increase in the high school graduation rate, a common point of reference for measuring academic achievement and adult success.

Implications for This Analysis

While Buckley et al. (2004) affirm the hypothesis that a positive relationship exists between facilities and achievement, their model may be underspecified. Frazier (2003) builds on this deficiency, acknowledging that “the relationship between student achievement and building facilities, while assumed, has not been rigorously studied” (p. 3). To address this deficiency, this analysis includes additional family and student measures that may have a significant impact on educational outcomes. Table 2 on the following page summarizes the regression results of the empirical studies discussed above and compares the models used to the specifications in this analysis.

A positive result in this study, while not definitive by any means, will establish the synthesis of school finance and education policy, attesting to the validity of the *Williams* settlement. The complete regression model is described next in Chapter 3, which is followed by an analysis of the results in Chapter 4. The study concludes with an assessment of validity and indicates potentially significant implications for policy makers.

Table 2: Comparison of Regression Models

	Buckley, et al.	Schneider, et al.	Proposed Model
Year of Study	2004	n.d.	2007
Locale	LAUSD	Washington, DC and Chicago	Los Angeles County
Facility Measure	Facility OCR, District-developed composite (goal: high OCR)	Facility score from teacher surveys (goal: high score)	5-Year Maintenance and Necessary Repair costs, tabulated from State records (goal: low costs)
Facility Coefficient	.434*** OCR increase associated with achievement increase	-.05** (Washington, DC) -.07** (Chicago) Lower teacher assessments associated with lower reading and math test scores[1]	Unknown
Control Variables (Coefficient)	School enrollment (-.007)* % African American (.024)*** % Hispanic (.020)*** % Free/reduced price lunch (-.023)*** School level dummy District dummy	% ELL (-.14)** % Low income (-.72)** % African American (-.19)** % Hispanic (-.06)** School size (.38)	% African American % American Indian % Asian % Filipino % Hispanic % Pacific Islander % English-language Learners % Free/reduced price lunch % High School graduate % Some college % College graduate % Graduate school Student mobility School enrollment Site acreage Year-round education dummy % Teachers fully credentialed School level dummy % Students tested District dummy

* significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level (all in two-tailed tests)
[1] Control coefficients are indicated for their effect on reading test scores in Chicago only

CHAPTER 3: METHODOLOGY

The regression model follows the classic education production function, attributing academic achievement to the broad causal factors of student inputs, family or social inputs and school inputs. This analysis attempts to strengthen the latter by including measures for short and long-term facilities needs as identified by the School Facilities Needs Assessment Grant Program established pursuant to SB 6. These measures will help to characterize the relationship between school facilities and academic achievement, holding other factors expected to affect student achievement constant.

This section begins with a brief overview of the research design, followed by a description of the causal model and the anticipated effects of each explanatory variable. Each variable is then identified by source and characterized by means of descriptive statistics and bivariate correlations.

Research Design Considerations

Dependent Variable

The dependent variable chosen for this analysis is the Academic Performance Index (API) 2003 Base. Since the implementation of California's Public Schools Accountability Act of 1999 (PSAA), the API (a numeric index that ranges from 200 to 1000) has been the primary measure of academic achievement at the school and district levels. Pursuant to state reporting requirements, API data includes both base scores and growth targets based on tests administered in grades two through eleven.[13] The API is

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[13] The 2003 API Base data used in this analysis was calculated based on results from the Standardized Testing and Reporting (STAR) Program and the California High School Exit Examination (CAHSEE). Test weights are established each year by the State Board of Education (SBE) (CDE, 2006a).

designed to measure school-level performance and progress based on state content standards, which encompass both traditional knowledge and practical skills (CDE, 2006a). While the state-wide API target for all schools remains at 800, the California Department of Education (CDE) has identified schools in deciles one through three—the lowest-ranking 30% of the API Base—that will be the beneficiaries of the *Williams* settlement.

The API is a particularly useful variable given the sheer volume of data with which it is associated. Each year's API Base provides measures that proxy for all three of the broad causal factors for academic achievement. In particular, the family or social inputs identifying the percentage of students participating in free or reduced-price lunch programs and the parent education level (school-level) proxy for socioeconomic status according to standards in the literature.

Sample

This analysis is limited to the *Williams* schools of Los Angeles County. Within this area, data has been compiled for all eligible schools that submitted School Facilities Needs Assessment reports to the Office of Public School Construction (OPSC) pursuant to SB 6. This accounts for approximately 28% of the 2,116 *Williams* schools originally identified in the settlement.

Beginning in 2007, the *Williams* "cohort" of schools eligible to seek funds under the Emergency Repair Program (ERP) changes from those qualified on the basis of the 2003 API Base to those qualified on the basis of the 2006 API Base pursuant to Assembly Bill 607.

Causal Model

The broad causal model used to explore the relationship between school facilities and school-level academic performance is expressed as follows:

> School Achievement = ƒ [student inputs, family/social inputs, school inputs, *Williams* settlement inputs];
>
> where:
>
> School Achievement = ƒ [2003 API Base Score];
>
> Student Inputs = ƒ [% African American (-), % American Indian (-), % Asian (+), % Filipino (-), % Hispanic (-), % Pacific Islander (-), % English-language learners (-)];
>
> Family/Social Inputs = ƒ [% participating in free or reduced-price lunch programs (-), % high school graduate (+), % some college (+), % college graduate (+), % graduate school, % students first attending this school in the present year (-)];
>
> School Inputs = ƒ [enrollment (+/-), site acreage (+/-), Year Round Education dummy (+/-), % teachers with full credentials (+)];
>
> *Williams* Settlement Inputs = ƒ [5-year maintenance estimate per student (-), necessary repairs estimate per student (-)]; and
>
> Other Control Variables = ƒ [elementary school dummy (+/-), middle school dummy (+/-), percent of students tested (+),district dummy (+/-)].

Anticipated Effects

The expected direction of effects is indicated above with a (+) sign when academic achievement is expected to increase with an increase in the explanatory variable, a (-) sign when academic achievement is expected to decrease with an increase in the explanatory variable, and a (+/-) sign if the effect is uncertain or potentially insignificant.

Minority status is expected to have a negative impact on achievement, except with regard to Asian students, as suggested by recent literature. Higher levels of parent education are expected to increase achievement, acting as a proxy for socioeconomic status and a rich home environment, while participation in free or reduced-price lunch programs is anticipated to have the opposite effect with regards to socioeconomic status. Student Mobility, measured as the percentage of students first attending this school in the present year, proxies for an instable home environment and reflects the adjustments students have to make when they switch schools. A high percentage of students who are new to their school is expected to have a negative effect on achievement.

At the school level, controls are provided for grade configuration (elementary, middle, high). For each configuration, enrollment and site acreage provide a measure of school size, which is expected to have a mixed effect on achievement.[14] Year Round Education (YRE), a program that is being phased out pursuant to *No Child Left Behind*, has an uncertain or potentially insignificant effect. The percentage of teachers with full credentials is expected to increase achievement; however, it is important to note that many credentialed teachers are teaching outside of their specialty.

Finally, school facilities—the variable of interest—is represented in both the long and short term by a five-year maintenance estimate and a necessary or critical repairs estimate. These figures were calculated by independent inspectors pursuant to SB 6 and presented to the State Allocation Board for approval at its February 22, 2006 meeting. It is anticipated that as each of these measures increases, indicating low-quality facilities,

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[14] Overcrowding is thought to play a particularly important role when site density exceeds 150% of the CDE-recommended density of 85 students per acre for K-6 or 65 students per acre for 7-12, as evidenced by the upcoming implementation of the Overcrowding Relief Grant Program pursuant to AB 127.

academic achievement will decrease.

Characterization of Variables

Before presenting the results of the regression, it is useful to first characterize the explanatory variables. Within this subsection, this task is accomplished in two ways: Table 1 assigns a label to each variable and provides a description and source for the data while Table 2 provides the descriptive statistics for each variable. Bivariate correlations by causal theme are provided in Table 3. Characterization of the data in such detail is done primarily to facilitate future replication efforts.

Table 3: Description of Variables

Variable Label	Description	Source
Dependent		
2003 API Base (03 API)	2003 Academic Performance Index Base Score	California Department of Education (CDE), 2003 API Base data file <http://api.cde.ca.gov/datafiles.asp>
Independent: Student Inputs		
African American (AA)	Percent of students African American	CDE, 2003 API Base file
American Indian (AI)	Percent of students American Indian	CDE, 2003 API Base file
Asian (AS)	Percent of students Asian	CDE, 2003 API Base file
Filipino (FI)	Percent of students Filipino	CDE, 2003 API Base file
Hispanic (HI)	Percent of students Hispanic	CDE, 2003 API Base file
Pacific Islander (PI)	Percent of students Pacific Islander	CDE, 2003 API Base file
English-language Learners (EL)	Percent of students English-language Learners	CDE, 2003 API Base file
Independent: Family/Social Inputs		
Lunches	Percent of students tested participating in free or reduced-price lunch programs	CDE, 2003 API Base file
High School Grad	Percent of students whose parent education level is equal to graduation from high school	CDE, 2003 API Base file
Some College	Percent of students whose parent education level is equal to some college	CDE, 2003 API Base file

Variable Label	Description	Source
College Grad	Percent of students whose parent education level is equal to graduation from college	CDE, 2003 API Base file
Grad School	Percent of students whose parent education level is equal to graduate school attendance	CDE, 2003 API Base file
Student Mobility	Percent of students first attending this school in the present year	CDE, 2003 API Base file
Independent: School Inputs		
Enrollment	2003 CBEDS enrollment	Office of Public School Construction (OPSC), School Facilities Needs Assessment reports; hand-tallied <http://www.applications.opsc.dgs.ca.gov/ fnaReporting/fnaReporting.asp>
Site Acreage	Size of school site in acres	OPSC, School Facilities Needs Assessment reports; hand-tallied
Year Round Education (YRE)	Dummy variable for year-round calendar (1 = yes)	CDE, 2003 API Base file
Full Credential	Percent of teachers with full credentials	CDE, 2003 API Base file
Independent: *Williams* Settlement Inputs		
5-year Maintenance	Estimate of 5-year maintenance cost per student	OPSC, School Facilities Needs Assessment reports; hand-tallied
Necessary Repairs	Estimate of necessary repairs cost per student	OPSC, School Facilities Needs Assessment reports; hand-tallied
Independent: Other Controls		
Elementary	Dummy variable for elementary school (1 = yes)	CDE, 2003 API Base file
Middle	Dummy variable for middle school (1 = yes)	CDE, 2003 API Base file
Percent Tested	Percent of students enrolled on first day of instruction taking test	CDE, 2003 API Base file
School District	Dummy variable for school district (LAUSD is omitted)	CDE, 2003 API Base file

Table 4: Descriptive Statistics

Variable Label	Mean	Standard Deviation	Maximum	Minimum
Dependent				
2003 API Base	608.02	45.348	674	447
Independent: Student Inputs				
African American	13.05	17.985	91	0
American Indian	0.17	0.411	3	0
Asian	2.01	3.881	43	0
Filipino	1.01	1.779	16	0
Hispanic	78.12	20.690	100	6
Pacific Islander	0.28	0.928	9	0
English-language Learners	49.54	20.826	92	1
Independent: Family/Social Inputs				
Lunches	85.15	15.909	100	9
High School Grad	30.38	10.118	100	0
Some College	17.49	8.942	60	0
College Grad	9.05	7.268	60	0
Grad School	3.08	3.849	33	0
Student Mobility	16.64	8.498	86	2
Independent: School Inputs				
Enrollment	1311.74	918.444	5299	104
Site Acreage	11.01	9.220	64	2
Year Round Education (YRE)	0.40	0.491	1	0
Full Credential	73.69	12.120	100	28
Independent: *Williams* Settlement Inputs				
5-year Maintenance	3462.15	3266.292	16454	0
Necessary Repairs	274.98	823.955	10085	0
Independent: Other Controls[1]				
Elementary	0.71	0.454	1	0
Middle	0.18	0.387	1	0
Percent Tested	98.95	1.739	105	85

[1] Descriptive statistics for District dummy variables are listed in Appendix A.

Table 5A: Bivariate Correlation Matrix – School Achievement and Student Inputs[1]

	03 API	AA	AI	AS	FI	HI	PI	EL
03 API	1	-.079 .071	.115** .009	.101* .021	.052 .240	.004 .932	.029 .513	.079 .073
AA	-.079 .071	1	.082 .062	-.122** .005	-.064 .142	-.869** .000	.132** .003	-.528** .000
AI	.115** .009	.082 .062	1	-.023 .598	.107* .015	-.266** .000	.045 .300	-.308** .000
AS	.101* .021	-.122** .005	-.023 .598	1	.150** .001	-.119** .007	.139** .002	-.036 .410
FI	.052 .240	-.064 .142	.107* .015	.150** .001	1	-.173** .000	.325** .000	-.221** .000
HI	.004 .932	-.869** .000	-.266** .000	-.119** .007	-.173** .000	1	-.216** .000	.713** .000
PI	.029 .513	.132** .003	.045 .300	.139** .002	.325** .000	-.216** .000	1	-.146** .001
EL	.079 .073	-.528** .000	-.308** .000	-.036 .410	-.221** .000	.713** .000	-.146** .001	1
Lunches	.129** .003	-.144** .001	-.194** .000	-.066 .130	-.283** .000	.390** .000	-.112* .011	.690** .000
High School Grad	.105* .018	.213** .000	-.098* .026	-.066 .137	-.101* .021	-.108* .014	.039 .382	-.078 .075
Some College	.210** .000	.291** .000	.350** .000	.005 .908	.186** .000	-.494** .000	.095* .031	-.567** .000
College Grad	-.023 .607	.329** .000	.156** .000	.130** .003	.336** .000	-.493** .000	.155** .000	-.520** .000
Grad School	.110* .013	.092* .036	.156** .000	.099* .025	.128** .004	-.202** .000	.097* .029	-.240** .000
Student Mobility	-.023 .597	.404** .000	.203** .000	.088* .044	-.010 .819	-.512** .000	.111* .012	-.361** .000
Enrollment	-.585** .000	-.121** .006	-.180** .000	.043 .328	.138** .002	.095* .031	.022 .614	-.102* .020
Site Acreage	-.402** .000	-.098* .028	-.037 .414	.171** .000	.257** .000	-.047 .290	.122** .006	-.376** .000
YRE	-.066 .133	-.059 .179	-.007 .867	-.152** .001	-.058 .188	.117** .008	-.045 .304	.303** .000
Full Credential	.320** .000	-.290** .000	.189** .000	.113* .010	.140** .001	.098* .026	-.031 .487	-.053 .224
5-year Maintenance	-.277** .000	.189** .000	-.066 .132	-.094* .032	-.015 .738	-.048 .273	-.096* .028	.055 .213
Necessary Repairs	.037 .395	-.113** .010	-.016 .713	.079 .072	.003 .949	.064 .146	-.059 .182	-.051 .244
Elementary	.629** .000	.026 .555	.029 .505	-.112* .010	-.234** .000	.092* .036	-.085 .053	.425** .000
Middle	-.401** .000	.014 .750	.021 .631	.033 .453	.122** .005	-.056 .203	.061 .166	-.261** .000
Percent Tested	.315** .000	-.086 .015	-.013 .776	-.005 .907	-.091* .037	.146** .001	.039 .377	.192** .000

Shaded = correlation > .800

[1] Bivariate correlations for District dummy variables are listed in Appendix B.

Table 5B: Bivariate Correlation Matrix – Family/Social Inputs[1]

	Lunches	High School Grad	Some College	College Grad	Grad School	Student Mobility
03 API	.129** .003	.105* .018	.210** .000	-.023 .607	.110* .013	-.023 .597
AA	-.144** .001	.213** .000	.291** .000	.329** .000	.092* .036	.404** .000
AI	-.194** .000	-.098* .026	.350** .000	.156** .000	.156** .000	.203** .000
AS	-.066 .130	-.066 .137	.005 .908	.130** .003	.099* .025	.088* .044
FI	-.283** .000	-.101* .021	.186** .000	.336** .000	.128** .004	-.010 .819
HI	.390** .000	-.108* .014	-.494** .000	-.493** .000	-.202** .000	-.512** .000
PI	-.112* .011	.039 .382	.095* .031	.155** .000	.097* .029	.111* .012
EL	.690** .000	-.078 .075	-.567** .000	-.520** .000	-.240** .000	-.361** .000
Lunches	1	-.020 .658	-.443** .000	-.464** .000	-.213** .000	-.235** .000
High School Grad	-.020 .658	1	-.201** .000	-.201** .000	-.294** .000	-.003 .944
Some College	-.443** .000	-.201** .000	1	.449** .000	.298** .000	.294** .000
College Grad	-.464** .000	-.201** .000	.449** .000	1	.533** .000	.276** .000
Grad School	-.213** .000	-.294** .000	.298** .000	.533** .000	1	.077 .082
Student Mobility	-.235** .000	-.003 .944	.294** .000	.276** .000	.077 .082	1
Enrollment	-.193** .000	-.141** .001	-.202** .000	.166** .000	-.008 .865	-.159** .000
Site Acreage	-.527** .000	-.094* .037	.009 .834	.262** .000	.094* .031	-.014 .748
YRE	.340** .000	-.147** .001	-.124** .005	-.191** .000	-.098* .026	-.080 .068
Full Credential	-.068 .123	-.103* .019	.184** .000	-.020 .649	.144** .001	-.039 .379
5-year Maintenance	.259** .000	.047 .288	-.193** .000	-.017 .700	-.124** .005	-.109* .013
Necessary Repairs	-.141** .001	.021 .634	.073 .098	-.091* .039	-.036 .416	.063 .149
Elementary	.500** .000	.114** .009	-.007 .874	-.330** .000	-.043 .333	.002 .964
Middle	-.189** .000	-.065 .138	.014 .760	.183** .000	.009 .832	.022 .612
Percent Tested	.220** .000	.064 .144	-.018 .679	-.252** .000	-.059 .181	-.108* .014

Shaded = correlation > .800

[1] Bivariate correlations for District dummy variables are listed in Appendix B.

Table 5C: Bivariate Correlation Matrix – School and *Williams* Settlement Inputs[1]

	Enrollment	Site Acreage	YRE	Full Credential	5-year Maintenance	Necessary Repairs
03 API	-.585** .000	-.402** .000	-.066 .133	.320** .000	-.277** .000	.037 .395
AA	-.121** .006	-.098* .028	-.059 .179	.297** .000	.189** .000	-.113** .010
AI	-.180** .000	-.037 .414	-.007 .867	.189** .000	-.066 .132	-.016 .713
AS	.043 .328	.171** .000	-.152** .001	.113* .010	-.094* .032	.079 .072
FI	.138** .002	.257** .000	-.058 .188	.140** .001	-.015 .738	.003 .949
HI	.095* .031	-.047 .290	.117** .008	.098* .026	-.048 .273	.064 .146
PI	.022 .614	.122** .006	-.045 .304	-.031 .487	-.096* .028	-.059 .182
EL	-.102* .020	-.376** .000	.303** .000	-.053 .224	.055 .213	-.051 .244
Lunches	-.193** .000	-.527** .000	.304** .000	-.068 .123	.259** .000	-.141** .001
High School Grad	-.141** .001	-.094* .037	-.147** .001	-.103* .019	.047 .288	.021 .634
Some College	-.202** .000	.009 .834	-.124** .005	.184** .000	-.193** .000	.073 .098
College Grad	.166** .000	.262** .000	-.191** .000	-.020 .649	-.017 .700	-.091* .039
Grad School	-.008 .865	.094* .031	-.098* .026	.144** .001	-.124** .005	-.036 .416
Student Mobility	-.159** .000	-.014 .748	-.080 .068	-.039 .379	-.109* .013	.063 .149
Enrollment	1	.535** .000	.202** .000	-.155** .000	.185** .000	-.114** .010
Site Acreage	.535** .000	1	-.252** .000	-.004 .926	-.112* .012	.102* .022
YRE	.202** .000	-.252** .000	1	.019 .658	.114** .009	-.203** .000
Full Credential	-.155** .000	-.004 .926	.019 .658	1	-.173** .000	.095* .030
5-year Maintenance	.185** .000	-.112* .012	.114** .009	-.173** .000	1	-.129** .003
Necessary Repairs	-.114** .010	.102* .022	-.203** .000	.095* .030	-.129** .003	1
Elementary	-.651** .000	-.678** .000	.179** .000	.182** .000	-.105* .016	-.035 .422
Middle	.272** .000	.236** .000	-.114** .010	-.222** .000	.121** .006	-.016 .714
Percent Tested	-.383** .000	-.232** .000	.033 .450	.023 .593	-.210** .000	.070 .111

Shaded = correlation > .800

[1] Bivariate correlations for District dummy variables are listed in Appendix B.

Table 5D: Bivariate Correlation Matrix – Other Control Variables[1]

	Elementary	Middle	Percent Tested
03 API	.629** .000	-.401** .000	.315** .000
AA	.026 .555	.014 .750	-.086 .051
AI	.029 .505	.021 .631	-.013 .776
AS	-.112* .010	.033 .453	-.005 .907
FI	-.234** .000	.122** .005	-.091* .037
HI	.092* .036	-.056 .203	.146** .001
PI	-.085 .053	.061 .166	.039 .377
EL	.425** .000	-.261** .000	.192** .000
Lunches	.500** .000	-.189** .000	.220** .000
High School Grad	.114** .009	-.065 .138	.064 .144
Some College	-.007 .874	.014 .760	-.018 .679
College Grad	-.330** .000	.183** .000	-.252** .000
Grad School	-.043 .333	.009 .832	-.059 .181
Student Mobility	.002 .964	.022 .612	-.108* .014
Enrollment	-.651** .000	.272** .000	-.383** .000
Site Acreage	-.678** .000	.236** .000	-.232** .000
YRE	.179** .000	-.114** .010	-.033 .450
Full Credential	.182** .000	-.222** .000	.023 .593
5-year Maintenance	-.105* .016	.121** .006	-.210** .000
Necessary Repairs	-.035 .422	-.016 .714	.070 .111
Elementary	1	-.739** .000	.305** .000
Middle	-.739** .000	1	.028 .525
Percent Tested	.305** .000	.028 .525	1

Shaded = correlation > .800

[1] Bivariate correlations for District dummy variables are listed in Appendix B.

Much of the significant correlation in the model occurs between student input variables, particularly race. While there is a fair amount of significant correlation in the model as presented, theory strongly suggests that each of these variables could have a significant impact on educational achievement. To reduce the potential introduction of bias from the variables, both the 5-year maintenance and necessary repairs costs are reported on a per-student basis. None of the explanatory variables were considered for exclusion based on correlation alone.

CHAPTER 4: RESULTS

With the model and data fully described, this section presents the results an several incremental regression analysis. Table 6 first presents a comparison of functional form. Corrective measures are then employed to address biases unintentionally introduced into the model in chosen form. The corrected regression result is presented in Table 7.

Table 6: Comparison of Functional Forms

Variable Label[1] (Ln = variable is in log form)	Log-Log[1]	Log-Lin	Linear	VIFs for Log-Log
Constant	5.973*** (.749)	6.352*** (.169)	582.053*** (98.998)	-
Independent: Student Inputs				
African American	-.002*** (.000)	-.003*** (.001)	-1.920*** (.332)	10.961
American Indian	-.005 (.006)	-.008 (.006)	-4.905 (3.646)	1.506
Asian	.002*** (.001)	.001 (.001)	.393 (.625)	2.637
Filipino	.002 (.002)	.001 (.002)	.336 (.986)	1.773
Hispanic (Ln)	-.022 (.024)	-.002*** (.001)	-.954*** (.350)	17.927
Pacific Islander	.000 (.004)	-.002 (.004)	-1.401 (2.191)	2.867
English-language Learner (Ln)	-.054*** (.012)	-.002*** (.000)	-1.001*** (.168)	11.391
Independent: Family/Social Inputs				
Lunches (Ln)	-.007 (.024)	.000 (.000)	.063 (.206)	6.800
High School Grad	.001*** (.000)	.001** (.000)	.336** (.162)	1.666
Some College	.001 (.000)	.000 (.000)	.215 (.245)	3.101
College Graduate	.002*** (.001)	.001** (.001)	.866** (.364)	4.274
Grad School	-.001 (.001)	.000 (.001)	-.372 (.643)	4.366
Student Mobility (Ln)	-.015* (.008)	-.001** (.000)	-.440** (.211)	2.347

Variable Label[1] (Ln = variable is in log form)	Log-Log[1]	Log-Lin	Linear	VIFs for Log-Log
Independent: School Inputs				
Enrollment (Ln)	-.017** (.007)	-1.99E-005*** (.000)	-.011*** (.003)	4.588
Site Acreage (Ln)	-.010 (.006)	.000 (.000)	-.323 (.291)	4.347
Year Round Education (YRE)	-.009 (.007)	-.003 (.007)	-1.651 (3.905)	2.526
Full Credential (Ln)	.032* (..018)	.001* (.000)	.287* (.155)	2.186
Independent: *Williams* Settlement Inputs				
5-year Maintenance	-4.20E-006*** (.000)	-4.41E-006*** (.000)	-.002*** (.001)	3.079
Necessary Repairs	-8.59E-007 (.000)	-8.78E-008 (.000)	-1.14E-004 (.002)	2.544
Independent: Other Controls				
Elementary	0.141*** (.016)	.129*** (.019)	76.282*** (11.055)	11.788
Middle	0.040*** (.012)	.022 (.014)	12.500 (8.273)	4.777
Percent Tested (Ln)	0.152 (.158)	.002 (.002)	1.173 (.948)	1.785
ABC Unified	-.038* (.022)	-.056** (.022)	-32.248** (12.742)	1.297
Antelope Valley Union High	-.043 (.034)	-.060* (.036)	-39.056* (21.035)	1.554
Azusa Unified	-.011 (.023)	-.038* (.023)	-22.165* (13.216)	2.965
Baldwin Park Unified	-.019 (.020)	-.025 (.020)	-13.945 (11.745)	1.712
Bassett Unified	-.027 (.036)	-.041 (.035)	-23.524 (20.556)	1.706
Bellflower Unified	-.018 (.036)	-.033 (.035)	-17.875 (20.637)	1.131
Bonita Unified	-.356*** (.077)	-.223*** (.066)	-131.958*** (38.894)	2.648
Centinela Valley Union High	-.021 (.031)	-.033 (.031)	-20.246 (18.124)	1.291
Duarte Unified	-.019 (.036)	-.040 (.035)	-21.993 (20.475)	1.124
East Whittier City Elementary	-.007 (.036)	-.018 (.035)	-9.406 (20.578)	1.139
Eastside Union	-.034 (.031)	-.087*** (.033)	-48.791** (19.556)	1.252
El Monte Union High	.027 (.033)	.012 (.033)	6.283 (19.467)	1.491
El Rancho Unified	-.036 (.023)	-.044* (.023)	-25.915* (13.484)	1.385

Variable Label[1] (Ln = variable is in log form)	Log-Log[1]	Log-Lin	Linear	VIFs for Log-Log
Garvey Elementary	-.144** (.060)	-.133** (.059)	-75.066** (34.538)	1.600
Hacienda La Puente Unified	-.038** (.018)	-.053*** (.018)	-31.103*** (10.586)	1.742
Hawthorne Elementary	.046* (.026)	.031 (.026)	20.067 (15.099)	1.219
Inglewood Unified	-.002 (.030)	.025 (.030)	12.282 (17.405)	1.620
Keppel Union Elementary	-.040 (.028)	-.078*** (.029)	-43.857*** (16.945)	1.420
Lancaster Elementary	-.054*** (.020)	-.089*** (.023)	-51.688*** (13.331)	1.965
Lawndale Elementary	.009 (.037)	-.017 (.036)	-6.825 (21.010)	3.005
Lennox Elementary	6.37E-005 (.026)	.016 (.026)	10.352 (15.009)	1.227
Long Beach Unified	.000 (.024)	-.005 (.023)	-1.108 (13.622)	3.180
Lynwood Unified	-.007 (.021)	.003 (.020)	.598 (11.854)	1.696
Montebello Unified	-.041*** (.014)	-.044*** (.014)	-25.966*** (8.017)	1.560
Mountain View Elementary	-.017 (.022)	-.027 (.021)	-14.157 (12.458)	1.648
Norwalk-La Mirada Unified	-.044** (.020)	-.062*** (.019)	-35.631*** (11.350)	1.668
Palmdale Elementary	-.025 (.017)	-.070*** (.019)	-39.941*** (10.910)	2.076
Paramount Unified	-.013 (.015)	-.029** (.015)	-17.984** (8.513)	1.368
Pasadena Unified	-.002 (.031)	-.020 (.031)	-14.362 (18.119)	1.731
Pomona Unified	-.005 (.014)	-.015 (.014)	-8.665 (8.178)	1.842
Rowland Unified	.014 (.029)	.003 (.029)	5.123 (16.887)	1.133
South Whittier Elementary	-.077** (.041)	-.066* (.038)	-39.064* (22.411)	1.485
Whittier City	-.086*** (.028)	-.097*** (.027)	-57.707*** (15.925)	1.344
Whittier Union High	.020 (.039)	.010 (.038)	3.149 (22.086)	1.335
Wilsona	-.014 (.049)	-.074 (.051)	-39.222 (29.819)	1.090

Variable Label[1] (Ln = variable is in log form)	Log-Log[1]	Log-Lin	Linear	VIFs for Log-Log
R-Squared	**0.674**	**0.684**	**0.684**	
Adjusted R-Squared	**0.632**	**0.643**	**0.643**	
Observations	**495**	**495**	**495**	

Shade = functional form selected
* significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level (all in two-tailed tests)
[1] Many independent variables could not be logged due to zero values. Those that were logged in the Log-Log functional form are marked with "Ln" in the variable label.

Log-log was chosen as the functional form of preference due to the expected nature of the relationship between variables (Wassmer, 2004). Since the results for each model were virtually identical, log-log was selected to reduce potential bias and for the convenience of regression coefficients representing elasticities.

Detecting Multicollinearity

Imperfect multicollinearity occurs when more than two independent variables move closely together because of their correlation. When multicollinearity exists, *t*-scores are lower, resulting in less significance in the regression results; however, examining the variance inflation factors (VIFs) can help to detect this problem (Studenmund, 2006).

Based on the initial regression result, variables with VIFs greater than 5 were considered for their potential to introduce multicollinearity to the model. The independent variables African American, Hispanic, English Learner, Free/Reduced Price Lunch and Elementary School Dummy all had VIFs greater than 5 in the log-log model. Despite this, the regression coefficients on the African American and Elementary School Dummy variables were statistically significant. Only the regression coefficient on English Learner was significant and this is likely due to the detected multicollinearity of it with Hispanic and English Learner. Since these are meant to be control variables in the study, and theory and literature strongly support the inclusion of each, they were left in the final regression specification.

Correcting for Heteroskedasticity

To further reduce potential bias in the regression coefficients, the Park Test was used to test for heteroskedasticity, a condition that occurs when the variance of the error term is not constant (Studenmund, 2006). The Park Test was run, regressing the natural log of the squared unstandardized residuals from the above Log-Log specification, against the explanatory variable Enrollment.[15] The result was significant at the 99% level, triggering the use of Weighted Least Squares (WLS) to minimize bias. The corrected regression results are presented below in Table 5.

Table 7: Corrected Regression Results

Variable Label (Ln = variable is in log form)	Log-Log Uncorrected	VIFs	Log-Log Corrected for Heteroskedasticity[1]	VIFs
Constant	5.973*** (.749)	-	5.295*** (.606)	-
Independent: Student Inputs				
African American	-.002*** (.000)	10.961	-.003*** (.000)	9.742
American Indian	-.005 (.006)	1.506	-.005 (.008)	1.561
Asian	.002*** (.001)	2.637	.002** (.001)	2.241
Filipino	.002 (.002)	1.773	.004** (.002)	2.182
Hispanic (Ln)	-.022 (.024)	17.927	-.059** (.027)	15.801
Pacific Islander	.000 (.004)	2.867	-.002 (.004)	3.408
English-language Learner (Ln)	-.054*** (.012)	11.391	-.056*** (.012)	8.420
Independent: Family/Social Inputs				

15 Variables of scale like Enrollment are the most likely to cause heteroskedasticity in the statistical model. In dividing the other variables through by Enrollment, scale issues are reduced and the overall model is more reliable.

Variable Label (Ln = variable is in log form)	Log-Log Uncorrected	VIFs	Log-Log Corrected for Heteroskedasticity[1]	VIFs
Lunches (Ln)	-.007 (.024)	6.800	.017 (.023)	6.385
High School Grad	.001*** (.000)	1.666	.001*** (.000)	1.553
Some College	.001 (.000)	3.101	.001** (.000)	3.213
College Graduate	.002*** (.001)	4.274	.002*** (.001)	4.638
Grad School	-.001 (.001)	4.366	-.001 (.001)	4.711
Student Mobility (Ln)	-.015* (.008)	2.347	-.015** (.007)	2.158
Independent: School Inputs				
Enrollment (Ln)	-.017** (.007)	4.588	-	-
Site Acreage (Ln)	-.010 (.006)	4.347	-.008 (.007)	5.296
Year Round Education (YRE)	-.009 (.007)	2.526	-.018*** (.006)	2.211
Full Credential (Ln)	.032* (..018)	2.186	.050*** (.019)	2.072
Independent: Facilities Measures (Variables of Interest)				
5-year Maintenance	-4.20E-006*** (.000)	3.079	-3.36E-006*** (.000)	3.102
Necessary Repairs	-8.59E-007 (.000)	2.544	1.49E-006 (.000)	3.107
Independent: Other Controls				
Elementary	0.141*** (.016)	11.788	.166*** (.015)	11.787
Middle	0.040*** (.012)	4.777	.040*** (.010)	4.342
Percent Tested (Ln)	0.152 (.158)	1.785	.262** (.128)	1.984
ABC Unified	-.038* (.022)	1.297	-.031 (.027)	1.201
Antelope Valley Union High	-.043 (.034)	1.554	-.043 (.029)	2.399
Azusa Unified	-.011 (.023)	2.965	-.002 (.029)	2.794
Baldwin Park Unified	-.019 (.020)	1.712	-.019 (.022)	1.614
Bassett Unified	-.027 (.036)	1.706	-.020 (.041)	1.598
Bellflower Unified	-.018 (.036)	1.131	-.023 (.031)	1.211
Bonita Unified	-.356*** (.077)	2.648	-.306* (.183)	1.130

Variable Label (Ln = variable is in log form)	Log-Log Uncorrected	VIFs	Log-Log Corrected for Heteroskedasticity[1]	VIFs
Centinela Valley Union High	-.021 (.031)	1.291	-.021 (.025)	1.474
Duarte Unified	-.019 (.036)	1.124	-.018 (.052)	1.060
East Whittier City Elementary	-.007 (.036)	1.139	.004 (.056)	1.045
Eastside Union	-.034 (.031)	1.252	-.048 (.045)	1.132
El Monte Union High	.027 (.033)	1.491	.039 (.032)	1.796
El Rancho Unified	-.036 (.023)	1.385	-.037 (.031)	1.165
Garvey Elementary	-.144** (.060)	1.600	-.142 (.095)	1.156
Hacienda La Puente Unified	-.038** (.018)	1.742	-.013 (.021)	1.262
Hawthorne Elementary	.046* (.026)	1.219	.054* (.032)	1.175
Inglewood Unified	-.002 (.030)	1.620	.028 (.034)	1.511
Keppel Union Elementary	-.040 (.028)	1.420	-.050 (.043)	1.166
Lancaster Elementary	-.054*** (.020)	1.965	-.066*** (.024)	1.958
Lawndale Elementary	.009 (.037)	3.005	-.001 (.043)	3.010
Lennox Elementary	6.37E-005 (.026)	1.227	.011 (.027)	1.222
Long Beach Unified	.000 (.024)	3.180	.005 (.024)	3.751
Lynwood Unified	-.007 (.021)	1.696	.002 (.019)	1.834
Montebello Unified	-.041*** (.014)	1.560	-.033** (.014)	1.615
Mountain View Elementary	-.017 (.022)	1.648	-.010 (.024)	1.398
Norwalk-La Mirada Unified	-.044** (.020)	1.668	-.051** (.021)	1.436
Palmdale Elementary	-.025 (.017)	2.076	-.033* (.020)	1.956
Paramount Unified	-.013 (.015)	1.368	.014 (.015)	1.213
Pasadena Unified	-.002 (.031)	1.731	.022 (.031)	1.571
Pomona Unified	-.005 (.014)	1.842	.008 (.016)	1.542

Variable Label (Ln = variable is in log form)	Log-Log Uncorrected	VIFs	Log-Log Corrected for Heteroskedasticity[1]	VIFs
Rowland Unified	.014 (.029)	1.133	.012 (.038)	1.067
South Whittier Elementary	-.077** (.041)	1.485	-.075 (.053)	1.290
Whittier City	-.086*** (.028)	1.344	-.091** (.042)	1.129
Whittier Union High	.020 (.039)	1.335	.028 (.033)	1.479
Wilsona	-.014 (.049)	1.090	-.037 (.068)	1.061
R-Squared	**0.674**		**0.736**	
Adjusted R-Squared	**0.632**		**0.702**	
Observations	**495**		**495**	

* significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level (all in two-tailed tests)
[1] Weighted variable = Enrollment

Addressing Endogeneity

Endogenous variables are those that are simultaneously determined. While there is no expectation in this case that the dependent variable API is determined simultaneously with any of the explanatory variables, endogeneity may exist among the explanatory variables themselves. Specifically, controls for family and social inputs may be limited in their ability to address a school's discretionary spending on capital outlay projects from sources such as Parent-Teacher Associations, other private donations and corporate sponsorships. Further, available data does not quantify a school's total capital outlay spending, nor does it report a school's subscription to State Allocation Board (SAB) programs such as Deferred Maintenance and Extreme Hardship that target ailing facilities and provide additional grants for their repair.

CHAPTER 5: CONCLUSION

I now turn to the task of making the regression result presented in Chapter 4 digestible for general consumption. To do this, Table 6 follows the conversion of log-log coefficients to elasticities and confidence intervals derived to facilitate comparison. I then assess the overall fitness of the model by interpreting R-squared and compare the final results to pre-regression predictions. I conclude this thesis by describing the potential for further research and important implications for policymakers.

Elasticities and Confidence Intervals

To best allow for comparison of outcomes, the coefficients reported in Table 5 are converted to elasticities and reproduced in Table 6. The elasticities reported represent the percentage change in API based on a one percent change in an explanatory variable holding all other explanatory variables constant. In the log-log functional form, coefficients of logged explanatory variables are elasticities; for explanatory variables that are in linear form, the elasticity is derived by multiplying the coefficient by the mean. As shown in Table 6, a one percent increase in the percentage of English Language Learners results in an API that is expected to be lower by 0.56%; a one percent increase in the five-year maintenance cost results in an API that is expected to be lower by .012%. Though this change is small, the regression indicates that it statistically significant.

Confidence intervals, of particular importance when bridging zero, are also reported in Table 6 to show the range of possible outcomes. A 90% confidence interval indicates the actual coefficient will be within the given range 90% of the time. The tighter the confidence interval, the more accurate the estimated coefficient and the more reliable the information for public decision making tasks. This model, with low standard errors, has very little variation in either the coefficient or elasticity confidence intervals. The confidence intervals below are calculated by adding and subtracting from the coefficient the product of the standard error and the critical *t* score, 1.645.

Table 8: Elasticities and Confidence Intervals (Significant Results)

Variable Label (Ln = variable is in log form)	OLS Log-Log Coefficient	Elasticity[1]	Coefficient Confidence Interval (90%)[2]	Elasticity Confidence Interval (90%)
Independent: Student Inputs				
African American	-.003*** (.000)	-.039	-.004 to -.002	-.049 to -.030
Asian	.002** (.001)	.004	.001 to .003	.001 to .007
Filipino	.004** (.002)	.004	.001 to .007	.001 to .007
Hispanic (Ln)	-.059** (.027)	-.059	-.104 to -.014	-.104 to -.014
English-language Learner (Ln)	-.056*** (.012)	-.056	-.076 to -.036	-.076 to -.036
Independent: Family/Social Inputs				
High School Grad[3]	.001*** (.000)	.030	.000 to .002	.014 to .046
Some College[3]	.001** (.000)	.017	.000 to .002	.003 to .032
College Grad[3]	.002*** (.001)	.018	.001 to .003	.008 to .028
Student Mobility (Ln)	-.015** (.007)	-.015	-.027 to -.003	-.027 to -.003
Independent: School Inputs				
Year Round Education (YRE)	-.018*** (.006)	-	-.029 to -.007	-.011 to -.003
Full Credential (Ln)	.050*** (.019)	.050	.018 to .082	.018 to .082
Independent: Facilities Measures (Variables of Interest)				
5-year Maintenance	-3.36E-006*** (.000)	-.012	-5.01E-006 to -1.72E-006	-.017 to -.006
Independent: Other Controls				
Elementary[4]	.166*** (.015)	-	.142 to .190	.100 to .135
Middle[4]	.040*** (.010)	-	.023 to .057	.004 to .010
Percent Tested (Ln)	.262** (.128)	.262	.051 to .473	.051 to .473

Variable Label (Ln = variable is in log form)	OLS Log-Log Coefficient	Elasticity[1]	Coefficient Confidence Interval (90%)[2]	Elasticity Confidence Interval (90%)
Bonita Unified[5]	-.306* (.183)	-	-.608 to -.004	-.001 to .000
Hawthorne Elementary[5]	.054* (.032)	-	.001 to .107	.000 to .001
Lancaster Elementary[5]	-.066*** (.024)	-	-.106 to -.026	-.002 to -.001
Montebello Unified[5]	-.033** (.014)	-	-.056 to -.010	-.002 to .000
Norwalk-La Mirada Unified[5]	-.051** (.021)	-	-.086 to -.016	-.002 to .000
Palmdale Elementary[5]	-.033* (.020)	-	-.066 to .000	-.002 to .000
Whittier City[5]	-.091** (.042)	-	-.159 to -.023	-.001 to .000

* significant at the 90% level, ** significant at the 95% level, *** significant at the 99% level (all in two-tailed tests)

1 Dummy variables cannot be converted to elasticities; the Log-Log coefficient represents the percentage change in the dependent variable (API) from moving from the excluded category to one represented by the dummy variable.

2 critical t = 1.645

3 Excluded category is Parent Education Level = Not a High School Graduate

4 Excluded category is School Level = High School

5 Excluded category is District = Los Angeles Unified

Interpreting R-squared

R-squared, the coefficient of determination, is just one way to measure the "goodness of fit" of the statistical model. The R-squared value of .736 indicates that 73.6% of the variance in API can be explained by the model as specified. Yet, while R-squared is a formulaic indicator of a good model, theory should always be the driver of statistical research and reporting. Although R-squared is relatively high and more than one-third of the explanatory variables are significant at the 90% level, more research is needed to determine the effect of school facilities on academic achievement.

Pre-Regression Predictions

Of the variables found to be significant, all but two were in the expected direction: Percent Filipino and Percent of Students Tested. Both of these variables were found to have a significant (95% level) positive effect on the API. Still, low coefficients and tight confidence intervals suggest the impact, while significant, is not large in magnitude. Conventional (but cynical) wisdom on the Percent of Students Tested holds that school administrators or teachers may encourage struggling students to stay home on test day so as not to lower the school average. An alternate theory explaining the positive effect of Percent of Students Tested observed in this model is based on the notion that schools that encourage attendance during the test provide an overall learning environment based on positive reinforcement and support.

Policy Implications and the Potential for Future Research

The purpose of this thesis was to determine whether the condition of K-12 public school facilities affects academic achievement, as measured by the API. While the results of this analysis affirm the anticipated results, there is much work to be done to answer the question on every school district administrator's mind: Was *Williams* worth it?

Further Research is Needed

I would suggest that further research—much of which is several years off—be expanded in geographical scope and include time series and cost/benefit components that measure effects over time as well as the private and societal benefits of school improvements made pursuant to the *Williams* settlement. Logic alone would seem to suggest that the beneficiaries of *Williams* have been given only a band-aid rather than a cure.

The careful reader will be reminded that one regression or a dozen do not demonstrate causality. While findings of significance are important and notable, they should not be the only consideration in the policy making process. It is my hope that these initial positive results will point out flaws in the current system and push practitioners to develop a procedure to measure the facilities we value so that further research can build on these preliminary results.

Lack of Standardized Data

Facilities Directors, District Superintendents, and State lawmakers alike should take notice of these results, not for what they do or don't definitively prove—which is nothing, but for the deficiencies of the current system they highlight. There currently exists no mechanism for consistently measuring and reporting the condition of school facilities across the State's 1,054 school districts. Although the *Williams* settlement added a facilities component to the SARC, this assessment is qualitative in nature and does not produce a usable data source with which to further explore the link between school facilities and academic achievement.

The SFNAGP data used in this thesis represents the first time any significant portion of schools has assessed the condition of facilities and reported back to the state agency responsible for the administration of school facility funding. Although all decile 1-3 schools were required to submit Needs Assessments, this constitutes a sample of schools comprised entirely of the lowest-achieving 30% across the state. It is expected that statewide data representative of all levels of school achievement would produce significant results with coefficients farther from zero, indicating a greater magnitude of influence than I have shown here.

The results presented in this thesis do suggest that while the condition of facilities—in particular a school's long-term maintenance needs—may be a significant predictor of academic achievement, there are other significant factors of greater magnitude. Student and family/social inputs in particular are found to be significant virtually across-the-board, suggesting students do not start their education on equal ground with their peers.

Supporting this recommendation is recent statewide survey data compiled by the Public Policy Institute of California (PPIC, 2007), in which fully 90% of adult residents say the collection of data pertaining to K-12 school resources and student performance is at least somewhat important, with 56% categorizing this data collection as very important. Further, 66% of residents and 57% of likely voters would favor increased State funding to develop such a data system.

Educational Adequacy after Serrano

Education in California is a particular challenge given the diversity of our students paired with diversity in our system. State lawmakers must recognize that a cookie-cutter model of standards and accountability will not work in California. Local districts should be given the discretion to design educational programs suited to the needs of their students. New funds for charter schools and Career Technical Education approved as a part of Proposition 1D in November 2006 are just the beginning. Much more needs to be done at the State level to encourage local solutions to educational challenges. Where administrators can identify a high percentage of students entering their schools with language challenges, special resources should be dedicated to develop individualized programs to address the deficiency. That being said, it doesn't cost the same to educate a student from one district or one county to the next. This is the challenge that *Serrano* has left us with—to adequately educate all of California's students using (theoretically) the same resources for each student.

The* Williams *Investment

The $800 million investment of the *Williams* settlement for facility needs is a significant and important one; yet it is most important to remember this investment represents a one-time fix for schools that are academically challenged now. The settlement and ensuing legislative actions fail to change the way school construction, modernization and maintenance are funded in California. For this reason, we will continue to face the same challenges. Poor neighborhoods will stay poor, their schools under-funded and with no PTA to fill the gap. Facilities at these schools will fall by the wayside as districts dedicate the bulk of their discretionary revenue to much-needed educational programs. These districts will not experience an influx of revenue from new residential development, but will more likely be faced with declining enrollment and tough school closure choices. Failing schools will continue to fail unless we increase the size of the pie and make sure each school gets a piece that is big enough to meet its needs.

Grant Adequacy

The simplest way to increase the size of the school facility pie is to increase the per-pupil basic grant, which would conform to the principles of *Serrano*. The current basic grant for modernization is $3,262 per elementary school pupil, $3,450 per middle school pupil and $4,516 per high school pupil (DGS, 2007a).[16] Ongoing studies by the OPSC and Implementation Committee must continue until a conclusion on grant adequacy is reached. Given the virtually useless data gathered by the survey instrument designed to determine new construction grant adequacy, a new approach is clearly needed (OPSC, 2007). Additional data gathering during the project close-out audit could provide the evidence needed to support or de-emphasize better funding of school facilities.

Supporting Normative Arguments with Empirical Data

Funding schools, both programs and facilities, is somewhat of an intuitive matter. Many people have a knee-jerk reaction that says of course money should be spent (in whatever amount needed) to ensure that all California schoolchildren are housed in safe, clean and up-to-date classrooms. Yet the reality of these costs is significant, greater than even the Legislature has anticipated in the past. For this reason, the nexus between the condition of school facilities and academic achievement needs to be established over and over again until funding school facilities becomes engrained in our culture as it was in the 1950s. It's not enough to rely on common sense, conventional wisdom or even the ballot box. Until academia builds a full body of research affirming the results of this model, funding school facilities will continue to be a challenge fought at the expense of educational program development and student learning.

[16] These figures represent the grant amounts effective January 1, 2007, approved by the SAB as the annual funding adjustment at its January 24, 2007 meeting. Additional adjustments are made for special education, automatic fire detection and alarm, certain types of ADA compliance, facilities more than 50 years old and small school districts (less than 2,500 pupils).

APPENDIX A: DESCRIPTIVE STATISTICS FOR DISTRICT DUMMY VARIABLES

Variable Label	Mean	Standard Deviation	Maximum	Minimum
Independent: Other Controls				
ABC Unified (ABC)	.012	.107	1	0
Antelope Valley Union High (ANTV)	.006	.076	1	0
Azusa Unified (AZSA)	.025	.156	1	0
Baldwin Park Unified (BLPK)	.019	.137	1	0
Bassett Unified (BASS)	.006	.076	1	0
Bellflower Unified (BLLF)	.004	.062	1	0
Bonita Unified (BNTA)	.002	.044	1	0
Centinela Valley Union High (CNTV)	.006	.076	1	0
Duarte Unified (DUAR)	.004	.062	1	0
East Whittier City Elementary (EWHT)	.004	.062	1	0
Eastside Union (EASD)	.006	.076	1	0
El Monte Union High (EMUH)	.006	.076	1	0
El Rancho Unified (ELRN)	.012	.107	1	0
Garvey Elementary (GRVY)	.002	.044	1	0
Hacienda La Puente Unified (HCLP)	.023	.150	1	0
Hawthorne Elementary (HWTH)	.010	.098	1	0
Inglewood Unified (INGL)	.015	.123	1	0
Keppel Union Elementary (KPPL)	.008	.087	1	0
Lancaster Elementary (LNCS)	.021	.144	1	0
Lawndale Elementary (LWND)	.010	.098	1	0
Lennox Elementary (LNNX)	.008	.087	1	0
Long Beach Unified (LNGB)	.025	.156	1	0
Lynwood Unified (LYNW)	.019	.137	1	0
Montebello Unified (MNTB)	.037	.188	1	0
Mountain View Elementary (MTVW)	.017	.131	1	0
Norwalk-La Mirada Unified (NWLM)	.019	.137	1	0
Palmdale Elementary (PMDL)	.031	.173	1	0
Paramount Unified (PRMT)	.029	.168	1	0
Pasadena Unified (PSDN)	.017	.131	1	0
Pomona Unified (PMNA)	.040	.197	1	0
Rowland Unified (RWLD)	.006	.076	1	0
South Whittier Elementary (SWHT)	.006	.076	1	0
Whittier City (WHTC)	.008	.087	1	0
Whittier Union High (WHTH)	.004	.062	1	0
Wilsona (WLSN)	.002	.044	1	0

APPENDIX B: BIVARIATE CORRELATIONS FOR DISTRICT DUMMY VARIABLES

	ABC	ANTV	AZSA	BLPK	BASS	BLLF	BNTA	CNTV
03 API	.006 .893	-.075 .087	.036 .419	.071 .106	-.002 .959	.021 .640	-.078 .077	-.106* .016
AA	-.035 .421	.048 .276	-.094* .032	-.093* .034	-.048 .272	.031 .481	-.020 .655	.039 .370
AI	-.001 .979	.030 .494	-.037 .403	-.024 .581	.030 .494	.050 .258	.195** .000	-.032 .470
AS	.083 .058	-.020 .651	-.042 .341	-.008 .861	.000 .995	.024 .588	-.011 .794	.019 .659
FI	.081 .066	.014 .749	.048 .275	.070 .109	-.015 .741	.105* .017	.025 .576	.014 .749
HI	-.008 .847	-.132** .003	.054 .220	.082 .062	.051 .244	-.076 .085	-.100* .022	-.050 .259
PI	.064 .143	-.023 .600	-.048 .270	-.042 .335	-.023 .600	.048 .273	-.013 .762	.059 .178
EL	-.011 .810	-.120** .006	-.046 .300	-.016 .709	-.075 .087	-.094* .032	-.102* .020	-.079 .072
Lunches	-.044 .316	-.204** .000	-.141** .001	-.180** .000	-.045 .301	-.083 .059	-.210** .000	-.159** .000
High School Grad	.034 .448	.005 .915	-.032 .472	.178** .000	-.069 .121	-.009 .847	-.063 .155	.002 .961
Some College	.057 .198	.067 .128	.115** .009	-.057 .200	.007 .870	.084 .057	.416** .001	.064 .145
College Grad	.019 .665	.133** .002	-.090* .042	-.079 .075	.126** .004	.103* .020	.109* .013	.006 .884
Grad School	.045 .311	.018 .680	-.020 .657	-.014 .751	.324** .000	.023 .602	.022 .619	-.022 .625
Student Mobility	.041 .355	-.006 .896	.013 .775	-.082 .063	-.110* .012	.010 .821	.359** .000	-.009 .842
Enrollment	-.050 .256	.145** .001	-.089* .042	-.037 .401	-.026 .561	.046 .296	-.058 .188	.091* .038
Site Acreage	.078 .080	-.048 .285	.054 .229	.099* .026	.088* .048	.140** .002	-.045 .311	.123** .006
YRE	-.089* .044	-.062 .155	-.131** .003	-.115** .009	-.062 .155	-.051 .246	-.036 .413	-.062 .155
Full Credential	.162** .000	-.053 .231	.193** .000	.112* .010	-.078 .077	.017 .699	.095* .030	.000 .998
5-year Maintenance	-.056 .203	-.078 .077	-.056 .200	-.146** .001	-.072 .103	-.047 .280	-.026 .550	-.016 .717
Necessary Repairs	.007 .867	-.013 .770	.646** .000	-.041 .349	-.023 .605	.019 .661	-.015 .739	.060 .175
Elementary	-.010 .816	-.119** .007	-.033 .449	-.003 .946	-.063 .150	-.029 .514	-.069 .118	-.119** .007
Middle	-.004 .919	-.036 .412	.202 .650	-.030 .495	.030 .499	-.029 .504	-.021 .637	-.036 .412
Percent Tested	-.033 .450	-.102* .020	.054 .223	.038 .386	-.015 .733	.012 .781	-.263** .000	.025 .574

Shaded = correlation > .800

	DUAR	EWHT	EASD	EMUH	ELRN	GRVY	HCLP	HWTH
03 API	.040 .358	.057 .195	.053 .226	-.053 .230	.078 .076	.039 .378	.028 .526	.048 .272
AA	-.005 .903	-.042 .343	.056 .200	-.054 .220	-.075 .086	-.029 .503	-.096* .029	.101* .022
AI	.050 .258	.050 .258	.030 .494	-.032 .470	-.001 .979	-.018 .677	-.002 .970	-.041 .350
AS	-.024 .581	-.016 .712	-.026 .547	.144** .001	-.047 .287	.464** .000	.009 .831	.010 .823
FI	.017 .694	-.035 .424	.000 .996	-.029 .512	-.031 .484	-.025 .572	.108* .014	.033 .454
HI	.010 .817	.031 .478	-.144** .001	.036 .407	.088* .044	-.055 .207	.084 .056	-.091* .038
PI	-.019 .669	.015 .738	.004 .922	-.023 .600	-.033 .457	-.013 .762	-.005 .908	.161** .000
EL	-.015 .732	.013 .762	-.097* .027	-.014 .747	-.054 .220	.012 .793	-.078 .076	-.007 .869
Lunches	.056 .202	-.046 .300	-.047 .284	-.037 .394	-.087* .047	.019 .667	-.098* .025	-.002 .960
High School Grad	.013 .767	.022 .613	.050 .256	-.023 .602	.025 .578	.016 .721	-.064 .145	.067 .130
Some College	-.04 .343	.032 .475	.019 .673	-.053 .232	.154** .000	.017 .695	.055 .213	.114** .009
College Grad	-.039 .375	-.043 .325	-.025 .569	-.039 .374	.019 .665	-.012 .778	.036 .414	-.017 .699
Grad School	-.042 .342	-.034 .444	-.022 .625	-.041 .348	.026 .558	-.012 .778	-.027 .544	-.023 .606
Student Mobility	-.041 .347	.003 .953	.165** .000	-.090* .041	-.065 .136	.007 .873	.006 .883	.037 .404
Enrollment	-.047 .280	-.054 .219	-.062 .159	.039 .376	-.081 .064	-.044 .319	-.100* .023	-.049 .265
Site Acreage	-.021 .642	-.006 .885	.004 .921	.199** .000	-.039 .379	-.028 .535	.065 .144	-.042 .348
YRE	-.051 .246	-.051 .246	-.062 .155	-.062 .155	-.089* .044	-.036 .413	-.126** .004	.000 .993
Full Credential	.040 .362	.012 .787	.105* .017	-.013 .772	.055 .212	.041 .351	-.076 .082	-.027 .543
5-year Maintenance	-.047 .282	-.048 .274	-.071 .108	-.012 .791	-.057 .194	-.045 .304	-.107* .015	-.033 .453
Necessary Repairs	.055 .215	-.021 .637	-.019 .666	.249** .000	.050 .256	-.012 .778	.031 .481	-.028 .518
Elementary	.040 .366	.040 .366	.049 .267	-.119** .007	.029 .503	.028 .523	-.015 .741	-.024 .588
Middle	-.029 .504	-.029 .504	-.036 .412	-.036 .412	-.004 .919	-.021 .637	-.006 .885	.055 .207
Percent Tested	.037 .395	.023 .599	.019 .658	-.036 .417	.030 .489	.026 .548	.086* .050	.039 .379

Shaded = correlation > .800

	INGL	KPPL	LNCS	LWND	LNNX	LNGB	LYNW	MNTB
03 API	-.018 .688	.061 .167	.047 .281	.095* .031	.020 .651	.029 .509	-.008 .848	-.062 .160
AA	.281** .000	.007 .871	.141** .001	.017 .694	-.055 .208	.087* .048	-.026 .553	-.139** .002
AI	-.052 .236	.178** .000	.232** .000	.055 .211	-.037 .404	-.037 .403	-.058 .184	-.056 .201
AS	-.065 .139	-.040 .362	-.045 .302	.106* .015	-.046 .298	.336** .000	-.069 .116	-.059 .180
FI	-.062 .158	-.037 .394	.045 .310	.022 .619	-.037 .394	.145** .001	-.079 .071	-.099* .024
HI	-.204** .000	-.101* .022	-.286** .000	-.051 .245	.074 .092	-.175** .000	.069 .116	.169** .000
PI	.030 .501	-.027 .544	-.030 .493	.076 .082	.068 .120	.656** .000	-.027 .534	-.059 .179
EL	-.171** .000	-.130** .003	-.240** .000	-.050 .256	.112* .011	-.041 .346	.106* .016	.061 .162
Lunches	-.257** .000	-.067 .125	-.148** .001	-.073 .097	.043 .323	-.029 .514	-.129** .003	.070 .109
High School Grad	.287** .000	-.021 .637	-.089* .043	-.186** .000	-.003 .940	.016 .717	.059 .183	.006 .893
Some College	-.031 .476	.136** .002	.312** .000	.074 .092	-.084 .057	-.001 .991	-.027 .547	-.052 .237
College Grad	.038 .390	.021 .640	.053 .234	.302** .000	-.034 .439	.094* .032	-.005 .911	-.084 .058
Grad School	-.011 .805	.044 .318	.067 .131	.703** .000	.050 .259	-.013 .766	-.036 .415	-.063 .152
Student Mobility	.106* .015	.071 .105	.203** .000	.064 .142	-.095* .031	.120** .006	-.078 .075	-.065 .136
Enrollment	-.016 .711	-.078 .076	-.056 .201	-.034 .445	-.004 .936	.048 .273	.054 .215	.022 .617
Site Acreage	.021 .633	.025 .570	-.032 .471	.014 .757	.005 .905	.077 .084	-.004 .927	.011 .812
YRE	-.039 .378	-.072 .100	.152** .001	-.081 .066	-.072 .100	-.006 .898	-.115** .009	-.076 .083
Full Credential	-.248** .000	.066 .133	.136** .002	.151** .001	.022 .613	-.062 .158	-.274** .000	.019 .659
5-year Maintenance	-.054 .221	-.034 .437	-.147** .001	-.102* .020	-.075 .086	-.167** .000	-.145** .001	-.175** .000
Necessary Repairs	.013 .764	-.001 .974	-.013 .767	-.022 .617	-.027 .538	-.044 .318	-.019 .664	.061 .162
Elementary	-.058 .189	.008 .859	.035 .424	.020 .655	.008 .859	-.060 .169	.028 .526	-.033 .446
Middle	.022 .320	.015 .727	.000 .994	.004 .920	.015 .727	.052 .238	-.030 .495	.041 .356
Percent Tested	-.007 .875	.080 .067	-.016 .714	.042 .342	.033 .446	.007 .867	.008 .850	.025 .565

Shaded = correlation > .800

	MTVW	NWLM	PMDL	PRMT	PSDN	PMNA	RWLD	SWHT
03 API	.033 .447	.031 .479	.075 .088	-.013 .763	-.002 .969	.021 .633	.096* .029	.041 .352
AA	-.094* .032	-.069 .116	.082 .062	.007 .869	.129** .003	-.071 .108	-.045 .301	-.052 .232
AI	-.055 .208	.044 .318	.251** .000	.012 .783	-.055 .208	.010 .826	.030 .494	.092* .036
AS	.152** 001	.010 .814	-.047 .289	-.027 .535	-.038 .381	.009 .831	-.020 .651	-.020 .651
FI	-.059 .183	.070 .109	.037 .400	-.026 .548	-.034 .444	-.094* .032	.043 .332	-.029 .512
HI	.086* .049	.033 .452	-.210** .000	.003 .947	-.122** .005	.092* .036	.052 .233	.052 .233
PI	-.040 .360	.018 .682	-.042 .340	.183** .000	-.024 .581	-.052 .240	.004 .922	-.023 .600
EL	.094* .033	-.135** .002	-.210** .000	-.038 .392	-.096* .029	.067 .124	.008 .859	-.101* .021
Lunches	.121** .006	-.165** .000	-.137** .002	.022 .614	-.104* .017	.050 .258	.014 .756	-.065 .141
High School Grad	-.052 .240	.042 .341	-.133** .003	-.066 .135	-.148** .001	.046 .301	.022 .612	-.018 .683
Some College	-.099* .025	.019 .666	.353** .000	.018 .689	.089* .043	-.094* .033	.004 .921	-.064 .146
College Grad	-.105* .017	-.024 .582	.085 .054	-.081 .067	.429** .000	-.073 .097	-.032 .466	-.067 .127
Grad School	-.065 .143	-.047 .287	.098* .026	-.007 .878	.090* .041	-.033 .461	-.028 .523	-.041 .348
Student Mobility	-.014 .759	-.055 .209	.136** .002	.040 .366	.127** .004	.144** .001	-.033 .457	-.042 .343
Enrollment	-.053 .229	-.051 .247	-.063 .150	-.044 .318	-.064 .146	-.082 .061	-.046 .292	-.046 .294
Site Acreage	.138** .002	.073 .101	.006 .890	-.025 .575	.022 .630	.014 .752	-.008 .852	-.009 .837
YRE	-.109* .013	-.115** .009	.217** .000	.140** .001	-.109* .013	-.168** .000	-.062 .155	-.062 .155
Full Credential	.186** .000	.098* .025	.085 .054	-.038 .384	-.032 .468	-.073 .096	.019 .670	.121** .006
5-year Maintenance	-.139** .002	-.093* .034	-.175** .000	.072 .103	-.138** .002	-.177** .000	-.080 .069	-.066 .132
Necessary Repairs	-.036 .407	-.018 .684	-.005 .910	-.017 .698	-.038 .385	.084 .054	-.023 .596	-.023 .598
Elementary	.020 .650	-.034 .442	.040 .358	.060 .175	-.045 .305	.002 .962	.049 .267	-.007 .870
Middle	.014 .757	.006 .887	.002 .960	-.081 .063	.014 .757	.029 .503	-.036 .412	.030 .499
Percent Tested	.069 .118	.038 .390	.021 .633	.061 .167	-.193** .000	.060 .170	.038 .384	.003 .952

Shaded = correlation > .800

	WHTC	WHTH	WLSN
03 API	.044 .315	-.001 .974	.042 .343
AA	-.060 .170	-.038 .385	.015 .741
AI	.070 .108	-.026 .556	.089* .044
AS	-.029 .514	-.008 .852	-.011 .794
FI	-.050 .257	-.018 .688	-.025 .572
HI	.055 .212	.021 .638	-.064 .145
PI	-.027 .544	-.019 .669	-.013 .762
EL	-.058 .184	-.090* .041	-.052 .239
Lunches	-.059 .179	-.175** .000	.041 .351
High School Grad	.093* .035	.035 .432	.077 .081
Some College	.099* .024	.046 .303	-.002 .956
College Grad	-.013 .771	.021 .634	-.006 .885
Grad School	-.025 .572	-.001 .976	-.024 .588
Student Mobility	-.007 .880	-.049 .268	.043 .325
Enrollment	-.077 .079	.059 .180	-.028 .517
Site Acreage	-.039 .387	.197** .000	-.010 .824
YRE	-.072 .100	-.051 .246	-.036 .413
Full Credential	.100* .022	.022 .615	.001 .980
5-year Maintenance	-.088* .045	-.065 .138	-.024 .580
Necessary Repairs	-.011 .794	-.017 .706	.019 .668
Elementary	.056 .200	-.097* .027	.028 .523
Middle	-.042 .343	-.029 .504	-.021 .637
Percent Tested	.001 .978	-.004 .926	-.004 .925

Shaded = correlation > .800

APPENDIX C: LIST OF ACRONYMS

AB	Assembly Bill
API	Academic Performance Index
CAHSEE	California High School Exit Examination
CBEDS	California Basic Educational Data System
CDE	California Department of Education
CSR	Class Size Reduction
DMP	Deferred Maintenance Program
ELL	English Language Learners
ERP	Emergency Repair Program
FIS	Facilities Inspection System
IEI	Interim Evaluation Instrument
LAO	Legislative Analyst's Office
LAUSD	Los Angeles Unified School District
LEA	Local Educational Agency
LEF	Local Education Foundation
OCR	Overall Compliance Rating
OPSC	Office of Public School Construction
PBS	Public Broadcasting System
PPIC	Public Policy Institute of California
PSAA	Public School Accountability Act
PTA	Parent-Teacher Association

SAB	State Allocation Board
SARC	School Accountability Report Card
SB	Senate Bill
SBE	State Board of Education
SFID	School Facilities Improvement District
SFNAGP	School Facilities Needs Assessment Grant Program
SRCP	State Relocatable Classroom Program
STAR	Standardized Testing and Reporting
VIF	Variance Inflation Factor
YRE	Year Round Education

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