SCHOOL BOARD TRAINING EFFECTS ON STUDENT ACHIEVEMENT

Cherise Evette Revell
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SCHOOL BOARD TRAINING EFFECTS ON STUDENT ACHIEVEMENT

A Thesis

by

Cherise Evette Revell

Approved by:

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

_____, Second Reader
Su Jin Gatlin Jez, Ph.D.

_____
Date

Student: Cherise Evette Revell

I certify that this student has met the requirements for format contained in the University format manual, and that this thesis is suitable for shelving in the Library and credit is to be awarded for the thesis.

_____, Department Chair _____

Robert W. Wassmer, Ph.D. Date

Department of Public Policy and Administration

Abstract

of

SCHOOL BOARD TRAINING EFFECTS ON STUDENT ACHIEVEMENT

by

Issue and Purpose

In the age of accountability and high stakes testing, school boards cannot simply be a representative body of the community; they must be functional governing bodies with effective trustees that hold the district accountable for student results. Public school board members can positively influence student achievement by acting within their policy and accountability roles and creating a positive district culture of learning. Likewise, providing school board members with quality training opportunities could help board members understand and appreciate the power of their policy and accountability functions and help dissuade them from delving into administrative functions that distract from districts goals. For this reason, pinpointing exactly how board governance training changes behavior and which board actions impact district and school site culture merits additional research and evaluation. Along this vein, the purpose of this study is to discover whether school board actions, specifically completing governance training, have any quantifiable influence on student achievement in their districts.

Scope, Limitations, Procedures

In order to test this question, I used data from all 1,000 school districts in California for 2003, 2005, and 2007 and a pooled data set of all three years and

performed multiple regression analyses to control for a variety of student, social, school site, and district administrative factors. I compiled district data for this study from the following sources: the California Department of Education, EdData, and the California School Boards Association. It is important to note that this study uses district level data, including district API scores and is therefore not measuring the affect of school board training on an individual student's achievement. This is significant because some factors that may be important at the site or individual child level may be somewhat different from those factors found to have the greatest impact on the system/district as a whole. One important limitation was the availability of usable data. To perform a regression analysis, all factors must be held constant, meaning every district must have available data for all of the independent variables chosen. In the four data sets, after controlling for each of the 20 independent variables chosen, only 393, 506, 578 and 342 districts remained for the 2003, 2005, 2007, and pooled data set respectively, notably the 342 districts in the pooled data set actually represent 1029 individual observations. The explanatory variables chosen for this regression model cover aggregate student ethnicity data, income, parent education level, special student needs, teacher and classroom variables, financial and administrative variables, and lastly school board variables on ethnicity, board consistency and board training.

Results and Recommendations

My results conform to previous literature in that the student and social inputs have the most significant impact on student achievement, followed by school site and teacher

inputs coming as a close second. My results also indicate that some district administrative variables have a small but significant impact on district achievement. In regards to my key explanatory variables, individual and team training, I found that there was not a statistically significant relationship between board training and achievement at the district level, but that there is a statistically significant relationship between board consistency and district results. Board consistency with its limitations from the available data has room to become a much more important area of study and possible connection between board training and district achievement, where completing board training results in longevity and stability on the board, which in turn improves district results. My results also indicate a need additional research on district climate and culture, a variable I could not measure but has been shown in previous literature to link board actions to district results. Due to the limitations of the data and need for future research, I detail some recommendations for the California School Boards Association that can help fix current data limitations and also help the association build its research capacity and agenda for the future.

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

_____
Date

DEDICATION

This thesis is dedicated to my loving family, without whom I would have never reached this point or been able to finish my degree. To my mother and grandfather, may he rest in peace, for believing in my abilities and encouraging me to attain a college degree and pursue my dreams. My achievements are a direct result of their belief that I could be better and attain more than they ever dreamed possible for themselves and the tremendous sacrifices they made in their lives that led me to my decisions. To my father for teaching me to adapt and overcome obstacles and the tenacity to dream past my current circumstance, I learned with you and through you to become the strong and dedicated person I am today. To both of my grandmothers, whose prayers and perseverance were an example of how anything is possible if I have the right perspective and pray. And lastly my little brother, even while you struggled you were always encouraging, your love and support mean so much to me. I love you all so much and am so grateful for your encouragement to push onward and upward.

ACKNOWLEDGMENTS

I would like to thank the California School Boards Association (CSBA) for allowing me the use of their data on school boards and for being a workplace that encouraged me to learn and apply my Master's degree. In particular, I want to thank my former boss Stephanie Goodlett for being an excellent manager who gave me the space to grow and learn as a professional and who challenged me to think harder and dig deeper for the progress we made in moving our board training program to the next level. Without this superb environment to learn and apply my studies in organizational development, public administration and public policy I would not have the depth of understanding I currently possess and the many examples of academic concepts in practice.

I also want to thank Mary Kirlin, Rob Wassmer, Su Jin Jez and the entire Public Policy and Administration department at California State University, Sacramento. Mary is the one person who encouraged me to enroll in the program when I had almost given up on completing a Master's program, I will forever be thankful for your nudging. Rob and Su Jin, without your patience with my "fits and starts" style of inspiration and writing, your keen insights and mastery of regression analysis, I would not be finishing this thesis. Your comments and encouragement to push through were truly appreciated. Throughout the duration of the program, I was consistently amazed and appreciative of the tremendous insight, encouragement and support from the faculty and department staff like Suzi Byrd. The wealth of professional and academic knowledge of the faculty

helped me translate my academic learning into concrete plans to better the programs I have worked for at CSBA. Thank you all for such a wonderful academic experience.

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Chapter 1

INTRODUCTION

We elect Boards of Education to oversee local public schools in California. Most often, the public knows little about their local board of education, its function, roles and responsibilities unless they have a problem at their local school, their favorite program is in danger of being cut, or favorite teacher has been fired. In this manner, local school board members are much like other elected officials, they become more visible in a crisis. Where school boards differ from other elected officials is their potential involvement in the day-to-day operations of the entity for which they are charged to set policy and hold accountable. The extent to which school boards play a policy role versus an administrative role can have a huge impact on the culture and operations of a school district. Since the dawn of the accountability movement and enactment of the federal No Child Left Behind Act of 2001 (NCLB), board members are increasingly focused on student achievement and specifically how to raise it.

Although school boards have long been concerned with student outcomes and how to best lead their districts, the accountability movement has shifted the focus of what achievement means making it more standard across each state. Although the goal has become more standard, there has not been a significant focus on quantitative research-based approaches to what effective governance at the district level, and more specifically the board level looks like and what principles are universally applicable to boards across the state. My research is an attempt to use quantitative statistical analysis to analyze one

factor in effective district leadership, whether professional development for school board members that focuses on teaching their appropriate roles and responsibilities in a collaborative governance model has any appreciable effect on district level outcomes. This chapter starts with a discussion of the political and policy context of school board governance in recent years as seen in the news media's coverage on urban school boards and mayoral attempts to overtake or collaborate with the local school board. I then discuss the evolution of the board's role in public education, although boards have always been the elected voice of the community, the leadership literature on what their role has changed from a focus on avoiding micromanagement to a policy and accountability role. I then discuss the school board training opportunities delivered by the California School Boards Association (CSBA), which are based on teaching school boards how to effectively govern their districts using a policy and accountability model differentiated and collaborative governance theories. The training programs provided by CSBA are the basis for my two key explanatory variables of Individual and Team Training, which I explain in Chapter 2 how these programs relate to previous academic literature on school boards. This chapter ends with a brief description of the major sections in the remainder of the thesis.

Governing Dilemmas and Political Quagmires

School boards and their impact on achievement and district operations has generally been a public and/or political debate, usually centered on the effectiveness of school boards and their ability to affect meaningful organizational change. This debate

comes to the broader public consciousness when there is a school closure, crisis, district financial failure, or recall/challenge. I use the word challenge in the meaning that some entity, group of citizens or a mayor, wishes to change the composition of the board and how members are selected for reasons other than financial failure or district reorganization under NCLB. In California, the most recent challenge of this type came in 2006 from Los Angeles Mayor Antonio Villaraigrosa who wanted to take over control of California's largest district, Los Angeles Unified School District (LAUSD), as has been done in Boston, Chicago, and New York City. Mayor Villaraigrosa worked through the state legislature to pass a bill to strip the board of its powers and give the mayor authority to hire the superintendent and take charge of 36 low performing schools in the district (Egelko, 2007).

The Second District Court of Appeals ruled the law was unconstitutional and the board still has authority over LAUSD, but the debate never turned to a policy or quantitative research question of what affects school board members have on district operations and student achievement more specifically. Unlike Los Angeles, where Mayor Villagrosa was looking to move to a strong mayor governance model giving himself authority over all local government including the local school district, San Francisco had a more collaborative relationship with their mayor, Gavin Newsom, who wanted to create a partnership with the school district to provide resources and support to the ailing city schools. In 2006, the San Francisco Chronicle did a six-part series on the

San Francisco Unified School District (SFUSD), detailing frustrations centered on the board of education's perceived lack of focus on achievement and a leadership vacuum.

In the case of SFUSD, there was not a direct challenge to authority, but there was believed to be a leadership crisis and a large exodus from the city schools that was leading to increased school closures. In the San Francisco Chronicle article, Gordon and Knight (2006) detail the boards' debate on cutting the Junior ROTC program to protest the "Don't Ask, Don't Tell" policy of the armed services. The article makes the cast that instead of focusing on whether the Junior ROTC program benefitted students and helped prevent high school dropouts, their focus was on federal policy and politics. These types of politically motivated rather than policy and data driven debates/actions by school boards bring up the same questions raised in Los Angeles, if boards have negative effects on districts or likewise do little to improve the district that is not already done by the superintendent, why do we need school boards in the first place? Although I do not plan to focus on urban districts specifically, major media outlets cover their activities and debates in detail; they also make great examples of the need for quantitative research on school boards, especially non-urban boards, and their effect on student achievement.

From Micromanagement to the Policy and Accountability Role

During my work with veteran school board members and longtime superintendents, they speak of school boards shift in focus from attempting to avoid micromanagement in the 1980s to a new policy and accountability based focus since the late 1990s and more recently a focus on district culture. In their examination, the focus in

the 1980s and early 1990s for school boards was on “what not to do” as a board member, essentially to avoid “micromanaging” the superintendent, district office staff, and principals.

Qualitative research and popular leadership literature demonstrated the negative affect that micromanagement by the board could have on a district and schools. Indeed, a 1985-86 Institute for Education Leadership (IEL) survey of nine metropolitan school districts across the nation and rural districts in three states found that school boards spent too much time on “administrative trivia” and “growing problems in board/superintendent relations, particularly in the urban school systems, and indicated a lack of skill among board members in resolving conflicts and tensions both within the board and with superintendents” (Danzberger, 1994, p. 369). In the IEL’s 1992 survey, evidence on the shift comes from the focus on “systemic education reform” and their findings that

> School boards frequently appear dysfunctional because of conflicts between members and the resulting incapacity to chart a clear direction for their school systems. Data from our sample suggest that such conflict often comes about because individual board members lack a common definition of the board's role. (Danzberger, 1994, p. 370)

Propelled by literature on non-profit boards in the 1980s and 1990s by Dr. John Carver and Dr. Peter F. Drucker, school boards began to focus on what their appropriate role is and how best to function under this policy and accountability based role. Although the Carver and Drucker models assign different levels of collaboration and

authority to the board versus superintendent, they both stress the that the school board's primary function is to set system wide goals and policy and work with or simply hold the superintendent accountable for district goals. More recently, literature on organizational culture has begun to permeate educational leadership and the focus has come to include how acting within the proper board governance role can help create a positive culture within districts and schools.

Togneri's (2003) research on districts that have been able to successfully implement systemic reforms that have improved academic achievement throughout their district and specifically in their lowest performing schools best demonstrates this shift in focus. Togneri found that in successful districts, boards focused on establishing a district wide shared vision, district wide curriculum, and policies to support schools and administrators while allowing site principals the flexibility to respond to the unique circumstance with different innovative strategies (Togneri, 2003). The supportive and positive cultures created in these districts are reflected in the high adoption and implementation of systemic reforms by teachers and principals alike and evidenced in their successful turnaround of low performing schools. Over the past 30 years there has been a large shift in what boards believed their role is as district leaders and what research and popular leadership trends have said the role of the board should be. During this same time, professional development opportunities for school board members have slowly evolved to include these research-based principles of board role and responsibilities. Next, I cover two such professional development opportunities that

CSBA provides to California school board members and which serve as my key explanatory variables in the regression equations.

CSBA and Professional Development for Leadership and Governing Boards

The California School Boards Association is a membership organization, sometimes referred to as trade association, for California's over 5,000 elected public school board members. For over two decades the association has offered basic skills training to newly elected school board members on parliamentary procedure, how to read a district budget, and some basics on the open meeting laws and dealing with the media. For the past 11 years the association has also run a comprehensive governance-training program for board members that define their roles and responsibilities during 60 hours (nine full days) of interactive in person training (California School Boards Association, 2009). The program's theory on governance is that board members play an overarching policy and accountability role, where board members help translate the needs and preferences of their communities into district goals and policies, support district staff as they carry out the action plans to meet goals, and then assess results and hold the superintendent and district staff accountable for results. To help instill this theory of collaborative governance while reinforcing the dichotomy of policy versus administrative roles of the board versus superintendent, the program employs the use of graphics and metaphors. To demonstrate the differences in roles between the board and administration the program uses a Venn diagram to illustrate the interplay between these functions, as shown in Figure 1.

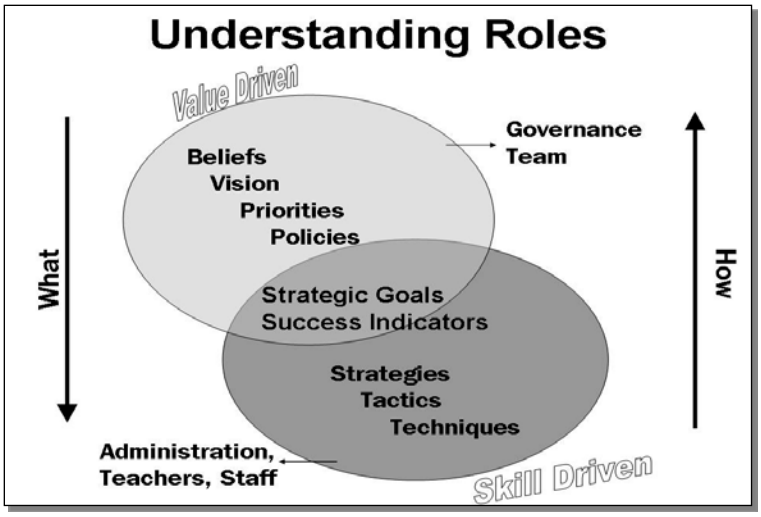

Figure 1. Differentiating Governance Roles from Staff Duties.

The program teaches that there are a few key areas of responsibilities of the board, some examples being district budget development, adopting district wide policies, adjudicating student expulsions and employee terminations, bargaining with employee groups, adopting state approved curriculum, and most importantly hiring and holding accountable the chief administrator of the district, the superintendent. To help board members understand how to perform their responsibilities in each job area of the board, the program uses a clock metaphor (see Figure 2), where the board's responsibilities are above the wavy line and on the outside of the clock and the staff perform the functions below the line and inside of the clock. The line is wavy as sometimes there is a larger role for the board to be completing the task, for example in the hiring and evaluation of the superintendent, or other times when their role is solely setting policy and holding staff accountable for results, such as in the hiring and evaluation of teachers.

Figure 2. Dynamic and Symbiotic Responsibilities.

The program updates information on each of the nine learning modules every year to every other year depending on the subject area and whether or not laws have changed in these job areas. For example, the learning module on school finance is updated annually due to changes in statute and budget conditions as where the learning module on visioning is updated every other year to keep the content fresh even though little changes in law or in research. In 2010, approximately 20% of active board members are receiving training and/or have completed the program. I worked as an assistant program consultant for four years in this program, which is what first generated my interest in quantifying the student achievement effects of board actions.

Although it may be premature to jump to board training before proving that board actions of any kind affect achievement, my previous research and one key study gives me hope that this link will exist even though it may be relatively small in magnitude. My research question attempts to test the policy recommendations made in an article

published in Public Administration Quarterly in 2000 that found that board involvement in site-based decisions decreases student achievement. The author suggests that state school board associations should train school board members on their appropriate policy and accountability role to thwart the tendency of some board members to micromanage district staff. The governance training given by the California School Board Association fits the suggestions of the author, that the training "stress the politics-administration dichotomy as a sort of starting point in trying to sort out where a school board's appropriate role ends and that of professionals begins" (Peterson, 2000, p. 63). I will be testing whether CSBA's governance training has a statistically significant affect on student achievement at the district or aggregate level. Testing this policy recommendation could lead to further academic research on what specific actions, behaviors, and beliefs of board members have positive impacts on student achievement.

Research Question and Section Layout

My broad research question is: what impact does board of education actions have on student achievement, and more specifically, do board members who completed governance training have more positive effects than their peers on student achievement? In order to test this question, I will be using multiple regression techniques, discussed later, to single out the link between completion of school board governance training and district API scores for the 2003, 2005 and 2007 academic years.

The remainder of this paper will systematically explore whether there is a statistically significant relationship between school board governance training and

student achievement. Chapter 2 details previous academic literature that used econometric approaches to researching factors that affect student achievement. This chapter is broken down into sections on the various inputs into the education production function. The first section covers academic literature that demonstrates how student demographic factors and local environment factors contribute to a student's initial foundation for learning and how this foundation can impact future achievement. The second section covers literature on school site factors such as site staff information and staffing levels that have shown mixed results in econometric research. The third section covers the small amount of econometric literature on district administrative inputs such as superintendent tenure or quality and one study on school board behavior. Chapter 2 ends with a summary of how the literature informs my initial expectations for the regression equation results.

Chapter 3 is focused on the methodology and data used in the regression equations. The chapter starts with a discussion of what the district Academic Performance Index score is and why it was chosen to be my dependent variable. The next section details the many explanatory variables that help make up the education production function I used, the expected direction of the relationship they will have to the dependent variable, and the sources of the raw data. I then detail how I combined the three separate data sets into one pooled cross-sectional data set to enhance the quality and quantity of data in the final regression. Chapter 3 also provides descriptive statistics for

each of the regression equations and ends with bivariate correlation matrices for each data set that shows the initial relationships between each of the explanatory variables.

Chapter 4 explains the statistical methods used to analyze the relationship of board training and student achievement and detail procedures, steps and corrections made to achieve the final regression equation results. The first section explains the three functional forms in standard regression analysis and the initial tests I ran in order to choose the best fitting functional form for the final regression analyses. I then detail what tests I used to detect issues of multicollinearity and heteroskedasticity and the remedies I applied to the final corrected regression equations. The next section summarizes the statistically significant variables, their actual direction of influence versus expectations, and the goodness of fit to the data. Chapter 4 ends with a comparison of the affects of the explanatory variables on district achievement using elasticities and their magnitudes.

Chapter 5 concludes the thesis with a discussion of the lack of significance of the board training variables, provide recommendations for CSBA on ways to enhance their research and policies priorities and how they might translate this into enhancing their training programs, and conclude with recommendations for future research on boards of education by the academic community.

Chapter 2

REVIEW OF THE LITERATURE

Research studies of public education, both nationally and internationally, use a variety of methodologies to assess the impact of public education on students, many in the form of case studies, best practice research, or discrepancy modeling. My thesis uses an economics-based approach to studying the effects of inputs from different student, social, school site, and central district administrative factors into the outcome of student achievement, also known as the education production function. In econometric research, student, social and school site inputs have received extensive attention in the education production function; however, district and central administrative inputs into the system, such as superintendent and board of education factors, have received considerably less attention. Research addressing district administrative affects on student achievement, although sparse and traditionally included as a school factor, generically called leadership, will be a separate subsection in the review of the literature due to the focus of my thesis. This chapter begins by covering existing research on social and student inputs, school site inputs, and district administrative inputs and then conclude with implications from the literature regarding my research question and study design.

Social and Student Inputs

Econometric education research has repeatedly found that the family background and individual student characteristics, or socio-economic status (SES), influence student achievement. These factors combine to form students' initial foundations for learning,

influencing the educational opportunities and attainment of students over their academic careers. Family background is a measure that accounts for the parental education levels, parental occupation, family structure, family wealth and occasionally cultural resources (Nonoyama-Tarumi, 2008). Parent education levels is an important example of family background, this input is used to assess whether parents are able to help their children with school work and likely to spend time doing this. Even though parent education often is used as a proxy variable, it does have a statistically significant affect on student achievement. Rainey and Murovay (2004) found that a 1% increase in the number of parents with a college education positively influences student achievement by 0.79%, as where a one percent increase in parents with only a high school diploma has a negative impact on student achievement, lowering scores by 0.99%.

Student characteristics, such as ethnicity, innate intelligence or physical, mental, and learning disabilities also have an impact on student achievement. Often student characteristics and family background are impossible to disentangle, making it difficult to tease out the impact of just one of these variables on achievement. For example, Brooks-Gunn, Klebanov, and Duncan (1996) found that once poverty (both regionally and for individual families), maternal education levels and learning environment were controlled, the effect of ethnicity on IQ test results for five-year-old children were eliminated, going from a -4.42% impact on IQ Scores to a -1.93% impact but was no longer statistically significant. Studies using the education production function typically choose one variable in each category, such as ethnicity, family wealth, and parent education, or use a

combined variable to represent socio-economic status. Regardless of the ability to disentangle the individual effects of these variables, it is essential to have proxy measures for student characteristics and family background as part of the education production function.

Some literature asserts that there is also a separate effect for aggregate conditions, such as neighborhood socio-economic status and neighborhood ethnic make-up. In district level analysis, the social and student inputs are sometimes termed "task difficulty," meaning it is more difficult for districts to achieve high gains in student achievement when the school's student population is heterogeneous in both ethnic and socio-economic status (Meier, Doerfler, Hawes, Hicklin, & Rocha, 2006). Meier et al. (2006) found in their study of managerial inputs, that percentage of students who are African American, Hispanic, and/or low income, with few exceptions, exerted statistically significant and negative impacts on exam passage. Unfortunately, their study did not specify magnitudes or give descriptive statistics for their explanatory variables, making it difficult to compare my results to their study.

Palardy (2008) also found that when African American students attended schools with a low mean socio-economic status, their achievement was lower. This is shown in the relationship between African American and socioeconomic status where a one percent increase in African American students at low socioeconomic schools has a 3.17% decrease in test scores as where the same one percent increase is diminished at high socioeconomic schools to a 0.174% decrease in test scores and the relationship loses its

statistical significance. Similarly, Rumberger and Palardy (2005) and Palardy (2008) found that social class or average socio-economic status at a school had significant effects on student achievement, with low social class schools exhibiting a collective influence of factors that create poor learning conditions. For example, Rumberger and Palardy (2005) found that regardless of ethnicity, the mean socioeconomic status of the school had an impact on test scores with a 1% increase in socioeconomic status of a school creating a 0.05% increase in scores compared to individual students' socioeconomic status that only increased scores by 0.008%. These findings are particularly important for the purposes of my research since I will be using district level data and thus be looking at aggregate conditions and highlighting how districts deal with the task difficulty rather than trying to disentangle the reasons for individual student achievement.

School Site Inputs

School site inputs are the inputs in the classroom and individual school buildings, typically including some variation of the following factors: teacher quality, teacher to student ratios, principal leadership, school culture and/or climate, textbooks and facilities. These inputs are different from aggregate student and social inputs, or neighborhood effects, as they are external to the students themselves and are inputs provided by the school site and not the students, students' families, or neighborhood. There are many econometric studies on the effects of teacher to student ratios, teacher salary and education on test scores; however, the results for these factors are extremely mixed.

Palardy (2008) found that the relationship of average teacher salary to student achievement actually varies by the social class of schools, with teacher salary being positive and most significant in low social class schools where a 1% increase in average teacher salaries equates to a 0.9% increase in test score versus the total population at a 0.4% increase.

Meier et al. (2006) found that teacher stability and experience were statistically significant in general and with mixed results for the subpopulations of low-income, African American and Hispanic students. In the Meier et al. study, the coefficient for teacher stability effects on student achievement goes from .0492 for the general population to .0490 for low-income students, .1861 for African American students but insignificant and .0307 for Hispanic students (NB: the Meier et al.'s study does not give descriptive statistics and calculating magnitudes of effects was not possible). Likewise, Rainey and Murovay (2004) found student-teacher ratio to be statistically significant, where a one percent increase in the student-teacher ratio creates a 1.29% drop in student achievement. Contrary to these studies, Hanushek (2003) did a meta-analysis of 376 education production function estimates and showed that in the United States, classroom resources such as teacher to student ratio and teacher education show mixed results with little confidence that increases in these resources would produce significant academic improvements. There is a large and ongoing debate on classroom inputs and resources, with the ability to identify consistent and significant affects evading econometric measurement.

A great deal of case study research has indicated that principals have an indirect impact on student achievement and that site-based management can improve student outcomes. For example, effective schools literature reported that principals with control over personnel and site financial decisions made schools more effective, however, econometric studies have found mixed or little significance to principal autonomy in the areas of site finances, school policy and teacher improvement (Maslowski, Scheerens, & Luyten, 2007; Zigarelli, 1996). Zigarelli (1996) did find that the principals' ability to hire and fire site level staff did have a significant and positive effect on student achievement, where a 1% increase in autonomy to hire and fire staff was associated with a 2.24% increase in student achievement. Thus exercising instructional leadership and judgment in personnel matters is one area that principals can have a significant impact on student achievement. A key caveat to these findings of principal level effects is qualitative findings that site-based management's positive effects on student achievement and teacher quality are negligible or non-existent without pressure from district leadership and the state (Leithwood & Menzies, 1998).

Studies like that of Leithwood and Menzies (1998) demonstrate the necessary, but insufficient problem with leadership variables generally, where site-based management or distributed leadership may be necessary to produce positive gains in student achievement, but are not sufficient to create these effects in isolation or without other inputs. Thus, as with teacher input variables, principal input variables have received mixed results in econometric studies and qualitative studies show that mitigating district factors can

influence site level variables, thus further decreasing confidence that school site inputs would have large and predictable impacts on student achievement. Since qualitative studies have shown that district level inputs can heavily influence site level inputs, it seems plausible that some of the unexplained variation in student achievement may be attributable to systemic and district administrative inputs.

District Administrative Inputs

District administrative inputs have received significantly less attention in literature using the education production function. A small handful of studies utilize factors such as tenure and/or salary of the superintendent, and one study looked at board of education involvement in site-based decisions. Meier, O'Toole, and Goerdel (2003) found that superintendent quality can be successfully measured using a common salary model, and that superintendent quality has a positive and significant relationship to student performance on standardized tests for all students, but especially for low-income, Black and Latino students. Similarly, managerial stability or tenure of superintendents has a positive and significant relationship to student achievement with a coefficient of .0164, and coefficients of .0416, .0428, and .0366 for low-income, Black, and Hispanic students respectively (Meier et al., 2006). Most significantly, Meier et al. found that managerial stability was almost as influential as teacher stability for low-income students with a .0074 difference in slope, and managerial stability being more influential for Hispanic students with a .0059 difference in slope and teacher stability no longer statistically significant. Although the quantity of research is small, existing research on

superintendent quality and stability are identified as important factors in creating the systemic conditions for student success.

Econometric studies of the board of education are even more rare than studies on superintendent inputs, where only one study I found had the board of education as their primary independent variable. Peterson (2000) found that board of education intrusion in site-based management had a significant negative impact of about 2.0% on student achievement. Peterson measured board intrusion using combined survey responses by school administrators using a rating scale ranging from zero (no involvement) to 3 (major influence over policy issue) regarding eight policy issue areas ranging from the hiring and firing of personnel to deciding how school site funds were to be spent. The other notable finding by Peterson is board of education intrusion in site-based decisions has a negative effect on achievement through its impact on school learning climate, which worsens by 1.45% as board intrusion in site decisions increases. Further, Peterson reflects that board of education members may serve students best when they stay in a policy role and use their legitimate power to encourage and facilitate positive school cultures and empowerment of site professionals.

Meier et al. (2006) in their study of managerial quality, used frequency of contact between the superintendent and board of education as one of the managerial quality measures called “managing upward.” They found that managing upward, or increased frequency of interaction between the board of education and the superintendent, had negative and mixed results. They found that increased frequency caused a negative

impact on student achievement for the total student population with a coefficient of -.1843 and for Black students in particular with a coefficient of -.4462, along with negative but statistically insignificant relationships for low-income (-.1828) and Hispanic (-.0025) student subpopulations. The findings about school board intrusion in site-based management show a small negative but significant relationship with student achievement. I will next highlight qualitative research on school boards and non-profit boards to provide a better context and academic foundation on board behavior effects on student achievement and district effectiveness.

In qualitative research on school boards and non-profit boards generally, there is a more substantial literature on what makes boards effective and the connection between effective boards and effective organizations. In Togneri and Anderson's (2003) "Beyond Islands of Excellence: What Districts Can Do to Improve Instruction and Achievement in All Schools," the authors found that districts and school boards that were successful at improving student achievement and closing achievement gaps exhibited a few key characteristics. The characteristics of these boards were as follows: policy and accountability driven instead of mired in administrative functions, goal driven and focused on improving student achievement, spoke with one voice, valued consensus and collegiality, and had a "solution-seeking" orientation (Togneri & Anderson, 2003). Togneri and Anderson also found that effective school boards had stable membership or low turnover in their membership, played instrumental roles in hiring reform-minded superintendents, and had constructive relationships with district administrators (Togneri

& Anderson, 2003). Essentially, the boards that function best, exhibit a positive goal oriented culture that permeates the district and at the same time supports the needs of the schools, their leadership, and district leadership. The characteristics detailed by Togneri and Anderson are similar to those found in studies of non-profits boards generally.

In a stepwise regression of a 121 non-profit board survey, Brown (2005) found that boards positively contribute to organizational effectiveness when they strategically develop goals and monitor implementation, and when they use collegial group processes and value strong interpersonal relationships. Quasi-experimental research on non-profit boards has demonstrated the positive impact of board development programs on board effectiveness. In Holland and Jacksons's study (1998), they were able to demonstrate large and statistically significant improvements in the competency and effectiveness of non-profit boards who received board development training, coaching and retreats (pp. 126-127). In particular, the authors noted,

> The most effective boards in our demonstration projects learned to attend to how board members worked together as well as to what work the board did. Their members began taking responsibility for considering the ways the board carried out its work and for seeking new ways to improve performance. (Holland & Jackson, p. 132)

With the addition of qualitative research on school boards and non-profit boards generally, a better picture of the linkage between board development, effective boards and high achieving organizations becomes clearer. Although harder to quantify and tease

out the effects of board level behavior, board and system level inputs do effect student achievement and organizational effectiveness.

Implications

One implication of the econometric studies discussed in this review is that student and social factors produce the largest most significant and predictable influences on student achievement. Thus, student and social variables should explain most of the variance in achievement scores and I would expect high statistical correlations and magnitudes of effects. School site inputs had mixed results, especially depending on the socioeconomic status of the schools, so at the district level this would mean that districts with lower socio-economic status would have lower test scores before controlling for other factors. According to the literature, I should expect the school site inputs of teacher salary, experience and class size to be statistically significant. Similarly, I should expect district inputs of per pupil expenditures and superintendent tenure to be statistically significant in my results. To test board of education inputs in school districts, I address the issue of school board make-up and actions. I test whether training school boards to work collaboratively with superintendents and to stay within their policy and accountability role helps create a positive culture in districts as evidenced in leadership stability and student achievement outcomes. Since there is little econometric research on boards of education, this paper will be attempting to help fill the void. Due to constraints of time and available data, I do not address principal autonomy, site-based decision making, or school/district climate as an input into the education production function.

Table 1 provides a quick summary of the effects of various explanatory variables from studies cited in the literature review.

Table 1

Summary of Explanatory Variables from Literature Review

Author(s) (Year Published)	Functional Form/ Methods	Statistically Significant Variables	Key Variable Results
Brooks-Gunn, Klebanov and Duncan (1996)	Ordinary Least Square (OLS) multiple linear regression; Experimental, data from clinical trial	Differences in IQ: - Family and neighborhood economic status - Maternal parenting behavior	Ethnic differences in IQ go from statistically significant - 17.76 for Black children to -3.42 and not statistically significant
Hanushek (2003)	Meta-analysis, comparing results of 376 education production function s	Input variables of Teacher to pupil ratio and Expenditures per pupil were only significant at the statewide aggregate level	High Quality Teachers have greater impact on achievement than resource inputs
Holland and Jackson (1998)	Unspecified functional form; Quasi-experimental Comparison Group, Self-Assessment Questionnaire	Experimental Group - Contextual - Educational - Interpersonal - Political - Strategic Control Group - Political	0.11 Gain in overall board competency for boards that completed three-year developmental intervention
Leithwood & Menzies (1998)	Systemic Review, Review of Research, non-regression	Finding (not statistical analysis): - Leadership is second only to classroom instruction among school-related factors that contribute to what students learn. - Leadership effects are usually largest where they are greater needs.	N/A

Table 1 (continued)

Author(s) (Year Published)	Functional Form/ Methods	Statistically Significant Variables	Key Variable Results
Maslowski, Scheerens, & Luyten (2007)	Multilevel Techniques (MlwiN) with a Two-Stage Stratified Sample	Student Characteristics - Gender - Age - Immigrant status - Parents' occupational status - Grade level - Educational track (vocational education) Autonomy in Personnel Management School Context - School size - School type: private government Independent - Location: village and small town - School average parents' occupational status Human and Material Resources - Teachers with an ISCED 5A qualification in the language of assessment - Teacher shortage School Climate - Disciplinary climate - Teacher support - Achievement pressure - Students' belonging at school - Teacher related factors affecting school - Climate - Student related factors affecting school climate - Teachers' morale and commitment Other Effectiveness-Enhancing Factors at School - School self-evaluation - Student admission based on performance - Likeliness to transfer low achievers to other school	-1.69 decrease in students reading literacy when schools have personnel management autonomy and school composition/socioeconomic status are controlled for.

Table 1 (continued)

Author(s) (Year Published)	Functional Form/ Methods	Statistically Significant Variables	Key Variable Results
Meier, Doerfler, Hawes, Hicklin & Rocha (2006)	Ordinary Least Square (OLS) time series regression	Controls - Race: Black and Latino - Low income students - Class size - Teacher experience - Non certified teachers - Teacher's salaries Stability - Teacher stability - Management stability Management - Management quality - Managerial networking - Managing upward measured as frequency of school board contact with superintendent	- Management quality increased achievement for all groups: 0.2187 (all students); 0.2606 (low income); 0.6158 (Black); 0.4633 (Latino) - Managerial networking increased achievement for all groups: 0.2877 (all students); 0.3091(low income); 0.3946 (Black); 0.1447 (Latino) - Managing upward, increased frequency of school board contact with superintendent, decreases achievement for the following: -0.1843 (all students); -0.4462 (Black)
Meier, O'Toole & Goerdel (2003)	Ordinary Least Square (OLS) time series regression	Superintendent quality Teachers salaries Race: Black and Hispanic Economic status (low income) Class size Non-certified teachers	0.8866 increase in achievement was associated with higher superintendent quality as measured by the common salary model

Table 1 (continued)

Author(s) (Year Published)	Functional Form/ Methods	Statistically Significant Variables	Key Variable Results
Nonoyama-Tarumi (2008)	Ordinary Least Square (OLS), international student data used	Parental education Parental occupation Home educational resources, Home possession of classical cultural resources Number of books at home Family wealth	Multidimensional Socioeconomic Status (SES) has a larger effect size and lower standard error than standard SES that only includes parent education and occupation.
Palardy (2008)	Multilevel Latent Growth Curve (MLGC); National Educational Longitudinal Study data	Socioeconomic Status (SES) variation Mean parental aspirations School size (student population) School type (rural vs. urban) Mean teacher salary Proportion students feel unsafe Proportion fair discipline policies Proportion in academic track Proportion excellent teachers as rated by principal	Low SES schools are more sensitive to school factors, where most school factors were insignificant for middle and high SES schools.
Peterson (2000)	Structural Equation Modeling (SEM); National Educational Longitudinal Study data	Family background (SES and parent education) Ethnicity Prior and current student achievement School climate School board involvement in school level decisions	A 2 percent reduction in student achievement when there is high involvement by the school board in school level decisions. As board involvement increases school climate becomes worse and negatively influences student achievement.

Table 1 (continued)

Author(s) (Year Published)	Functional Form/ Methods	Statistically Significant Variables	Key Variable Results
Rainey & Murovay (2004)	Ordinary Least Square (OLS); National Educational Longitudinal Study data	Total number of non-white students Median household income Student dropout rate Percentage of population with high school diploma Percentage of population with Bachelor's degree or higher Total number of students in the program for students with disabilities Student-teacher ratio	Larger schools do better on improving achievement but parent education is important to this, larger schools with larger populations of limited education parents reduces achievement.
Rumberger & Palardy (2005)	Hierarchical Linear Modeling (HLM); National Educational Longitudinal Study data	Student socioeconomic status (SES) School SES School type (magnet) School size (large and extra large) Number of National Assessment of Educational Progress units earned in high school Homework time Teacher expectations School safety	School (aggregate) SES is comparable to student SES, creating gains of .11 and .13 standard deviations respectively.

Table 1 (continued)

Author(s) (Year Published)	Functional Form/ Methods	Statistically Significant Variables	Key Variable Results
Togneri & Anderson (2003)	Case Study, non-regression	Successful Reforms happen when (not statistical analysis): 1. Districts had the courage to acknowledge poor performance and the will to seek solutions. 2. Districts put in place a system wide approach to improving instruction—one that articulated curricular content and provided instructional supports. 3. Districts instilled visions that focused on student learning and guided instructional improvement. 4. Districts made decisions based on data, not instinct. 5. Districts adopted new approaches to professional development that involved a coherent and district-organized set of strategies to improve instruction. 6. Districts redefined leadership roles. 7. Districts committed to sustaining reform over the long haul.	N/A

Table 1 (continued)

Author(s) (Year Published)	Functional Form/ Methods	Statistically Significant Variables	Key Variable Results
Zigarelli (1996)	Ordinary Least Square (OLS) multiple linear regression on findings of past literature reviews; used National Educational Longitudinal Study data	Student - Initial achievement level - 12th grade achievement - Homework hours per week - Perception of student effort by teacher - Race: Only Black and Hispanic significant - Gender (Female) Parent/Family - Parents expectations at 8th grade - Socioeconomic status School - Region: Only Midwest and South significant - School Size Culture of Achievement - School emphasized achievement - Class minutes per day Teacher Quality/Satisfaction - Teacher perception of teacher morale as high Principal Leadership/Involvement - Principal free to hire and fire staff	N/A

Chapter 3

METHODOLOGY

Theoretical Model

Quality data analysis and empirical research begin with a firm theoretical underpinning. A theoretical model incorporates previous research and theoretical understanding into a functional logic model to explain the authors' choice in variables and expectations for results. This chapter details the theoretical model I use to explain student achievement results at the district level by detailing my rationale for using California's Academic Performance Index as a dependent variable, listing the chosen explanatory variables and key explanatory variables, and detailing my expectations of the relationship and direction of influence for each explanatory variable. After discussing the dependent and explanatory variables, I then cover the reasons for creating an additional pooled or cross-sectional data set that combines the results of the 2003, 2005 and 2007 data sets to make one large, more reliable data set that can show change over time even using a the short time span from 2003 through 2007. The chapter ends with descriptive statistics for the explanatory variables including their frequencies and inter-variable correlations.

Dependent Variables

The dependent variables used in this regression will be the 2003, 2005, and 2007 Growth Academic Performance Index (API) scores for each district. The Public Schools Accountability Act (PSAA) of 1999 established the API as a composite score that

combines multiple weighted standardized test results for students at each school and district (California Department of Education [CDE], 2003). Over the years, there have been changes to the weights and included standardized tests as well as the type and organization of ethnic and student subgroup information reported. In the data sets I am using, the most notably changes in the API calculation are the inclusion of the California High School Exit Examination (CAHSEE) in 2005, and the inclusion of the grade eight California Science Standards Test (CDE, 2005; CDE, 2007). According the Department of Education, these changes make the API scores "better reflects the combined accomplishments of all students at a school by taking into account that students at some grade levels are tested in more content areas and/or with different tests and that schools have a variety of grade span configurations" (CDE, 2005, p. 7).

The API index initially was applied only to individual schools, but beginning in the 2002-2003 academic year, was also applied to school districts, making it possible to compare district or system level achievement as well as school site achievement. The API is a useful measure for comparing district level achievement as it creates a comparable measure across districts. With the API, gains in student achievement for high school districts are comparable to gains in student achievement in elementary school districts. If I were to choose specific standardized tests or measures such as dropout rates and the high school exit exams (CAHSEE), which are not applicable to elementary school districts, I would only be able to compare high school districts or have to move down to school level analysis rather than district analysis. The other reason the API is a

useful measure for cross-district comparison is its importance to board members, superintendents, and district staff. API scores are used by the state and federal government to hold boards and districts accountable, with failure to reach student achievement targets including such penalties as classification as a program improvement district and increasing corrective action against the school/district for each year not meeting growth targets, ultimately ending in district/school restructuring, state takeover and disbanding the board. As a composite measure for district achievement of student academic growth targets, the API is an excellent measure for cross-district analysis and is of importance to districts and policymakers alike.

Explanatory Variables

The broad causal factors expected to impact student achievement as measured by API are student and social factors, school site factors, and district administrative factors. There will be three separate data sets and one pooled data set for this study, all employing the same explanatory variables shown in the equations below:

School Achievement = f [student/social inputs, school site inputs, district administrative inputs]

where:

School Achievement = 2003, 2005, and 2007 Growth API Score for District

For each academic year 2003, 2005, 2007, and the pooled regression the following explanatory variables are used:

Student and Social Factors = f [% African American students; % Asian/Pacific Islander students, % Hispanic students, % English learners, % students participating in free/reduced price meal program, average parent education level]

School Site Factors = *f* [% teachers with full credentials, % teachers with less than two years experience, average teacher salary at district, average class size for a number of core academic courses in district, % schools in district in Program Improvement]

District Administrative Factors = *f* [district size measured by enrollment, superintendent tenure at district by September 30 of previous year (2002, 2004, and 2006), % of board that is African American divided by the % African American students, % of board that is Asian/Pacific Islander divided by the % Asian/Pacific Islander students, % of board that is Hispanic divided by the % Hispanic students, board consistency as measured by the % of board members active across all three data sets, district has done specialized team trainings, % board members have completed individual governance training by September 30 of previous year (2002, 2004, and 2006), average years since completion of training.

Finally, the full regression model or education production function reads as follows:

School Achievement = *f* [Students African American, Students Asian/Pacific Islander, Students Hispanic, English Learner Students, Free or Reduced Lunch, Average Parent Education Level, Fully Credentialed Teachers, Teachers Under Two-Years Experience, Average Teacher Salary, Average Class Size, Percentage Schools Program Improvement, District Size, Superintendent Tenure, Board African American, Board Asian/Pacific Islander, Board Hispanic, Board Consistency, Team Training, Individual Board Training, Years Since Individual Training]

I run four regression equations using the explanatory variables above and the respective API Growth dependent variables for each of the individual data sets for 2003, 2005, and 2007 as well as the pooled data set and then comparing the results for consistency.

Expected direction of explanatory variables influence.

Based on research noted in the literature review section of this paper and personal experience with board members in the field, I have hypothesized the expected direction of influence that each explanatory variable will have on district API scores as well as the rationale for my choice of direction (found in Table 2). These signs show my hypothesis

that an increase in the specified variable will cause an increase (+), decrease (-), or uncertain (+/-) non-zero effect in the districts API score and includes a short rationale for my choice.

Table 2

Expected Direction of Affect for Explanatory Variables

Explanatory Variable	Expected Direction	Rationale
Percent African American	-	Previous research indicates that African American students typically do worse on standardized tests than their peers. Some research has shown this affect can be controlled for by parental educational and poverty levels, which may diminish the negative effect.
Percent Asian/Pacific Islander	+	Although some subgroups of Asian/Pacific Islander students perform worse than their peers, generally Asian and Pacific Islander students as a whole perform as well as if not better than their peers.
Percent Hispanic	-	Hispanic students, although highly correlated with English Learner students, typically has a negative or insignificant impact on test scores.
English Learner Students	-	Due to language barriers, students who are learning to become English proficient will generally do poorly compared to their peers on English only standardized tests.
Free or Reduced Lunch	-	As a measure of poverty, research shows that low socioeconomic status has a negative impact on student and therefore district test scores.
Average Parent Education Level	+	As parent education level increases, parents are able to assist their children with homework and provide better home learning environments. Previous research shows positive and strong correlations with parent education. Lower parent education levels are also a proxy for low socio-economic status.
Fully Credentialed Teachers	+	It is believed that teachers who are fully credentialed have the knowledge and experience necessary to teach students and thus achieve higher test scores.
Teachers Under Two-Years Experience	-	Although not always the case, typically the more experienced teachers are better equipped to help students learn, those with less than two-years teaching would be considered inexperienced and thus have a negative effect on test scores.
Average Teacher Salary	+	Average teacher salary is a proxy for a districts ability to recruit and retain highly qualified teachers, thus the higher the average salary the better the test scores should be. In a union environment, this can also signify a district with a more senior teaching pool.

Table 2 (continued)

Explanatory Variable	Expected Direction	Rationale
Average Class Size	+/-	Class size has received significant attention in research and has continuously found mixed results. I therefore cannot accurately hypothesize the direction of the variable.
Percentage Schools Program Improvement	-	Program Improvement is the designation given to schools when they are not meeting Adequate Yearly Progress, specifically academic achievement growth targets. As the number of schools in Program Improvement increases the district API score should be adversely affected by the growing number of failing schools.
District Size	+/-	There is some evidence that school size has affects on student learning and test performance, but the lack of literature and significance of findings leads me to not hypothesize a direction for this variable.
Superintendent Tenure	+	Previous literature shows that managerial stability and quality exerts a positive influence on student achievement, this measurement does not incorporate quality or salary and therefore only measures leadership consistency within a district.
Board African American	+/-	These variables are a measure of the difference in percentages between the boards ethnic make-up and the students ethnic make-up. Although some non-academic and non-econometric studies show that students benefit from having board members and principals of similar ethnic background, there are no studies that I am aware of that link student academic achievement and thus API scores to ethnic make-up of the board.
Board Asian/Pacific Islander	+/-	
Board Hispanic	+/-	
Board Consistency	+	Boards with more consistent and experienced leadership should have a positive effect on student achievement similar to superintendent tenure Since data is only available on board member tenure for the last year of the sample, I am assuming consistency will remain unchanged over all periods.
Team Training	+	Boards receiving team training should be even more effective than boards with only a percentage of the board attending individual training. The two programs in question are based on the same theory of collaborative governance and teamwork. Thus more effective boards should increase student achievement.
Individual Board Training	+	In my previous study, increasing the percentage of board trained was correlated with positive effects on student achievement. The training would presumably lead to more board members acting within their roles and responsibilities thus mitigating the negative effects on student achievement found in the reviewed literature on board actions.

Table 2 (continued)

Explanatory Variable	Expected Direction	Rationale
Years Since Individual Training	+	Typically, professional development programs have bigger initial effects with performance waning over time. However, it is my experience that as board members are able to practice their newfound skills and encourage other board members to get training, a shared culture of "effective governance" develops their effectiveness increases. This would presumably have a positive effect on student achievement the more they practice these skills overtime.

Data

It would be unwise for policymakers to rely on a single source of data for their decisions, so in order to conduct further research on the impacts of boards of education on education outcomes, this study must be replicable. To make it easier to replicate this study and validate its findings, it is important to give the background information on the data I used. In this section, I give background information on the sample and data used in this regression including definitions and sources, descriptive statistics including the means, standard deviations, and range of values, and finally show initial correlations between the explanatory variables.

Data Sources

Due to the time span over which the regression covers, I tried to take each variable from the same source for all three data sets. As with all data collection, the amount collected and its accuracy improves over time. Thus variables that were in the 2007 API Data Files were not available in the 2003 API Data Files, thus requiring me to do district level queries at the Ed Data website so that all variables were taken from the

same source. As seen in Table 3, the data collected for this regression come from four sources: the California Department of Education's (CDE) API Data Files for 2003, 2005, and 2007 Growth Data Sets, CDE's Program Improvement Data Files, Ed-Data who compiles multiple sources of data from a variety of CDE reports, and the raw data for the superintendent and board variables were all provided by the California School Boards Association. Specifically, the variables of superintendent tenure, board size, board African American, board Asian/Pacific Islander, board Hispanic, board consistency, team training, individual board training, and years since individual training were all created with the data made available through the California School Boards Association database.

Table 3

Variables Descriptions and Sources

Variable	Description	Source
2003, 2005, and 2007 District Growth API Score	Composite Score that summarizes the districts performance on the STAR, CST and CAHSEE standardized tests. The 2003 score reflects the districts performance on the 2003 spring tests, likewise for 2005 and 2007.	California Department of Education (CDE), 2003, 2005, and 2007 Growth API Data File at http://www.cde.ca.gov/ta/ac/ap/apidatafiles.asp
Percent African American	Percent of students African American	CDE, 2003, 2005, and 2007 Growth API Data File
Percent Asian/Pacific Islander	Percent of students Asian/Pacific Islander	CDE, 2003, 2005, and 2007 Growth API Data File
Percent Hispanic	Percent of students Hispanic	CDE, 2003, 2005, and 2007 Growth API Data File
English Learner Students	Percentage of students who are designated as English learners (ELs) based on results of the California English Language Development Test (CELDT)	Ed Data (district-level query)
Free or Reduced Lunch	Percentage of students who participated in the free or reduced-price lunch program	Ed Data (district-level query)
Average Parent Education Level	Average on self-reported parent education level, represented by following categories: 1 = Not a high school graduate; 2 = High school graduate; 3 = Some college; 4 = College graduate; 5 = Graduate school	Ed Data (district-level query) at http://www.ed-data.k12.ca.us.asp
Fully Credentialed Teachers	Percent teachers with full credentials	Ed Data (district-level query)
Teachers Under Two-Years Experience	Percent of teachers with two or less years total experience teaching	Ed Data (district-level query)
Average Teacher Salary	Average teacher salary, not including additional bonuses and/or stipends	Ed Data (district-level query)
Average Class Size	Average class size in the following subject areas: English, foreign languages, mathematics, science, and social science	Ed Data (district-level query)

Table 3 (continued)

Variable	Description	Source
Percentage of Schools Program Improvement	Percent of schools within the district that are in some stage of Program Improvement as defined by the California Department of Education.	California Department of Education (CDE), 2003, 2005, and 2007 Program Improvement Data Files http://www.cde.ca.gov/ta/ac/ay/tidatafiles.asp
District Size	Enrollment- total number of students enrolled in the district.	Ed Data (district-level query)
Superintendent Tenure	Years serving as Superintendent for district as of 09/30 of 2002, 2004, and 2006.	California School Boards Association
Board African American	Percentage of active board members of African American ethnicity divided by the percent of students African American.	California School Boards Association
Board Asian/Pacific Islander	Percentage of active board members of Asian or Pacific Islander ethnicity divided by the percent of students Asian/Pacific Islander.	California School Boards Association
Board Hispanic	Percentage of active board members of Hispanic ethnicity divided by the percent of students Hispanic.	California School Boards Association
Board Consistency	Percentage of board members that were actively serving during the 2003, 2005 and 2007 data sets and where still active in January 2010.	California School Boards Association
Team Training	Dummy variable for whether board has done district-based team training with the Single District Governance Services or Governance Consulting Services as of 9/30 of 2002, 2004, and 2006.	California School Boards Association
Individual Board Training	Percent of board members completed CSBA's Masters in Governance program as of 09/30 of 2002, 2004, and 2006.	California School Boards Association
Years Since Individual Training	Average years since training Masters in Governance program completion as of 9/30 of 2002, 2004, and 2006.	California School Boards Association
* All data is at the district level		

Board Consistency and Data Limitations

Unfortunately, most studies run into data limitations where either data does not exist or it is limited to a format that is not preferred by the researcher. The variable of

Board Consistency is just such a variable, where only election dates were available for past board members. Without the date that individuals left their board, it was extremely difficult to identify correctly the individuals that were active on their boards for each data set and their individual tenure amounts. It would be preferred to use board tenure, as is used for superintendents, unfortunately the data limitations are such that it would require an inordinate amount of time to correctly identify the inactive dates for each of the over 12,000 possible past board members and then to calculate each districts average board tenure rate for the three data sets. Board Consistency is a very limited variable since in order to be counted in the variable the individual must still be an active board member in 2010 and have been on the board for all three periods, meaning they must have become board members on or before September 30, 2002. Thus, Board Consistency is serving as an imperfect proxy for tenure, where I assume higher consistency correlates with higher average tenure. For future studies, it would be beneficial to have not only election dates, but also inactive dates for all board members. Although the California School Boards Association will begin cleaning their database to accomplish this task, among others, this study will be complete before the cleaning project begins.

Pooled Data Set

In addition to the regression equations for 2003, 2005, and 2007, I also created a pooled data set that will allow for greater comparison of statistically significant variable consistency across the all data sets. To create the pooled data set I combined the three data sets variables sequentially, also called stacking, and removed any districts that did

not have valid observations for all three years, which reduced the number of districts from a high of 578 down to 342 districts. However, in the pooled data set, each observation counts as a unique piece of data, which allows the pooled data set to have 1029 valid observations. I then created control variables for data from the 2005 and 2007 years as well as control variables for each district so that the pooled regression would control for individual year variations and variations unique to each district. By significantly increasing the number of observations, it increases the explanatory power of the regression equations results, which in a single year regression, would require significantly more observations and/or a random sample to accomplish the same effect. It also allows me to compare the results of the individual year regression to the pooled regression results, where consistency across all four regressions would indicate those variables have significantly stronger explanatory power than other significant variables that are only significant in the individual years. The pooled data set will provide important information that I could not otherwise get with the current limitations of my data. For the remainder of this thesis, the pooled data set information and results will be given alongside the information and results for the individual year data sets.

Descriptive Statistics

The sample, or observations, for these regressions are from all 1001 public school districts in the state of California. In order to adequately control for all indentified explanatory variable effects on API scores, only districts that had available data for all variables are included in the final regression, making the number of observations drop to

393 districts in the 2003 data set, 506 districts in the 2005 data set, 581 districts in the 2007 data set and 1029 observations with 342 districts in the pooled data set. Although these are significant decreases in the sample size for the earlier years, the sample is still relatively large and useful for modeling education factors in California, and the pooled data set helps ameliorate concerns of small sample size.

So that other researchers and policy experts can more easily analyze the results of my regression analysis, I have provided descriptive statistics on all variables used in the education production function in Tables 4-7 below. Each table displays the mean or average value, standard deviation, and minimum and maximum values for each explanatory variable.

Table 4

2003 Descriptive Statistics for Dependent and Explanatory Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
2003 District Growth API Score	704.07	103.831	312	939
Ln 2003 District Growth API Score	6.5444	.12624	5.74	6.84
Percent African American	.0306	.0536	.0000	.6413
Percent Asian/Pacific Islander	.0576	.09179	.0000	.6421
Percent Hispanic	.2889	.2478	.0000	.9634
English Learner Students	.1652	.1806	.0000	.9560
Free or Reduced Lunch	.4178	.2800	.0000	1.0000
Average Parent Education Level	2.3069	.7324	1.00	4.00
Ln Average Parent Education Level	.7792	.3519	.00	1.39
Fully Credentialed Teachers	.8524	.2387	.0000	1.0000
Teachers Under Two-Years Experience	.0586	.1045	.0000	1.0000
Average Teacher Salary	$52,553.48	$5,964.86	$34,333.00	$76,266.00
Ln Average Teacher Salary	10.8630	.1152	10.44	11.24
Average Class Size	23.1186	4.7270	.0000	32.6000
Percentage of Schools Program Improvement	.0267	.0975	.0000	1.0000
District Size	6095.51	25371.251	7	729047
Ln District Size	7.2741	1.8960	2.20	13.52
Superintendent Tenure	2.8812	2.6256	.00	9.00
Board African American	.0123	.0568	.0000	1.0000
Board Asian/Pacific Islander	.0100	.0464	.0000	.4286
Board Hispanic	.0457	.1135	.0000	1.0000
Board Consistency	.3454	.2642	.0000	1.0000
Team Training	.0519	.2219	.0000	1.0000
Individual Board Training	.0229	.0906	.0000	1.0000
Years Since Individual Training	.0457	.2097	.0000	2.0000

Valid Number of Observations: 393

* (Ln) indicates the natural log of variable values; this was only used in log functional form equations covered in chapter 4.

Table 5

2005 Descriptive Statistics for Dependent and Explanatory Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
2005 District Growth API Score	727.6860	95.4344	379.00	958.00
Ln 2005 District Growth API Score	6.5805	.1411	5.94	6.86
Percent African American	2.7638	2.6573	.0000	9.0000
Percent Asian/Pacific Islander	2.6614	2.7735	.0000	9.0000
Percent Hispanic	1.2550	2.5073	.0000	9.0000
English Learner Students	.1688	.1816	.0000	.9640
Free or Reduced Lunch	.4300	.2825	.0000	1.8750
Average Parent Education Level	2.3076	.7428	1.00	5.00
Ln Average Parent Education Level	.7799	.3484	.00	1.61
Fully Credentialed Teachers	.8597	.2730	.0000	1.0000
Teachers Under Two-Years Experience	.0645	.0954	.0000	1.0000
Average Teacher Salary	54515.4963	6479.6317	33188.00	78615.00
Ln Average Teacher Salary	10.8990	.1217	10.41	11.27
Average Class Size	23.7876	4.6525	5.0000	32.6000
Ln Average Class Size	3.1444	.2412	1.61	3.48
Percentage of Schools Program Improvement	.0635	.1586	.0000	1.0000
District Size	6061.3357	24586.5173	7.00	705831.00
Ln District Size	7.2640	1.9182	2.08	13.52
Superintendent Tenure	2.7009	2.4249	.00	9.00
Board African American	.0123	.0568	.0000	1.0000
Board Asian/Pacific Islander	.0100	.0464603	.0000	.4286
Board Hispanic	.0458	.1136	.0000	1.0000
Board Consistency	.3452	.2643	.0000	1.0000
Team Training	.1107	.3139	.00	1.00
Individual Board Training	.0436	.1231	.0000	1.0000
Years Since Individual Training	.2251	.6970	.0000	4.0000
Valid Number of Observations: 506 * (Ln) indicates the natural log of variable values; this was only used in log functional form equations covered in chapter 4.				

Table 6

2007 Descriptive Statistics for Dependent and Explanatory Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
2007 District Growth API Score	742.3041	90.8666	384.00	962.00
Ln 2007 District Growth API Score	6.6016	.13077	5.95	6.87
Percent African American	.0320	.0527	.0000	.6768
Percent Asian/Pacific Islander	.0633	.0970	.0000	.6415
Percent Hispanic	.3206	.2548	.0000	.9583
English Learner Students	.1798	.1841	.0000	1.1010
Free or Reduced Lunch	.4399	.2811	.0000	1.1160
Average Parent Education Level	2.7930	.6699	1.0000	5.0000
Ln Average Parent Education Level	.9978	.24520	.00	1.61
Fully Credentialed Teachers	.8981	.2292	.0000	1.0000
Teachers Under Two-Years Experience	.0587	.0759	.0000	1.0000
Average Teacher Salary	59769.4200	7676.2498	36009.00	88965.00
Ln Average Teacher Salary	10.9898	.1312	10.49	11.40
Average Class Size	23.2567	4.9321	1.0000	31.4000
Ln Average Class Size	3.1123	.3084	.00	3.45
Percentage of Schools Program Improvement	.1119	.2173	.0000	1.0000
District Size	6005.3102	23368.1060	3.00	665397.00
Ln District Size	7.2606	1.9416	1.39	13.47
Superintendent Tenure	4.8105	5.3782	.00	35.00
Board African American	.0123	.0568	.0000	1.0000
Board Asian/Pacific Islander	.0100	.0465	.0000	.4286
Board Hispanic	.0487	.1511	.0000	3.1429
Board Consistency	.3448	.2641	.0000	1.0000
Team Training	.1474	.3547	.00	1.00
Individual Board Training	.0754	.1642	.0000	1.0000
Years Since Individual Training	.5212	1.2233	.0000	6.0000
Valid Number of Observations: 578 * (Ln) indicates the natural log of variable values; this was only used in log functional form equations covered in chapter 4.				

Table 7

Pooled Data Descriptive Statistics – Dependent and Explanatory Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
District Growth API Score	740.08	80.764	537	959
Ln District Growth API Score	6.600902	.1081989	6.2860	6.8700
Percent African American	.035864	.0550159	.0000	.6768
Percent Asian/Pacific Islander	.081433	.1063683	.0000	.6460
Percent Hispanic	.349755	.2512529	.0000	.9641
English Learner Students	.202049	.1867368	.0000	.9640
Free or Reduced Lunch	.442728	.2638106	.0000	1.0020
Average Parent Education Level	2.485258	.7921187	1.0000	4.6400
Ln Average Parent Education Level	.853966	.3504060	.0000	1.5300
Fully Credentialed Teachers	.926318	.0987016	.0000	1.0000
Teachers Under Two-Years Experience	.057021	.0578012	.0000	1.0000
Average Teacher Salary	$56,483.5821	$7,153.55036	$34,333.00	$88,965.00
Ln Average Teacher Salary	10.9337	.12665	10.44	11.40
Average Class Size	24.851603	3.4950034	9.0000	31.8000
Ln Average Class Size	3.201108	.1613172	2.1972	3.4595
Percentage of Schools Program Improvement	.076168	.1669740	.0000	1.0000
District Size	8350.95	39982.839	31	746852
Ln District Size	7.932472	1.4564894	3.4300	13.5236
Superintendent Tenure	4.146744	4.2969587	.0000	35.0000
Board African American	.011995	.0475115	.0000	.2857
Board Asian/Pacific Islander	.010662	.0508698	.0000	.4286
Board Hispanic	.056060	.1235975	.0000	.8000
Board Consistency	.355491	.2589693	.0000	1.0000
Team Training	.120505	.3257098	.0000	1.0000
Individual Board Training	.061725	.1531496	.0000	1.0000
Years Since Individual Training	.313920	.9021878	.0000	5.0000
2005 Dummy Variable	.3333	.47163	.00	1.00
2007 Dummy Variable	.3333	.47163	.00	1.00
Valid Number of Observations: 1029 * (Ln) indicates the natural log of variable values; this was only used in log functional form equations covered in chapter 4.				

Bivariate Correlations of Explanatory Variables

Finally, this chapter concludes with correlation matrices for each data set that shows the initial, uncontrolled, bivariate relationships of each explanatory variable to another. A correlation matrix is a simple tool for identifying mutlicollinearity, when two variables move together so closely as to potentially bias the standard errors of the regression coefficients and inaccurately show variables as statistically insignificant when they are not. In a correlation matrix, when one explanatory variable is highly correlated to another explanatory variable the coefficient will be .80 or higher. As seen in Tables 8-11 in the following pages, the only highly correlated variables are percentage Students Hispanic and percentage English Learners Students in all but the 2005 data set, at .854 (2003), .829 (2007), and .841 (pooled data). This consistently high correlation could end up biasing the standard error in my final regression equations, and in Chapter 4, I cover possible remedies for the multicollinearity detected in my regression equations.

Table 8

2003 Correlation Coefficient Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1	.211***	.062**	.084***	.122***	-.070**	-.048	.003	.159***	.208***	.169***	.184***	-.029	.412***	.014	.027	.006	.055*	.025	.037
2	.211***	1	-.043	.105***	-.103***	.160***	.106***	-.002	.398***	.318***	-.007	.124***	.002	.083***	.258***	-.009	.014	.063**	.139***	.115***
3	.062**	-.043	1	.854***	.638***	-.597***	-.038	.105***	-.019	.256***	.274***	.109***	.021	.070**	-.018	.517***	.135***	.098***	.064**	.019
4	.084**	.105***	.854***	1	.638***	-.542***	.039	.102***	-.020	.182***	.259***	.111***	.005	.088***	-.019	.433***	.042	.082**	.069**	.035
5	.122***	-.103***	.638***	.638***	1	-.683***	.192***	.112***	-.315***	-.078**	.277***	.042	-.018	.099**	-.071**	.328***	.024	.036	-.027	-.043
6	-.070**	.160***	-.597***	-.542***	-.683***	1	.136***	-.106***	.299***	.029	-.216***	-.017	-.052	-.071**	.091**	-.316***	-.152***	.021	.027	.024
7	-.048	.106***	-.038	.039	.192***	.136***	1	.021	.125***	-.161***	-.034	-.102***	-.062	-.112***	-.012	-.096**	-.188***	.021	.006	.004
8	.003	-.002	.105***	.102***	.112***	-.106***	.021	1	-.145***	-.117***	.048	-.010	-.043	-.014	-.008	.036	-.057*	-.012	-.014	-.026
9	.159***	.398***	-.019	-.020	-.315***	.299***	.125***	-.145***	1	.444***	-.081**	.137***	.003	.074**	.103**	.035	.051	.081**	.161***	.146***
10	.208***	.318***	.256***	.182***	-.078**	.029	-.161***	-.117***	.444***	1	.082**	.163***	.004	.086**	.123***	.128***	.123***	.107***	.141***	.106***
11	.169***	-.007	.274***	.259***	.277***	-.216***	-.034	.048	-.081**	.082**	1	.068**	-.059	.102**	-.009	.187***	.039	.041	-.005	-.020
12	.184***	.124***	.109***	.111***	.042	-.017	-.102***	-.010	.137***	.163***	.068**	1	-.009	.134***	.045	.034	.027	.025	.047	.042
13	-.029	.002	.021	.005	-.018	-.052	-.062	-.043	.003	.004	-.059	-.009	1	-.069	-.026	.003	.109**	-.029	-.038	-.072*
14	.412***	.083**	.070**	.088**	.099**	-.071**	-.112***	-.014	.074**	.086**	.102**	.134***	-.069	1	.123***	.107***	.073**	.008	.051	.058*
15	.014	.258***	-.018	-.019	-.071**	.091**	-.012	-.008	.103**	.123***	-.009	.045	-.026	.123***	1	.026	.077**	.062*	.069**	.035
16	.027	-.009	.517***	.433***	.328***	-.316***	-.096**	.036	.035	.128***	.187***	.034	.003	.107***	.026	1	.278***	.038	.091**	.085**
17	.006	.014	.135***	.042	.024	-.152***	-.188***	-.057*	.051	.123***	.039	.027	.109**	.073**	.077**	.278***	1	-.008	.196***	.112***

Table 8 (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
18	.055*	.063**	.098**	.082**	.036	.021	.021	-.012	.081**	.107***	.041	.025	-.029	.008	.062*	.038	-.008	1	.016	.022
19	.025	.139***	.064**	.069**	-.027	.027	.006	-.014	.161***	.141***	-.005	.047	-.038	.051	.069**	.091**	.196***	.016	1	.641***
20	.037	.115***	.019	.035	-.043	.024	.004	-.026	.146***	.106***	-.020	.042	-.072*	.058*	.035	.085**	.112***	.022	.641***	1

*** Correlation is significant at the 0.01 level (2-tailed); ** Correlation is significant at the 0.05 level (2-tailed); * Correlation is significant at the 0.10 level (2-tailed).
Legend: 1 = Students African American; 2 = Students Asian/Pacific Islander; 3 = Students Hispanic; 4 = English Learner Students; 5 = Free or Reduced Lunch;
6 = Average Parent Education Level; 7 = Fully Credentialed Teachers; 8 = Teachers Under Two-Years Experience; 9 = Average Teacher Salary;
10 = Average Class Size; 11 = Percentage Schools in Program Improvement; 12 = District Size; 13 = Superintendent Tenure; 14 = Board African American;
15 = Board Asian/Pacific Islander; 16= Board Hispanic; 17= Board Consistency; 18 = Team Training; 19 = Individual Board Training;
20 = Years Since Individual Training;

Table 9

2005 Correlation Coefficient Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1	.047	-.015	-.013	-.050	-.031	.031	-.049	.121***	.203***	-.010	-.011	-.050	-.018	.037	.006	.058*	.047	.047	-.005
2	.047	1	-.047	.046	.018	-.082**	-.006	-.048	-.009	.097**	.050	.018	-.072*	-.034	-.067**	.091**	.107***	.004	.004	-.009
3	-.015	-.047	1	-.405***	-.290***	.288***	-.118***	-.127***	-.023	-.177***	-.188***	-.081**	.011	-.051	.005	-.167***	-.033	-.021	-.064**	-.012
4	-.013	.046	-.405***	1	.639***	-.544***	.200***	.166***	-.005	.171***	.457***	.100**	-.086**	.098**	-.032	.417***	.057*	.089**	.097**	.033
5	-.050	.018	-.290***	.639***	1	-.646***	.222***	.220***	-.313***	-.125***	.378***	.032	-.105**	.093**	-.068**	.294***	.018	.039	-.019	-.069**
6	-.031	-.082**	.288***	-.544***	-.646***	1	.105***	-.105***	.299***	-.040	-.337***	-.030	.084**	-.066**	.084**	-.310***	-.181***	.000	-.015	.006
7	.031	-.006	-.118***	.200***	.222***	.105***	1	.123***	.207***	.121***	.067*	-.007	-.070*	-.061*	.014	-.008	-.114***	.081**	.053*	.011
8	-.049	-.048	-.127***	.166***	.220***	-.105***	.123***	1	-.264***	-.146***	.062**	-.015	-.022	.007	.047	.030	-.017	.009	-.020	-.029
9	.121***	-.009	-.023	-.005	-.313***	.299***	.207***	-.264***	1	.495***	-.064*	.132***	.026	.047	.080**	.066*	.027	.053	.183***	.171***
10	.203***	.097**	-.177***	.171***	-.125***	-.040	.121***	-.146***	.495***	1	.137***	.191***	-.029	.098**	.099**	.131***	.163***	.137***	.206***	.218***
11	-.010	.050	-.188***	.457***	.378***	-.337***	.067**	.062**	-.064*	.137***	1	.061*	-.067*	.119***	-.028	.250***	.050	.077**	.016	-.002
12	-.011	.018	-.081**	.100**	.032	-.030	-.007	-.015	.132***	.191***	.061*	1	.013	.134***	.045	.035	.031	.014	.050	.061*
13	-.050	-.072*	.011	-.086**	-.105**	.084**	-.070*	-.022	.026	-.029	-.067*	.013	1	-.025	-.056	-.031	-.027	-.012	.022	-.016
14	-.018	-.034	-.051	.098**	.093**	-.066**	-.061*	.007	.047	.098**	.119***	.134***	-.025	1	.123***	.107***	.073**	.051	.074**	.034
15	.037	-.067**	.005	-.032	-.068**	.084**	.014	.047	.080**	.099**	-.028	.045	-.056	.123***	1	.026	.077**	.065**	.080**	.014
16	.006	.091**	-.167***	.417***	.294***	-.310***	-.008	.030	.066*	.131***	.250***	.035	-.031	.107***	.026	1	.278***	.014	.090**	.077**
17	.058*	.107***	-.033	.057*	.018	-.181***	-.114***	-.017	.027	.163***	.050	.031	-.027	.073**	.077**	.278***	1	-.081**	.227***	.187***

Table 9 (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
18	.047	.004	-.021	.089**	.039	.000	.081**	.009	.053	.137**	.077**	.014	-.012	.051	.065**	.014	-.081**	1	.072**	.052
19	.047	.004	-.064**	.097**	-.019	-.015	.053*	-.020	.183***	.206***	.016	.050	.022	.074**	.080**	.090**	.227***	.072**	1	.672***
20	-.005	-.009	-.012	.033	-.069**	.006	.011	-.029	.171***	.218***	-.002	.061*	-.016	.034	.014	.077**	.187***	.052	.672***	1

*** Correlation is significant at the 0.01 level (2-tailed); ** Correlation is significant at the 0.05 level (2-tailed); * Correlation is significant at the 0.10 level (2-tailed).
Legend: 1 = Students African American; 2 = Students Asian/Pacific Islander; 3 = Students Hispanic; 4 = English Learner Students;–5 = Free or Reduced Lunch;
6 = Average Parent Education Level; 7 = Fully Credentialed Teachers; 8 = Teachers Under Two-Years Experience; 9 = Average Teacher Salary;
10 = Average Class Size; 11 = Percentage Schools in Program Improvement; 12 = District Size; 13 = Superintendent Tenure; 14 = Board African American;
15 = Board Asian/Pacific Islander; 16= Board Hispanic; 17= Board Consistency; 18 = Team Training; 19 = Individual Board Training;
20 = Years Since Individual Training;

Table 10

2007 Correlation Coefficient Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1	.200***	.034	.044	.099***	-.046	-.032	.036	.116***	.206***	.108***	.171***	-.068*	.386***	.034	.015	.003	.079**	.094**	.077**
2	.200***	1	-.080**	.058*	-.158***	.280**	.120***	.023	.383***	.335***	-.080**	.124***	-.042	.078**	.261***	-.031	.024	.068**	.173***	.146**
3	.034	-.080**	1	.829***	.594***	-.598***	.077**	.164***	.027	.270***	.541***	.115***	.115***	.086**	-.022	.350***	.149***	.081**	.056**	.093**
4	.044	.058*	.829***	1	.627***	-.545***	.171***	.161***	-.006	.146***	.568***	.085**	.088**	.117***	-.033	.275***	.056*	.076**	.069**	.069**
5	.099***	-.158***	.594***	.627***	1	-.616***	.311***	.176***	-.311***	-.163***	.439***	.033	.049	.109***	-.073**	.200***	.020	.028	-.022	-.042
6	-.046	.280***	-.598***	-.545***	-.616***	1	.178***	-.079**	.296***	.085**	-.424***	-.027	-.143***	-.091**	.102**	-.257***	-.146***	-.009	.057*	.031
7	-.032	.120***	.077**	.171***	.311***	.178**	1	.088**	.068*	-.006	-.010	-.110***	-.078**	-.075**	-.007	-.106***	-.162***	.019	.022	-.019
8	.036	.023	.164***	.161***	.176***	-.079**	.088**	1	-.200***	-.088**	.123***	.000	-.050	.006	.066**	.026	-.037	.007	-.011	-.013

Table 10 (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
9	.116***	.383***	.027	-.006	-.311***	.296***	.068*	-.200***	1	.510***	-.068*	.146***	.026	.032	.072**	.076**	.082**	.059*	.168***	.188**
10	.206***	.335***	.270***	.146**	-.163***	.085**	-.006	-.088**	.510***	1	.150***	.193***	-.062*	.088**	.117***	.122***	.165***	.147***	.239***	.245**
11	.108***	-.080**	.541***	.568**	.439***	-.424***	-.010	.123***	-.068*	.150***	1	.075**	.063*	.175***	-.026	.302***	.087**	.061*	.015	.027
12	.171***	.124***	.115***	.085*	.033	-.027	-.110***	.000	.146***	.193***	.075**	1	-.036	.135***	.048	.036	.036	.009	.060*	.067*
13	-.068*	-.042	.115***	.088*	.049	-.143***	-.078**	-.050	.026	-.062*	.063*	-.036	1	.002	-.075**	.081**	.149***	-.041	-.046	-.047
14	.386***	.078**	.086**	.117**	.109***	-.091**	-.075**	.006	.032	.088**	.175***	.135***	.002	1	.123***	.126***	.073**	.045	.112***	.063*
15	.034	.261***	-.022	-.033	-.073**	.102**	-.007	.066**	.072**	.117***	-.026	.048	-.075**	.123***	1	.016	.077**	.037	.097**	.018
16	.015	-.031	.350***	.275**	.200***	-.257***	-.106***	.026	.076**	.122***	.302***	.036	.081**	.126***	.016	1	.216***	.022	.045	.136**
17	.003	.024	.149***	.056*	.020	-.146***	-.162***	-.037	.082**	.165***	.087**	.036	.149***	.073**	.077**	.216***	1	-.076**	.181***	.184**
18	.079**	.068**	.081**	.076**	.028	-.009	.019	.007	.059	.147***	.061	.009	-.041	.045	.037	.022	-.076**	1	.088**	.112**
19	.094**	.173***	.056*	.069**	-.022	.057*	.022	-.011	.168***	.239***	.015	.060*	-.046	.112***	.097**	.045	.181***	.088**	1	.665**
20	.077**	.146***	.093**	.069**	-.042	.031	-.019	-.013	.188***	.245***	.027	.067**	-.047	.063**	.018	.136***	.184***	.112***	.665***	1

*** Correlation is significant at the 0.01 level (2-tailed); ** Correlation is significant at the 0.05 level (2-tailed); * Correlation is significant at the 0.10 level (2-tailed).
Legend: 1 = Students African American; 2 = Students Asian/Pacific Islander; 3 = Students Hispanic; 4 = English Learner Students; 5 = Free or Reduced Lunch;
6 = Average Parent Education Level; 7 = Fully Credentialed Teachers; 8 = Teachers Under Two-Years Experience; 9 = Average Teacher Salary;
10 = Average Class Size; 11 = Percentage Schools in Program Improvement; 12 = District Size; 13 = Superintendent Tenure; 14 = Board African American;
15 = Board Asian/Pacific Islander; 16= Board Hispanic; 17= Board Consistency; 18 = Team Training; 19 = Individual Board Training;
20 = Years Since Individual Training;

Table 11

Pooled Data Set Correlation Coefficient Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	.074**	-.002	-.029	.083**	-.044	-.076**	.063**	.129***	.119***	.082**	.125***	-.033	.352***	.001	.041	.032	-.028	.023	.041	.005	.001
2	.074**	1	-.186***	-.025	-.263***	.304***	.038	.004	.335***	.281***	-.125***	.038	-.028	.042	.354***	-.068**	-.041	.060*	.118***	.089**	.014	.016
3	-.002	-.186***	1	.841***	.732***	-.658***	-.229***	.136***	-.007	.152***	.484***	.092**	.106***	.086**	-.030	.549***	.192***	.103***	.065*	.049	.019	.042
4	-.029	-.025	.841***	1	.732***	-.606***	-.171***	.132***	-.048	.020	.483***	.068**	.109***	.084**	-.015	.464***	.108***	.102***	.093**	.047	-.003	.034
5	.083**	-.263***	.732***	.732***	1	-.762***	-.194***	.079**	-.274***	-.104***	.440***	.052	.088**	.124***	-.040	.393***	.194***	.092**	.007	-.020	-.007	.038
6	-.044	.304***	-.658***	-.606***	-.762***	1	.262***	-.105***	.406***	.051	-.308***	-.019	.019	-.059*	.061**	-.343***	-.174***	.000	.061*	.082**	-.150***	.299***
7	-.076**	.038	-.229***	-.171***	-.194***	.262***	1	-.144***	.235***	-.013	-.062**	-.101***	.035	-.020	.013	-.192***	-.075**	.061**	.045	.070**	.004	.199***
8	.063**	.004	.136***	.132***	.079**	-.105***	-.144***	1	-.113***	.002	.107***	.010	-.010	.022	-.009	.100***	.027	.058	.023	.001	.022	-.009
9	.129***	.335***	-.007	-.048	-.274***	.406***	.235***	-.113***	1	.346***	.016	.069**	.156***	.039	.060*	.029	-.006	.094**	.206***	.231***	-.098**	.416***
10	.119***	.281***	.152***	.020	-.104***	.051	-.013	.002	.346***	1	.064**	.118***	-.078**	.066**	.081**	.122***	.078**	.048	.155***	.164***	.081**	-.027
11	.082**	-.125***	.484***	.483***	.440***	-.308***	-.062**	.107***	.016	.064**	1	.050	.129***	.114***	-.031	.351***	.037	.094**	.029	.049	.008	.203***
12	.125***	.038	.092**	.068**	.052*	-.019	-.101***	.010	.069**	.118***	.050	1	-.014	.179***	.016	-.004	.006	-.014	.019	.016	.001	.000
13	-.033	-.028	.106***	.109***	.088**	.019	.035	-.010	.156***	-.078*	.129***	-.014	1	-.037	-.051	.027	.092**	.008	.028	.047	-.153***	.345***
14	.352***	.042	.086**	.084**	.124***	-.059*	-.020	.022	.039	.066**	.114***	.179***	-.037	1	.190***	.195***	.091**	.068**	.105***	.066**	.000	.000
15	.001	.354***	-.030	-.015	-.040	.061**	.013	-.009	.060*	.081**	-.031	.016	-.051	.190***	1	.054*	.006	.085**	-.009	-.058*	.000	.000
16	.041	-.068**	.549***	.464***	.393***	-.343***	-.192***	.100***	.029	.122***	.351***	-.004	.027	.195***	.054*	1	.272***	.052*	.102***	.047	.000	.000

Table 11 (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
17	.032	-.041	.192***	.108***	.194***	-.174***	-.075**	.027	-.006	.078**	.037	.006	.092**	.091**	.006	.272***	1	-.068**	.182***	.151***	.000	.000
18	-.028	.060*	.103***	.102***	.092**	.000	.061**	.058*	.094**	.048	.094**	-.014	.008	.068**	.085**	.052	-.068**	1	.067**	.096**	.036	.125***
19	.023	.118***	.065**	.093**	.007	.061*	.045	.023	.206***	.155***	.029	.019	.028	.105***	-.009	.102***	.182*****	.067**	1	.659***	-.025	.170***
20	.041	.089**	.049	.047	-.020	.082**	.070**	.001	.231***	.164***	.049	.016	.047	.066**	-.058*	.047	.151***	.096**	.659***	1	-.035	.235***
21	.005	.014	.019	-.003	-.007	-.150***	.004	.022	-.098**	.081**	.008	.001	-.153***	.000	.000	.000	.000	.036	-.025	-.035	1	-.500***
22	.001	.016	.042	.034	.038	.299***	.199***	-.009	.416***	-.027	.203***	.000	.345***	.000	.000	.000	.000	.125***	.170***	.235***	-.500***	1

*** Correlation is significant at the 0.01 level (2-tailed); ** Correlation is significant at the 0.05 level (2-tailed); * Correlation is significant at the 0.10 level (2-tailed).
Legend: 1 = Students African American; 2 = Students Asian/Pacific Islander; 3 = Students Hispanic; 4 = English Learner Students; 5 = Free or Reduced Lunch;
6 = Average Parent Education Level; 7 = Fully Credentialed Teachers; 8 = Teachers Under Two-Years Experience; 9 = Average Teacher Salary;
10 = Average Class Size; 11 = Percentage Schools in Program Improvement; 12 = District Size; 13 = Superintendent Tenure; 14 = Board African American;
15 = Board Asian/Pacific Islander; 16= Board Hispanic; 17= Board Consistency; 18 = Team Training; 19 = Individual Board Training;
20 = Years Since Individual Training; 21 = 2005 Dummy; 22 = 2007 Dummy

Chapter 4

RESULTS AND DISCUSSION

To facilitate a better understanding of the results of my regression equations and how I arrived at my findings, this chapter details the steps taken to reach each data sets final results, corrections to the equation to fix problems of multicollinearity and heteroskedasticity (defined later), and ends with analysis of what those results mean in reference to district achievement scores. This chapter begins with a summary of the three functional forms I used to run initial tests on my regression and the general methods used to choose the best fitting functional form used in the final regression analysis. This includes the regression results in the three functional forms for each of the 2003, 2005, 2007, the pooled data set, and a description of the reasons for choosing the linear functional form for the final analysis. I then detail what tests I used to detect issues of multicollinearity and heteroskedasticity and the remedies I choose for each, and displays the corrected final regression equations. Next, I discuss the final regression equations results including summarizing the statistically significant variables, their actual direction of influence versus expectations, and the goodness of fit to the data. Finally, I convert the results of the statistically significant variables into elasticities for comparison purposes and discuss the magnitude of the effects the variables have on district achievement.

Selecting a Functional Form for the Regression Equations

I used a regression estimation technique called Ordinary Least Squares (OLS), which attempts to estimate theoretical relationships between the dependent and explanatory variables into linear relationships while minimizing error between estimated results and actual results. In OLS, there are three possible functional forms for the regression equation that make use of linear forms (actual values) of a variable and logged forms (natural exponent values) of a variable, where a natural log is used to reduce the absolute size of the value but keep the same impact or magnitude of the variables affect. The three functional forms work as follows on the education production function for my regression equations: linear or log values of school achievement = linear or log function of [student/social inputs, school site inputs, district administrative inputs]. Thus, Lin-Lin is linear on both sides of the equation, and Log-Log is the natural log of both sides of the equation. Since variables containing a value of zero cannot be logged, my regression equation at most can be a Log-Semilog functional form. Finally, since I have three separate year data sets and one pooled data set, I will be choosing one functional form for all four data sets for comparability purposes, the determination of the final functional form will be based on the results from the individual year data set comparisons.

In order to choose the best functional form for my regression equations, I ran each regression using all three functional forms and then evaluated the fit of the functional form to the data. Best fit between the functional form and the data is determined through theory, such as certain variables that theoretically should be statistically significant are

significant in the actual results and have a relationship to the dependent variable that is expected (Studenmund, 2006, p. 220). Tables 12-15, in the following pages, shows the regression results for the 2003, 2005, 2007 and the pooled data sets and the three functional forms along with their coefficients, standard error, and statistical significance. In looking at the results for each form, only in the 2003 and pooled data sets is there any variation in the total number of explanatory variables that were statistically significant. In the 2003 data set, the Log-Semilog form has two more significant variables than the Lin-Lin and Log-Lin forms and in the pooled data set, the Lin-Lin form has one more significant variable than the Log-Lin and Log-Semilog forms. Notably, the Free and Reduced Lunch variable is consistently significant in all data sets and forms until the pooled data set where it loses significance in the Log-Lin and Log-Semilog forms.

Table 12

2003 Comparison of Functional Forms for Board Training

Variable (Ln indicates Log form)	Best OLS Fit Lin-Lin	Log-Lin[1]	Log-SemiLog[1]	VIFs for Lin-Lin
2003 District API Growth Score (Ln)	Constant	Constant	Constant	Constant
Percent African American	-176.835*** (46.973)	-.227*** (.065)	-.197** (.067)	1.323
Percent Asian/Pacific Islander	124.056*** (28.135)	.162*** (.039)	.182*** (.039)	1.687
Percent Hispanic	-53.141** (21.897)	-.077** (.030)	-.094** (.030)	6.433
English Learner Students	27.390 (24.647)	.025 (.034)	.055 (.034)	3.864
Free or Reduced Lunch	-107.341*** (15.731)	-.141*** (.022)	-.162*** (.021)	4.569
Average Parent Education Level (Ln)	38.274*** (4.858)	.050*** (.007)	.081*** (.014)	3.028
Fully Credentialed Teachers	71.366** (26.388)	.107** (.037)	.098** (.037)	1.585

Table 12 (continued)

Variable (Ln indicates Log form)	Best OLS Fit Lin-Lin	Log-Lin[1]	Log-SemiLog[1]	VIFs for Lin-Lin
Teachers Under Two-Years Experience	-65.422** (24.601)	-.089** (.034)	-.085** (.034)	1.068
Average Teacher Salary (Ln)	.0004 (0.0005)	6.351E-7 (0.000001)	.123** (.040)	1.929
Average Class Size	-1.471** (.643)	-.002** (.001)	.023 (.015)	1.479
Percentage of Schools Program Improvement	-95.218*** (26.268)	-.160*** (.037)	-.136*** (.037)	1.212
District Size (Ln)	-2.966E-5 (0.0001)	-3.694E-8 (0.0000001)	-.015*** (.003)	1.083
Superintendent Tenure	.350 (.839)	.001 (.001)	.0005 (.001)	1.045
Board African American	76.649 (55.504)	.104 (.077)	.122 (.076)	1.307
Board Asian/Pacific Islander	-29.775 (49.098)	-.034 (.068)	-.025 (.068)	1.265
Board Hispanic	-11.771 (21.297)	-.031 (.030)	-.034 (.030)	1.709
Board Consistency	10.640 (9.000)	.018 (.013)	.021* (.013)	1.198
Team Training	-6.616 (11.380)	-.007 (.016)	-.001 (.016)	1.082
Individual Board Training	-17.854 (31.042)	-.029 (.043)	-.012 (.043)	2.082
Years Since Individual Training	6.434 (14.629)	.012 (.020)	.010 (.020)	2.068
R-Squared	.760	.760	.759	-
Adjusted R-Squared	.747	.747	.747	-
Number of Observations	393	393	393	-
Total Variables Significant	9	9	11	-

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level;
Standard Error shown in parentheses under regression coefficient.
[1] Indicates the log of either the dependent or all variables was used in this equation instead of the variables linear form.

Table 13

2005 Comparison of Functional Forms for Board Training

Variable (Ln indicates Log form)	Best OLS Fit Lin-Lin	Log-Lin[1]	Log-SemiLog[1]	VIFs for Lin-Lin
2005 District API Growth Score (Ln)	Constant	Constant	Constant	Constant
Percent African American	-98.017** (39.090)	-.113** (.054)	-.082 (.055)	1.366
Percent Asian/Pacific Islander	97.447*** (22.886)	.128*** (.031)	.155*** (.032)	1.609
Percent Hispanic	-19.517 (17.383)	-.023 (.024)	-.026 (.024)	6.003
English Learner Students	19.896 (21.462)	.015 (.029)	.044 (.030)	4.759
Free or Reduced Lunch	-102.030*** (14.403)	-.134*** (.020)	-.165*** (.019)	4.305
Average Parent Education Level (Ln)	42.214*** (4.125)	.054*** (.006)	.096*** (.012)	3.074
Fully Credentialed Teachers	49.007** (15.352)	.069*** (.021)	.070*** (.021)	1.133
Teachers Under Two-Years Experience	-130.360*** (25.646)	-.186*** (.035)	-.163*** (.036)	1.226
Average Teacher Salary (Ln)	.0005 (0.0004)	5.659E-7 (0.000001)	.102*** (.031)	1.857
Average Class Size	-2.938*** (.644)	-.004*** (.001)	-.015 (.021)	1.696
Percentage of Schools Program Improvement	-36.988** (12.825)	-.060*** (.018)	-.048** (.018)	1.356
District Size (Ln)	-5.951E-5 (0.0001)	-7.765E-8 (0.0000001)	-.016*** (.003)	1.070
Superintendent Tenure	-.456 (.803)	-.0006 (.001)	-.0005 (.001)	1.028
Board African American	-22.406 (33.603)	-.045 (.046)	-.029 (.046)	1.247
Board Asian/Pacific Islander	44.899 (40.175)	.064 (.055)	.072 (.056)	1.212
Board Hispanic	-36.416* (19.125)	-.056** (.026)	-.052** (.026)	1.531
Board Consistency	18.107** (7.835)	.025** (.011)	.025** (.011)	1.241
Team Training	4.356 (5.543)	.006 (.008)	.012 (.008)	1.061
Individual Board Training	.948 (8.003)	.001 (025)	.012 (.025)	1.959
Years Since Individual Training	-.798 (3.327)	-.0006 (.005)	-.001 (.005)	1.944

Table 13 (continued)

Variable (Ln indicates Log form)	Best OLS Fit Lin-Lin	Log-Lin[1]	Log-SemiLog[1]	VIFs for Lin-Lin
R-Squared	.752	.743	.738	-
Adjusted R-Squared	.742	.733	.727	-
Number of Observations	506	506	506	-
Total Variables Significant	10	10	10	-

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level
Standard Error shown in parentheses under regression coefficient.
[1] Indicates the log of either the dependent or all variables was used in this equation instead of the variables linear form.

Table 14

2007 Comparison of Functional Forms for Board Training

Variable (Ln indicates Log form)	Best OLS Fit Lin-Lin	Log-Lin[1]	Log-SemiLog[1]	VIFs for Lin-Lin
2007 District API Growth Score (Ln)	Constant	Constant	Constant	Constant
Percent African American	-120.744*** (30.188)	-.143*** (.040)	-.116** (.042)	1.327
Percent Asian/Pacific Islander	54.593** (17.728)	.068** (.024)	.090*** (.024)	1.716
Percent Hispanic	-20.145 (14.054)	-.029 (.019)	-.047** (.019)	6.036
English Learner Students	63.000*** (17.735)	.082*** (.024)	.109*** (.024)	4.995
Free or Reduced Lunch	-86.283** (12.269)	-.119*** (.016)	-.144*** (.016)	5.089
Average Parent Education Level (Ln)	55.064*** (4.623)	.067*** (.006)	.152*** (.017)	5.113
Fully Credentialed Teachers	130.994*** (29.683)	.188*** (.039)	.156*** (.041)	1.420
Teachers Under Two-Years Experience	-9.575 (22.863)	-.016 (.030)	.001 (.031)	1.253
Average Teacher Salary (Ln)	.001** (0.0003)	9.087E-7** (0.0000003)	.097*** (.022)	1.917
Average Class Size	-2.166*** (.494)	-.003*** (.001)	.006 (.012)	1.652
Percentage of Schools Program Improvement	-26.856** (8.734)	-.044*** (.012)	-.037** (.012)	1.772
District Size (Ln)	-2.524E-5 (0.00005)	-2.823E-8 (0.0000001)	-.012*** (.002)	1.089

Table 14 (continued)

Variable (Ln indicates Log form)	Best OLS Fit Lin-Lin	Log-Lin[1]	Log-SemiLog[1]	VIFs for Lin-Lin
Superintendent Tenure	.543* (.284)	.001* (0.0004)	.001 (0.0004)	1.105
Board African American	-27.361 (26.076)	-.055 (.035)	-.045 (.035)	1.248
Board Asian/Pacific Islander	11.850 (31.046)	.018 (.041)	.029 (.042)	1.187
Board Hispanic	-7.211 (15.230)	-.013 (.020)	-.004 (.021)	1.513
Board Consistency	13.534** (6.200)	.020** (.008)	.019** (.008)	1.230
Team Training	3.451 (3.949)	.005 (.005)	.008 (.005)	1.045
Individual Board Training	6.318 (10.494)	.007 (.014)	.011 (.014)	1.843
Years Since Individual Training	-1.815 (1.492)	-.002 (.002)	-.002 (.002)	1.851
R-Squared	.793	.788	.780	-
Adjusted R-Squared	.786	.780	.772	-
Number of Observations	579	579	579	-
Total Variables Significant	11	11	11	-

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level

Standard Error shown in parentheses under regression coefficient.

[1] Indicates the log of either the dependent or all variables was used in this equation instead of the variables linear form.

Table 15

Pooled Data Set Comparison of Functional Forms for Board Training

Variable (Ln indicates Log form)	Best OLS Fit Lin-Lin	Log-Lin[1]	Log-SemiLog[1]	VIFs for Lin-Lin
District API Growth Score (Ln)	Constant	Constant	Constant	Constant
Percent African American	-141.644** (71.674)	-.214** (.106)	-.225** (.106)	80.488
Percent Asian/Pacific Islander	-20.876 (49.363)	-.066 (.073)	-.077 (.073)	142.709
Percent Hispanic	-42.114** (19.408)	-.061** (.029)	-.064** (.029)	123.084
English Learner Students	-14.336 (18.534)	-.010 (.027)	-.009 (.027)	62.006
Free or Reduced Lunch	-17.220* (9.562)	-.022 (.014)	-.019 (.014)	32.940
Average Parent Education Level (Ln)	-.834 (2.058)	-.002 (.003)	.009 (.006)	13.762
Fully Credentialed Teachers	9.145 (6.813)	.016 (.010)	.013 (.010)	2.340
Teachers Under Two-Years Experience	16.243 (10.030)	.023 (.015)	.021 (.015)	1.740
Average Teacher Salary (Ln)	.0004 (0.0003)	5.389E-7 (.0000005)	.046* (.027)	25.409
Average Class Size	-.239 (.381)	-.0003 (.001)	-.006 (.012)	9.155
Percentage of Schools Program Improvement	28.609*** (5.172)	.056*** (.008)	.054*** (.008)	3.861
District Size (Ln)	.0001 (.0004)	1.816E-7 (.000001)	.010 (.011)	1583.702
Superintendent Tenure	.133 (.142)	.0002 (.0002)	.0002 (0.0002)	1.919
Board African American	SPSS Excluded– Partial Correlation	SPSS Excluded– Partial Correlation	SPSS Excluded– Partial Correlation	-
Board Asian/Pacific Islander				
Board Hispanic				
Board Consistency				
Team Training	2.761 (2.735)	.004 (.004)	.004 (.004)	4.107
Individual Board Training	-.213 (6.320)	-.001 (.009)	-.0004 (.009)	4.850
Years Since Individual Training	.285 (.959)	.0003 (.001)	.0001 (.001)	3.874
2005 Dummy Variable	21.094*** (1.493)	.029*** (.002)	.029*** (.002)	2.565

Table 15 (continued)

Variable (Ln indicates Log form)	Best OLS Fit Lin-Lin	Log-Lin[1]	Log-SemiLog[1]	VIFs for Lin-Lin
2007 Dummy Variable	31.313*** (2.973)	.044*** (.004)	.039*** (.004)	10.178
R-Squared	.980	.976	.976	-
Adjusted R-Squared	.970	.963	.963	-
Number of Observations	1029	1029	1029	-
Total Variables Significant	6	5	5	-

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level;
Standard Error shown in parentheses under regression coefficient.
[1] Indicates the log of either the dependent or all variables was used in this equation instead of the variables linear form.

Two aberrations worth noting in the above results are that in the Log-Semilog form in the 2005 data set, the percentage of African American students becomes insignificant, and in the 2003, 2005 and 2007 data sets, the Average Class Size variable loses significance only in the Log-Semilog form and even goes from negative to positive in 2003. Another aberration worth noting is that the Free or Reduced Lunch variable is consistently negative and statistically significant as expected in the 2003, 2005, 2007 linear forms of the panel data set, but it loses significance in the non-linear form in the panel data set. Due to the almost equivalent number of statistically significant variables, and the previously mentioned aberrations from expected direction and significance in the non-linear and specifically Log-Semilog form, I have chosen to use the Lin-Lin functional form as the best functional form fit for my data. Another good reason to choose the Lin-Lin functional form is its ability to provide a straightforward interpretation of the regression coefficients that measure change in the dependent variable given a one-unit change in an explanatory variable.

After choosing a functional form for the regression equations, it is important to fix potential statistical problems within the regression estimation that could lead to misinterpretations of the findings. This is covered next in the discussion of multicollinearity and heteroskedasticity and the changes made to each equation to remedy multicollinearity and heteroskedasticity in all four of the data sets.

Detecting and Fixing Problems

Multicollinearity

In order to detect multicollinearity, refer to Chapter 3. I obtained Variance Inflation Factors (VIF) indicators for the Lin-Lin regression equations for each data set, where a VIF of 5.0 or higher indicates high multicollinearity, and matched these results to the correlation matrix provided earlier. As seen in Tables 12-15, I found high VIFs consistently across the three single year data sets for the percentage Hispanic variable, at 6.433, 6.003, and 6.036 respectively, while Average Parent Education Level and Free or Reduced Lunch had high VIFs in only the 2007 data set. According to the correlation matrices for the 2003, 2005 and 2007 data sets, some highly correlated variables (greater than .800) are percentage Hispanic and English Learner students correlated at .829 and .854 in 2003 and 2005, while others are not, with Average Parent Education Level and Free or Reduced Lunch having scores of .683, .646 and .616 in 2003, 2005 and 2007. Some remedies for multicollinearity are do nothing, drop redundant variables, transform the variables into a combination variable, or increase the sample size (accomplished with the pooled data set). As seen in Tables 11 (Chapter 3) and 15 (above), the increased

sample size did not help the multicollinearity problem, where percentage Hispanic students and percentage English Learner students have a .841 correlation and the VIFs are so high as to be unusable. For my regression equation, I chose to leave Hispanic and remove English Learners for theoretical reasons. I kept Hispanic instead of English Learners in my regression equation due to the high percentage of Hispanic students in California in comparison to other states and its consistency in analyzing the other two ethnic subcategories of African American and Asian/Pacific Islanders. Since multicollinearity can bias the standard error upwards and inappropriately cause explanatory variables to be statistically insignificant when they should not be, remedying the multicollinearity problem should give more confidence in the results of the regression equations. After fixing problems of multicollinearity, I next turned my attention to detecting and fixing problems of heterskedasticity.

Heteroskedasticity

Regression analysis using Ordinary Least Squares requires that the calculated standard errors on regression coefficients are minimized and uniform; non-uniform standard errors in a regression is an indication of heteroskedasticity and corrective action is required to ensure unbiased results. Heteroskedasticity is typical in cross-sectional data sets, observations from one period, and generally found in variables of population, income, and education, which have the highest variation in the sample. In my regression equations, I have variables and data sets that approximate all of these conditions, with one cross-sectional data set and approximations of the three high variation variables, so I

performed Park Tests on my continuous logged variables. A Park Test checks for statistical significance of variables to the logged squared residuals of each regression equation. The Park Test results are below in Table 16.

Table 16

Park Test Results

Variable	2003	Sig	2005	Sig	2007	Sig	Pooled Data Set	Sig
Average Parent Education Level	-5.962 (178.486)	.973	-35.789 (238.885)	.881	-287.762 (147.463)	.051	-40.288 (10.528)	.000
Average Teacher Salary	-.043 (.023)	.060	-.065 (.029)	.024	-.059 (.013)	.000	-.010 (.001)	.000
District Size	-.004 (.004)	.271	-.005 (.006)	.326	-.005 (.003)	.118	-.0004 (.0002)	.045
Standard Error shown in parentheses under regression coefficient.								

Since Average Teacher Salary is the only variable that is statistically significant across all data sets, I chose to use it as a weight to the regression equation in order to correct for heteroskedasticity. The Weighted Least Squares (WLS) method is where the heteroskedastic variable is used as a weight against the regression equation, meaning the dependent and independent variables are all divided by the heteroskedastic variable in its linear form in order to correct the standard error variance. My corrected regression results are below in Tables 17-20.

Table 17

2003 Corrected Regression Results Weighted by Average Teacher Salary

Variable	Lin-Lin Uncorrected	VIFs Uncorrected	Lin-Lin Corrected for Multicollinearity/ Heteroskedasticity	VIFs Corrected
2003 District API Growth Score	Constant	Constant	Constant	Constant
Percent African American	-176.835*** (46.973)	1.323	-180.364*** (46.646)	1.313
Percent Asian/Pacific Islander	124.056*** (28.135)	1.687	134.960*** (26.379)	1.493
Percent Hispanic	-53.141** (21.897)	6.433	-38.287** (17.255)	3.993
English Learner Students	27.390 (24.647)	3.864	Removed to fix Multiciollinearity	-
Free or Reduced Lunch	-107.341*** (15.731)	4.569	-102.494*** (15.152)	3.585
Average Parent Education Level	38.274*** (4.858)	3.028	38.323*** (4.851)	3.027
Fully Credentialed Teachers	71.366** (26.388)	1.585	73.032** (26.452)	1.582
Teachers Under Two-Years Experience	-65.422** (24.601)	1.068	-66.266** (24.623)	1.067
Average Teacher Salary	.0004 (0.0005)	1.929	.0004 (0.0005)	1.923
Average Class Size	-1.471** (.643)	1.479	-1.556** (.641)	1.462
Percentage of Schools Program Improvement	-95.218*** (26.268)	1.212	-93.964*** (26.376)	1.209
District Size	-2.966E-5 (0.0001)	1.083	-2.874E-5 (0.0001)	1.083
Superintendent Tenure	.350 (.839)	1.045	.359 (.839)	1.045
Board African American	76.649 (55.504)	1.307	75.664 (55.392)	1.307
Board Asian/Pacific Islander	-29.775 (49.098)	1.265	-34.863 (48.785)	1.256
Board Hispanic	-11.771 (21.297)	1.709	-11.786 (21.284)	1.708
Board Consistency	10.640 (9.000)	1.198	8.852 (8.860)	1.162
Team Training	-6.616 (11.380)	1.082	-6.402 (11.343)	1.082
Individual Board Training	-17.854 (31.042)	2.082	-15.182 (30.836)	2.069

Table 17 (continued)

Variable	Lin-Lin Uncorrected	VIFs Uncorrected	Lin-Lin Corrected for Multicollinearity/ Heteroskedasticity	VIFs Corrected
Years Since Individual Training	6.434 (14.629)	2.068	6.174 (14.579)	2.066
R-Squared	.760	-	.760	-
Adjusted R-Squared	.747	-	.748	-
Number of Observations	393	-	393	-
* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level Standard Error shown in parentheses under regression coefficient.				

Table 18

2005 Corrected Regression Results Weighted by Average Teacher Salary

Variable	Lin-Lin Uncorrected	VIFs Uncorrected	Lin-Lin Corrected for Multicollinearity/ Heteroskedasticity	VIFs Corrected
2005 District API Growth Score	Constant	Constant	Constant	Constant
Percent African American	-98.017** (39.090)	1.366	-99.552** (38.854)	1.361
Percent Asian/Pacific Islander	97.447*** (22.886)	1.609	105.122*** (21.437)	1.424
Percent Hispanic	-19.517 (17.383)	6.003	-9.329 (13.431)	3.593
English Learner Students	19.896 (21.462)	4.759	Removed to fix multicollinearity	-
Free or Reduced Lunch	-102.030*** (14.403)	4.305	-98.284*** (13.808)	3.970
Average Parent Education Level	42.214*** (4.125)	3.074	42.460*** (4.116)	3.075
Fully Credentialed Teachers	49.007** (15.352)	1.133	50.917*** (15.327)	1.118
Teachers Under Two-Years Experience	-130.360*** (25.646)	1.226	-131.992*** (25.774)	1.218
Average Teacher Salary	.0005 (0.0004)	1.857	.0005 (0.0004)	1.850
Average Class Size	-2.938*** (.644)	1.696	-3.078*** (.634)	1.638
Percentage of Schools Program Improvement	-36.988** (12.825)	1.356	-35.675** (12.782)	1.343

Table 18 (continued)

Variable	Lin-Lin Uncorrected	VIFs Uncorrected	Lin-Lin Corrected for Multicollinearity/ Heteroskedasticity	VIFs Corrected
District Size	-5.951E-5 (0.0001)	1.070	-5.963E-5 (0.0001)	1.070
Superintendent Tenure	-.456 (.803)	1.028	-.427 (.801)	1.027
Board African American	-22.406 (33.603)	1.247	-20.214 (33.515)	1.243
Board Asian/Pacific Islander	44.899 (40.175)	1.212	38.717 (39.774)	1.195
Board Hispanic	-36.416* (19.125)	1.531	-35.429* (19.091)	1.531
Board Consistency	18.107** (7.835)	1.241	16.951** (7.756)	1.220
Team Training	4.356 (5.543)	1.061	4.363 (5.527)	1.060
Individual Board Training	.948 (8.003)	1.959	2.272 (17.895)	1.951
Years Since Individual Training	-.798 (3.327)	1.944	-.816 (3.313)	1.945
R-Squared	.752	-	.753	-
Adjusted R-Squared	.742	-	.743	-
Number of Observations	506	-	506	-

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level
Standard Error shown in parentheses under regression coefficient.

Table 19

2007 Corrected Regression Results Weighted by Average Teacher Salary

Variable	Lin-Lin Uncorrected	VIFs Uncorrected	Lin-Lin Corrected for Multicollinearity/ Heteroskedasticity	VIFs Corrected
2007 District API Growth Score	Constant	Constant	Constant	Constant
Percent African American	-120.744*** (30.188)	1.327	-130.459*** (30.212)	1.314
Percent Asian/Pacific Islander	54.593** (17.728)	1.716	79.912*** (16.334)	1.443
Percent Hispanic	-20.145 (14.054)	6.036	8.496 (11.639)	4.070
English Learner Students	63.000*** (17.735)	4.995	Removed to fix multicollinearity	-
Free or Reduced Lunch	-86.283** (12.269)	5.089	-75.673*** (12.043)	4.825
Average Parent Education Level	55.064*** (4.623)	5.113	54.778*** (4.659)	5.123
Fully Credentialed Teachers	130.994*** (29.683)	1.420	143.748*** (29.813)	1.401
Teachers Under Two-Years Experience	-9.575 (22.863)	1.253	-5.346 (23.259)	1.249
Average Teacher Salary	.001** (0.0003)	1.917	.001** (0.0003)	1.891
Average Class Size	-2.166*** (.494)	1.652	-2.621*** (.483)	1.545
Percentage of Schools Program Improvement	-26.856** (8.734)	1.772	-17.929** (8.449)	1.625
District Size	-2.524E-5 (0.00005)	1.089	-2.720E-5 (0.00005)	1.089
Superintendent Tenure	.543* (.284)	1.105	.583** (.285)	1.103
Board African American	-27.361 (26.076)	1.248	-18.522 (26.176)	1.238
Board Asian/Pacific Islander	11.850 (31.046)	1.187	-2.735 (31.008)	1.165
Board Hispanic	-7.211 (15.230)	1.513	-6.919 (15.346)	1.513
Board Consistency	13.534** (6.200)	1.230	10.621* (6.199)	1.211
Team Training	3.451 (3.949)	1.045	3.758 (3.976)	1.045
Individual Board Training	6.318 (10.494)	1.843	8.474 (10.540)	1.836

Table 19 (continued)

Variable	Lin-Lin Uncorrected	VIFs Uncorrected	Lin-Lin Corrected for Multicollinearity/ Heteroskedasticity	VIFs Corrected
Years Since Individual Training	-1.815 (1.492)	1.851	-1.707 (1.500)	1.850
R-Squared	.793	-	.790	-
Adjusted R-Squared	.786	-	.783	-
Number of Observations	579	-	579	-
* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level Standard Error shown in parentheses under regression coefficient.				

Table 20

Pooled Data Set Corrected Results Weighted by Average Teacher Salary

Variable	Lin-Lin Uncorrected	VIFs Uncorrected	Lin-Lin Corrected	VIFs Corrected
District API Growth Score	Constant	Constant	Constant	Constant
Percent African American	-141.644** (71.674)	80.488	-132.989** (71.057)	80.244
Percent Asian/Pacific Islander	-20.876 (49.363)	142.709	-23.085 (49.138)	143.259
Percent Hispanic	-42.114** (19.408)	123.084	-45.150** (18.936)	117.968
English Learner Students	-14.336 (18.534)	62.006	Removed to fix multicollinearity	-
Free or Reduced Lunch	-17.220* (9.562)	32.940	-17.777** (9.465)	32.529
Average Parent Education Level	-.834 (2.058)	13.762	-.799 (2.051)	13.793
Fully Credentialed Teachers	9.145 (6.813)	2.340	9.429 (6.836)	2.347
Teachers Under Two-Years Experience	16.243 (10.030)	1.740	16.005 (10.010)	1.738
Average Teacher Salary	.0004 (0.0003)	25.409	.0004 (.0003)	25.471
Average Class Size	-.239 (.381)	9.155	-.233 (.380)	9.158
Percentage of Schools Program Improvement	28.609*** (5.172)	3.861	29.080*** (5.121)	3.808
District Size	.0001 (.0004)	1583.702	.0001 (.0004)	1573.344

Table 20 (continued)

Variable	Lin-Lin Uncorrected	VIFs Uncorrected	Lin-Lin Corrected	VIFs Corrected
Superintendent Tenure	.133 (.142)	1.919	.127 (.141)	1.921
Board African American	SPSS Excluded–Partial Correlation	-	SPSS Excluded–Partial Correlation	-
Board Asian/Pacific Islander	SPSS Excluded–Partial Correlation	-	SPSS Excluded–Partial Correlation	-
Board Hispanic	SPSS Excluded–Partial Correlation	-	SPSS Excluded–Partial Correlation	-
Board Consistency	SPSS Excluded–Partial Correlation	-	SPSS Excluded–Partial Correlation	-
Team Training	2.761 (2.735)	4.107	2.732 (2.725)	4.121
Individual Board Training	-.213 (6.320)	4.850	-.410 (6.285)	4.861
Years Since Individual Training	.285 (.959)	3.874	.324 (.952)	3.881
2005 Dummy Variable	21.094*** (1.493)	2.565	21.061*** (1.488)	2.568
2007 Dummy Variable	31.313*** (2.973)	10.178	31.201*** (2.955)	10.167
R-Squared	.980	-	.980	-
Adjusted R-Squared	.970	-	.970	-
Number of Observations	1029	-	1029	-

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level
Standard Error shown in parentheses under regression coefficient.
Note: District variables used as control variables not included in chart.

Final Results – Significant Variables and Assessing Their Impact

Before getting into the analysis, I will note which variables were statistically significant and at what degree of confidence. As seen in Table 21, the number of statistically significant variables ranges from a low of six variables for the pooled data set, nine variables in the 2003 data set, and 10 variables in both the 2005 and 2007 data

sets. Most notably, only three variables are statistically significant across all four data sets, African American students, Free or Reduced Lunch, and the Percentage of Schools in Program Improvement, showing their consistently strong affect on student achievement.

Table 21

All Corrected Regression Results Weighted by Average Teacher Salary

Variable	2003	2005	2007	Pooled Data Set
District API Growth Score	Constant	Constant	Constant	Constant
Percent African American	-180.364*** (46.646)	-99.552** (38.854)	-130.459*** (30.212)	-132.989** (71.057)
Percent Asian/Pacific Islander	134.960*** (26.379)	105.122*** (21.437)	79.912*** (16.334)	-23.085 (49.138)
Percent Hispanic	-38.287** (17.255)	-9.329 (13.431)	8.496 (11.639)	-45.150** (18.936)
English Learner Students	Removed to fix multicollinearity	Removed to fix multicollinearity	Removed to fix multicollinearity	Removed to fix multicollinearity
Free or Reduced Lunch	-102.494*** (15.152)	-98.284*** (13.808)	-75.673*** (12.043)	-17.777** (9.465)
Average Parent Education Level	38.323*** (4.851)	42.460*** (4.116)	54.778*** (4.659)	-.799 (2.051)
Fully Credentialed Teachers	73.032** (26.452)	50.917*** (15.327)	143.748*** (29.813)	9.429 (6.836)
Teachers Under Two-Years Experience	-66.266** (24.623)	-131.992*** (25.774)	-5.346 (23.259)	16.005 (10.010)
Average Teacher Salary	.0004 (0.0005)	.0005 (0.0004)	.001** (0.0003)	.0004 (.0003)
Average Class Size	-1.556** (.641)	-3.078*** (.634)	-2.621*** (.483)	-.233 (.380)
Percentage of Schools Program Improvement	-93.964*** (26.376)	-35.675** (12.782)	-17.929** (8.449)	29.080*** (5.121)
District Size	-2.874E-5 (0.0001)	-5.963E-5 (0.0001)	-2.720E-5 (0.00005)	.0001 (.0004)
Superintendent Tenure	.359 (.839)	-.427 (.801)	.583** (.285)	.127 (.141)
Board African American	75.664 (55.392)	-20.214 (33.515)	-18.522 (26.176)	SPSS Excluded– Partial Correlation

Table 21 (continued)

Variable	2003	2005	2007	Pooled Data Set
Board Asian/Pacific Islander	-34.863 (48.785)	38.717 (39.774)	-2.735 (31.008)	SPSS Excluded– Partial Correlation
Board Hispanic	-11.786 (21.284)	-35.429* (19.091)	-6.919 (15.346)	SPSS Excluded– Partial Correlation
Board Consistency	8.852 (8.860)	16.951** (7.756)	10.621* (6.199)	SPSS Excluded– Partial Correlation
Team Training	-6.402 (11.343)	4.363 (5.527)	3.758 (3.976)	2.732 (2.725)
Individual Board Training	-15.182 (30.836)	2.272 (17.895)	8.474 (10.540)	-.410 (6.285)
Years Since Individual Training	6.174 (14.579)	-.816 (3.313)	-1.707 (1.500)	.324 (.952)
2005 Dummy Variable	Not Applicable	Not Applicable	Not Applicable	21.061*** (1.488)
2007 Dummy Variable	Not Applicable	Not Applicable	Not Applicable	31.201*** (2.955)
Total Significant Variables	9	10	10	6
R-Squared	.760	.753	.790	.980
Adjusted R-Squared	.748	.743	.783	.970
Number of Observations	393	506	579	1029
* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level; Standard Error shown in parentheses under regression coefficient.				

In looking at the varying impact on student achievement of the three groups of inputs in the education production function used in my regression, student and social factors have the strongest impact on student achievement, with school site factors being the next strongest impact, and district administrative factors having the smallest impact. Within student and social factors, the lowest number of significant variables is 3 out of 5 or 60% for the pooled data set and the highest being 5 out of 5 or 100%. Within school site factors, the lowest number of significant variables is 1 out of 5 or 20% for the pooled

data set, and the other three data sets all have 4 out of 5 or 80% variables significant. This is juxtaposed against the district administrative factors, where both the 2003 and pooled data set have no significant variables and the 2005 and 2007 data sets have 2 out of 9 or 22% variables significant. In looking at my research question, Individual Board Training and Team Training were not statistically significant in any of the four data sets, which was rather surprising given my past research. Further, Board Consistency and Board Hispanic are the only school board related variables that were found to be significant, and only in the 2005 and 2007 data sets. Clearly, student and social factors and school site factors have the largest impact on student achievement with district administrative factors showing little to no impact on student achievement in my regression results. In Chapter 5, I discuss some data issues that may have contributed to the lack of significance in the district administrative variables.

Table 22

Regression Results by Education Production Function Inputs

	Variable	2003	2005	2007	Pooled Data Set
Student and Social Factors	Percent African American	-180.364*** (46.646)	-99.552** (38.854)	-130.459*** (30.212)	-132.989** (71.057)
	Percent Asian/Pacific Islander	134.960*** (26.379)	105.122*** (21.437)	79.912*** (16.334)	-23.085 (49.138)
	Percent Hispanic	-38.287** (17.255)	-9.329 (13.431)	8.496 (11.639)	-45.150** (18.936)
	English Learner Students	Removed to fix Multiciollinearity	Removed to fix multicollinearity	Removed to fix multicollinearity	Removed to fix multicollinearity
	Free or Reduced Lunch	-102.494*** (15.152)	-98.284*** (13.808)	-75.673*** (12.043)	-17.777** (9.465)
	Average Parent Education Level	38.323*** (4.851)	42.460*** (4.116)	54.778*** (4.659)	-.799 (2.051)
Total Student and Social Factors		5	4	4	3
School Site Factors	Fully Credentialed Teachers	73.032** (26.452)	50.917*** (15.327)	143.748*** (29.813)	9.429 (6.836)
	Teachers Under Two-Years Experience	-66.266** (24.623)	-131.992*** (25.774)	-5.346 (23.259)	16.005 (10.010)
	Average Teacher Salary	.0004 (0.0005)	.0005 (0.0004)	.001** (0.0003)	.0004 (.0003)
	Average Class Size	-1.556** (.641)	-3.078*** (.634)	-2.621*** (.483)	-.233 (.380)
	Percentage of Schools Program Improvement	-93.964*** (26.376)	-35.675** (12.782)	-17.929** (8.449)	29.080*** (5.121)
Total School Site Factors		4	4	4	1
District Administrative Factors	District Size	-2.874E-5 (0.0001)	-5.963E-5 (0.0001)	-2.720E-5 (0.00005)	.0001 (.0004)
	Superintendent Tenure	.359 (.839)	-.427 (.801)	.583** (.285)	.127 (.141)
	Board African American	75.664 (55.392)	-20.214 (33.515)	-18.522 (26.176)	SPSS Excluded– Partial Correlation
	Board Asian/Pacific Islander	-34.863 (48.785)	38.717 (39.774)	-2.735 (31.008)	

Table 22 (continued)

	Variable	2003	2005	2007	Pooled Data Set
District Administrative Factors	Board Hispanic	-11.786 (21.284)	-35.429* (19.091)	-6.919 (15.346)	SPSS Excluded– Partial Correlation
	Board Consistency	8.852 (8.860)	16.951** (7.756)	10.621* (6.199)	
	Team Training	-6.402 (11.343)	4.363 (5.527)	3.758 (3.976)	2.732 (2.725)
	Individual Board Training	-15.182 (30.836)	2.272 (17.895)	8.474 (10.540)	-.410 (6.285)
	Years Since Individual Training	6.174 (14.579)	-.816 (3.313)	-1.707 (1.500)	.324 (.952)
	Total District Administrative Factors	0	2	2	0
	2005 Dummy Variable (Pooled Data Set Only)	Not Applicable	Not Applicable	Not Applicable	21.061*** (1.488)
	2007 Dummy Variable (Pooled Data Set Only)	Not Applicable	Not Applicable	Not Applicable	31.201*** (2.955)
	R-Squared	.760	.753	.790	.980
	Adjusted R-Squared	.748	.743	.783	.970
	Number of Observations	393	506	579	1029

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level
Standard Error shown in parentheses under regression coefficient.

Expected Versus Actual Relationships – Some Highlights

Most all of the explanatory variables exhibited the expected relationship direction with the exception of Percentage of Schools in Program Improvement in the pooled data set. As seen in Table 23, the Percentage of Schools in Program Improvement is negative in 2003, 2005 and 2007 but switches to positive in the pooled data set. Meaning that as the percentage of schools in program improvement increases in a district the district achievement score goes down, which makes sense. It is counterintuitive that think that

overtime, the increased percentage of schools in program improvement would have a positive effect on district achievement scores, however this could be due to reforms made within districts to get out of program improvement and get their academic schools up to avoid sanctions. Also worth mentioning on actual relationship directions is with Average Class Size, where the literature is mixed on whether it is positive or negative, but in my results, it is consistently negative across all four data sets.

Table 23

Expected versus Actual Relationship Directions (significant variables only)

Variable	Expected Direction	2003 Actual	2005 Actual	2007 Actual	Pooled Actual
Percent African American	-	-	-	-	-
Percent Asian/Pacific Islander	+	+	+	+	N/A
Percent Hispanic	-	-	N/A	N/A	-
Free or Reduced Lunch	-	-	-	-	-
Average Parent Education Level	+	+	+	+	N/A
Fully Credentialed Teachers	+	+	+	+	N/A
Teachers Under Two-Years Experience	-	-	-	N/A	N/A
Average Teacher Salary	+	N/A	N/A	+	N/A
Average Class Size	+/-	-	-	-	N/A
Percentage of Schools Program Improvement	-	-	-	-	+
Superintendent Tenure	+	N/A	N/A	+	N/A
Board Hispanic	+/-	N/A	-	N/A	N/A
Board Consistency	+	N/A	+	+	N/A

Model Fit – Looking at the Residuals[2]

In order to show that the final functional form and regression equation are a good fit with the data it is analyzing I compared adjusted R-squared values. Adjusted R-squared measures the percentage of variation of API score around the mean created by the explanatory variables. Adjusted R-squared values generally go from 0.00 to 1.0 with

the best fit being 1.0; however, the adjusted R-squared is only comparable for equations using the same variables (plus or minus one) and same number of variables. Note that in the pooled data set, SPSS removed four variables due to partial correlation so the adjusted R-squared is not comparable to the other three data sets.

Table 24

Adjusted R-squared Values

Variable	Best OLS Fit Lin-Lin	Log-Lin	Log-SemiLog	Lin-Lin Corrected for Multicollinearity/ Heteroskedasticity
2003 Adjusted R-Squared	.747	.747	.747	.748
2005 Adjusted R-Squared	.742	.733	.727	.743
2007 Adjusted R-Squared	.786	.780	.772	.783
Pooled Data Adjusted R-Squared	.970	.963	.963	.970

If we look at the results presented in Table 24, it is clear that the Lin-Lin functional form I chose consistently had the highest adjusted R-squared value. Similarly, as mentioned in Chapter 4, the Lin-Lin functional form results were more theoretically correct in comparison to the non-linear forms, further showing the Lin-Lin form to be the best fit for the data. Notably, corrections made to the regressions to fix multicollinearity and heteroskedasticity improved the R-squared for the 2003 and 2005 data sets, with a small reduction in explanatory power, 0.3%, to the 2007 data set. What this means is that my final regression equations effectively explain 74.8%, 74.3%, 78.3%, and 97.0%, respectively of the variation in district API scores. This is a relatively good fit for the 2003, 2005 and 2007 data, and an extremely good fit for the pooled data even though we cannot compare it to the other adjusted R-squared scores. I also believe that if I were

able to include variables for district culture I could significantly increase the explanatory power of the regression.

Elasticities and Confidence Intervals

In order to more easily see and compare the impact of the statistically significant explanatory variables on API, I translated the regression coefficients into elasticities. Converting regression coefficients into elasticities will display the results for each variable as a percentage increase in API scores holding all other variables constant. The elasticities for the statistically significant variables are separated by data set and displayed in Tables 25-28 below, with explanations of the formulas used to calculate elasticity and confidence intervals in the index beneath the table.

Table 25

2003 Elasticities and Confidence Intervals (significant variables only)

Variable (Ln indicates Log form)	Log-SemiLog[1]	Elasticity[2]	Confidence Interval[3]
Percent African American	-180.364*** (46.646)	-0.0078	-257.281 to -103.446
Percent Asian/Pacific Islander	134.960*** (26.379)	0.0110	91.462 to 178.458
Percent Hispanic	-38.287** (17.255)	-0.0157	-66.740 to -9.833
Free or Reduced Lunch	-102.494*** (15.152)	-0.0608	-127.479 to -77.509
Average Parent Education Level	38.323*** (4.851)	0.1256	30.324 to 46.321
Fully Credentialed Teachers	73.032** (26.452)	0.0884	29.414 to 116.650
Teachers Under Two-Years Experience	-66.266** (24.623)	-0.0055	-106.868 to -25.662

Table 25 (continued)

Variable (Ln indicates Log form)	Log-SemiLog[1]	Elasticity[2]	Confidence Interval[3]
Average Class Size	-1.556** (.641)	-0.0513	-2.614 to -0.498
Percentage of Schools Program Improvement	-93.964*** (26.376)	-0.0036	-137.457 to -50.471

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level

[1] Standard Error shown in parentheses under regression coefficient.

Formulas:

[2] Coefficient B_1 * Mean X_1/Mean Y_1 (since X_1 is in linear form)

[3] Coefficient +/- (Standard Error *Critical-t); critical-t based on data sets degrees of freedom

Table 26

2005 Elasticities and Confidence Intervals (significant variables only)

Variable (Ln indicates Log form)	Log-SemiLog[1]	Elasticity[2]	Confidence Interval[3]
Percent African American	-99.552** (38.854)	-0.0044	-163.583 to -35.521
Percent Asian/Pacific Islander	105.122*** (21.437)	0.0091	69.794 to 140.449
Free or Reduced Lunch	-98.284*** (13.808)	-0.0581	-121.041 to -75.527
Average Parent Education Level	42.460*** (4.116)	0.1346	35.677 to 49.242
Fully Credentialed Teachers	50.917*** (15.327)	0.0602	25.657 to 76.175
Teachers Under Two-Years Experience	-131.992*** (25.774)	-0.0117	-174.467 to -89.516
Average Class Size	-3.078*** (.634)	-0.1006	-4.123 to -2.032
Percentage of Schools Program Improvement	-35.675** (12.782)	-0.0031	-56.740 to -14.610
Board Hispanic	-35.429* (19.091)	-0.0022	-66.891 to -3.967
Board Consistency	16.951** (7.756)	0.0080	4.169 to 29.732

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level

[1] Standard Error shown in parentheses under regression coefficient.

Formulas:

[2] Coefficient B_1 * Mean X_1/Mean Y_1 (since X_1 is in linear form)

[3] Coefficient +/- (Standard Error *Critical-t); critical-t based on data sets degrees of freedom

Table 27

2007 Elasticities and Confidence Intervals (significant variables only)

Variable (Ln indicates Log form)	Log-SemiLog[1]	Elasticity[2]	Confidence Interval[3]
Percent African American	-130.459*** (30.212)	-0.0056	-180.236 to -80.682
Percent Asian/Pacific Islander	79.912*** (16.334)	0.0068	53.000 to 106.823
Free or Reduced Lunch	-75.673*** (12.043)	-0.0448	-95.514 to -55.830
Average Parent Education Level	54.778*** (4.659)	0.2061	47.101 to 62.455
Fully Credentialed Teachers	143.748*** (29.813)	0.1739	94.628 to 192.868
Average Teacher Salary	.001** (0.0003)	0.0665	.0003 to 0.001
Average Class Size	-2.621*** (.483)	-0.0821	-3.417 to -1.824
Percentage of Schools Program Improvement	-17.929** (8.449)	-0.0027	-31.850 to -4.008
Superintendent Tenure	.583** (.285)	0.0038	.113 to 1.053
Board Consistency	10.621* (6.199)	0.0049	.408 to 20.834

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level

[1] Standard Error shown in parentheses under regression coefficient.

Formulas:

[2] Coefficient B_1 * Mean X_1/Mean Y_1 (since X_1 is in linear form)

[3] Coefficient +/- (Standard Error *Critical-t); critical-t based on data sets degrees of freedom

Table 28

Pooled Elasticities and Confidence Intervals (significant variables only)

Variable (Ln indicates Log form)	Log-SemiLog[1]	Elasticity[2]	Confidence Interval[3]
Percent African American	-132.989** (71.057)	-0.0064	-250.030 to -15.948
Percent Hispanic	-45.150** (18.936)	-0.0213	-76.340 to -13.959
Free or Reduced Lunch	-17.777** (9.465)	-0.0106	-33.368 to -2.185
Percentage of Schools Program Improvement	29.080*** (5.121)	0.0030	20.645 to 37.515
2005 Dummy Variable	21.061*** (1.488)	0.0095	18.610 to 23.512
2007 Dummy Variable	31.201*** (2.955)	0.0141	26.333 to 36.068

* Statistically Significant at 90% level; ** Statistically Significant at 95% level; *** Statistically Significant at 99% level

[1] Standard Error shown in parentheses under regression coefficient.

Formulas:

[2] Coefficient B_1 * Mean X_1/Mean Y_1 (since X_1 is in linear form)

[3] Coefficient +/- (Standard Error *Critical-t); critical-t based on data sets degrees of freedom

The variable with the highest elasticity, and thus the highest impact, across the 2003, 2005 and 2007 data sets is Average Parent Education Level (.1256, .1346, .2061 respectively), while the variable with the highest elasticity for the pooled data set was percentage Hispanic students (-.0213). Note that both of the highest impact variables are student and social factors, as noted in the literature review it is what the students bring with them to school in the home and environmental influences that have the most impact on student achievement. The variables with the next highest elasticity were Fully Credentialed Teachers in the 2003 and 2007 data sets (.0884 and .1739) and Average Class Size for the 2005 data set (.1006) and Free or Reduced Lunch for the pooled data

set (.0106). Within the second highest impact variables, we see that school site factors begin to become prominent, with the percentage of Fully Credentialed Teachers and Average Class Size becoming important, but notice that student and social factors still play a prominent role with the Free or Reduced Lunch variable. Variables that were relatively inelastic and had the least impact of the significant variables, were Percentage of Schools in Program Improvement in the 2003, 2007 and pooled data sets (.0036, .0027 and .0030 respectively), and percentage Board Hispanic in the 2005 data set (.0022).

In looking at the inelastic variables, note that we don't have many district administrative factors that were statistically significant in the four data sets and that Board Hispanic is the variable with lowest elasticity, and that Percentage of Schools in Program Improvement is a school site factor that proxies for previous performance. This means that even though they affect achievement scores those improvements make smaller impacts on achievement scores. For example, Superintendent Tenure is significant in the 2007 data set, but its elasticity is low (.0038), so efforts to keep a good superintendent in the district longer would not make as much change in achievement scores as would lowering class size (.0821). These findings are comparable to the literature in that district administrative factors have significantly less affect on student achievement than school site factors or student and social factors.

Magnitude of Affects

I next looked at the relative magnitude of the statistically significant variables on district API scores, by detailing the percentage change in API caused by each of the

statistically significant variables. As seen in Table 29, the highest impact on district API scores are found in the variables Average Parent Education Level for the 2003, 2005, and 2007 data sets and Percentage Hispanic for the pooled data set. Where a 10% increase in Average Parent Education Levels translates into a 1.26%, 1.35%, and 2.06% increase in API scores, and a 10% increase in the percentage Hispanic students translates into a .21% decrease in API scores. The variables with the next highest magnitude were Percentage Fully Credentialed Teachers for the 2003, 2005 and 2007 data sets and Free or Reduced Lunch for the pooled data set. Where a 10% increase in Fully Credentialed Teachers translates into a in these variables translates into a 0.88%, 0.60%, and 1.74% increase in API scores, and a 10% increase in Free or Reduced Lunch translates into a 0.11% decrease in API scores. The variables with the least magnitude were Percentage of Schools in Program Improvement for the 2003, 2007 and pooled data sets and Board Hispanic for the 2005 data set. Where a 10% increase in the Percentage of Schools in Program Improvement translates into a decrease of 0.04%, 0.03%, and 0.03% in API scores and a 10% increase in the Board Hispanic variable translates into a decrease of 0.02% in API scores.

Table 29

Magnitudes of Elasticities (significant variables only)

Explanatory Variable	Change in API at 10% increase in IV			
	2003	2005	2007	Pooled
Percent African American	-. 08%	-.04%	-.06%	-.06%
Percent Asian/Pacific Islander	.11%	.09%	.07%	N/A
Percent Hispanic	-.16%	N/A	N/A	-.21%
Free or Reduced Lunch	-.61%	-.58%	-.45%	-.11%
Average Parent Education Level	1.26%	1.35%	2.06%	N/A
Fully Credentialed Teachers	.88%	.60%	1.74%	N/A
Teachers Under Two-Years Experience	-.06%	-.12%	N/A	N/A
Average Teacher Salary	N/A	N/A	.67%	N/A
Average Class Size	-.51%	-1.01%	-.82%	N/A
Percentage of Schools Program Improvement	-.04%	-.03%	-.03%	.03%
Superintendent Tenure	N/A	N/A	.04%	N/A
Board Hispanic	N/A	-.02%	N/A	N/A
Board Consistency	N/A	.08%	.05%	N/A

Using the same example from the discussion of elasticities, a 10% increase in Superintendent Tenure only yields a 0.04% increase in API scores as where the same 10% decrease in Average Class Size would yield a 0.82% increase in API scores. Looking at the magnitude of the variables helps translate regression results into policy options for school boards; if a district must decide whether to spend more money to keep a superintendent or invest in lower class sizes, reducing class size will have a larger impact on student achievement. Similarly, if we look at the magnitude of Board Consistency in 2005 and 2007 (0.08% and 0.05%), we see that it is comparable to the magnitude of both percentage African American (0.04% and 0.06%) and Asian/Pacific Islander students (0.09% and 0.07%). Meaning that increasing board consistency, having

board members with greater tenure/longevity, would have a similar sized impact as student demographic factors on achievement scores. This leads me to believe that districts with a high percentage of African American students would benefit from having a stable school board with members who have served multiple terms. If we look at the magnitude of Board Consistency (0.08% and 0.05%) in comparison to previous literature, it is significantly smaller than Peterson's (2000) finding that intrusive board actions have a -2% impact on achievement scores. However, Peterson measured direct board actions, not characteristics, and included a district culture variable, which could have significantly enhanced my model and our understanding of why board consistency would have a positive impact on achievement. Data limitations also limited the utility of the Board Consistency variable so that it created a partial correlation in the pooled data set, and it is my belief that there would have been a stronger impact if I were able to have a board tenure variable instead of a measure of consistency. In the final chapter, I discuss some reasons for the lack of statistical significance of my key explanatory variables and then provide some recommendations for future research and policy priorities that the California School Boards Association can make to enhance their research, policy activities, programs and services provided to school districts statewide.

Chapter 5

CONCLUSION

The regression results presented in Chapter 4 showed that my key explanatory variables of Individual Board Training or Team Training did not have statistically significant relationships with district achievement in any of the four regression equations. In the concluding chapter, I detail possible reasons that I may not have been able to find a statistically significant relationship between Board Training and district achievement. I then discuss how a focus on creating quantitative data on district culture and learning climate variables could help find the connection between board training and actions and district achievement, and further how CSBA can help in the creation of this data and encouraging further academic research of school boards and their impacts on district achievement. The next section of this chapter addresses data limitations within my regression and in the data stored by CSBA in their database. I then provide some recommendations to CSBA on their current data collection and storage that would significantly improve their current data including ways to add additionally relevant data to their database and cleaning-up historical data. The chapter ends with a brief reflection on this thesis project and the work of CSBA with school board members.

Expanding the Research Question and Data Collection

The intention of this regression analysis was to detect the impact of board training, and thus board action, on district achievement scores. After controlling for a variety of student, social, school site and district factors, I found that board training does

not have a statistically significant impact on student achievement. In a previous study of the impacts of board training on 2008 district achievement scores, I found statistically significant results for the Individual Board Training variable. Some reasons that it may have been significant in 2008, but not in the 2003, 2005, 2007 and pooled data regressions are the use of additional explanatory variables, especially those dealing with school boards, and a significant decrease in the number of observations. The 2008 regression had a total of 16 explanatory variables in the final regression, as compared to the 19 explanatory variables (21 for the pooled data) for the final regressions included in this thesis. There was also a significant decrease in the number of districts, or observations, where I had 563 districts in 2008 but had 393(2003), 506 (2005), 579 (2007) and 1029 observations but only 342 districts in the pooled regressions. This decrease in observations was caused by data limitations in the Superintendent Tenure variable created using CSBA data, where CSBA's more recent data is more complete. This combination of factors is important as the increase in explanatory variables combined with a decrease in the number of valid observations decreases the degrees of freedom of the final regressions, the 2008 regression had 546 degrees of freedom as where this thesis's regressions had degrees of freedom ranging from 373 (2003), 486 (2005), 559 (2007), and 1007 (pooled). Decreases in the degrees of freedom can decrease the confidence in each variable's results. Also, since I added significantly more district administrative variables than in the 2008 model, it is possible that it further

decreased my ability to accurately test the impact of my key explanatory variables of board training beyond what the decrease in the degrees of freedom may have caused.

Another possibility is that not having a board culture variable affected the final results. As noted in the literature and referenced in Chapter 2, board actions exerted an influence on student achievement largely through its impact on school/district learning climate, a variable that I was not able to include in this regression. It is possible that Board Training was not statistically significant but Board Consistency was because the culture and climate of the board has a greater affect on consistency of the board, where greater consistency and longevity on the school board correlates and possibly is even caused by positive board and district culture. It is also important to note the positive and statistically significant relationship between Board Consistency and Board Training, where in all four data sets there were correlations of .196, .227, .181, and .182 for the 2003, 2005, 2007 and pooled data sets. More importantly, when I ran regressions for the impact of Board Training on Board Consistency there was a positive and statistically significant relationship at the 99 degree level with results of .571, .488, .291 and .308 for the 2003, 2005, 2007 and pooled data sets. There is a strong and significant relationship between Board Training and Board Consistency that merits additional research. It is also possible that if I were able to include district culture and climate variables, the regression would show that Board Training and Board Consistency impact district achievement through district culture and climate. Since I cannot explore this hypothesis without collecting district culture and climate data, I recommend that CSBA begin focusing its

research and resources on developing viable district culture and climate data for further quantitative study and in turn use the findings of those studies to inform their training programs, policies and services.

Focus Research on District Culture and Learning Climate

CSBA does not currently have a research arm or think-tank within the organization or the funding to create one at the moment, but it can help foster and focus academic research on district culture and climate. One way that the organization can begin to focus research on district culture and climate, is to create collaborative relationships and partnerships with higher education institutions across California, focusing specifically on graduate level Public Policy, Public Administration, and Educational Leadership programs. Although I chose to research Board Training because I worked for CSBA's board training program, graduate programs have a never-ending supply of eager individuals looking to research and analyze a wide variety of topics. When choosing a thesis or dissertation topic, some students create their own research question and others take up offers from professors or organization to research a topic of their choosing. It is in this capacity where CSBA can play a prominent role in providing a variety of research agendas, topics, and resources in the form of information, access to research subjects, and possibly even raw data. For example, it would be extremely worthwhile to try to replicate Peterson's results on board intervention in site-based decision making and impacts on school/district culture to further define positive versus negative board member actions.

CSBA can coordinate with graduate programs to find students interested in researching this topic, creating the surveys, computing the data, and even analyzing the data collected for statistically significant relationships in a thesis or dissertation. This option provides easier access to potential researchers willing to focus on school board related research questions, but also requires greater support and resources from CSBA to complete these studies. It also comes with potential risks and delays as students may discontinue their education and not produce final products, students have other commitments and may deliver final products much later than expected, and although faculty will supervise their work, they lack the expanded knowledge of seasoned research professionals.

Another option is to work on creating partnerships with other education focused research organizations like EdSource, The Education Trust, WestEd, or RAND. These companies have the research staff, data collection apparatus and financial resources to accomplish the research in a professional and timely manner, and CSBA can assist in getting district cooperation for the studies and providing board level data. The one major difficulty in this option is that these organizations have pre-existing research agendas and have historically not focused on school board action and influences on district achievement. So gains in the level of expertise, self-sufficiency in data collection, and speed of deliverables go hand in hand with more restrictions on the types of research questions these organizations are willing to take on. Regardless of which option, or both,

that CSBA chooses to embark on, CSBA can take steps now to prepare the organization for these future partnerships.

Making Better Use of Existing Resources

In order to maximize CSBA's use of current resources and research and prepare for future research partnerships, CSBA should explore greater use of their current online survey system and creating a biennial survey of district culture. CSBA currently licenses a robust online survey system through Informz that it uses for its biennial membership survey and other surveys geared toward providing feedback on products and services provided by the association. The Informz survey system actually has the ability to do extremely complicated branching surveys and the capacity to set-up automatic coding of survey answers that download directly into a database or statistical analysis program such as SPSS or STATA. Currently none of the surveys given by the association makes full use of these advanced options, and as far as I am aware, the association does not create surveys to gather research on board governance factors, culture and climate, or even district administrative practices.

As an initial starting point, CSBA should begin exploring the use of the advanced survey features, especially coding answers for at least the membership survey, and possibly even creating surveys to collect basic information on district operations, such as what districts use site-based management, curriculum committees, or teacher evaluations with student performance as a factor in the evaluation. Starting to use the coding function and gathering data on policies and legislation that the association advocates for,

or against, will prepare the association for more difficult research endeavors, like a biennial survey on district culture and climate. CSBA should make an effort to create a robust district and board culture and climate survey and administer it to random samples of board members, superintendents and school principles biennially. A district culture and climate survey in the near future would inform training programs of subject areas needing additional development and could be used in future academic research. Working towards fully utilizing the current survey system makes the association more efficient and helps improve current programs and services while preparing the association for a broader research agenda in the future.

Statistically Significant Board Variables and Data Limitations

Unlike the Board Training variables, Board Consistency was statistically significant in the 2005 and 2007 data sets, and had it been a more precise variable, such as average board tenure, it would not have had partial-correlation problems and been excluded from the pooled regression. As discussed in Chapter 3, the Board Consistency variable is extremely limited due to the available data on past school board rosters within CSBA's database. CSBA's data collection for board member election dates is extremely better than its records on when a board member left and/or returned to serve on the same board, and its current practices are better than they were a few years ago. Without being able to reliable show board terms during the 2003, 2005 and 2007 academic years it was not possible to calculate average board tenure, like the superintendent tenure variable.

Thus, Board Consistency was a measure of what board members served on their current district's board during all three years and were still on that board in 2010. Similarly, the Superintendent Tenure variable was not only limited by the available data but also limited the final number of observations for the 2003, 2005 and 2007 data sets since it was the variable with the least number of valid observations. The reason Superintendent Tenure was limited is due to missing data or data entry errors, with many of the past superintendents not having appointment and termination dates, or having inaccurate termination dates that required case-by-case basis verification. To ameliorate these problems, I recommend that CSBA take the following course of action: fix current/active board members and superintendent data, move to using ID numbers that match the district ID numbers of the California Department of Education, and lastly begin the slow process of cleaning historical data for future research use.

Addressing Missing and Incomplete Data

The data CSBA keeps on active school board members, superintendents, and their districts is robust but is not always complete. Due to lack of time and experienced data collection and entry professionals, the one or two staff that is responsible for updating and ensuring the accuracy of the data are often stuck playing catch-up on data entry and rely on a volunteer group of other association staff to assist in annual updates. I have personally assisted as a volunteer to help in the annual updates, but since the volunteers still have to complete all of their regular duties, our ability to follow up with every district is limited and a certain percentage of districts information will not be addressed.

Also complicating this issue is district responsiveness to CSBA data requests, where some districts provide prompt, accurate and complete information and others do not. To help address this problem, I recommend that as CSBA analyzes its organizational needs and restructures staff to areas of greatest need, which it is currently doing, that the association dedicates at least one more part-time position to data collection, entry, and cleaning. This part-time position can work with the other current database staff on lists of current board members and superintendents without election dates, missing demographic information, and ensuring accurate end dates of service. This staff member would have the time to make additional phone calls to districts to verify information and follow-up on changes in status that have eluded its previous efforts. Additional resources of staff time to ensuring the accuracy of current board member and superintendent data would take the association a big step towards creating a future research agenda.

Integrating and Bolstering CSBA Data with Data from the CDE

Another way to bolster CSBA's future research agenda is to integrate California Department of Education (CDE) data into its own database. Currently each school district has a unique identification (ID) number in its database, but this number is not its CDE provided County-District-School (CDS) Code that CDE uses to report all academic achievement information. This adds a layer of complexity to creating data sets with CSBA data that is unnecessary, as there are a few districts with exactly the same district name and the only way to differentiate them is by their county. This also complicates individual board member and superintendent information as you must track down their

district information changes using their CSBA ID and then match each change in CSBA ID to its CDE ID, this is particularly burdensome with superintendents whose tenure at any one school district may be short. Moving each district to CDS Codes (CDE IDs) would require an initial dedication of staff hours but would have exponential pay offs since it would also allow CSBA to add achievement, enrollment, and other district data to its database in automated updates, making its database a valuable commodity in research terms. The conversion to CDS Codes would also allow for the addition of district financial information from CDE to the database, which could produce additional valuable information to CSBA on the programs and services that would benefit a district. Overall, for the small amount of time required for a one-time conversion to CDS Codes, it would be a worthwhile investment for CSBA in future research agenda impacts as well as future program and service impacts.

Cleaning-up Historical Data and Creating Historical Data Sets

The most helpful but also most time-consuming endeavor CSBA can make towards creating a future research agenda is cleaning and fixing its historical data, and once fixed, creating historical data sets integrated with achievement data as ready to use data. This will be a longer-term endeavor than the other two recommendations regarding current data and CDS Codes, and will take significantly more staff and or volunteer time to complete. As I noted in Chapter 3, there are over 12,000 past school board members in CSBA's database, and adding past superintendents would increase the number and complexity due to their movements between districts. Each record would need to have its

dates of service verified, including changes in district or temporary stops in service. On top of this, the staff and/or volunteers working on this would need to work collaboratively with school district staff and county election staff, as they may have to do significant research on older data that district staff do not have or keep records on.

For this reason, I suggest cleaning and creating historical data in phases, starting with data from 1999 to present, working from newest to oldest, since that is the beginning of the current accountability system in California. Once the 1999 to present data is verified and entered, the staff can begin work on creating ready to use data sets for each academic year so that academic achievement data can be integrated into each data set. As each academic year data set is completed, the association can begin looking for research partners to use these data sets in quantitative analyses and thus begin building their research apparatus and agenda. After completing the 1999 to present data cleaning and sets, the association can then make a determination of what years the next phase should include and which achievement measures to integrate into those data sets. By fixing historical data in phases, CSBA can build its research partnerships alongside this endeavor and take advantage of their partners' assistance in researching and fixing the data while building their research program.

Reflections

I cannot express the amount of gratitude I have to the California School Boards Association and its staff and membership over the duration of my masters program and thesis. Over the past seven years of service at CSBA, I have been able to gather a broad

range of perspectives on good governance and been given the opportunity to integrate academic principles of organizational development and program management into the programs I have worked with at CSBA. Both the staff and members have been supportive of my endeavor to try to show the links between district outcomes and the excellent work the association does with and on behalf of school board members on teaching good governance principles. Although my research did not show the linkage I had hoped to find from board training to district outcomes, I firmly believe that future research on district culture and climate will show that school boards who learn and practice good governance principles have a small but significant impact on their districts achievement. Through future research, I believe the California School Boards Association can build a solid quantitative base of research that informs the training, programs and services the association provides and further elevate the role and work of school boards for the betterment of the children of California.

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