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Exploratory Study of the Relationship Between State Fiscal Effort and Academic Achievement

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EXPLORATORY STUDY OF THE RELATIONSHIP BETWEEN STATE FISCAL EFFORT AND ACADEMIC ACHIEVEMENT

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ABSTRACT

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Prior empirical research has taken many varying approaches to determine if differences in funding significantly impacts student academic achievement. However, much of these studies exhibit weak generalizability due to their limited scope, timeframe and dissimilar achievement measures. To expand upon the already robust literature in education finance this study measures interstate funding disparities via state fiscal effort and determines its impact on several measures of student academic achievement. To control for threats to external validity the research investigates the variables over ten years to determine if the relationships hold over time. Statistical measures employed within the research include bivariate correlation, simple linear regression, time lagged correlation, predictive linear regression modeling and historical panel data analysis via a least square dummy variable model. Findings established that state fiscal effort and academic achievement are not significantly correlated. Additionally, findings were inconclusive in establishing that state fiscal effort is a significant predictor of achievement. The historical relationship between the variables of state fiscal effort and academic achievement negligible given a lack of significant time lagged correlations and the breadth of calculated lead times for states to reach established levels of achievement. Lastly, in the historical panel data analysis the amount of variance explained by other variables such as race and socio economic status were much more significant compared to state fiscal effort.

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Chapter 1

INTRODUCTION

This dissertation investigates current and past state educational fiscal practices and determines their impact on student achievement in the United States. The study expands on previous research by investigating a common measure of fiscal effort for each of the fifty states. Additionally, student outcomes are measured on a common national assessment. To increase the validity of the research, the project addresses data for more than ten years, from 1996-2007. An outcome of the study is a trend analysis which will provide historical evidence of the relationship between the measure of state fiscal effort and its impact on student academic achievement. The first chapter of the dissertation presents the background of the study, specifies the problem of the study, describes its significance and provides an overview of the methodology. Delimitations and term definitions conclude the chapter.

Background

Education spending has consistently been a focal point of debate in United States society. Taxpayers often believe that schools receive too much funding, and therefore do not want more of their tax dollars going toward education spending. Opponents of increased funding for public schools often fuel taxpayer discontent with the argument that, "money doesn't matter" in education. They cite the rise in federal and state support for schools and the lack of measurable progress in United States public schools (Walberg & Walberg, 1994). Additionally, Couch, Shughart, & Williams (1993), determined that education spending has increased at every level of government while educational

achievement in the United States, whether measured in terms of student performance on standardized tests, literacy rates, or other dimensions of learning, has been stagnant.

However, educators often claim that current funds are insufficient to finance necessary school programs. Advocates of increased funding cite that total dollars towards education at the federal level have only increased due to special education mandates and that money earmarked at the state and local levels for general education and gifted students has remained constant despite legislation that commands improvement across all groups (Ladd, Chalk & Hansen, 1999). Still some research has cited gains in achievement in spite of insufficient funds. In recent assessments the average mathematics scores of both U.S. fourth-graders (529) and eighth-graders (508) were higher than the Trends in International Mathematics and Science Study (TIMSS) scale average (Gonzales et al, 2008). Additionally, compared to 1995, the average mathematics scores for both U.S. fourth- and eighth-grade students were higher in 2007 (Gonzales et al, 2008).

A review of past trends and findings of school finance research help give perspective to the study and provide a better understanding of current research in the field. In the early 20th century research perceived schools as a closed system which assumed that leadership and task behavior were determined exclusively by internal dynamics (Marion & Flanigan, 2001). It was believed that outside forces had little impact within school settings. School finance research in this era investigated school spending practices and their efficiency. Major studies concluded that greater educational outcomes were seen in schools with higher expenditure practices (Marion & Flanigan, 2001).

The perception of schools then moved to an open system in the 1950s. Researchers of open systems focused on outside factors and their effect on student

achievement. Studies progressed from spending at the district or state level to investigating the impact of school level factors. Studies concluded that socioeconomic status of students had larger impacts on student achievement compared to variations of school/district level disparities (Marion & Flanigan, 2001).

In the 1970s and 1980s student populations changed due to the inclusion of special needs students and school culture shifted with the advent of the report entitled "A Nation at Risk" (National Commission on Excellence in Education, 1983). Federal legislation in the form of the Elementary and Secondary Education Act (ESEA) of 1965 and the Education for All Handicapped Children Act of 1975 dramatically changed the demographics of public school student populations. The *Nation at Risk* report contributed to a growing sentiment that public schools were failing miserably and it sparked a wave of local, state, and federal reform efforts starting with its release in 1983. During this era research transformed in to a mixed approach that examined both internal and external influences on student achievement. Education finance research focused specifically on the impact of detailed expenditures such as student resources and teacher salaries on student achievement. Findings were mixed in determining the impact of varying resource levels on academic achievement. Studies examined in chapter two reflect the aforementioned mixed research perspective of schools. A prominent research study with wielding influence during the 1970s and 1980s was hailed as the "Coleman Report" (Coleman et al, 1966). The Coleman Report indicated that differences between schools have little impact on achievement. This interpretation was derived from the fact that only about 10% of the variance in the test scores was associated with differences between

schools, while about 90% was associated with differences between individuals within the examined schools (Coleman et al, 1966).

Hanushek (1986) found that average class size, teacher content preparation and the number of books in school libraries were all positive indices of student achievement. These are all organizational fiscal decisions that can have great variability from school district to school district and state to state. It is extremely important to note that student academic ability is a product of years of development. Hanushek (1986) concluded that focusing on student achievement over a short period of time can be unduly negatively discriminating.

Building on this suggestion are two major studies that investigated school spending practices on a long-term basis. Flanigan, Marion & Richardson (1997) examined student reading achievement in South Carolina across a seven-year period in which funding for education increased for four years and then dwindled. They found that expenditures for teachers with graduate degrees, district taxing effort, and median family income positively affected achievement as measured by the South Carolina Basic Skills Assessment. In contrast, state aid, district wealth, local expenditures, and allocations for administration negatively impacted achievement. In analyzing indirect effects of the state policy it was found that increased family income stimulates increased taxing effort which was related to higher achievement levels. Local expenditures enhanced achievement indirectly because they were negatively related to administrative overhead and positively related to advanced teaching degrees. The negative effects on achievement were strongest during low initiative years of the excellence movement and weakest during high initiative years; conversely, the positive effect variables increased in strength during peak initiative

years (Flanigan, Marion & Richardson 1997). In this study it was evident that increased effort by the state resulted in improved academic achievement. Verstegen and King (1998) conducted a major meta-analysis which spanned 35 years of data of education funding research with respect to achievement. Findings suggested that teacher characteristics, class size and classroom resources all positively influence student achievement as measured by various financial and achievement outcomes.

The common thread among historical research is the specific focus on either specific funding or achievement variables. Research has been inclined to focus on single fiscal policy practices such as improving teacher quality. All too often, studies have concentrated too briskly with respect to time or exclusively on certain states and localities. Marion & Flanigan (2001) revealed the wide range of research agendas involved within the history of educational funding. Regardless of perspective, historical findings have demonstrated that either money or education resources impact achievement at various levels. The weakness within the literature is that funding is loosely defined and achievement is measured on dissimilar assessments.

Hanushek (1986) is often cited for demonstrating that certain administrative practices that are associated with increased spending positively influence academic achievement. The self proclaimed weakness within Hanushek's study was its limited timeframe and differing funding measures when comparing states.

Flanigan, Marion & Richardson, (1997) and Verstegen and King (1998) combat the research weakness of timeframe by conducting investigations that span several years. The results from these studies show promise in the historical trend analysis on the impact of funding, but the scope within Flanigan, Marion & Richardson, (1997) research was

specific to a single state and difficult to generalize to a broader audience. Verstegen and King (1998) looked at specific funding increases associated with teacher characteristics, class size and resources. This funding variable is very specific and again difficult to make broad inferences on the impact of money on achievement.

These highly cited and respected research studies show promise with respect to the importance of improved resources but could be improved by expanding the scope of the research. Current research reflects these limitations in funding variables, scope and timeframe. This investigation improves upon these studies by looking at funding and achievement on common variables over an increased time span while implementing econometric statistics such as distributed lag analysis and a fixed effect least squares dummy variable model, which are not often used in education finance studies. The outcomes clarify the impact of funding at the state level on academic achievement.

Problem Statement

Currently, the professional and academic debate on school funding and achievement has two general concentrations. The first centers on state or district level equity of funding. Equity is usually described as the evenness of capital supplied to schools (Owings & Kaplan, 2006). The second looks at specific state or local reform efforts that have increased funding and their subsequent impact on student achievement. Numerous outlier studies have researched resource reallocation, legislation and litigation practices, and cost comparisons of school privatization. Subsequently, research findings have been mixed or inconclusive. There is abundant research that attempts to correlate federal, state and local educational spending practices with student achievement. However, the limitations of these studies include poor generalizability due to limited

range of populations and locations examined. Studies often focus on specific districts or single state education funding practices. Generalizing to larger populations is difficult. Additionally, the variability in educational spending is broad and a weak indicator total funding commitment from local, state, or federal government. The varied findings of current research studies add to the partisan outlook on educational spending and academic achievement. Unfortunately, findings from these studies are all too often over generalized and perceived as factual evidence either for or against funding public education initiatives.

Significance

This study examines the impact of state fiscal effort on student achievement for more than ten years, from 1996-2007. Fiscal effort is an analysis of education funding as it examines how much of a state's wealth is earmarked for education (Owings & Kaplan, 2006). This study expands on previous research by investigating each of the fifty states' effort towards education funding along with assessing student outcomes on a common national assessment. To increase the reliability of the findings the scope of the project addresses data on these variables from the past ten plus years.

Current research has identified many different issues of investigation and equally as many stances on school funding. This study adds to and expands the current body of knowledge about school funding practices and their impact on student achievement. The exploratory nature of the research will open new outlets of research with respect to fiscal effort, state to state comparisons, and time series analysis within education spending research. More importantly, with distributed lag analysis policy trends of education spending can identify the time frame for expected return on investment for education

spending. This model will enlighten policy makers and provide evidence that achievement gains are a product of years of work and investment. In addition the study will take a national perspective of education funding and achievement and create a trend analysis that spans more than ten years. This study fills gaps in the literature concerning state level education funding policy and its impact on student achievement. The empirical findings produced from the study provide a long-term trend analysis of state spending practices and determine if past education spending impacts student academic achievement. Lastly, econometric models provide forecasts of future achievement based on past inputs.

The design of the study employs unique variables with respect to education funding research. The measure of state fiscal effort will determine the extent to which state governments utilize their fiscal capacity to fund education. This funding variable differs from much of the previous research in that it measures a state's commitment to providing money towards education. The measure also allows for straightforward comparison of states because they are assessed on a common variable. This type of comparability is not frequently seen in education finance studies. Additionally, the study has a national perspective by analyzing each state in their effort to fund education and each state's student academic achievement.

Moreover, the academic achievement variable is measured by a single common assessment in which each state participates. The National Assessment of Educational Progress (NAEP) is considered the nation's report card, and very few finance studies use data from this assessment. It is rare to have a common basis for analysis between states with regard to achievement. NAEP data extends for multiple years with results in three

different grade levels (4^{th} , 8^{th} & 12^{th}). This allows for a long-term trend analysis of the impact of state fiscal effort, a major weakness in prior research. The current study also provides a forecast of lead time for each state to reach a set maximum level of achievement and if a definitive lag time between funding and achievement exists.

Methodology

A non-experimental ex post facto research perspective examines the impact of state fiscal effort on student academic achievement. Fiscal effort is a more detailed analysis of a local, state, or federal governments' dedication to funding education and is calculated as the ratio of a gross state product per capita to state level per pupil expenditures. In context of the study, the treatment of state fiscal effort and the academic achievement outcomes have already occurred. An important outcome of the study will be a historical econometric trend analysis that will explain the strength of the relationships between state fiscal effort and achievement, determine significant lag times of funding on achievement and account for variance that often explains differences associated with achievement levels.

Delimitations

A weakness that exists in ex post facto research designs is the absence of true random sampling. However, in studying causal relationships some circumstances or phenomenon are better served by studying the naturally occurring groups rather than manipulated random samples. In the instance of examining phenomenon surrounding education funding it is much more effective to examine groups that are already different and search retrospectively for the factors that brought about differences. This is in contrast to taking groups that are equivalent and subjecting them to different treatments.

Additionally, biased correlation estimates can result in distributed lags analysis due to a failure to include possible covariance. Lastly, fixed effects models least squares dummy variable model with many variables may exhibit multicollinearity, which increases the standard errors and consumes the model of statistical power to test significance. Nevertheless, the strength of this research will be the evidence provided in the state to state differences in funding and their impact on student achievement. If little or negative correlations are found then future research can focus on intrastate funding disparities and their impact on achievement. Lastly, the generalizability of this research can only be at the state level as localities are not examined.

Definitions

1. Fiscal Effort: A ratio of a state's Gross Domestic Product (GDP) to its actual total allocation of funds towards K-12 education
2. Ex post facto: Studies in which the variation in the independent variable has already occurred in the past, and the researcher, "after the fact".
3. NAEP: National Assessment of Educational Progress, only nationally representative and continuing assessment of what U.S. students know and can do in various subject areas
4. NCLB: The No Child Left Behind Act of 2001, legislation that requires all children is assessed each year in order to show adequate yearly progress in reading and mathematics.
5. Achievement: A number of students scoring proficient or above a given standard
6. NELS 88: National Education Longitudinal Study of 1988, nationally representative sample of eighth-graders that reported on a range of topics.

7. Gross State Product: GSP, measurement of the economic output of a given state and its collective resources.
8. IDEA: Individuals with Disabilities Education Act, law that governs how states and public agencies provide services to children with disabilities.
9. ESEA: Elementary and Secondary Education Act, legislation to provide financial assistance to schools educating low-income students.
10. Property tax: Taxes paid on privately owned properties and are based on local tax rates and assessed property values
11. Equity: allocation of the necessary resources (material and human) for all people to learn at the highest level.
12. Per Capita: Used to indicate the average amount of something per person
13. Capacity: The total amount of available money for a given entity
14. FCAT: Florida Comprehensive Assessment Test
15. TIMMS: Trends in International Mathematics and Science Study
16. GDP: Gross Domestic Product, the total market values of goods and services produced by workers and capital within a nation's borders during a given period
17. American Recovery and Reinvestment Act of 2009: an economic stimulus package enacted by the 111th United States Congress and signed into law by President Barack Obama on February 17, 2009.
18. Title I: A federal program that provides funds to improve the academic achievement for educationally disadvantaged students who score below the 50th percentile on standardized tests, including the children of migrant workers.

Chapter 2

LITERATURE REVIEW

Introduction

The dispute over school funding and impact on student achievement is longstanding and at a current stalemate. Recent empirical findings do not discredit or fully support the utility of increased funding and its subsequent impact on academic achievement. The crux of the funding debate stems from the perceived success of schools and the amount of tax payer expenditure. Taxpayers feel that schools receive adequate funds and do not want tax increases that would go towards education (Kozol, 1991). Others viewpoints ascertain that education funding is adequate but inefficient, citing that consistently underperforming groups that attend private and parochial schools that spend equally on students have improved academic records (Hill, 2008).

Education professionals often claim that the status quo of funding is deficient to support merely adequate school programs (Cummins, 2006). Viewed as a whole, most societies consider education as a valuable input for quality of life. Several empirical studies confirm that education provides positive returns to society as more education leads to higher productivity and wages (Angrist & Krueger, 1991; Ashenfelter & Krueger, 1994; Card, 1995). The funding debate does not question the value of a quality education. Disagreement stems from differences in perceptions regarding academic success and funding for "quality" schools. Many education researchers contend that a majority of schools located in poor urban and rural areas do not have enough funding to minimally equip their students according to a bare bones guideline of adequacy (Cummins, 2006). The consensus among many professional educators is that "adequate"

schools alone are not nearly enough and that society should strive for "great" schools that prepare students for difficult future challenges. This perception drives the appeal for increased funding for United States public schools. Regardless of viewpoint, academic achievement has room for improvement among public schools in the United States. Individual state progress reports based on the No Child Left Behind Act of 2001 (NCLB) and international comparisons confirm that U.S. students are behind with respect to achievement gains in several subjects (Gonzales et al, 2008). The public perception of failing schools and professed increases in school funding steer the viewpoints on the futility of increased educational funding. In addressing the general question, "Does funding impact student academic achievement?" this investigation examines the importance of state level monetary effort on student academic achievement in reading and mathematics. A goal of the study is to provide a holistic view of state level funding and fiscal policy, and its impact on achievement.

Conceptual Framework

The review of the current research literature has identified many different issues of investigation and equally as many stances on the importance of school funding. Some research attempts to correlate federal, state and local educational spending practices with student achievement. A limitation of these studies includes weak generalizability because of narrow focus on setting and funding variables. Spending variables in past research such as per pupil spending are broad and do not isolate a state's commitment to education funding. In demonstrating the importance of the study, the review of the literature investigates three related areas to school funding and academic achievement. First, the sources and current practices of school funding are explained, examined and placed

within the context of this study. Next, the controversy of school funding and academic achievement is reviewed within the related empirical research. Relevant research touches many subsets of the education funding debate and findings are presented on the range of fiscal practices utilized. These funding practices reflect agendas that aim to better schools by decreasing class size or improving teacher quality. Some poignant differences among studies are found within their respective areas of investigation. These differences include studies that researched various funding initiatives at the state or local level and longevity of the studies. Additionally, the historical use of NAEP data in education finance is explored and placed within context to this study. Lastly, the concept of fiscal effort was examined, along with various econometric statistical measures that have been previously employed in school funding research. Moreover, relative strengths and weaknesses of these measures are provided for use in educational funding research. The chapter concludes with relevant research objectives, questions and hypotheses.

The rationale for the conceptual framework is derived from the research design and questions. This study explores the measure of state fiscal effort and its impact on student achievement. It enhances previous research by investigating the impact of state fiscal effort towards funding education by assessing academic achievement on a common national assessment. To increase the reliability of the research, the scope of the investigation will address data on these variables over the past ten plus years.

Sources and Practices of School Funding

Historically, The U.S. Constitution leaves the responsibility for funding public K-12 education with the states. However, in the past 50 years the federal government has provided additional assistance to the states and public schools in an effort to supplement

fiscal support for education. Federal funds are not intended to be used to supplant existing support from the state and local levels. This support to schools is granted through legislative acts such as the Economically Disadvantaged Students (ESEA, Title I) and Individuals with Disabilities Education Act (IDEA) (United States Department of Education, 2005). Given the advent of this legislation, the federal share of K-12 spending has risen in recent years. In 1990, the federal share was 5.7 percent of the total cost of K-12 funding. That figure has increased to 8.3 percent as of the 2006 fiscal year budget and has provided at total of $37.6 billion for K-12 education. Given the federal mandates of education reform one would presume that budget allocations for education will increase but this trend would be purely speculative. However, it is important to note that the federal share is still the smallest portion of total education costs for American public schools.

Education is the largest budget item in each of the fifty states. State share of education funding varies widely from state to state, from a high of 83.9 percent in New Mexico to a low of 38.2 percent in Nebraska (United States Department of Education, 2005). However, while elementary and secondary education expenditures on a per–pupil basis have been growing over time, education expenditures have been relatively stable as a percentage of state budgets (about 22 percent) over the last 20 years (Murray, Rueben, & Rosenberg, 2007). Much of the increased cost has been passed to the localities.

Consequently, states develop educational funding formulas to determine the total amount of funds needed for each student educated at K-12 public institutions. There exists much variation between states funding formulas.

A frequency break down of the type of formula and the number of states that utilize them is as follows:

- Foundation/Base Formula (25 states)
- Modified Foundation/Base Formula (12 states)
- Teacher Allocation (7 states)
- Dollar Funding per Student (2 states)
- Other Systems (4 states)

The Foundation/Base Formula provides equal base-funding amount for each locality that is multiplied by a weight for each enrolled student. The weight factor varies depending on the perceived level of the student educational needs (Griffith, 2005). In these scenarios schools that have higher populations of disadvantaged and special needs students are afforded more funding.

A Modified Foundation/Base Formula provides a structure that is similar to a traditional foundation formula but includes modifications which can cause it to function quite differently (Griffith, 2005). The most relevant difference found in a modified foundation/base formula is that base funding is not equal for all local districts. Base funding amounts vary widely at the local district level. In most instances states that employ this strategy often leave funding of high needs students to the local government.

A Teacher Allocation formula allocates funding for education staff as well as other costs to districts based on total student enrollment (Griffith, 2005). In this formula state policy makers determine an adequate funding measure to provide acceptable student-to-teacher ratio.

States that employ a Dollar Funding per Student formula provide an exact dollar amount per student that is weighted by need (Griffith, 2005). Students of varying backgrounds receive set amounts of funding based on perceived need. However, the states that use the dollar funding per student formula put into legislation the exact dollar level of funding that each student needs for education (Griffith, 2005). An issue that can arise with this type of funding allocation is the potential interference from legislative negotiations and politics.

Lastly, several states employ uncommon measures to fund education. One which includes funding school districts based on previous year budget allocation with a standard yearly increase based on inflation rates. Other states are absence of a traditional state funding system. These include states such as Hawaii and the District of Columbia that only have one source of capital to fund education. These funding formula differences can cause interstate disparities in education resources. These disparities can lead to inequitable educational opportunities for various state localities which in turn can impact achievement.

Variability in state funding and effort is of great concern within the U.S. public school system. Federal law mandates that every student be afforded and equitable and equal education (Odden & Picus, 2004). All too often states rely on local property taxes to fund gaps in the education budget. Dramatic variations in property wealth across communities create large inequalities in local districts' ability to pay for school infrastructure (Arsen & Davis, 2008). Local property values vary widely across the United States. Disparity is caused when property-rich districts can raise large amounts of revenue with low tax rates and property-poor districts struggle to rely on insufficient

funding with high property tax rates on citizens that commonly cannot afford increases (Holahan et al, 2004).

For local government education is also the largest area of spending. Local governments generally contribute about 44 percent of total education costs on average (United States Department of Education, 2005). These costs are paid primarily by property taxes which often create district to district disparity in tax revenue and subsequent gaps in funding (Baicker & Gordon 2006).

Two problems arise with current funding practices of public schools. The first is interstate funding disparity, which is the focus of this study. The second is intrastate funding disparity. Interstate disparities in school finance include the inequities of funding among the different states. This disparity is caused by a number of factors, including state capacity or how well off a state is based on their economy and resources and effort or the state's willingness to provide funding for education (Augenblick, Meyers, & Anderson, 1997).

Intrastate disparity is caused by the differences in revenue generation among the various school districts within a specific state (Augenblick, Meyers, & Anderson, 1997). This research provides evidence that interstate disparities may be a cause of student academic achievement differences. If this fails to be the case, future research could focus on intrastate disparities using a similar framework.

Controversy of School Funding and Achievement

Several studies in the area of education finance focus on a variety of models that intend to predict spending practices of state or local government and their subsequent

impact on academic achievement. Studies focus on increased spending practices with the intention to reduce class size or increase teacher salary and their impact on student achievement.

A study conducted by Archibald (2006) looked at school expenditures for instruction, support, leadership and operations and their relative impact on student achievement. The research focused on one school district and its student achievement on a state level assessment for reading and math. It concluded that expenditures for instruction and support were positively related and significant for reading achievement in four of the grade levels examined during the course of a single school year.

A similar study conducted by O'Connell-Smith (2004) examined achievement scores on an eighth grade state math and reading skills assessment during a single school year in Minnesota. Funding variables that were examined included average teacher salary, student-to-teacher ratio and per pupil expenditure. It should be noted that per pupil spending was further analyzed with respect to proportion of spending allocated to regular, vocational and exceptional instruction, support service, and administration costs. Findings suggested that math and reading scores were positively influenced by the financial variables of average teacher salaries and per pupil spending with respect to instructional support services.

While some studies have found positive correlations between increased funding initiatives, others have identified inconclusive results. In a study that investigated cost-effectiveness of educational practices, it was determined that reducing class size was not the largest predictor of student achievement (Ilon & Normore, 2006). Findings suggested that hiring teachers with Master's degrees was more influential on assessment scores

(Ilon & Normore, 2006). In either case both practices increase local and state budgets. This analysis looked at over 1,000 elementary schools in Florida over one year. Variables studied included student demographics, percentage of administrators, percentage of instructional staff, per pupil expenditure, school size, percentage of teachers with advanced degrees and average class size. Achievement was measured on scores from the Florida Comprehensive Assessment Test (FCAT).

A similar study conducted in Florida investigated the impact of school resources on student achievement. Again, the major focus was on fiscal initiative to reduce class sizes throughout the state. The research focused on south Florida and examined 531 schools. Outcomes from the investigation suggest that smaller class size and increased per pupil spending has little or no impact on FCAT achievement (Nyhan & Alkadry, 1999).

An investigation of the effects of funding on operational resources conducted by Grubb (2006) found several disparities in funding initiatives and achievement. The study focused on results and data from the National Educational Longitudinal Survey of the Class of 1988 (NELS88). Prior research focused primarily on single assessment success as the indicator to student achievement. The NELS88 collected data on math, reading, history, science knowledge and measures of progress such as graduation rates, subsequent college enrollment and attitudes towards educational and occupational aspirations (Grubb, 2006). The educational funding variable was established as revenue available for various school resources. Findings ascertained that the most powerful effects of expenditures per pupil were on simple resources such as lowering student-to-teacher ratio, increased teacher salaries and teacher experience (Grubb, 2006). Further

outcomes showed that increased resource allocation towards enriched curriculum, remedial education, staff development and counseling had no increased impact on student achievement. However, it should be noted that the sample within this study was nationally representative generalizations towards states are difficult to formulate.

Lastly, empirical studies provide evidence that increased funding is not necessary to increase student academic achievement; sometimes it can be is a negative predictor of success. An analysis of five elementary schools investigated a resource reallocation process of current funding towards education initiatives and its impact on student achievement. Two of the schools shifted money in their budgets to fund reduction in class sizes and three of the schools reallocated money to increase tutoring for struggling students and increase professional development experiences (Odden & Archibald, 2000). In summation, all the schools were able to fund the initiatives with minimal new funding and the strategies were successful in boosting student achievement (Odden & Archibald, 2000). The findings from this study suggest that increased funding is not necessary to improve student achievement. Rather, improved fiscal management of current resources can achieve desired outcomes.

A past investigation of funding initiatives and their impact on student achievement examined the level of fiscal resources and the relationship to teacher tenure length and number of disadvantaged students. It was found that the level of fiscal resources was a negative predictor of student achievement (Biniaminov & Glasman, 1983). It should be noted that with higher levels of fiscal resources, the number of disadvantaged students increased and teacher tenure also increased. Lower student

achievement could be rooted within the higher levels disadvantaged students compared to schools with lower funding and fewer disadvantaged students.

The studies reviewed show levels of disparity and inconclusiveness in research literature. Findings are often contradictory and studies all too often try to generalize beyond the scope of the research. Archibald (2006) and O'Connell-Smith (2004) looked at current resource allocations and attempted to determine the wisest use of money. They concluded that increased spending in areas of instruction appears to positively impact student achievement. The scope of these two studies does not factor increased spending as a variable and student achievement is based on a single state level assessment. Additionally, the research focuses on an individual district and or state. A true picture of funding and achievement relationships is hard to extract.

Studies by Ilon & Normore (2006) and Nyhan & Alkadry (1999) focused on the state of Florida's initiative to reduce class size and its subsequent impact on achievement. This focuses on a single funding variable in one state during the course of one year. An clear status of funding initiatives and their impact are hard to draw with a small span of data and analysis.

Grubb (2006) accounted for many variables of achievement and a single variable of effort in duration of a single year. Findings in funding research are hard to draw in such a small scope and the research improved on previous studies by using a national assessment and different variables of "achievement" but falls short in project scope.

Odden & Archibald (2000) investigated funding practices with the aim to establish that increased school funding is not necessary. While the study examines school

funding and achievement it only examined five schools over one year. As such, no generalizations beyond those schools should be made.

Finally, Biniaminov & Glasman (1983) correlated fiscal resources with achievement and other education characteristics. The study was isolated to a few local schools during a single year. In conclusion, studies that have looked fiscal spending practices have underlying faults or weaknesses that need to be improved in future studies.

To achieve a holistic picture of funding in education and its impact on student achievement a study needs to span over multiple years, find a common ground of assessment and investigate multiple districts, states or governments.

The field of education finance is broad and the research in the field reflects the expansive sectors that are possible to investigate. While previously mentioned studies concentrated on spending measures of focused efforts or particular budget categories, other scholars have looked at the variable of education finance as a single total measure with varying results. Jefferson (2005) examined the measure of total system expenditure of schools and the connection with student achievement. The study was an intensive review of research that noted findings of high expenditure and under-performing students and schools. Jefferson (2005) concludes, "Dollars have the potential to increase educational opportunities...but the translation of these opportunities to actual student achievement is less closely linked as one would assume (p. 122)".

Expansive research done by LeFevre & Hederman (2001) found that a correlation between states' expenditures per pupil, funds from the federal government and teacher salaries with educational performance does not exist. Additionally, LeFevre & Hederman

(2001) noted that Missouri, Illinois and Alabama have experienced increases in the Scholastic Aptitude Test (SAT) while not significantly increasing educational spending.

Murnane & Levy (1996) investigated total budget increase and its impact on achievement. Fifteen Texas schools were allocated substantial extra funds through litigation over the course of four years. During the influx of money only two of the schools showed improvement in achievement (Murnane & Levy, 1996).

A study by Okpala (2002) investigated total educational resources available and correlated student achievement in math and reading. Instructional supply expenditures per pupil alone were positively correlated with math achievement scores (Okpala, 2002).

Marlow (2000) determined education spending does not appear to raise student achievement in California. When defined as spending per pupil, increased education spending exerts a negative influence on student achievement in five out of nine districts. Spending per pupil was found to exert a positive influence in one case and, in the remaining seven cases, no significant influence was determined (Marlow, 2000).

Lastly, Chambers, Levin, & Parrish (2006) examined NYC public schools and determined that for a majority of districts significantly higher levels of spending are required if the state wishes to provide a sound basic education to all public school students. Additionally, results show a clear negative relationship between the district-level shortfall in spending and educational outcomes across virtually all student subpopulations (Chambers, Levin, & Parrish, 2006).

The research focused on total budget expenditure and effects on student achievement continue to have design flaws that decrease generalizabilty. The research

adds to the body of knowledge but limitations to the studies need to be noted. Jefferson's (2005) review of research is not an empirical study and may not account for covariance that could invalidate the findings. LeFevre & Hederman (2001) noted improvement in three states on an assessment that is commonly associated with high performing students. This limited sample hinders generalizability to larger sub sets of populations. Murnane & Levy (1996) took a simple input/output approach to investigation and failed to account for demographic variables or note that student ability is a product of years of development and achievement may take years to notice. Marlow (2000) and Chambers, Levin, & Parrish (2006) investigated a single state or city over the course of a single year and generalization beyond similar districts within the same state would be unwarranted. It should be noted that each of the studies found inconclusive results of the positive impact of funding on student academic achievement. However, these studies most similar to current study but look at measures of total expenditure. The current study isolates the effect of an individual state's share towards its total education budget. In addition, potential effects of covariates associated with student differences are accounted for in appropriate statistical models.

Further studies in school finance and educational achievement have investigated intrastate equity and its impact on select populations of students. Again results were mixed. A study by Glenn (2006) focused on school finance adequacy litigation and achievement in African American students from a national perspective. It was found that successful school finance litigation showed a positive relation with African American proficiency in math and reading (Glenn, 2006). The concept of adequacy in school funding is a trend that is based on a model that represents a system of school finance that

links resources to outcomes to ensure all students receive an adequate level of education (Clune, 1994).

While Glenn researched litigation to provide adequacy, others have attempted to model implementation strategies. Sweetland (2002) investigated litigation in Ohio and determined most court cases aimed to create adequacy among the schools and restructure the tax-based system of school funding. However, a positive link between the legislation and achievement was not determined. Crampton (2007) took a national perspective and found that state funding measures and litigation sought to provide funding for school infrastructure, education technology, charter schools, class size reduction, programs expansion, teacher quality and early childhood education but failed to link any of these measures to achievement gains. Issues within this research include that Clune, (1994) and Sweetland (2002) investigated funding adequacy at the state level. This does not generalize nationally and the fiscal variable does not account for an increase in spending or an outcome of student academic achievement. Crampton (2007) and Glenn (2006) broadened the scope of the research to a national perspective but lacked a defined academic achievement variable. In essence, this research investigates legislative trends associated with increased funding but failed to account for its impact on academic achievement.

Further research in the field of educational finance has evaluated the effectiveness of financial practices and the cost effectiveness of privatization. These studies have generally found that privatization often costs less and produces gains in achievement but state sponsored often fails to achieve improvement. Goe (2006) investigated a state sponsored school improvement funding initiative in California. It was determined that the

extra money allocated at specific under-performing schools had minimal impact due to poor allocation and utilization of funds (Goe, 2006). Conversely, O'Toole & Meier (2004) explored data from more than 1,000 Texas school districts and found that private contracting of services is negatively related to spending on school districts' central tasks of achievement and is not positively associated with district performance. It was determined that effects of privatization efforts to increase efficiency ended up costing more and achieving less within examined school districts (O'Toole & Meier, 2004)

Another finance study investigated the impact of mandated privatization of two school districts in Maryland. The study looked at schools' expenditures and achievement before and after privatization. It was found that the private school model has a lower per pupil expenditure and showed increase in achievement scores mandated by the NCLB act of 2001 (Rhim, 2007). At issue in these studies is that Goe (2006) and Rhim (2007) looked at current schools that were failing and determined that funding did not improve achievement. To generalize beyond that state or to schools that do not reflect those studies is not valid. These special cases are examples of allocating extra money towards a problem without requiring reform.

Needs analysis papers about funding in education seek to draw attention to the current condition of education finance. This type of research seems to fuel the debate on the need for further spending on education. A report by the Virginia Consortium for Adequate Resources for Education (Virginia CAREs, 2001) analyzed state budgets and determined that Virginia teachers were underpaid compared to the national average of salaries and that school infrastructure needs vast improvement. Rothstein (2001) cites the lag in teacher salaries and the shift of spending from instruction to administration. The

studies cite the need for education allocation to adjust with the increases due to inflation and cost of living differences. Findings from institutes such as Virginia CAREs need to be taken skeptically being that they are commonly not peer reviewed.

Research exists that investigates the impact of school funding on academic achievement over the course of multiple years. Investigations that span multiple years are generally literature reviews or meta-analysis. Previously mentioned studies by Flanigan, Marion & Richardson (1997) and Verstegen and King (1998) span multiple years and have shown a positive correlation between funding and academic achievement. The current study adds to the body of knowledge for multiple year investigations.

Fiscal Effort

The measure of state fiscal effort helps indentify whether or not wealthy states spend more on education as a percentage of Gross Domestic Product (GDP) than poorer states (Goldschmidt & Eyermann, 1999). A system with lower education expenditures then that of another may actually be devoting a larger share of resources to education even with a smaller GDP. In these cases the state is showing greater monetary effort. A state's fiscal effort is computed as a ratio of utility which is analyzed as state level per pupil spending over Gross State Product (GSP) per capita which is also known as capacity (Owings & Kaplan, 2006).

Fiscal capacity is defined as the capability of a government to finance its public services (Berry & Fording, 1997). The measure most often used to evaluate or describe the intensity of the attempt of one local government to raise revenue relative to other comparable government entities. Capacity is typically computed as state wealth present in Gross State Product or various measures of existing tax base (Chervin, (2007). Utility is

the extent to which the state governments make use of their capacity (Berry & Fording, 1997). In the current study these measures are estimated to an individual level by computing each measure on a per capita/pupil basis.

Fiscal effort, also known as tax effort is one of the most important indicators used to compare and monitor changes in national, state, and local investment for education is (Alexander, 2001). Using tax effort to adjust for wealth is particularly relevant when comparing how governments invest in human capital through education (Alexander, 2001). Measuring the levels of fiscal effort and capacity towards education is useful in determining equity within interstate comparisons. The importance of fiscal effort towards education was highlighted in the American Recovery and Reinvestment Act of 2009. In this legislation education funding initiatives required that states and localities using federal government stimulus funds to maintain levels fiscal effort towards education (Reyna, 2009). This stipulation has always the standard to receive Title I funds and other sources of government aid. This demonstrates the perceived importance of states and localities of utilizing and at minimum maintaining available resources for education and other civic programs.

In education research, state fiscal effort as a ratio of GDP is an aggregate measure of a systems fiscal support (Goldschmidt & Eyermann, 1999). The advantages include that measurement error is reduced through aggregation. Aggregation captures underlying externalities and differences in a studied system. This technique is useful in grouping and comparing data from a wide range of similar sources (Burstein, 1980). In essence aggregation provides a common basis of comparison for similar subjects with dissimilar backgrounds. In the current study states are different with respect to wealth, student

demographics and fiscal policy. However, a measure such as fiscal effort allows for a comparison of states on a common funding variable. Aggregation can improve reliability of outcomes by establishing homogeneity within the independent variable (Burstein, 1980). Negatives of aggregation include the elimination of possible covariance. Bias may be introduced and external validity could be threatened due to omitted state level covariance (Goldschmidt & Eyermann, 1999).

The use of fiscal effort as a measure of spending has controversy that stems from sources used in calculating capacity. Several differences in fiscal effort calculation can arise from using tax bases or revenue collection as the sole representation of capacity to spend (Oakland, 1994). These calculations fail to account for other sources of wealth associated with trade and revenue (Oakland, 1994). This creates the potential for fiscal capacity to vary dramatically across the states. Controversy with the utilization of fiscal effort also develops with the consistency of some states diminished fiscal capacity. While relative fiscal capacity can change in some states, many are consistently poorly endowed and many are consistently richly endowed (Mikesell, 2007). In accounting for past controversy this study utilizes gross state product (GSP) per capita as the baseline for state capacity to fund education. Gross state product is a measurement of the economic output of a state or province. GSP is the sum of all value added by industries within the state and accounts for all major sources of revenue collected. In context of this study GSP will accurately reflect a state's wealth and capacity to fund civic agendas.

Fiscal effort as a funding variable in education research has only been used once by Goldschmidt & Eyermann. In their 1999 study, an association between relative fiscal effort and achievement was found and that the United States performed as expected

(average achievement), given its average relative fiscal effort (Goldschmidt & Eyermann, 1999). The funding variable of fiscal effort differs from much of the previous research. This is because the variable measures both total money towards funding education and a state commitment to providing money towards education. The measure also allows for straightforward comparison of states because they are measured on a common variable. This type of analysis is not frequently seen in education finance studies. The current study is parallel with the Goldschmidt & Eyermann study but instead of comparing nations it compares states over a length of time on a universal assessment. It is based on a longitudinal study of state effort and student achievement outcomes started by William Owings.

Econometrics in Education Research

Education funding research has previously utilized econometric approaches in evaluating the impact of funding disparities. In most cases researchers have investigated fiscal inputs to account for achievement outputs in cost function analyses. In essence, a cost function analysis calculates the value received given the cost of creating a measured output. In reviewed studies the cost of education is defined as the minimum amount of money that a school district must spend in order to achieve a given educational outcome (Imazeki, 2008).

Cost functions for K-12 education are utilized to provide estimates of base costs associated with per-pupil expenses in districts with relatively low levels of student need and marginal costs related to specific student characteristics (Imazeki, 2008). Opponents to this type of research claim that cost functions are superficially attractive because they give the impression of objectivity (Costrell, Hanushek & Loeb, 2008). It has been cited

that cost functions studies portend the promise of scientifically estimating the cost of achieving specified levels of performance from actual data on spending (Costrell, Hanushek & Loeb, 2008). Some researchers claim that education cost functions do not estimate the cost of achieving any specified level of performance. Instead, they provide estimates of average spending for districts of given characteristics and current performance (Costrell, Hanushek & Loeb, 2008). Regardless of controversy surrounding cost function studies, findings are important to note due to the implementation of econometric analyses in the current study.

In a 2008 California study it was estimated that overall, local districts needed an additional $1.7 to $5.7 billion in order to achieve current accountability standards (Imazeki, 2008). Similarly in Texas, researchers concluded that local school districts would need at least $2 billion in additional revenue to satisfy the requirements of the accountability system (Imazeki & Rechovsky, 2005). A comparison study to the Texas investigation found that in aggregate, the level of education funding in Texas is more than sufficient to meet performance goals consistent with the state's accountability system (Imazeki & Rechovsky, 2005). Both studies used a cost function methodology and similar data.

The ambiguity present in cost function research is noted by Hanushek (2006) who cites "none of the existing cost function studies claim that providing additional resources will have any effect on achievement". He also cites that past experience provides plentiful evidence of instances where funding was increased with no fundamental change and where student performance did not change. In any case, in education finance research the potential for econometric analysis is abundant. Provided that outcomes can

show a positive relationship with achievement, the models can provide substantial evidence about the impact of fiscal disparity.

In the current study econometric analysis is conducted via a time series approach of distributed lag analysis. This analysis is uncommon in education finance research and will provide insight on the return of investment of education spending. Distributed lag analysis can identify significant lag time between money input on increases or decreases in achievement. In addition, a time lagged regression forecast to reach levels of peak achievement is calculated. This is done by calculating the slope of the best fit fiscal effort line and lead time to reach a sustained level. Estimates are based on each states prior achievement and fiscal effort calculations. Lastly, panel data analysis via least squares dummy variable model is an approach to analyze data that spans multiple variables and determine error estimates. Most uses of these statistics in education settings have looked at student associated variables to see what differences among students explain differences in achievement. Fiscal data has not been actively researched by these means.

Objectives

The review of current research literature has identified many different issues among the research findings and equally as many stances on the importance of school funding. Bringing focus to these findings is necessary to provide rationalization for the research on fiscal effort. The current study expands the current body of knowledge with respect to state-level funding practices and their impact on student achievement. The research expands on studies that measured fiscal effort in school funding, which has been investigated minimally. In addition, the study solidifies findings by taking a national perspective of education funding and achievement and creates a trend analysis that spans

10 years. The reviewed research has shown gaps in significant findings. The empirical data produced from the study allows for a long-term analysis of state spending practices that helps determine if increased spending on education impacts student academic achievement.

To improve on prior studies the proposed research takes a national perspective by analyzing each state in their effort to fund education on academic achievement. The variable of academic achievement will be measured on a single common assessment to which each state participates. The National Assessment of Educational Progress (NAEP) is regarded as the nation's report card and very few finance studies use data from this assessment. It is rare to have a common basis for analysis between states with regards to achievement. NAEP data extends beyond 10 years and takes results in three different grade levels. The comprehensive NAEP data allows for a long-term trend analysis with respect to the impact of funding. This was a major weakness in prior research; where the scope was a short-term snapshot on the variable of funding and achievement. In this current study the ability to identify significant lag time of funding and student achievement is established. The variables under investigation in the proposed research provide for some unique findings that could be of great benefit to the education community.

A primary objective of this study will be to provide details of the exploratory study of the relationship between state fiscal effort and student academic achievement. A major goal of this study is to expand upon the previous empirical research on school funding and academic achievement at the state level. Given these objectives this study will seek to address the following research questions.

1. Are state fiscal effort and state level student achievement correlated?
2. How much is state fiscal effort a predictor of student academic achievement?
3. What historical trends are present in relation to a state's fiscal effort and student academic achievement?

The exploratory nature of this study and the fact that a non-experimental ex post facto perspective will be employed place dictates that hypothesis testing is not required. However, based on findings from the literature review it is presumed that:

1. The variables of fiscal effort and academic achievement will be positively correlated
2. State fiscal effort will predict a small insignificant amount of variance in achievement
3. A lag time of two years will prove to be significantly correlated
4. Within the panel data analysis variables associated with student differences will account for more of the variance in achievement compared to state fiscal effort.

Chapter 3

METHODOLOGY

Perspective

The research conducted adhered to a quantitative non-experimental ex post facto perspective. The goal of ex post facto research is to find naturally occurring groups or trends and follow them forward. Ex post facto research investigates whether preexisting conditions have caused significant differences in the studied groups (Cohen, Manion & Morrison, 2007). Within this study, preexisting conditions of state fiscal effort and achievement were investigated to determine influence over time. A major weakness in ex post facto research is the absence of true random sampling (Cohen, Manion & Morrison, 2007). In studying causal relationships some phenomenon are better served by studying naturally occurring groups rather than manipulated random samples. In the case of fiscal effort, it would be infeasible and unethical for a researcher to knowingly manipulate the amount of state money given to schools. Within the context of the non-experimental ex post facto perspective the current study employs a post-test only, non-equivalent group research design. This is due to the absence of random assignment of the independent variable. In addition, the investigated states represent non-equivalent groups that were measured through post-test performance on applicable NAEP assessments.

Ex post facto research designs are generally considered quantitative and pseudo-experimental in nature. Kerlinger (1970) defined ex post facto designs as research in which the independent variables have already occurred and the research starts with the observation of dependent variables. Research retrospectively examines the effects of an event or action on a subsequent outcome with the goal of establishing a causal link. In

some instances, ex post facto designs correspond to experimental research in reverse because the research begins with groups that are already different in some respect and searches backwards for the factor that brought about the difference. In this study, the groups or states differ in their level of achievement and the amount of fiscal effort towards education.

The goal of this research was to determine if differing levels of fiscal effort was a significant cause of the disparity in student achievement amongst states. The methodology establishes statistical rigor and sound research design to take non-experimental components and establish significant and useful quantitative findings.

Context

In an ex post facto research design the principal components of this study have already taken place. Data is representative of participant samples in each of the fifty United States for each year investigated from 1996-2007. Student achievement populations are introduced from preexistent National Assessment of Education Progress (NAEP) test administrations procedures in each of the states. Geographic scope covers the entire United States and samples are large enough to provide state-level estimates. In all cases, the selection process has utilized a probability sample design in which every school and student has a non-zero chance of being selected. In terms of this study the timeframe of the assessment covered the years 1996 through 2007. The independent variable of state fiscal effort was calculated for the years under investigation for each state. Each States' calculated ratio of fiscal effort is analyzed with its corresponding results on NAEP results for each year investigated.

Participants

For the variable of academic achievement the participants consist of all students that received NAEP assessments for years 1996-2007 in grades 4 & 8 for the subjects of math and reading. Participants at each grade level vary in regards of race, age, socioeconomic status and gender. In general, each year a state has roughly 25 % of its student population assessed for each grade level assessment. For the years under investigation, all content areas of NAEP assessments sampled for students attending both public and nonpublic schools, selection was based on a stratified, three-stage sampling plan. In sampling schools at the state level, the first stage includes defining geographic sampling criteria, which are sets of neighboring counties. This subsequently classifies the state-level sample into strata that is defined by region and community type (NCES, 2004). The second stage selects public schools from an inclusive list with selection probability set proportional to the number of age-eligible students within the school (NCES, 2004). The third stage involves systematically selecting students within a school for participation with equal probability (NCES, 2004). This study is inclusive of all results from 4^{th} and 8^{th} grade reading and math for the years 1996, 1998, 2002, 2003, 2005 and 2007.

The variable of state fiscal effort is representative of the fifty United States and the District of Columbia for the years under investigation. Representative data were compiled from state level budget and census data. Required data from the sample states include total gross state product and population along with total state level education expenditures per pupil for the years under investigation.

Measures

The National Assessment of Education Progress (NAEP) is a criterion referenced assessment that is administered in a standardized method and can be used to determine the amount of knowledge an individual has learned about a specific subject (Feurer et al., 1999). Content areas evaluated in current study include reading and mathematics at the fourth and eighth grade level. These NAEP assessments contain a range of constructed-response and multiple-choice questions that measure performance on sets of objectives (United States Department of Education, 1999). These objectives and questions are developed by nationally representative panels of mathematics specialists, educators, and other interested stakeholders to establish construct and content validity. The process of establishing construct and content validity of NAEP assessment items involves the following:

1. Test development specialists and various subject-matter experts write questions and exercises based on subject and grade level
2. Test development staff experienced in the subject area review the questions and exercises for content concerns and revise them accordingly.
3. Pilot tests are administered, scored and analyzed.
4. Suitable questions for the assessment are selected (United States Department of Education, 1999).

To ensure reliability of achievement scores NAEP administrators develop focused, explicit scoring guides that match the criteria emphasized in the assessment frameworks (United States Department of Education, 1999). Additionally, qualified and experienced scorers are recruited, trained, verified through qualifying tests.

To conduct meaningful state level comparisons external validity of NAEP achievement needs to be established. This is done through the aggregation of all students tested in each state. What is produced is called the state aggregate sample where results are reported on a common scale for all fifty states (United States Department of Education, 1999).

Since 1990, state-level NAEP reporting has enabled the comparison of participating states. Separate representative samples of students are chosen for each jurisdiction that is selected to participate. These representative samples provide reliable state-level data concerning the achievement of their students in respective subjects and grade levels. In the current study state level achievement data is analyzed in reading for the years of 1998, 2002, 2003, 2005 and 2007 along with mathematics for the years of 1996, 2000, 2003, 2005, and 2007. These measures reflect the dependent variable of academic achievement at the state level.

The dependent variable of state fiscal effort is computed as a ratio of utility which is analyzed as state level per pupil spending over Gross State Product (GSP) per capita which is also known as capacity (Owings & Kaplan, 2006). State level per pupil spending is calculated from two measures. The first is state level budget expenditures for K-12 education. This information is gathered from the National Center for Education Statistics data on revenues for public elementary and secondary education by state. Next, total student enrollment information is collected from the National Center for Education Statistics data on student membership for public elementary and secondary education by state. To calculate state level per pupil spending total state revenue for education is divided by total student enrollment for each year within the current investigation (1996-

2007). Capacity or Gross State Product per capita is also calculated on two measures. First, Gross State Product data is gathered from the U.S. Department of Commerce's Bureau of Economic Analysis. Next, state level population estimates are collected from the U.S. Census Bureau. To calculate capacity, gross state product for each state is divided by total state population for each year within the current investigation (1996-2007). Finally, top calculate state fiscal effort the established measure of utility (state level per pupil spending) is divided by capacity (Gross State Product per capita) to calculate the ratio or percentage of state wealth that is allocated for K-12 public education. This measure is calculated for each state each for year within the current investigation (1996-2007).

Data Collection

Data for this study is preexisting in publically available databases or published state government statistics. Data collection with respect to achievement involved the use of an online database. Original state-level NAEP scale score data was downloaded from http://nces.ed.gov/nationsreportcard/naepdata/. In the current study state level achievement data was collected for reading for the years of 1998, 2002, 2003, 2005 and 2007 along with mathematics for the years of 1996, 2000, 2003, 2005, and 2007.

The independent variable of state fiscal effort required state-level budget data on four parameters. Gross State Product for the years 1996-2007 was collected online from the United State Bureau of Economic Analysis at http://www.bea.gov/ . Next, state population estimates for the years 1996-2007 was collected and downloaded from the United States Census Bureau at http://www.census.gov/. State gross domestic product and population was calculated to determine state gross domestic product per capita for

the years under investigation. Two other data measures collected included state level education revenue and total student enrollment for the years 1996-2007. These were downloaded from the United States Education Finance Statistics Center at http://nces.ed.gov/EDFIN/ .

All collected data was stored on a USB flash drive that was kept under lock and key in a filing cabinet. Given that the study used state-level data it was not foreseen that any individual results could be identified. Student achievement results from the NAEP records and state government expenditure information were compiled into single database. Information was later analyzed via SPSS version 16.

Analytic Approach

Initially, state level results were calculated and presented for each state on fiscal effort and average percent change for all years investigated (1996-2007). State fiscal effort was calculated as a ratio of state level per pupil spending over Gross State Product (GSP) per capita. Average percent change was calculated as the mean of the differences of state fiscal effort from each prior year (1996-2007) from the most current year 2007. Findings were interpreted by state ranking and largest margins of change over the years investigated.

Next, for an informal analysis of the relationship between state fiscal effort and academic achievement the means of each variable over the years of 1996-2007 were ranked and computed within quartiles. Findings were interpreted for consistency in ranking and quartiles among the variables.

Formal data analysis for this study will be guided by the proposed research questions:

1. Are state fiscal effort and state level student achievement correlated?
2. Is state fiscal effort towards education a predictor of student academic achievement?
3. What historical trends are present in relation to a state's fiscal effort and student academic achievement

The first research question "Are state fiscal effort and state level student achievement correlated?" was analyzed via bivariate correlation. A correlation analysis between the variables of state fiscal effort and mean state NAEP achievement for each subject area and grade level was calculated. A bivariate correlation measures the strength of the relationship between fiscal effort and achievement. The principal outcome from this analysis is the Pearson "r" value of the variables. This value is computed via the following formula:

$$r_{xy} = \frac{N\sum XY - \sum X \sum Y}{\sqrt{[N\sum X)^2 - (\sum X)^2]\,[N\sum Y^2 - (\sum Y)^2]}}$$

In this equation "r_{xy}" is the computed correlation between fiscal effort and achievement, "N" is the size of the sample, "X" is the computed value of fiscal effort, "Y" is the corresponding value of academic achievement, XY is the product of each fiscal effort value multiplied by its corresponding achievement value based on the year, X^2 is the state fiscal effort value squared and Y^2 is the achievement value squared. The strength of a correlation computation ranges from the absolute value from 0 to 1; the closer the correlation is to 1, the stronger the relationship, the closer the correlation is to 0, the

weaker the relationship (Huck, 2008). This value informs the researcher of the strength of the relationship between fiscal effort and achievement for each state. Findings from the analysis are displayed in a table inclusive of all fifty states and the District of Columbia. Computed correlation scores between fiscal effort and achievement for math and reading at the 4^{th} and 8^{th} grade levels are depicted. Significant relationships are denoted and discussed in further detail.

The second research question "Is fiscal effort a predictor of student academic success?" was assessed through a linear regression analysis. This predictor statistic calculated each of the states separately using data collected with respect to fiscal effort scores and NAEP achievement for corresponding years. Linear regression was calculated for each state using the same equation and outcomes were assessed with consistent measures. The regression equation is expressed as follows:

$$Y = a + bX + e$$

"Y" is the value of the dependent variable being predicted; in reference to this study it represents achievement on respective subject and grade level NAEP assessments. Alpha or "a" is a constant and equals the value of the dependent variable "Y" when the value of X=0. Beta or "b" is the coefficient of X and represents the slope of the regression line and how much the dependent variable of achievement changes for each unit change in the independent variable of fiscal effort. The value of the independent variable is represented by "X" and is predicting or explaining the value of "Y". Lastly, the error term "e" is the expressive error in predicting the value of "Y". Outcomes from this regression analysis are reported on three statistics of significance. The first statistic is R^2 which is a measure of association (Seber, 1977); it represents the percent of the variance in the values of Y

(achievement) that can be explained by knowing the value of X (fiscal effort). The values vary from 0.0 to 1.0 where a value closer 1.0 demonstrates a strong association between the variables and explains more of the variance in achievement scores (Seber, 1977). Next, the standard error of the estimate is reported; this statistic denotes a measure of error of prediction (Seber, 1977). The closer the value is to zero indicates less error in the predication of the dependent variable. Lastly, the "p" or significance statistic is reported which represents the probability of the regression coefficient in the population is zero (Seber, 1977). In the current study significance is represented by a score that is less than (.05).

The final research question "What historical trends are present in relation to a state's fiscal effort and student academic achievement?" was analyzed via a time lagged correlation, linear regression forecasting and a fixed effects least squares dummy variable model.

Specifically, time lagged correlation analysis was the main time series method utilized in the study. This is a specialized time series technique commonly used for examining the relationships between variables that involve some delay (Judge et al., 1985). In education, fiscal inputs and achievement outputs do not occur at coinciding measurable time points. In most cases, money is allocated from the state level prior to any measurable achievement in a given year. In any case, one can expect that achievement gains or losses will follow fiscal inputs with some delay. In other words, if a relationship exists, there will be a time lagged correlation (positive or negative) between fiscal effort and academic achievement. Time lagged correlations are particularly common in econometrics but are rarely used in education finance studies. In

econometrics a common example of time lagged correlation analysis involves investigating the benefits of investments in new machinery which usually only become evident after time. This statistical format lends itself to educational finance research in that the state level investment that is shown through fiscal effort can be analyzed for productivity in respect to student academic achievement over time.

In this study, the dependent variable of achievement "y" and an independent variable of state fiscal effort "x" were both measured repeatedly over time, although at different instances. The relationship between the variables is explained in the following formula:

$$Y_{T=} \sum \beta_{1*} x_{T-1}$$

With respect to this study "Y" represents the dependent variable of investigated NAEP achievement scores, "T" represents the year under investigation for the NAEP assessment, "$\sum$" symbolizes the sum of all the computations involving the dependent variable, "β" depicts beta weights or slope parameters in the linear equation between the independent and dependent variables and "X_{T-1}" is the value of the independent variable in the prior time sets. In this equation, the value of the dependent variable "Y" at time "T" is expressed as a linear function of the dependent variable "X" measured at times T, T-1, T-2, etc. As a result, the dependent variable is a linear function of "X", and "X" is lagged by 1, 2, etc. time periods. If the weights for the lagged time periods are statistically significant, it may be concluded that the differences in achievement is predicted or explained with the respective lag(s) in funding (Judge et al., 1985).

To discover the historical trends and relationships between the variables of state fiscal effort and academic achievement the time lagged correlation analysis was computed at a two year lag for each year of available NAEP scores (2003, 2005, 2007) for each of the fifty states. The time lag periods of fiscal effort spanned the two years prior to each of the assessments. From this analysis the evolving increase or decrease of NAEP scores can be positively or negatively correlated with the increase or decrease in state fiscal effort. Significant positive or negative lag correlations explain changing trends in achievement based on increased or decreased funding.

To investigate time lagged correlation further, data was analyzed via linear regression model. Regression analysis is commonly used for prediction. The prior values of state fiscal effort and academic achievement were used to predict the amount of time a state would require to reach an established level of achievement. This was done by first calculating the regression or "best fit" line between fiscal effort and achievement. The best fit line associated with the associated data points of (x_1, y_1), (x_2, y_2) and (x_3, y_3) is represented in the following equation of a line:

$$y = mx + b$$

In the current study, "y" is equal to data points associated with achievement and "x" is representative of figures of state fiscal effort. Within a scatter plot the values of (x_1, y_1) would represent values of achievement ("y") for the year of 2003 and fiscal effort ("x") for 2001, the values of (x_2, y_2) would represent values of achievement ("y") for the year of 2005 and fiscal effort ("x") for 2003 and values of (x_3, y_3) would represent values of achievement ("y") for the year of 2007 and fiscal effort ("x") for 2005. In a regression line "m" is representative of the slope which is calculated as the change in "y" values

over the change and "x" values. In essence, the slope dictates the best fit line between the variables. Lastly, in the equation of the regression line the intercept "b" is computed. The intercept of the regression line is its height when $x = 0$.

With the equation of the regression line established between the variables of fiscal effort and achievement the lead time for each state to reach an established or predicted value of achievement "y" can be determined. This was done projecting the regression line forward past the final values until it reaches the prior state level maximum or a level of peak achievement that is equal to the highest performing state. The slope between the "x" intercepts at 2007 and the predicted value of achievement "y" provides a lead time past 2007 required to reach the predicted value of "y". The main statistical outcome is a theoretical lead time for a state to reach the established achievement level. The forecast of the regression line to reach maximum achievement is represented as lead time in months.

In predictive linear regression modeling, there can be some instances where the slope of the linear equation may be close to or equal to zero and therefore impossible to predict when the regression line would reach the given value of achievement. This would happen due to a lack of a linear relationship. Theoretically, the line could never reach the max level of achievement and it would take an infinite amount of time or the value cannot be computed given a negative. Conversely, could be some instances where an individual states' regression line slope has already reached the maximum achievement "Y" and the lead time is equal to zero. In theory, these states are already putting forth the necessary effort to achieve their maximum achievement value. The lead time calculation for the states is a speculative forecast on the amount of time past the year 2007 it would

take to reach the maximum value of achievement "Y" given the slope of the regression line between prior achievement and state fiscal effort.

A fixed effect(s), least squares dummy variable model will expand upon and account for variance that may impact findings from the distributed lags analysis. The model employed in this research will have constant slopes between an investigated state's effort and achievement but intercepts will differ according to time (year under investigation). This model will demonstrate no significant differences between units but may have autocorrelation owing to time-lagged temporal effects (Greene, 2003). The model will account for the time effect of the dummy variables (covariates) on the dependent variable of state level NAEP achievement. Findings from this analysis will provide time effect statistics on effort and achievement while accounting for covariance associated with gender, socio economic status and race. The least squares dummy variable model is depicted and computed with the following formula:

$$Y_{it} = a_i + \lambda_t + \beta_1 X + \beta_2 X + \beta_3 X + e$$

In this equation "Y" represents the samples (state) achievement scores on respective NAEP assessment, "a" symbolizes the fiscal effort score for the given years NAEP score, "λ_t" depicts the years under investigation for the variables, "$\beta_1 X + \beta_2 X + \beta_3 X$" represent the covariance or "dummy variables" in the sample which in context to the study are differences in achievement associated with gender, socio economic status and race and lastly "e" signify the error term that will be computed among the variables on the right side of the equation. To test the effects of the fixed effects model a pooled regression model will serve as a baseline of comparison. First the effect of the state's fiscal effort over the years will be tested against group effects. A significance test will be

performed with an F test that resembles the structure of the test for R^2 change. Time effects are calculated by a contrast, using the first or last time point as a reference (Greene, 2003). It is assumed that the sum of the time effects is equal to zero. The time effect contrast is computed via a paired *t*-test between the reference and test value (achievement and effort).

Data for the fixed effect, least squares dummy variable model is computed within four separate models using a least squares dummy variable technique. Each subject and grade level of NAEP assessments are run through each model with corresponding variables for the years 2003, 2005 and 2007. For each subject and grade level, specific NAEP assessment achievement data is presented on five levels. First, a summary of the four employed models and the total amount of variance that is explained by each of the models is given at grade level and subject. Second, covariance factors of race, socio economic status and gender are ran in a separate model without the fiscal effort variable to show amount and significance of the covariates alone. Next, the fiscal effort variable is placed within the model with the covariates to determine its level of significance. State level data on achievement and effort are next added into another model and calculations depict the significance these differences have on achievement. Lastly, the states' fiscal effort scores are ranked into tertiles and ran in final model.

Data from this analysis is discussed on a state by state basis (inclusive of all fifty) emphasizing significant findings in the lag correlations, significant error estimates and clarification of possible interpretations from the data based on the research question and the parameters within the statistical measure.

In summary, the methodology provided a robust means to explore the study's research questions and examine the impact of state fiscal effort on academic achievement. The exploratory nature of the study sought to find significant relationships, explain predictive tendencies and validate historical connections between the variables of funding and achievement as investigated through state fiscal effort and state level NAEP achievement in reading and mathematics. However, outcomes from ex post facto research must not be over generalized beyond the scope of the study. In an ex post facto design it is important to account for many of the possible influences that can impact student achievement. Covariates such as gender, race and socio economic status that can influence the independent variable of academic achievement need to be accounted for in applicable statistical analysis.

Chapter 4

RESULTS

Introduction

This study sought to determine if relationships exist between the variables of state fiscal effort and student academic achievement. Previous research has typically investigated these variables with a narrow focus. All too often, achievement is represented as a single grade level or subject and educational spending failed to account for state level policy. This study sought to expand on the current research by examining achievement for two subjects and grade levels and by using a unique funding variable of fiscal effort.

This chapter is organized by research questions previously stated. Summarization of the findings will be discussed prior to depiction of corresponding data. To begin with, results of the state fiscal effort calculations and average percent change are presented for each of the fifty United States and the District of Columbia. This data is calculated for the years 1996 through 2007. To investigate these results further state level means for fiscal effort and achievement on the National Assessment of Education Progress (NAEP) fourth and eighth grade reading and math assessments are ranked and computed into quartiles.

To address the first research question "Are state fiscal effort and state level student achievement correlated?" two tables are presented that are specific to each NAEP subject assessed. Each of the fifty United States and the District of Columbia are assessed on overall scale score performance on the fourth and eighth grade reading and math NAEP assessments and state fiscal effort computations for the years 1996 through 2007.

State effort calculations were matched to specific years of NAEP results available during the ten plus year scope of the study. At minimum, each state was assessed for NAEP achievement and fiscal effort for the years 2003, 2005, 2007.

The second research question "Is state fiscal effort towards education a predictor of student academic achievement?" is addressed in two tables that are NAEP subject specific. These tables depict results from a linear regression analysis of overall scale score performance on the fourth and eighth grade reading and math NAEP assessments and state fiscal effort computations for the years 1996 through 2007. State effort calculations were matched to specific years of NAEP results available during the ten plus year scope of the study. At minimum, each state was assessed for NAEP achievement and fiscal effort for the years 2003, 2005, 2007.

The third research question "What historical trends and relationships are present in relation to a states' fiscal effort towards funding education and student academic achievement?" is addressed using three statistical methods which are presented in three separate sections. Initially, four separate tables present time lagged correlation statistics and time lagged regression forecasts for each of the fifty United States and the District of Columbia. These tables address each NAEP subject and grade level assessment separately and depict the significance of the lagged correlation, slope of the best fit fiscal effort line and lead time to reach a sustained level of each states prior peak achievement. These time lagged correlation and regression forecasts were computed for the years 2003, 2005 and 2007.

Next, this research question was addressed further by computing a time lagged regression forecast that used a uniform level of peak achievement. Four tables depict

findings for each of the fifty United States and the District of Columbia on the slope of the best fit fiscal effort line and lead time to reach a sustained level of peak achievement that is equal to the highest performing state. These tables address each NAEP subject and grade level assessment separately and regression forecasts were computed for the years 2003, 2005 and 2007.

Finally, this research question is addressed using four separate models using a least squares dummy variable technique. Each subject and grade level of NAEP assessments are run through each model with corresponding variables for the years 2003, 2005 and 2007. For each subject and grade level, specific NAEP assessment achievement data is presented on five levels. First, a summary of the four employed models and the total amount of variance that is explained by each of the models is given at grade level and subject. Second, covariance factors of race, socio economic status and gender are ran in a separate model without the fiscal effort variable to show amount and significance of the covariates alone. Next, the fiscal effort variable is placed within the model with the covariates to determine its level of significance. State level data on achievement and effort are next added into another model and calculations depict the significance these differences have on achievement. Lastly, the states' fiscal effort scores are ranked into tertiles and ran in final model. This model depicts whether states that exhibit high, medium or low effort have significant differences in achievement and what impact this differing level of effort has on the covariates.

Fiscal Effort by State

A state's fiscal effort is computed as a ratio of a state level per pupil spending (utility) over gross state product per capita (capacity). The result of this calculation is a

proportion of the each state's fiscal capacity that it has earmarked for education. Table 1 represents the calculation of fiscal effort towards education for each of the fifty United States and the District of Columbia for the years of 1996 through 2007. In addition, Table 1 depicts the yearly average percent change in fiscal effort for each state.

The general trend over the ten year period examined is that state fiscal effort towards education has increased. Of the states examined, 33 have increased fiscal effort towards education while 18 have decreased effort. In broad terms the data in Table 1 depicts that states that have increased their effort are showing an increase in state level support. Meanwhile, states that have decreased effort may have adopted a policy of shifting the education funding burden elsewhere. The most intriguing statistic portrayed in Table 1 is average percent change. This is computed by taking the difference for each of the past years (1996-2006) from the present figure (2007) and determining the mean change during the ten year span. States have shown dramatic range with increases in effort: 145% from New Hampshire and 82% from Vermont to a less than 1% increase from Kentucky. Decreases in state fiscal effort are generally below 5% with the exception of Louisiana and Oklahoma which have decreased state fiscal effort towards education by 16% and 11% respectively. It will be important to note the general trend of each state's fiscal effort for future analysis. In examining historic trends of the relationship between fiscal effort and achievement the general upward or downward drift of a state's fiscal effort towards education is revealing of state level policy of education funding.

Table 1

State Fiscal Effort for Education and Average Percent Change from 1997 to 2007

State	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Avg.% change
Alabama	0.1409	0.1410	0.1437	0.1576	0.1466	0.1478	0.1387	0.1306	0.1349	0.1387	0.1539	0.0861
Alaska	0.1447	0.1522	0.1482	0.1384	0.1394	0.1331	0.1290	0.1230	0.1216	0.1172	0.1328	-0.0069
Arizona	0.0886	0.0874	0.0833	0.0916	0.0922	0.1171	0.1162	0.1070	0.1028	0.1014	0.1195	0.2258
Arkansas	0.1329	0.1349	0.1298	0.1462	0.1455	0.1481	0.1441	0.1346	0.1637	0.1587	0.1595	0.1147
California	0.1150	0.1191	0.1125	0.1188	0.1357	0.1302	0.1332	0.1178	0.1210	0.1230	0.1345	0.1007
Colorado	0.0777	0.0758	0.0743	0.0741	0.0762	0.0819	0.0876	0.0872	0.0844	0.0832	0.0875	0.0946
Connecticut	0.0818	0.0810	0.0876	0.0936	0.0945	0.1054	0.0955	0.0894	0.0963	0.0997	0.0988	0.0751
Delaware	0.1066	0.1061	0.1041	0.1182	0.1149	0.1125	0.1099	0.1084	0.1052	0.1148	0.1211	0.1021
District of Columbia	0.0850	0.0773	0.0813	0.0878	0.1202	0.1046	0.0923	0.0947	0.0974	0.0905	0.0970	0.0571
Florida	0.1132	0.1139	0.1209	0.1198	0.1174	0.1038	0.0992	0.1017	0.0959	0.0925	0.1036	-0.0310
Georgia	0.1022	0.1004	0.1012	0.1054	0.1160	0.1213	0.1193	0.1099	0.1050	0.1114	0.1173	0.0787
Hawaii	0.1837	0.1905	0.1904	0.2023	0.2395	0.2591	0.2739	0.2529	0.2521	0.2913	0.3055	0.3420
Idaho	0.1376	0.1399	0.1370	0.1363	0.1479	0.1497	0.1448	0.1321	0.1256	0.1240	0.1503	0.0971
Illinois	0.0536	0.0575	0.0627	0.0676	0.0785	0.0788	0.0753	0.0783	0.0742	0.0689	0.0728	0.0648
Indiana	0.1370	0.1292	0.1356	0.1397	0.1533	0.1370	0.1336	0.1386	0.1405	0.1407	0.1318	-0.0468
Iowa	0.1141	0.1171	0.1188	0.1227	0.1252	0.1211	0.1178	0.1071	0.1101	0.1092	0.1097	-0.0546
Kansas	0.1330	0.1339	0.1444	0.1465	0.1460	0.1455	0.1439	0.1371	0.1377	0.1439	0.1502	0.0651
Kentucky	0.1345	0.1311	0.1384	0.1467	0.1434	0.1435	0.1396	0.1378	0.1361	0.1430	0.1403	0.0075
Louisiana	0.1011	0.1078	0.1085	0.1090	0.1123	0.1188	0.1141	0.1069	0.0977	0.0946	0.0895	-0.1604
Maine	0.1336	0.1348	0.1390	0.1387	0.1445	0.1479	0.1479	0.1388	0.1418	0.1466	0.1619	0.1467
Maryland	0.0946	0.0959	0.0964	0.0982	0.0959	0.0968	0.0989	0.0963	0.0989	0.1062	0.1150	0.1769
Massachusetts	0.0851	0.0881	0.0913	0.0964	0.1033	0.1102	0.1073	0.1009	0.1124	0.1285	0.1258	0.2466

State	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Avg.% change
Michigan	0.1710	0.1763	0.1669	0.1700	0.1843	0.1877	0.1786	0.1765	0.1715	0.1737	0.1766	0.0066
Minnesota	0.1192	0.1148	0.1260	0.1346	0.1462	0.1454	0.1770	0.1612	0.1596	0.1664	0.1574	0.1067
Mississippi	0.1172	0.1201	0.1221	0.1383	0.1398	0.1398	0.1420	0.1466	0.1458	0.1466	0.1475	0.0934
Missouri	0.0853	0.0867	0.0867	0.0870	0.0902	0.0904	0.0885	0.0844	0.0860	0.0863	0.0886	0.0171
Montana	0.1310	0.1315	0.1273	0.1320	0.1413	0.1423	0.1338	0.1288	0.1244	0.1288	0.1382	0.0478
Nebraska	0.0704	0.0709	0.0862	0.0870	0.0842	0.0888	0.0827	0.0782	0.0759	0.0776	0.0782	-0.0187
Nevada	0.0539	0.0562	0.0574	0.0554	0.0544	0.0615	0.0581	0.0550	0.0494	0.0472	0.0512	-0.0616
New Hampshire	0.0153	0.0192	0.0186	0.1199	0.1207	0.1259	0.1232	0.1180	0.1042	0.1056	0.1057	1.4462
New Jersey	0.1045	0.1082	0.1151	0.1162	0.1190	0.1272	0.1337	0.1363	0.1390	0.1344	0.1370	0.1210
New Mexico	0.1459	0.1604	0.1644	0.1773	0.1922	0.2075	0.1978	0.1875	0.1851	0.1858	0.1890	0.0585
New York	0.1020	0.1020	0.1091	0.1228	0.1296	0.1394	0.1352	0.1319	0.1336	0.1324	0.1347	0.1022
North Carolina	0.1142	0.1216	0.1298	0.1376	0.1363	0.1280	0.1231	0.1202	0.1176	0.1143	0.1209	-0.0232
North Dakota	0.0871	0.0890	0.0935	0.0965	0.0941	0.0911	0.0852	0.0916	0.0874	0.0869	0.0844	-0.0633
Ohio	0.0938	0.0968	0.1026	0.1077	0.1190	0.1285	0.1257	0.1244	0.1241	0.1273	0.1324	0.1667
Oklahoma	0.1386	0.1419	0.1412	0.1328	0.1407	0.1351	0.1235	0.1197	0.1151	0.1123	0.1145	-0.1135
Oregon	0.1140	0.1324	0.1346	0.1385	0.1471	0.1452	0.1238	0.1304	0.1165	0.1215	0.1224	-0.0548
Pennsylvania	0.1096	0.1048	0.1042	0.1065	0.1074	0.1080	0.1061	0.1057	0.1088	0.1072	0.1085	0.0159
Rhode Island	0.1109	0.1107	0.1139	0.1195	0.1249	0.1272	0.1259	0.1236	0.1158	0.1279	0.1287	0.0753
South Carolina	0.1216	0.1181	0.1233	0.1392	0.1503	0.1432	0.1288	0.1254	0.1238	0.1278	0.1291	-0.0025
South Dakota	0.0683	0.0698	0.0763	0.0745	0.0771	0.0757	0.0697	0.0725	0.0738	0.0724	0.0725	-0.0054
Tennessee	0.0830	0.0870	0.0858	0.0877	0.0886	0.0844	0.0843	0.0813	0.0847	0.0834	0.0864	0.0169
Texas	0.0761	0.0859	0.0826	0.0913	0.0886	0.0878	0.0886	0.0787	0.0700	0.0653	0.0744	-0.0766

State	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Avg.% change
Utah	0.1047	0.1017	0.1038	0.1056	0.1090	0.1135	0.1059	0.1017	0.0979	0.0971	0.1006	-0.0316
Vermont	0.0849	0.0887	0.2274	0.2333	0.2337	0.2387	0.2345	0.2300	0.3037	0.3156	0.3286	0.8164
Virginia	0.0678	0.0656	0.0712	0.0895	0.0894	0.0871	0.0844	0.0819	0.0874	0.0873	0.0959	0.1971
Washington	0.1437	0.1333	0.1254	0.1277	0.1340	0.1359	0.1348	0.1309	0.1270	0.1262	0.1292	-0.0188
West Virginia	0.2021	0.2114	0.2066	0.2113	0.2104	0.2134	0.2164	0.2114	0.2061	0.2010	0.2014	-0.0359
Wisconsin	0.1388	0.1397	0.1397	0.1464	0.1494	0.1503	0.1498	0.1442	0.1432	0.1446	0.1439	-0.0041
Wyoming	0.1036	0.1098	0.1291	0.1264	0.1169	0.1280	0.1285	0.1252	0.1324	0.1035	0.1413	0.1836

Table 2 depicts state rank and quartile placement for mean fiscal effort and NAEP scale score for fourth and eighth grade reading and math for the years 2003, 2005 and 2007. Assuming that any type of relationship exists between state fiscal effort and achievement, one may expect that quartile rank of effort and achievement variables would be equal if not similar. Of the fifty United States and the District of Columbia there were only seven instances where effort quartile score matched all four NAEP achievement quartile scores. Of those seven only Vermont and Minnesota ranked in the top quartile in all variables. In contrast, nine states scored in the top quartile in all NAEP assessments while not scoring in the top quartile for fiscal effort. Of the states that ranked in the bottom quartile for fiscal effort only Nevada, Tennessee and the District of Columbia scored in the bottom half quartiles for achievement on all the NAEP assessments. Virginia and North Dakota ranked in the bottom quartile for effort but scored in the top quartile for mean NAEP scale score for all assessments. Table 2 serves as an informal analysis of the relationship between the variables of state fiscal effort and achievement. Using this table in a holistic overview it would be hard to conclude that a definitive relationship exists based on the initial rankings and quartile computations.

Table 2

Rank and Quartile of Mean State Fiscal Effort and Mean NAEP Achievement for years 2003, 2005, & 2007

State	Rank Effort	Effort Quartile	Rank Reading 4th	Reading 4 Quartile	Rank Reading 8th	Reading 8 Quartile	Rank Math 4th	Math 4 Quartile	Rank Math 8th	Math 8 Quartile
Vermont	1	1	3	1	2	1	5	1	4	1
Hawaii	2	1	30	3	38	3	29	3	36	3
West Virginia	3	1	24	2	31	3	26	3	33	3
New Mexico	4	1	33	3	36	3	35	3	37	3
Michigan	5	1	19	2	22	2	18	2	24	2
Minnesota	6	1	7	1	8	1	4	1	2	1
Arkansas	7	1	25	2	28	3	23	2	32	3
Maine	8	1	6	1	6	1	11	1	13	2
Wisconsin	9	1	14	2	15	2	10	1	8	1
Mississippi	10	1	35	3	35	3	33	3	39	4
Kansas	11	1	14	2	12	1	3	1	7	1
Alabama	12	1	30	3	34	3	34	3	38	3
Kentucky	13	2	17	2	19	2	27	3	25	2
Indiana	14	2	18	2	20	2	9	1	14	2
Idaho	15	2	16	2	18	2	13	2	17	2
Montana	16	2	6	1	4	1	11	1	6	1
New York	17	2	11	1	17	2	14	2	21	2
South Carolina	18	2	28	3	30	3	19	2	21	2
New Jersey	19	2	4	1	7	1	5	1	9	1
Washington	20	2	12	1	17	2	9	1	11	1
Oregon	21	2	23	2	18	2	20	2	15	2
Alaska	22	2	29	3	28	3	22	2	20	2
California	23	2	33	3	37	3	31	3	35	3
Ohio	24	2	9	1	10	1	8	1	12	1
Wyoming	25	2	10	1	11	1	6	1	10	1

State	Rank Effort	Effort Quartile	Rank Reading 4th	Reading 4 Quartile	Rank Reading 8th	Reading 8 Quartile	Rank Math 4th	Math 4 Quartile	Rank Math 8th	Math 8 Quartile
Rhode Island	26	3	22	2	24	2	25	2	28	3
Oklahoma	27	3	27	3	23	2	24	2	29	3
North Carolina	28	3	20	2	25	2	8	1	15	2
New Hampshire	29	3	2	1	3	1	2	1	6	1
Georgia	30	3	26	3	28	3	25	2	30	3
Iowa	31	3	11	1	10	1	11	1	10	1
Massachusetts	32	3	1	1	1	1	1	1	1	1
Delaware	33	3	6	1	15	2	13	2	20	2
Arizona	34	3	31	3	32	3	29	3	27	3
Pennsylvania	35	3	12	1	13	2	11	1	16	2
Louisiana	36	3	34	3	33	3	32	3	35	3
Utah	37	3	17	2	21	2	17	2	20	2
Florida	38	3	17	2	29	3	15	2	26	3
Maryland	39	4	15	2	21	2	19	2	19	2
District of Columbia	40	4	36	3	39	4	36	3	40	4
Connecticut	41	4	3	1	14	2	7	1	15	2
North Dakota	42	4	7	1	6	1	7	1	3	1
Missouri	43	4	15	2	16	2	21	2	22	2
Virginia	44	4	5	1	9	1	9	1	9	1
Tennessee	45	4	28	3	27	3	28	3	31	3
Colorado	46	4	8	1	13	2	16	2	12	1
Nebraska	47	4	14	2	12	1	18	2	12	1
Texas	48	4	21	2	26	3	11	1	18	2
Illinois	49	4	22	2	18	2	23	2	23	2
South Dakota	50	4	13	2	5	1	12	1	5	1
Nevada	51	4	32	3	34	3	30	3	34	3

Correlation of State Fiscal Effort and Achievement

To address the question "Are state fiscal effort and state level student achievement correlated?" a bivariate correlation analysis was conducted for all available NAEP reading and assessments from 1996 through 2007. The years of available NAEP data were matched with state fiscal effort scores for corresponding years. A state could have as many as five matching data points (1998, 2002, 2003, 2005 & 2007) and as little as three (2003, 2005 & 2007). Table 3 depicts correlation statistics for all available fourth and eighth NAEP reading assessments and paired fiscal effort scores. The Pearson moment correlation score represents the strength and direction of the correlation and relationship. The closer the correlation score is to (+/-) 1 the stronger relationship. The "p" statistic within Table 3 confirms statistical significance relationship at the .05 level.

In examining NAEP grade four reading, seven states, Arkansas, Colorado, Hawaii, Massachusetts, New Hampshire, New York and Virginia were determined to demonstrate statistically significant positive correlations. Grade eight reading had four states, Iowa, North Carolina, Oklahoma and Oregon that showed statistically significant positive correlations. There were no statistically significant negative correlations. However, 30 of the 102 reading assessments examined were determined to have a negative correlation. In summation, there lacked a substantial amount of either negatively or positively statistically significant relationships between state fiscal effort and NAEP reading achievement.

Table 3

Correlation of State Fiscal Effort and NAEP Reading Achievement for Years 1998-2007

State	NAEP Assessment	r	P	State	NAEP Assessment	r	P
Alabama	Reading 4	.675	.211	Indiana	Reading 4	-.676	.324
	Reading 8	-.184	.767		Reading 8	-.698	.302
Alaska	Reading 4	.931	.237	Iowa	Reading 4	-.169	.786
	Reading 8	-.182	.884		Reading 8	.999*	.027
Arizona	Reading 4	.463	.433	Kansas	Reading 4	.711	.178
	Reading 8	-.751	.144		Reading 8	-.117	.851
Arkansas	Reading 4	.950*	.013	Kentucky	Reading 4	.400	.504
	Reading 8	.400	.505		Reading 8	.537	.350
California	Reading 4	.668	.218	Louisiana	Reading 4	-.293	.632
	Reading 8	-.191	.759		Reading 8	.516	.373
Colorado	Reading 4	.962*	.038	Maine	Reading 4	.494	.398
	Reading 8	.813	.187		Reading 8	-.324	.594
Connecticut	Reading 4	-.426	.475	Maryland	Reading 4	.850	.068
	Reading 8	-.606	.279		Reading 8	.849	.069
Delaware	Reading 4	.395	.511	Massachusetts	Reading 4	.932*	.021
	Reading 8	.370	.540		Reading 8	.769	.129
District of Columbia	Reading 4	.827	.084	Michigan	Reading 4	.294	.631
	Reading 8	.806	.099		Reading 8	.795	.205
Florida	Reading 4	-.741	.152	Minnesota	Reading 4	.681	.206
	Reading 8	-.152	.807		Reading 8	.943	.057
Georgia	Reading 4	.699	.189	Mississippi	Reading 4	.601	.283
	Reading 8	.786	.115		Reading 8	.059	.925
Hawaii	Reading 4	.942*	.017	Missouri	Reading 4	.298	.627
	Reading 8	.632	.253		Reading 8	.613	.272
Idaho	Reading 4	-.196	.804	Montana	Reading 4	.014	.982
	Reading 8	.659	.341		Reading 8	.498	.394
Illinois	Reading 4	-.906	.279	Nebraska	Reading 4	.061	.939
	Reading 8	.962	.176		Reading 8	.708	.292

State	NAEP Assessment	r	P	State	NAEP Assessment	r	P
Nevada	Reading 4	-.116	.853	South Carolina	Reading 4	.658	.227
	Reading 8	-.123	.844		Reading 8	.784	.116
New Hampshire	Reading 4	.997*	.047	South Dakota	Reading 4	.197	.874
	Reading 8	.605	.395		Reading 8	-.751	.459
New Jersey	Reading 4	-.101	.936	Tennessee	Reading 4	.131	.834
	Reading 8	.617	.577		Reading 8	-.366	.545
New Mexico	Reading 4	.170	.784	Texas	Reading 4	-.823	.087
	Reading 8	-.598	.287		Reading 8	.464	.431
New York	Reading 4	.943*	.016	Utah	Reading 4	.288	.638
	Reading 8	-.483	.410		Reading 8	.558	.329
North Carolina	Reading 4	.620	.265	Vermont	Reading 4	.816	.184
	Reading 8	.944*	.016		Reading 8	.050	.950
North Dakota	Reading 4	-.077	.923	Virginia	Reading 4	.978*	.004
	Reading 8	-.274	.726		Reading 8	.551	.336
Ohio	Reading 4	.746	.254	Washington	Reading 4	-.279	.649
	Reading 8	.881	.119		Reading 8	.302	.621
Oklahoma	Reading 4	.293	.632	West Virginia	Reading 4	.876	.052
	Reading 8	.927*	.023		Reading 8	.796	.107
Oregon	Reading 4	.270	.661	Wisconsin	Reading 4	-.413	.587
	Reading 8	.892*	.042		Reading 8	.413	.587
Pennsylvania	Reading 4	.802	.198	Wyoming	Reading 4	.873	.053
	Reading 8	.843	.157		Reading 8	-.618	.267
Rhode Island	Reading 4	.374	.535				
	Reading 8	-.705	.184				

*denotes significance at the (.05) level

When examining NAEP grade four math assessments, eight states, Arizona, Connecticut, District of Columbia, Hawaii, Massachusetts, Ohio, Vermont and Wyoming were determined to demonstrate statistically significant positive correlations, while two states, Washington and Oklahoma had significant negative correlations. Grade eight reading had seven states, District of Columbia, Hawaii, Maryland, Massachusetts, Minnesota, Mississippi, New York and Vermont that showed statistically significant positive correlations and one state, Washington that had a significant negative correlation. In total there were three statistically significant negative correlations and fifteen significant positive correlations. In total 35 of the 102 math assessments examined were determined to have a negative correlation with the remaining 67 having a positive correlation. In summation, there lacked a substantial amount of either negatively or positively statistically significant relationships between state fiscal effort and NAEP math achievement.

Table 4

Correlation of State Fiscal Effort and NAEP Math Achievement for Years 1996-2007

State	NAEP Assessment	r	P	State	NAEP Assessment	r	P
Alabama	Math 4	.019	.976	Indiana	Math 4	-.484	.409
	Math 8	.610	.275		Math 8	-.354	.559
Alaska	Math 4	-.833	.167	Iowa	Math 4	-.633	.251
	Math 8	-.153	.847		Math 8	-.563	.437
Arizona	Math 4	.909*	.033	Kansas	Math 4	-.112	.888
	Math 8	.775	.123		Math 8	.633	.367
Arkansas	Math 4	.848	.069	Kentucky	Math 4	-.224	.717
	Math 8	.750	.144		Math 8	.114	.855
California	Math 4	.766	.131	Louisiana	Math 4	-.298	.627
	Math 8	.681	.205		Math 8	-.383	.525
Colorado	Math 4	.622	.263	Maine	Math 4	.749	.145
	Math 8	.948	.052		Math 8	.585	.300
Connecticut	Math 4	.999*	.001	Maryland	Math 4	.698	.190
	Math 8	.591	.294		Math 8	.908*	.033
Delaware	Math 4	.469	.531	Massachusetts	Math 4	.985*	.002
	Math 8	.527	.473		Math 8	.972*	.006
District of Columbia	Math 4	.988*	.002	Michigan	Math 4	.622	.263
	Math 8	.970*	.006		Math 8	-.741	.152
Florida	Math 4	-.818	.182	Minnesota	Math 4	.806	.100
	Math 8	-.711	.289		Math 8	.909*	.032
Georgia	Math 4	.635	.249	Mississippi	Math 4	.858	.063
	Math 8	.670	.216		Math 8	.906*	.034
Hawaii	Math 4	.953*	.012	Missouri	Math 4	.719	.171
	Math 8	.978*	.004		Math 8	.717	.173
Idaho	Math 4	.012	.988	Montana	Math 4	.129	.837
	Math 8	.423	.577		Math 8	.290	.636
Illinois	Math 4	.823	.177	Nebraska	Math 4	-.193	.765
	Math 8	.591	.409		Math 8	-.752	.143

State	NAEP Assessment	r	P	State	NAEP Assessment	r	P
Nevada	Math 4	-.413	.489	South Carolina	Math 4	-.071	.910
	Math 8	-.666	.334		Math 8	-.132	.832
New Hampshire	Math 4	-.827	.380	South Dakota	Math 4	.991	.086
	Math 8	-.117	.926		Math 8	.790	.420
New Jersey	Math 4	.929	.071	Tennessee	Math 4	.091	.884
	Math 8	.498	.668		Math 8	.055	.930
New Mexico	Math 4	.708	.181	Texas	Math 4	-.506	.384
	Math 8	.348	.566		Math 8	-.458	.437
New York	Math 4	.855	.065	Utah	Math 4	-.751	.144
	Math 8	.888*	.044		Math 8	-.363	.548
North Carolina	Math 4	-.071	.909	Vermont	Math 4	.919*	.027
	Math 8	.109	.861		Math 8	.880*	.049
North Dakota	Math 4	-.676	.210	Virginia	Math 4	.815	.093
	Math 8	-.782	.118		Math 8	.809	.097
Ohio	Math 4	.950*	.050	Washington	Math 4	-.969*	.031
	Math 8	.860	.140		Math 8	-.993*	.007
Oklahoma	Math 4	-.979*	.021	West Virginia	Math 4	-.125	.841
	Math 8	-.668	.332		Math 8	.329	.588
Oregon	Math 4	-.291	.635	Wisconsin	Math 4	.361	.639
	Math 8	.189	.761		Math 8	.246	.754
Pennsylvania	Math 4	-.247	.753	Wyoming	Math 4	.912*	.031
	Math 8	.664	.537		Math 8	-.469	.425
Rhode Island	Math 4	.711	.179				
	Math 8	.761	.135				

Does State Fiscal Effort Predict Student Achievement?

To address the second research question "Is state fiscal effort towards education a predictor of student academic achievement?" a simple linear regression was computed for all available NAEP reading and math assessments from 1996 through 2007. The years of available NAEP data were matched with state fiscal effort scores for corresponding years. A state could have as many as five matching data points (1998, 2002, 2003, 2005 & 2007) and as little as three (2003, 2005 & 2007). A simple linear regression model attempts to explain the relationship between two variables using a straight line. Table 5 portrays the results from the simple linear regression model run for fourth and eighth grade reading. Statistics reported include *(B)* which is the size of the coefficient for the independent variable. Coefficient values gives the size of the effect that state fiscal effort is having on your achievement, and the sign on the coefficient gives the direction of the effect. In the current study the coefficient tells the researcher how much the achievement is expected to increase or decrease when that fiscal effort increases by one. Additionally, reported R^2 which gives the proportion of the variance of one variable that is predictable from the other variable, SE the standard error of the estimate which is a measure of the accuracy of predictions and (p) which is the measure of statistical significance of the relationship.

Looking at NAEP fourth grade reading achievement there was a total of six states, Arkansas, Colorado, Hawaii, Massachusetts, New York and Virginia that had significant relationships. Reading achievement for NAEP grade eight assessments had five states; Iowa, New Hampshire, North Carolina, Oklahoma and Oregon demonstrate statistically significant relationships. These states provide evidence that that over 90% of the variance in reading test scores is predicted by state fiscal effort. Conversely, it must be noted that

the multiple sources of variance that could possible explain differences in test scores are not accounted for in the tested simple linear regression model. Provided the extreme range in proportion of the variance (R^2) from .004 to .998 and the lack of substantial statistically significant linear regression relationships it is difficult to definitively summate that fiscal effort is a noteworthy predictor of academic achievement for NAEP fourth and eighth grade reading.

Standard error of the estimate findings demonstrated a range from .060 for New Hampshire to 17.691 for Wyoming. The standard error of the estimate tells us the accuracy to expect from our prediction. The small numbers in the current study and the large standard error of the estimate found for most cases presents a wide range within subjective predictions. This dictates the need for large samples and a high degree of relationship for accurate predicting.

Lastly, coefficients showed great range from a finding of (1940) for Pennsylvania to (-1284) for Illinois. For the most part coefficients were found to be positive. In general findings showed that in most instances that when fiscal effort increased achievement also increased.

Table 5

Linear Regression of State Fiscal Effort and NAEP Reading Achievement for Years 1998-2007

State	NAEP Assessment	*B*	R^2	*SE*	*P*	State	NAEP Assessment	*B*	R^2	*SE*	*P*
Alabama	Reading 4	341.93	.456	3.266	.211	Indiana	Reading 4	-337.89	.457	1.728	.324
	Reading 8	-29.78	.034	1.390	.767		Reading 8	-344.63	.487	1.661	.302
Alaska	Reading 4	251.91	.867	0.787	.237	Iowa	Reading 4	-65.19	.029	2.129	.786
	Reading 8	-55.69	.033	2.409	.884		Reading 8	124.82	.998	0.035	*.027
Arizona	Reading 4	70.85	.214	2.123	.433	Kansas	Reading 4	227.67	.505	1.684	.178
	Reading 8	-121.40	.563	1.672	.144		Reading 8	-20.68	.014	1.307	.851
Arkansas	Reading 4	269.77	.903	1.190	*.013	Kentucky	Reading 4	128.86	.160	1.605	.504
	Reading 8	48.38	.160	1.497	.505		Reading 8	204.01	.289	1.742	.350
California	Reading 4	240.16	.447	2.190	.218	Louisiana	Reading 4	-83.96	.086	3.792	.632
	Reading 8	-22.49	.036	0.948	.759		Reading 8	65.21	.266	1.500	.373
Colorado	Reading 4	346.74	.926	0.666	*.038	Maine	Reading 4	34.92	.244	0.710	.398
	Reading 8	250.22	.661	1.217	.187		Reading 8	-35.53	.105	1.196	.594
Connecticut	Reading 4	-75.27	.181	1.652	.475	Maryland	Reading 4	508.37	.722	2.875	.068
	Reading 8	-143.72	.367	1.949	.279		Reading 8	180.01	.721	1.021	.069
Delaware	Reading 4	491.69	.156	8.468	.511	Massachusetts	Reading 4	353.06	.869	2.144	*.021
	Reading 8	307.27	.137	5.707	.540		Reading 8	113.55	.591	1.477	.129
District of Columbia	Reading 4	534.01	.684	4.265	.084	Michigan	Reading 4	74.86	.068	1.674	.631
	Reading 8	152.35	.650	1.314	.099		Reading 8	279.41	.632	1.768	.205
Florida	Reading 4	-732.88	.549	5.213	.152	Minnesota	Reading 4	76.86	.464	2.205	.206
	Reading 8	-58.02	.023	2.954	.807		Reading 8	53.50	.890	0.609	.057
Georgia	Reading 4	266.25	.488	2.944	.189	Mississippi	Reading 4	113.28	.362	1.913	.283
	Reading 8	70.29	.618	0.597	.115		Reading 8	12.95	.004	2.776	.925
Hawaii	Reading 4	107.84	.887	1.867	*.017	Missouri	Reading 4	402.01	.089	2.585	.627
	Reading 8	20.14	.399	1.201	.253		Reading 8	899.34	.375	2.327	.272
Idaho	Reading 4	-37.48	.038	2.663	.804	Montana	Reading 4	3.01	.000	1.713	.982
	Reading 8	54.43	.434	0.882	.341		Reading 8	61.19	.248	0.838	.394
Illinois	Reading 4	-1284.8	.820	1.039	.279	Nebraska	Reading 4	10.18	.004	1.170	.939
	Reading 8	1203.8	.926	0.588	.176		Reading 8	214.95	.501	1.498	.292

State	NAEP Assessment	*B*	R^2	*SE*	*P*	State	NAEP Assessment	*B*	R^2	*SE*	*P*
Nevada	Reading 4	-46.68	.013	2.294	.853	South Carolina	Reading 4	165.97	.433	2.039	.227
	Reading 8	-68.93	.015	3.180	.844		Reading 8	103.31	.615	0.877	.116
New Hampshire	Reading 4	60.68	.366	1.259	.395	South Dakota	Reading 4	54.25	.039	0.801	.874
	Reading 8	54.40	.995	0.060	*.047		Reading 8	-207.25	.564	0.539	.459
New Jersey	Reading 4	-156.47	.010	5.858	.936	Tennessee	Reading 4	175.56	.017	1.916	.834
	Reading 8	230.073	.381	1.113	.577		Reading 8	-246.11	.134	0.899	.545
New Mexico	Reading 4	32.77	.029	3.859	.784	Texas	Reading 4	-246.08	.678	1.670	.087
	Reading 8	-100.02	.358	2.730	.287		Reading 8	89.38	.215	1.681	.431
New York	Reading 4	220.45	.890	1.365	*.016	Utah	Reading 4	112.76	.083	2.640	.638
	Reading 8	-17.34	.233	0.554	.410		Reading 8	76.41	.311	0.802	.329
North Carolina	Reading 4	579.54	.384	3.229	.265	Vermont	Reading 4	14.15	.666	0.578	.184
	Reading 8	687.42	.891	1.056	*.016		Reading 8	1.82	.003	2.089	.950
North Dakota	Reading 4	-43.46	.006	2.085	.923	Virginia	Reading 4	347.18	.956	0.963	*.004
	Reading 8	-105.12	.075	1.360	.726		Reading 8	56.11	.303	1.099	.336
Ohio	Reading 4	387.16	.556	1.545	.254	Washington	Reading 4	-187.11	.078	2.827	.649
	Reading 8	139.46	.776	0.335	.119		Reading 8	130.55	.091	1.808	.621
Oklahoma	Reading 4	60.38	.086	2.771	.632	West Virginia	Reading 4	300.93	.767	1.143	.052
	Reading 8	156.03	.860	0.886	*.023		Reading 8	545.31	.633	2.857	.107
Oregon	Reading 4	73.97	.073	3.391	.661	Wisconsin	Reading 4	-93.69	.170	1.068	.587
	Reading 8	156.33	.796	1.017	*.042		Reading 8	93.69	.170	1.068	.587
Pennsylvania	Reading 4	1940.58	.642	2.187	.198	Wyoming	Reading 4	136.29	.762	1.007	.053
	Reading 8	1247.18	.710	1.204	.157		Reading 8	-1050.5	.382	17.691	.267
Rhode Island	Reading 4	84.17	.140	1.916	.535						
	Reading 8	-192.28	.497	1.776	.184						

*denotes significance at the (.05) level

Looking at NAEP fourth grade mathematics achievement there was a total of nine states that had significant linear regression relationships. Math achievement for NAEP grade eight assessments also had nine states demonstrate a statistically significant linear regression relationship. Of these 18 instances of statistically significant linear regression relationships 10 were attributed to five states (Vermont, Washington, Massachusetts, Hawaii and District of Columbia). These instances of significance provide evidence that that over 90% of the variance in mathematics test scores is predicted by state fiscal effort. However, it must be noted that the multiple sources of variance that could possible explain differences in test scores are not accounted for in the tested simple linear regression model. Provided the extreme range in proportion of the variance (R^2) from .000 to .997 and the lack of substantial statistically significant linear regression relationships it is difficult to definitively state that state fiscal effort is an accurate predictor of academic achievement for NAEP fourth and eighth grade math.

Standard error of the estimate findings demonstrated a range from .037 for Connecticut to 26.430 for Wyoming. The standard error of the estimate tells us the accuracy to expect from our prediction. The small numbers in the current study and the large standard error of the estimate found for most cases presents a wide range within subjective predictions. This dictates the need for large samples and a high degree of relationship for accurate predicting.

Lastly, coefficients showed great range from a finding of (2780.9) for Missouri to (-1266.9) for Pennsylvanian. For the most part coefficients were found to be positive. In general findings showed that in most instances that when fiscal effort increased achievement also increased.

Table 6

Linear Regression of State Fiscal Effort and NAEP Math Achievement for Years 1996-2007

State	NAEP Assessment	*B*	R^2	*SE*	*P*	State	NAEP Assessment	*B*	R^2	*SE*	*P*
Alabama	Math 4	12.62	.000	7.762	.976	Indiana	Math 4	-796.91	.234	6.272	.409
	Math 8	205.40	.372	3.062	.275		Math 8	-304.47	.125	3.500	.559
Alaska	Math 4	-511.17	.694	4.010	.167	Iowa	Math 4	-687.41	.401	5.339	.251
	Math 8	-35.09	.023	2.684	.847		Math 8	-73.06	.317	.506	.437
Arizona	Math 4	428.53	.826	3.169	*.033	Kansas	Math 4	-150.68	.012	8.663	.888
	Math 8	186.73	.601	2.452	.123		Math 8	384.29	.401	3.034	.367
Arkansas	Math 4	722.21	.719	6.472	.069	Kentucky	Math 4	-332.32	.050	7.893	.717
	Math 8	423.47	.563	5.354	.144		Math 8	109.66	.013	5.219	.855
California	Math 4	871.57	.586	7.453	.131	Louisiana	Math 4	-278.82	.089	9.970	.627
	Math 8	325.19	.464	3.555	.205		Math 8	-314.14	.146	8.454	.525
Colorado	Math 4	564.68	.387	5.010	.263	Maine	Math 4	369.54	.561	4.104	.145
	Math 8	853.02	.899	1.639	.052		Math 8	116.61	.343	2.030	.300
Connecticut	Math 4	661.11	.997	0.337	*.001	Maryland	Math 4	776.49	.487	7.335	.190
	Math 8	135.22	.349	1.412	.294		Math 8	712.75	.824	3.031	*.033
Delaware	Math 4	804.80	.220	13.436	.531	Massachusetts	Math 4	607.41	.970	1.904	*.002
	Math 8	518.90	.278	7.408	.473		Math 8	534.84	.945	2.315	*.006
District of Columbia	Math 4	2117.28	.975	2.150	*.002	Michigan	Math 4	902.32	.386	5.020	.263
	Math 8	1142.50	.940	1.837	*.006		Math 8	-86.72	.550	0.347	.152
Florida	Math 4	-1264.7	.670	8.194	.182	Minnesota	Math 4	243.86	.649	4.697	.100
	Math 8	-525.52	.506	4.794	.289		Math 8	131.02	.827	1.572	*.032
Georgia	Math 4	732.75	.404	8.090	.249	Mississippi	Math 4	651.21	.736	5.515	.063
	Math 8	448.42	.449	4.511	.216		Math 8	458.31	.821	3.023	*.034
Hawaii	Math 4	161.28	.909	2.967	*.012	Missouri	Math 4	2780.90	.517	4.598	.171
	Math 8	58.36	.956	0.728	*.004		Math 8	1996.53	.514	3.320	.173
Idaho	Math 4	9.32	.000	10.123	.988	Montana	Math 4	187.60	.017	8.399	.837
	Math 8	113.62	.179	3.203	.577		Math 8	87.52	.084	1.676	.636
Illinois	Math 4	1446.25	.678	4.152	.177	Nebraska	Math 4	-184.32	.037	6.892	.756
	Math 8	361.71	.349	2.057	.409		Math 8	-197.58	.565	1.274	.143

State	NAEP Assessment	B	R^2	SE	P	State	NAEP Assessment	B	R^2	SE	P
Nevada	Math 4	-755.26	.171	6.549	.489	South	Math 4	-119.89	.005	13.268	.910
	Math 8	-447.83	.443	2.418	.334	Carolina	Math 8	-186.30	.017	10.990	.832
New	Math 4	-234.43	.684	2.384	.380	South Dakota	Math 4	1253.25	.982	0.506	.086
Hampshire	Math 8	-16.84	.014	2.145	.926		Math 8	577.25	.625	1.323	.420
New Jersey	Math 4	541.96	.864	4.265	.071	Tennessee	Math 4	321.99	.008	7.567	.884
	Math 8	750.95	.248	4.955	.668		Math 8	151.61	.003	5.913	.930
New Mexico	Math 4	233.89	.335	5.366	.181	Texas	Math 4	-329.27	.256	6.032	.384
	Math 8	56.68	.121	3.507	.566		Math 8	-312.40	.210	6.514	.437
New York	Math 4	520.84	.731	5.171	.065	Utah	Math 4	-1287.8	.563	4.629	.144
	Math 8	326.75	.788	2.774	*.044		Math 8	-304.57	.132	3.192	.548
North	Math 4	-65.81	.005	9.581	.909	Vermont	Math 4	86.72	.844	4.080	*.027
Carolina	Math 8	77.97	.012	7.367	.861		Math 8	44.65	.774	2.644	*.049
North	Math 4	-945.93	.457	5.791	.210	Virginia	Math 4	662.12	.665	5.700	.093
Dakota	Math 8	-608.65	.612	2.719	.118		Math 8	556.53	.654	4.906	.097
Ohio	Math 4	587.55	.903	2.478	.050	Washington	Math 4	-1078.9	.938	2.526	*.031
	Math 8	139.75	.740	1.066	.140		Math 8	-570.01	.985	0.639	*.007
Oklahoma	Math 4	-650.53	.959	1.423	*.021	West Virginia	Math 4	-111.85	.016	6.501	.841
	Math 8	-167.70	.446	1.969	.332		Math 8	133.97	.108	2.822	.588
Oregon	Math 4	-221.76	.085	8.027	.635	Wisconsin	Math 4	447.52	.130	6.420	.639
	Math 8	58.82	.036	3.364	.761		Math 8	70.05	.060	1.533	.754
Pennsylvania	Math 4	-1266.95	.061	9.365	.753	Wyoming	Math 4	796.23	.832	5.771	*.031
	Math 8	1593.75	.441	3.811	.537		Math 8	-869.15	.220	26.430	.425
Rhode Island	Math 4	641.56	.505	5.316	.179						
	Math 8	263.75	.580	1.879	.135						

*denotes significance at the (.05) level

Historical Relationships between State Fiscal Effort and Achievement

To address the final research question "What historical trends and relationships are present in relation to a states' fiscal effort towards funding education and student academic achievement?" three statistical approaches were utilized. The first method of analysis was a time lagged correlation with a linear regression prediction function. A time lagged correlation is used to predict the significance of a two year-lag in time of one variable on another variable. In this study, state fiscal effort was lagged by two years to study its impact on achievement. Achievement on NAEP assessments for the years 2003, 2005 and 2007 were analyzed with state fiscal effort scores for the years 2005, 2003 and 2001. Statistics reported for time lagged correlation include Pearson correlation *r* score which represents the strength and direction of the relationship and the *p* statistic which indicates statistical significance relationship at the (.05) level. In addition, this time lagged data were analyzed via a predictive linear regression model.

The predictive linear regression model takes the historical relationships between state fiscal effort and academic achievement and attempts to forecast a theoretical amount of time for given the slope of the regression to reach a given state's maximum level achievement based on prior outcomes. The forecast of the effort line of (X) to reach maximum achievement (Y) is represented as lead time in months. There are some instances where a state has consistent or identical achievement values and correlation statistics were impossible to compute. Additionally, in the predictive linear regression model the slope of the linear equation may be close to or equal to zero and therefore impossible to predict when the effort line of (X) would reach the given value of achievement (Y) since a linear relationship does not exist. Theoretically, the line could

never reach the maximum level of achievement and it would take an infinite amount of time or the value cannot be computed given a negative slope of the achievement or Y values. Conversely, there are some instances where an individual states' slope of effort X has already reached the maximum achievement Y and the lead time is equal to zero. In theory, these states are already putting forth the necessary effort to achieve their maximum achievement value. The lead time calculation for the remainder of the states is a speculative forecast on the amount of time past the year 2007 it would take to reach the maximum value of achievement Y given the slope of state fiscal effort X.

In using the time lagged correlation and a linear regression prediction model each NAEP achievement variable was assessed separately by subject and grade level. Table 7 depicts the findings from the NAEP grade four reading scale scores. In this analysis three states; Massachusetts, Montana and Wisconsin were found to have statistically significant two year time lagged correlation. Two of these significant correlations were negative. Positive correlations were found for 18 of the 51 examined variables while the remaining 32 showed a negative relationship between time-lagged state fiscal effort and achievement. There was one example where a correlation analysis could not be computed due to consistent achievement scores. In general, these findings denote that when state level fiscal effort was a level of two years prior a negative relationship exists between achievement and state fiscal effort. Provided the small amount of statistically significant data, evidence is inconclusive in showing the historical relationship or significance of a two year-lag in state fiscal effort on grade four reading achievement.

Employing a linear regression prediction model theoretically found that 21 states were putting forth enough effort to reach their maximum achievement value. The lead

time to achieve a given state's maximum achievement value ranged from a high of 40 months for Arizona to a low of 1.6 months for Hawaii. For the most part, most states had lead times under two years to attain their maximum achievement based on their previous performance.

Table 7

Time Lagged Correlation Data and Lead Time of State Fiscal Effort and NAEP Grade 4 Reading Achievement of Years 2003, 2005, 2007

State	r	P	Max "Y"	Effort Line "X"	Lead Time (months)
Alabama	-0.814	0.394	216	Effort(X)=0.131718	6.2
Alaska	-0.576	0.609	214	Effort(X)=0.113109	16
Arizona	-0.703	0.504	210	Effort(X)=0.0887517	40
Arkansas	0.446	0.706	217	Effort(X)=0.165261	0
California	-0.985	0.110	209	Effort(X)=0.121293	2.6
Colorado	X	X	224	Effort(X)=0.0916789	0
Connecticut	-0.543	0.635	228	Effort(X)=0.0937057	0
Delaware	-0.521	0.651	226	Effort(X)=0.100616	24
District of Columbia	-0.634	0.563	197	Effort(X)=0.0777792	2.6
Florida	-0.733	0.476	224	Effort(X)=0.0861006	5.3
Georgia	-0.975	0.143	219	Effort(X)=0.10455	8
Hawaii	0.252	0.838	213	Effort(X)=0.328385	1.6
Idaho	-0.746	0.464	223	Effort(X)=0.127231	0
Illinois	-0.686	0.519	219	Effort(X)=0.0722075	8
Indiana	0.343	0.777	222	Effort(X)=0.171654	24
Iowa	-0.515	0.656	225	Effort(X)=0.102979	24
Kansas	-0.970	0.158	225	Effort(X)=0.13738	8
Kentucky	-0.978	0.134	222	Effort(X)=0.135652	2.6
Louisiana	0.103	0.935	209	Effort(X)=0.195911	24
Maine	-0.435	0.713	226	Effort(X)=0.137625	0
Maryland	0.636	0.561	225	Effort(X)=0.101079	5.3
Massachusetts	*0.998	0.042	236	Effort(X)=0.112531	2
Michigan	-0.552	0.628	220	Effort(X)=0.166524	24
Minnesota	0.827	0.380	225	Effort(X)=0.17173	0

State	r	P	Max "Y"	Effort Line "X"	Lead Time (months)
Mississippi	0.824	0.383	208	Effort(X)=0.146679	13.3
Missouri	0.810	0.399	222	Effort(X)=0.0913027	0
Montana	*-0.998	0.042	227	Effort(X)=0.124646	0
Nebraska	-0.985	0.110	223	Effort(X)=0.0757322	8
Nevada	-0.906	0.278	211	Effort(X)=0.0484047	8
New Hampshire	-0.921	0.254	229	Effort(X)=0.104784	24
New Jersey	0.515	0.656	231	Effort(X)=0.153079	13.3
New Mexico	-0.612	0.581	212	Effort(X)=0.181005	0
New York	0.694	0.512	224	Effort(X)=0.13697	0
North Carolina	0.861	0.340	221	Effort(X)=0.138208	0
North Dakota	-0.882	0.312	226	Effort(X)=0.0847059	0
Ohio	0.517	0.654	226	Effort(X)=0.130529	4
Oklahoma	-0.753	0.458	217	Effort(X)=0.106449	8
Oregon	0.886	0.307	218	Effort(X)=0.144905	0
Pennsylvania	0.443	0.708	226	Effort(X)=0.110307	0
Rhode Island	-0.996	0.056	219	Effort(X)=0.115782	8
South Carolina	0.763	0.448	215	Effort(X)=0.152725	0
South Dakota	0.060	0.962	223	Effort(X)=0.144637	8
Tennessee	-0.816	0.392	216	Effort(X)=0.0829658	0
Texas	-0.657	0.543	220	Effort(X)=0.0700728	0
Utah	-0.712	0.496	221	Effort(X)=0.099606	0
Vermont	0.871	0.327	228	Effort(X)=0.303457	0
Virginia	-0.649	0.551	227	Effort(X)=0.0839748	0
Washington	-0.689	0.516	224	Effort(X)=0.126488	0
West Virginia	-0.090	0.942	219	Effort(X)=0.144794	0
Wisconsin	* -0.999	0.034	223	Effort(X)=0.143204	8
Wyoming	0.891	0.300	225	Effort(X)=0.135793	2.66667

*denotes significance

Table 8 depicts the findings from the NAEP grade eight reading scale scores. In this analysis three states; Colorado, Kentucky and Wisconsin were found to have statistically significant time lagged correlations of two years. Two of these significant correlations were positive. Negative correlations were found for 23 of the 51 examined variables while the remaining 24 showed a positive relationship between time-lagged

state fiscal effort and achievement. There were four examples where a correlation analysis could not be computed due to consistent achievement scores. In general, these findings are mixed and inconclusive as to whether relationship exists between time lagged state level fiscal effort and grade eight reading achievement. Acknowledging the small amount of statistically significant data, evidence is questionable in showing any historical relationship or significance of a two year lag in state fiscal effort.

Employing a linear regression prediction model for grade eight reading found that 36 states were theoretically putting forth enough effort to reach their maximum achievement value. The lead time to achieve a given states maximum achievement value ranged from a high of 24 months to a low of 1.22 months. For the most part, most states had lead times under two years to attain their maximum achievement based on their previous performance.

Table 8

Time Lagged Correlation Data and Lead Time of State Fiscal Effort and NAEP Grade 8 Reading Achievement of Years 2003, 2005, 2007

State	r	P	Max "Y"	Effort Line "X"	Lead Time (months)
Alabama	0.947	0.208	253	Effort(X)=0.147308	0
Alaska	-0.912	0.270	259	Effort(X)=0.124359	0
Arizona	X	X	255	Effort(X)=Inf	0
Arkansas	X	X	258	Effort(X)=NaN	X
California	-0.355	0.769	251	Effort(X)=0.117232	4.08
Colorado	* -0.999	0.032	268	Effort(X)=0.076341	0
Connecticut	-0.050	0.968	267	Effort(X)=0.0846667	1.22
Delaware	-0.025	0.984	266	Effort(X)=-0.117924	0
District of Columbia	-0.020	0.988	241	Effort(X)=-0.725386	16

State	r	P	Max "Y"	Effort Line "X"	Lead Time (months)
Florida	-0.411	0.730	260	Effort(X)=0.0725386	13.33
Georgia	-0.956	0.190	259	Effort(X)=0.105588	24
Hawaii	-0.933	0.235	251	Effort(X)=0.244379	0
Idaho	-0.992	0.082	265	Effort(X)=0.125407	8
Illinois	0.995	0.065	266	Effort(X)=0.0784762	0
Indiana	0.899	0.289	265	Effort(X)=0.151408	0
Iowa	0.857	0.344	268	Effort(X)=0.127902	0
Kansas	-0.697	0.509	267	Effort(X)=0.138939	0
Kentucky	* 1.000	0.013	266	Effort(X)=0.143375	0
Louisiana	X	X	253	Effort(X)=NaN	X
Maine	0.073	0.953	270	Effort(X)=0.169041	0
Maryland	0.286	0.815	265	Effort(X)=0.104825	13.33
Massachusetts	-0.077	0.951	274	Effort(X)=0.0393302	0
Michigan	0.942	0.218	264	Effort(X)=0.185785	0
Minnesota	X	X	268	Effort(X)=NaN	X
Mississippi	-0.879	0.317	255	Effort(X)=0.138636	0
Missouri	0.995	0.066	267	Effort(X)=0.0904006	0
Montana	-0.556	0.625	271	Effort(X)=0.117892	24
Nebraska	-0.641	0.557	267	Effort(X)=0.0769373	0
Nevada	0.819	0.389	253	Effort(X)=0.0600708	0
New Hampshire	0.389	0.746	271	Effort(X)=0.146735	0
New Jersey	0.965	0.168	270	Effort(X)=0.141257	0
New Mexico	0.071	0.955	252	Effort(X)=0.294805	0
New York	-0.240	0.845	265	Effort(X)=0.125849	0
North Carolina	0.861	0.340	262	Effort(X)=0.138208	0
North Dakota	0.272	0.824	270	Effort(X)=0.098676	0
Ohio	0.296	0.809	268	Effort(X)=0.136591	8
Oklahoma	0.947	0.209	262	Effort(X)=0.142357	0
Oregon	-0.409	0.732	266	Effort(X)=0.0864744	16
Pennsylvania	0.257	0.834	268	Effort(X)=0.11162	0
Rhode Island	0.996	0.056	261	Effort(X)=0.125418	0
South Carolina	0.984	0.114	258	Effort(X)=0.150792	0
South Dakota	0.895	0.295	270	Effort(X)=0.0759531	0
Tennessee	-0.996	0.059	259	Effort(X)=0.0845087	0
Texas	-0.944	0.215	261	Effort(X)=0.0700096	16
Utah	0.712	0.496	264	Effort(X)=0.113597	0
Vermont	0.861	0.340	273	Effort(X)=0.304026	24
Virginia	-0.098	0.937	268	Effort(X)=0.0723794	0
Washington	-0.414	0.728	265	Effort(X)=0.12594	0
West Virginia	-0.090	0.942	260	Effort(X)=0.144794	0

State	r	P	Max "Y"	Effort Line "X"	Lead Time (months)
Wisconsin	* 0.999	0.034	266	Effort(X)=0.149643	0
Wyoming	-0.240	0.846	268	Effort(X)=0.0923593	0

*denotes significance

Using the first statistical analysis of time lagged correlation and predictive linear regression, Table 9 depicts the findings from the NAEP grade four math scale scores. In this analysis three states; Connecticut, Massachusetts and Oklahoma were found to have statistically significant time lagged correlations of two years. Two of these significant correlations were positive, while a significant negative correlation was found for one state. Broad negative correlations were found for 34 of the 51 examined variables while the remaining 17 showed a positive relationship between time-lagged state fiscal effort and achievement. There were no examples where a correlation analysis could not be computed due to consistent achievement scores. These findings are mixed as to whether a negative relationship exists between time lagged state level fiscal effort and grade four math achievement. A small amount of statistically significant data exists to provide evidence of a significance historical relationship of a two year lag in state fiscal effort on achievement for the NAEP grade four math assessments.

Using a linear regression prediction model on fourth grade mathematics found that 38 states were theoretically putting forth enough effort to reach their maximum achievement value. The lead time to achieve a given states maximum achievement value ranged from a high of 24 months to a low of 1.14 months. All states had lead times less than or equal to two years to attain their maximum achievement based on their previous performance.

Table 9

Time Lagged Correlation Data and Lead Time of State Fiscal Effort and NAEP Grade 4 Math Achievement of Years 2003-2007

State	r	P	Max "Y"	Effort Line "X"	Lead Time (months)
Alabama	-0.926	0.246	229	Effort(X)=0.133094	2.66667
Alaska	-0.984	0.115	237	Effort(X)=0.122748	0
Arizona	0.265	0.829	232	Effort(X)=0.153323	2.66667
Arkansas	0.625	0.570	238	Effort(X)=0.164668	0
California	-0.632	0.564	230	Effort(X)=0.122813	0
Colorado	0.890	0.301	240	Effort(X)=0.087736	0
Connecticut	* 0.999	0.032	243	Effort(X)=0.096348	0
Delaware	-0.986	0.105	242	Effort(X)=0.105667	0
District of Columbia	-0.876	0.321	214	Effort(X)=0.0885221	0
Florida	-0.972	0.151	242	Effort(X)=0.0933225	0
Georgia	-0.469	0.689	235	Effort(X)=0.101356	0
Hawaii	0.283	0.817	234	Effort(X)=0.319293	1.14286
Idaho	-0.497	0.669	242	Effort(X)=0.122359	0
Illinois	-0.686	0.519	237	Effort(X)=0.0722075	8
Indiana	-0.439	0.711	245	Effort(X)=0.117162	3.42857
Iowa	-0.995	0.062	243	Effort(X)=0.109633	1.6
Kansas	-0.893	0.297	248	Effort(X)=0.138299	0
Kentucky	-0.978	0.134	235	Effort(X)=0.135652	2.66667
Louisiana	-0.409	0.732	230	Effort(X)=0.095284	0
Maine	-0.168	0.892	242	Effort(X)=0.13003	0
Maryland	0.963	0.173	240	Effort(X)=0.0994383	0
Massachusetts	*0.997	0.049	252	Effort(X)=0.112207	0
Michigan	-0.834	0.372	238	Effort(X)=0.173707	0
Minnesota	0.706	0.501	247	Effort(X)=0.177492	0
Mississippi	0.879	0.317	228	Effort(X)=0.145162	0
Missouri	-0.913	0.267	239	Effort(X)=0.0855349	8
Montana	-0.978	0.133	244	Effort(X)=0.125279	0
Nebraska	-0.641	0.557	238	Effort(X)=0.0769373	0
Nevada	-0.574	0.611	232	Effort(X)=0.0463647	0
New Hampshire	-0.797	0.413	249	Effort(X)=0.103037	0
New Jersey	0.965	0.168	249	Effort(X)=0.141257	0
New Mexico	-0.800	0.409	228	Effort(X)=0.182742	4.8
New York	0.500	0.667	243	Effort(X)=0.139216	3.42857
North Carolina	0.230	0.852	242	Effort(X)=0.149833	0

State	r	P	Max "Y"	Effort Line "X"	Lead Time (months)
North Dakota	-0.863	0.337	245	Effort(X)=0.084447	0
Ohio	0.787	0.423	245	Effort(X)=0.127157	0
Oklahoma	* -0.999	0.033	237	Effort(X)=0.114607	0
Oregon	-0.289	0.814	238	Effort(X)=0.065193	0
Pennsylvania	0.388	0.747	244	Effort(X)=0.110577	0
Rhode Island	-0.819	0.389	236	Effort(X)=0.115439	0
South Carolina	-0.763	0.448	238	Effort(X)=0.115817	24
South Dakota	-0.923	0.251	242	Effort(X)=0.070508	0
Tennessee	-0.960	0.180	233	Effort(X)=0.0840132	0
Texas	-0.503	0.664	242	Effort(X)=0.070097	0
Utah	-0.712	0.496	239	Effort(X)=0.099606	0
Vermont	0.871	0.327	246	Effort(X)=0.303457	0
Virginia	-0.091	0.942	244	Effort(X)=0.0559872	4.8
Washington	-0.579	0.607	243	Effort(X)=0.126316	0
West Virginia	-0.817	0.391	236	Effort(X)=0.203641	8
Wisconsin	-0.790	0.420	244	Effort(X)=0.143039	0
Wyoming	0.996	0.058	244	Effort(X)=0.132987	0

*denotes significance

The final subject analyzed via time lagged correlation and predictive linear regression is eighth grade mathematics. This analysis provides data for the final research question using the first of three analyses. Table 10 depicts the findings from the NAEP grade eight math scale scores. In this analysis two states; Massachusetts and South Carolina were found to have statistically significant time lagged correlations. One of these significant correlations was positive, while the other was a significant negative correlation. Minor negative correlations were found for 40 of the 51 examined variables while ten others showed a positive relationship between time-lagged state fiscal effort and achievement. There was one example where a correlation analysis could not be computed due to consistent achievement scores. These findings show that a general negative relationship exists between time-lagged state level fiscal effort and achievement

in eighth grade mathematics. However, the small amount of statistically significant data that exists fails to provide substantial evidence of a significance historical relationship of a two year lag in state fiscal effort on achievement for the NAEP grade eight math assessments.

Using a linear regression prediction model on fourth grade mathematics found that 18 states were theoretically putting forth enough effort to reach their maximum achievement value. The lead time to achieve a given states maximum achievement value ranged from a high of 32 months to a low of 1.6 months. Most states had lead times less than or equal to two years to attain their maximum achievement based on their previous performance.

Table 10

Time Lagged Correlation Data and Lead Time of State Fiscal Effort and NAEP Grade 8 Math Achievement of Years 2003-2007

State	r	P	Max "Y"	Effort Line "X"	Lead Time (months)
Alabama	-0.751	0.459	266	Effort(X)=0.13097	8
Alaska	-0.812	0.397	283	Effort(X)=0.117321	8
Arizona	0.542	0.635	276	Effort(X)=0.124312	0
Arkansas	0.648	0.552	274	Effort(X)=0.164612	0
California	-0.851	0.352	270	Effort(X)=0.121933	0
Colorado	-0.168	0.893	286	Effort(X)=0.0456739	18.6667
Connecticut	-0.692	0.514	284	Effort(X)=0.0939521	0
Delaware	-0.986	0.105	283	Effort(X)=0.105667	0
District of Columbia	-0.690	0.515	248	Effort(X)=0.0805371	1.6
Florida	-0.928	0.243	277	Effort(X)=0.0916566	0
Georgia	-0.806	0.403	275	Effort(X)=0.103572	1.6
Hawaii	-0.153	0.902	269	Effort(X)=0.124223	8
Idaho	-0.994	0.072	284	Effort(X)=0.125842	4
Illinois	-0.886	0.307	280	Effort(X)=0.0732286	2.66667

State	r	P	Max "Y"	Effort Line "X"	Lead Time (months)
Indiana	-0.404	0.735	285	Effort(X)=0.114689	4
Iowa	-0.874	0.323	285	Effort(X)=0.107695	8
Kansas	-0.970	0.158	290	Effort(X)=0.13738	8
Kentucky	-0.856	0.346	279	Effort(X)=0.134799	8
Louisiana	-0.906	0.278	272	Effort(X)=0.0971712	2.66667
Maine	-0.918	0.259	286	Effort(X)=0.14091	12
Maryland	0.508	0.661	286	Effort(X)=0.101924	8
Massachusetts	* 1.000	0.015	298	Effort(X)=0.112326	0
Michigan	-0.834	0.372	277	Effort(X)=0.173707	0
Minnesota	-0.562	0.620	292	Effort(X)=0.133421	24
Mississippi	0.993	0.074	265	Effort(X)=0.145977	4
Missouri	-0.490	0.674	281	Effort(X)=0.0841914	32
Montana	-0.897	0.291	287	Effort(X)=0.122229	8
Nebraska	-0.641	0.557	284	Effort(X)=0.0769373	0
Nevada	-0.408	0.732	271	Effort(X)=0.0446539	0
New Hampshire	-0.978	0.133	288	Effort(X)=0.104474	16
New Jersey	0.918	0.259	289	Effort(X)=0.142623	2
New Mexico	-0.899	0.288	268	Effort(X)=0.183581	8
New York	X	X	280	Effort(X)=NaN	X
North Carolina	-0.912	0.269	284	Effort(X)=0.114155	2.66667
North Dakota	-0.272	0.824	292	Effort(X)=0.0693263	8
Ohio	0.592	0.596	285	Effort(X)=0.129384	2.66667
Oklahoma	-0.572	0.612	275	Effort(X)=0.100923	13.3333
Oregon	-0.886	0.307	284	Effort(X)=0.10946	2.66667
Pennsylvania	0.706	0.501	286	Effort(X)=0.109533	3.42857
Rhode Island	-0.996	0.056	275	Effort(X)=0.115782	8
South Carolina	* -1.000	0.007	282	Effort(X)=0.123629	0
South Dakota	-0.608	0.584	288	Effort(X)=0.0682112	0
Tennessee	-0.816	0.392	274	Effort(X)=0.0829658	0
Texas	-0.898	0.290	286	Effort(X)=0.0700451	0
Utah	-0.253	0.837	281	Effort(X)=0.0911246	0
Vermont	0.984	0.114	291	Effort(X)=0.303645	4.8
Virginia	-0.233	0.850	288	Effort(X)=0.0753222	2.66667
Washington	-0.414	0.728	285	Effort(X)=0.12594	0
West Virginia	-0.576	0.609	271	Effort(X)=0.20197	0
Wisconsin	-0.838	0.367	286	Effort(X)=0.143067	0
Wyoming	0.350	0.772	287	Effort(X)=0.150329	18.6667

*denotes significance

In reviewing the initial findings of the time lagged correlation and predictive linear regression it was established that many states were already theoretically achieving their maximum achievement based on their own prior achievement results. Each of the NAEP assessments has shown great range in state level scale score. Given that in the prior analyses states were already achieving their max achievement it would be accurate to state that the range in these maximum achievement levels is broad. In essence, some states were already achieving a low level of maximum achievement compared to others that scored much higher on various NAEP assessments.

To investigate the linear regression prediction model further, each state was analyzed with maximum achievement level being set to the equivalent of the highest performing state. As a result, the prior achievement variables and state fiscal effort scores for each state used that make the best fit line will be extended forward until the new maximum achievement is reached. This new maximum achievement is set to match that of the highest performing state for each of the four analyzed NAEP assessments. The calculated lead time will theoretically illustrate the amount of time past 2007 for each state to reach the achievement level of the highest performing state. This altered linear regression prediction model will serve as the second statistical measure used to provide data for the third and final research question.

Using the established value of achievement "y" as 236, Table 11 depicts the lead time for each state to reach this value for NAEP grade four reading. Compared to the prior lead time analysis, the time to reach the new level of achievement has significantly increased. However, six states are already achieving at this level. This is partly due these states having either high levels of effort or achievement or both which will create a sharp

slope. In comparison to these states there are some instances of astronomical lead times such as Arizona with 1,288 months and Michigan with 792 months. Again, these results probably overstate the models importance of state fiscal effort. These states most likely have low fiscal effort scores or low achievement scores that decrease the slope of the best fit line and therefore extend the amount of time for these states to reach this new maximum achievement.

Table 11

Lead Time of State Fiscal Effort to Reach Max "y" = 236 for NAEP Grade 4 Reading Achievement

State	Effort Line "X"	Lead Time (months)
Alabama	Effort(X)=0.102204	112.889
Alaska	Effort(X)=-0.109941	544
Arizona	Effort(X)=-0.203108	1288
Arkansas	Effort(X)=0.434502	296
California	Effort(X)=-0.0190134	434.667
Colorado	Effort(X)=2.58053e+012	1.50
Connecticut	Effort(X)=0.0800082	0
Delaware	Effort(X)=0.00684419	504
District of Columbia	Effort(X)=-0.121292	210.667
Florida	Effort(X)=0.0270594	101.333
Georgia	Effort(X)=0.0592151	171.2
Hawaii	Effort(X)=0.960007	222.4
Idaho	Effort(X)=0.0479988	120
Illinois	Effort(X)=0.0399363	280
Indiana	Effort(X)=0.375837	360
Iowa	Effort(X)=0.0220197	288
Kansas	Effort(X)=0.120471	113.6
Kentucky	Effort(X)=0.101441	226.667
Louisiana	Effort(X)=1.38241	672
Maine	Effort(X)=0.066621	240
Maryland	Effort(X)=0.11057	93.3333
Massachusetts	Effort(X)=0.112531	2

State	Effort Line "X"	Lead Time (months)
Michigan	Effort(X)=-0.0194892	792
Minnesota	Effort(X)=0.349798	256
Mississippi	Effort(X)=0.19621	461.333
Missouri	Effort(X)=0.155504	0
Montana	Effort(X)=0.0863734	108
Nebraska	Effort(X)=0.0250039	320
Nevada	Effort(X)=-0.00351664	308
New Hampshire	Effort(X)=0.0262124	360
New Jersey	Effort(X)=0.177233	53.3333
New Mexico	Effort(X)=0.125952	128.889
New York	Effort(X)=0.187035	288
North Carolina	Effort(X)=0.218806	0
North Dakota	Effort(X)=0.0595846	116
Ohio	Effort(X)=0.163055	124
Oklahoma	Effort(X)=-0.0835788	312
Oregon	Effort(X)=0.357575	0
Pennsylvania	Effort(X)=0.119023	67.4286
Rhode Island	Effort(X)=0.0611782	280
South Carolina	Effort(X)=0.540258	0
South Dakota	Effort(X)=1.53078	632
Tennessee	Effort(X)=0.0536839	240
Texas	Effort(X)=-0.0285428	148.8
Utah	Effort(X)=-0.00532385	352
Vermont	Effort(X)=0.672709	192
Virginia	Effort(X)=0.0672853	104
Washington	Effort(X)=0.0774473	189.333
West Virginia	Effort(X)=-0.276924	0
Wisconsin	Effort(X)=0.101346	320
Wyoming	Effort(X)=0.200964	178.667
Wisconsin	Effort(X)=0.101346	320
Wyoming	Effort(X)=0.200964	178.667

In analyzing grade eight reading, the newly established value of achievement "y" is 274. Table 12 depicts the lead time for each state to reach this value for NAEP grade eight reading. Compared to the prior lead time analysis for grade eight reading, the time to reach the new level of achievement has increased for a handful of states. In contrast to

grade four reading, thirty states are already achieving at this level and have a lead time of zero. This result is partly due these states having either high levels of effort or achievement or both which will create a sharp slope for the state's best fit line. Several states were calculated to have sizeable lead times such as Tennessee with 712 months and Washington with 424 months. These results can probably be attributed to the overemphasis of the model on the significance of state fiscal effort. These two examples most likely have low or flat fiscal effort scores and or achievement scores that decrease the slope of the best fit line and therefore extend the amount of time for these states to reach this new maximum achievement.

Table 12

Lead Time of State Fiscal Effort to Reach Max "y" = 274 for NAEP Grade 8 Reading Achievement

State	Effort Line "X"	Lead Time (months)
Alabama	Effort(X)=0.375	0
Alaska	Effort(X)=0.0396427	232
Arizona	Effort(X)=-Inf	2.37
Arkansas	Effort(X)=Inf	0
California	Effort(X)=-0.760609	2.85
Colorado	Effort(X)=0.053263	0
Connecticut	Effort(X)=0.00940827	9.78
Delaware	Effort(X)=-2.85292	0
District of Columbia	Effort(X)=-17.1334	808
Florida	Effort(X)=-0.117075	237.333
Georgia	Effort(X)=-0.0121828	744
Hawaii	Effort(X)=-0.12735	0
Idaho	Effort(X)=-0.063774	440
Illinois	Effort(X)=0.0903422	0
Indiana	Effort(X)=0.199589	0
Iowa	Effort(X)=0.219724	0
Kansas	Effort(X)=0.0640874	328
Kentucky	Effort(X)=0.15798	0

State	Effort Line "X"	Lead Time (months)
Louisiana	Effort(X)=-Inf	0
Maine	Effort(X)=0.314937	88
Maryland	Effort(X)=0.131478	157.333
Massachusetts	Effort(X)=0.0393302	0
Michigan	Effort(X)=0.218506	0
Minnesota	Effort(X)=-Inf	0
Mississippi	Effort(X)=0.113835	0
Missouri	Effort(X)=0.0979435	0
Montana	Effort(X)=0.072117	168
Nebraska	Effort(X)=-0.00701555	328
Nevada	Effort(X)=0.253098	0
New Hampshire	Effort(X)=0.285001	0
New Jersey	Effort(X)=0.184142	96
New Mexico	Effort(X)=3.69695	0
New York	Effort(X)=-0.0617669	0
North Carolina	Effort(X)=0.202686	0
North Dakota	Effort(X)=0.157376	0
Ohio	Effort(X)=0.259457	296
Oklahoma	Effort(X)=0.285503	0
Oregon	Effort(X)=-0.118375	208
Pennsylvania	Effort(X)=0.126806	68
Rhode Island	Effort(X)=0.167175	0
South Carolina	Effort(X)=0.547293	0
South Dakota	Effort(X)=0.104756	0
Tennessee	Effort(X)=0.0221667	712
Texas	Effort(X)=-0.0266405	328
Utah	Effort(X)=0.18355	0
Vermont	Effort(X)=0.32739	48
Virginia	Effort(X)=-0.191971	0
Washington	Effort(X)=-0.0359733	424
West Virginia	Effort(X)=-0.133043	0
Wisconsin	Effort(X)=0.175402	0
Wyoming	Effort(X)=-0.108995	0

In examining fourth grade mathematics, the new value of achievement "y" is 252. Table 13 depicts the lead time for each state to reach this value for NAEP mathematics in grade four. When judged against to the prior lead time analysis for fourth grade math, the

time to reach the new level of achievement has significantly increased for most states. There are only three states that are achieving at the higher level of achievement and have a lead time of zero. These states most likely have either high levels of effort or achievement which will create a sharp slope for the state's best fit line. Several states were calculated to have sizeable lead times such as South Carolina with 696 months and Nebraska with 328 months. These findings can probably be attributed to the emphasis placed on state fiscal effort within the model. These two examples and other with large lead times most likely have low or flat fiscal effort and or achievement scores that decrease the slope of the best fit line and therefore extend the amount of time for these states to reach this new maximum achievement.

Table 13

Lead Time of State Fiscal Effort to Reach Max "y" = 252 for NAEP Grade 4 Math Achievement

State	Effort Line "X"	Lead Time (months)
Alabama	Effort(X)=0.084894	186.667
Alaska	Effort(X)=0.0574208	176
Arizona	Effort(X)=0.748571	322.667
Arkansas	Effort(X)=0.216512	70.2222
California	Effort(X)=-0.0342913	344
Colorado	Effort(X)=0.117642	110.4
Connecticut	Effort(X)=0.104719	216
Delaware	Effort(X)=0.0894453	77.3333
District of Columbia	Effort(X)=-0.051879	200
Florida	Effort(X)=0.0638177	58
Georgia	Effort(X)=-0.00135817	158.4
Hawaii	Effort(X)=0.634159	124.571
Idaho	Effort(X)=0.058382	77.3333
Illinois	Effort(X)=0.0508516	188
Indiana	Effort(X)=0.0728454	51.4286

State	Effort Line "X"	Lead Time (months)
Iowa	Effort(X)=0.0824102	88
Kansas	Effort(X)=0.131993	29.3333
Kentucky	Effort(X)=0.114881	138.667
Louisiana	Effort(X)=-0.114895	256
Maine	Effort(X)=0.0418636	116
Maryland	Effort(X)=0.105529	78.8571
Massachusetts	Effort(X)=0.112207	0
Michigan	Effort(X)=0.0804106	328
Minnesota	Effort(X)=0.218875	43.2
Mississippi	Effort(X)=0.17649	225.6
Missouri	Effort(X)=0.0723208	164
Montana	Effort(X)=0.108105	46
Nebraska	Effort(X)=-0.00701555	328
Nevada	Effort(X)=-0.0294183	240
New Hampshire	Effort(X)=0.0900655	24
New Jersey	Effort(X)=0.14769	14.4
New Mexico	Effort(X)=0.110999	235.2
New York	Effort(X)=0.153655	65.1429
North Carolina	Effort(X)=0.874698	0
North Dakota	Effort(X)=0.0740737	44.5714
Ohio	Effort(X)=0.136015	46.8571
Oklahoma	Effort(X)=0.0661518	88
Oregon	Effort(X)=-0.60637	0
Pennsylvania	Effort(X)=0.117503	46
Rhode Island	Effort(X)=0.079347	128
South Carolina	Effort(X)=-0.142538	696
South Dakota	Effort(X)=0.0552839	120
Tennessee	Effort(X)=0.0661448	177.6
Texas	Effort(X)=-0.00371797	88
Utah	Effort(X)=0.0541364	148
Vermont	Effort(X)=0.441926	72
Virginia	Effort(X)=-0.0268884	81.6
Washington	Effort(X)=0.101026	81.6
West Virginia	Effort(X)=0.168574	161.6
Wisconsin	Effort(X)=0.13234	53.7143
Wyoming	Effort(X)=0.175397	125.333

Finally, in examining eighth grade mathematics, the new value of achievement "y" is 298. Table 14 depicts the lead time for each state to reach this value for NAEP mathematics in grade eight. When judged against to the prior lead time analysis for eighth grade math, the time to reach the new level of achievement has increased for most states. There are only four states that are achieving at the higher level of achievement and have a lead time of zero. Again, these states most likely have either high levels of effort or achievement which that create a sharp slope for the state's best fit line. Several states were calculated to have sizeable lead times such as Michigan with 1,000 months and Montana with 328 months. These findings can probably be attributed to the emphasis placed on state fiscal effort within the model. Examples with large lead times most likely have low or flat fiscal effort and or achievement scores that decrease the slope of the best fit line and therefore extend the amount of time for these states to reach this new maximum achievement.

Table 14

Lead Time of State Fiscal Effort to Reach Max "y" = 298 for NAEP Grade 8 Math Achievement

State	Effort Line "X"	Lead Time (months)
Alabama	Effort(X)=0.0216491	392
Alaska	Effort(X)=0.0459616	188
Arizona	Effort(X)=0.31848	209.6
Arkansas	Effort(X)=0.261966	140
California	Effort(X)=-0.0465029	445.333
Colorado	Effort(X)=-0.121176	210.667
Connecticut	Effort(X)=0.08164	0
Delaware	Effort(X)=0.0813343	117.333
District of Columbia	Effort(X)=-0.34629	481.6
Florida	Effort(X)=0.00426612	168

State	Effort Line "X"	Lead Time (months)
Georgia	Effort(X)=0.0184645	222.4
Hawaii	Effort(X)=-1.77426	472
Idaho	Effort(X)=0.0443739	172
Illinois	Effort(X)=0.0432531	290.667
Indiana	Effort(X)=-0.0401763	160
Iowa	Effort(X)=-0.0873852	632
Kansas	Effort(X)=0.127132	72
Kentucky	Effort(X)=0.106723	190.4
Louisiana	Effort(X)=0.0125339	210.667
Maine	Effort(X)=0.125652	156
Maryland	Effort(X)=0.110944	80
Massachusetts	Effort(X)=0.112326	0
Michigan	Effort(X)=-0.106182	1000
Minnesota	Effort(X)=-0.031681	312
Mississippi	Effort(X)=0.194418	400
Missouri	Effort(X)=0.0546543	440
Montana	Effort(X)=-0.0579848	536
Nebraska	Effort(X)=-0.00701555	328
Nevada	Effort(X)=-0.143451	429.333
New Hampshire	Effort(X)=0.0352619	256
New Jersey	Effort(X)=0.167725	56
New Mexico	Effort(X)=0.110424	296
New York	Effort(X)=-Inf	0
North Carolina	Effort(X)=0.0174182	226.667
North Dakota	Effort(X)=0.0341066	65.6
Ohio	Effort(X)=0.179653	210.667
Oklahoma	Effort(X)=-0.150723	381.333
Oregon	Effort(X)=-0.0559503	226.667
Pennsylvania	Effort(X)=0.115927	85.7143
Rhode Island	Effort(X)=0.0419061	376
South Carolina	Effort(X)=0.03849	148.8
South Dakota	Effort(X)=0.028149	157.333
Tennessee	Effort(X)=0.0595403	192
Texas	Effort(X)=0.038275	64.8889
Utah	Effort(X)=-0.244072	0
Vermont	Effort(X)=0.411784	72
Virginia	Effort(X)=0.0400922	82.6667
Washington	Effort(X)=0.0674711	148
West Virginia	Effort(X)=-0.0403779	0
Wisconsin	Effort(X)=0.0899119	288
Wyoming	Effort(X)=0.251022	194.667

The predictive linear regression model assumes a linear relationship between state fiscal effort and achievement. As previously referenced in data from research questions one and two the variables of state fiscal effort and achievement are neither significantly correlated nor significant predictors of each other. Problems that exist in the employed models include the failure to account for other possible sources variance and the small amount of historical data for the investigated variables. It is important to note the lack of validity of the lead time findings due to these limitations. However, the use of predictive models is not often seen in education and with the appropriate data sets these type of models could be have utility in future research.

The concluding statistical analysis for the final research question "What historical trends are present in relation to a state's fiscal effort towards funding education and student academic achievement?" is a least squares dummy variable (LSDV) model. To analyze the available panel data, four separate models for each subject and grade level of the NAEP assessments will be employed. The data investigated spanned multiple years (2007, 2005, 2003), looked at the NAEP scale score achievement, sources of variance and fiscal effort computations for all fifty states and the District of Columbia

Results from the analysis of grade four reading are shown in Tables 15-19. Specifically, Table 15 provides a summary of the four models used in the least squares dummy variable analysis. In examining fourth grade reading, the first model which examined the effect of race, gender and socio economic status on achievement found that just below 90 percent of variance (R^2) in achievement is explained within the model. The second model added the variable of state fiscal effort and the proportion of the variance explained rose to just above 90%. State differences were added to model three and

proportion of the variance explained increased to above 97%. In attempt to isolate the impact of state fiscal effort on achievement scores were ranked into tertiles of high, medium and low for the fourth model. This change failed to yield an increase of a proportion of the variance explained by state fiscal effort.

Table 15

Least Square Dummy Variable Model Summaries for NAEP Grade 4 Reading

Model	R^2	SE
#1 Covariance	.898	6.23936
#2 Covariance + Effort	.904	6.10857
#3 Covariance + Effort + States	.978	3.59710
#4 Effort Tertile + Covariance	.904	6.12765

Examining each model in further detail for fourth grade reading reveals many noteworthy findings. Table 16 depicts least square dummy variable coefficients for model #1 which examined the effect of race, gender and socio economic status on achievement. In examining the race variable it was found that when compared to the achievement of white students, Black, Hispanic and students of other races all score significantly lower. Investigating the impact of socio economic status found that students eligible for reduced lunch score significantly lower compared to students that were ineligible. Lastly, it was found that females scored significantly higher compared to males on NAEP grade four reading assessments.

Table 16

Model #1 Least Square Dummy Variable Covariance Coefficients NAEP Grade 4 Reading

Covariance	B	SE	P
Race Other	-.150	.047	.002
Race Hispanic	-.105	.046	.026
Race Black	-.223	.043	.000
Eligible Reduced Lunch	-.349	.061	.000
Gender Female	4.530	.129	.000

In model #2 where the fiscal effort variable is included as one of the coefficients it was found that differing levels of fiscal effort did not significantly impact achievement. In fact, as shown in Table 17 when fiscal effort was higher it was determined by the coefficient score that achievement fell by 1.869 compared to instances of lower fiscal effort. However, all races still scored significantly lower compared to whites and those eligible for reduced lunch score still scored significantly lower compared to students that were ineligible even with effort added to the model. Additionally, females still scored significantly higher compared to males on NAEP grade four reading assessment

Table 17

Model #2 Least Square Dummy Variable Covariance and State Fiscal Effort Coefficients NAEP Grade 4 Reading

Variables	B	SE	P
Effort	-1.869	13.050	.886
Race Other	-.151	.048	.002
Race Hispanic	-.113	.048	.020
Race Black	-.224	.044	.000
Eligible Reduced Lunch	-.346	.062	.000
Gender Female	4.522	.130	.000

The third least square dummy variable model included states as a coefficient to the previous models. In the analysis state level achievement was compared to Virginia. When state differences are included into the model the fiscal effort coefficient increases in significance and showed that higher levels of fiscal effort had a positive impact on achievement although this was not a statistically significant finding. In examining Table 18, it is revealed that including all state differences within the model had a discernable impact on race. Blacks and Hispanics achieved significantly better compared to earlier models. Additionally, females still achieved significantly better compared to males while accounting for state level variables. Eligibility for free and reduced lunch is no longer significant on achievement when state differences are added to the model. Lastly, when comparing achievement of the states to Virginia a total of 21 states achieve significantly higher results than Virginia while nine states achieve significantly lower results when the coefficients of race, gender, socio economic status and fiscal effort are placed within the model.

Table 18

Model #3 Least Square Dummy Variable Coefficients Inclusive of States, Effort and Covariance for NAEP Grade 4 Reading

Variables	B	SE	P
Effort	61.841	37.894	.106
Race Other	.703	.398	.081
Race Hispanic	.637	.311	.043
Race Black	1.128	.299	.000
Eligible Reduced Lunch	.012	.183	.946
Gender Female	3.470	.185	.000
Alabama	-17.286	7.065	.016
Alaska	-4.782	13.315	.720
Arizona	-10.983	11.912	.359
Arkansas	-4.976	6.933	.475

Variables	B	SE	P
California	-27.255	14.312	.060
Colorado	18.814	8.435	.028
Connecticut	17.737	4.991	.001
Delaware	-8.346	4.059	.043
Washington D.C.	-103.801	17.115	.000
Florida	-6.507	6.329	.307
Georgia	-20.977	5.470	.000
Hawaii	-43.347	28.436	.131
Idaho	22.658	9.242	.016
Illinois	.110	5.247	.983
Indiana	11.071	6.191	.077
Iowa	26.657	7.310	.000
Kansas	14.302	7.108	.047
Kentucky	17.080	8.408	.045
Louisiana	-31.970	9.430	.001
Maine	34.423	9.437	.000
Maryland	-14.686	4.091	.001
Massachusetts	29.565	5.713	.000
Michigan	-.576	5.331	.914
Minnesota	18.116	6.851	.010
Mississippi	-42.288	10.062	.000
Missouri	13.656	5.336	.012
Montana	28.861	8.733	.001
Nebraska	21.096	6.682	.002
Nevada	-12.596	9.197	.174
New Hampshire	39.433	7.858	.000
New Jersey	9.493	5.392	.082
New Mexico	-28.481	16.745	.092
New York	-5.998	6.178	.334
North Carolina	-7.957	3.977	.048
North Dakota	33.509	8.079	.000
Ohio	13.325	4.951	.008
Oklahoma	-4.210	8.940	.639
Oregon	11.262	8.025	.164
Pennsylvania	13.711	4.866	.006
Rhode Island	8.435	7.003	.231
South Carolina	-16.429	6.389	.012
South Dakota	32.822	8.324	.000
Tennessee	-.516	4.970	.918
Texas	-10.939	11.536	.345
Utah	23.803	8.094	.004
Vermont	26.064	11.949	.032
Washington	13.278	7.349	.074
West Virginia	21.068	11.523	.071
Wisconsin	17.704	5.991	.004
Wyoming	27.666	8.417	.001

The fourth and final model utilizing the least squares dummy variable technique replaced the variable of state fiscal effort by establishing tertiles of the scores. Effort scores were ranked as high, medium or low in comparison of each other. In examining Table 19, cases of high and middle levels of effort were shown to have no significant impact on achievement. However, when the fiscal effort variable is categorized; race, socio economic status and gender are again significant. Black, Hispanic and students of other races all score significantly lower than white students. Students eligible for reduced lunch score significantly lower compared to students that were ineligible and females scored significantly higher compared to males.

Table 19

Model #4 Least Square Dummy Variable Coefficients Inclusive of State Fiscal Effort Tertiles and Covariance for NAEP Grade 4 Reading

Variables	B	SE	P
Effort High	.010	1.362	.994
Effort Middle	.379	1.252	.762
Race Other	-.154	.046	.001
Race Hispanic	-.111	.048	.022
Race Black	-.223	.046	.000
Eligible Reduced Lunch	-.347	.064	.000
Gender Female	4.514	.128	.000

Findings from the analysis of grade eight reading are shown in Tables 20-24. Specifically, Table 20 provides a summary of the four models used in the least squares dummy variable analysis for grade eight reading. The first model which examined the effect of race, gender and socio economic status on achievement found that just above 76 % of variance (R^2) in achievement is explained within the model. The second model

added the variable of state fiscal effort and the proportion of the variance explained rose to just above 77%. State differences were added to model three and proportion of the variance explained increased to above 97%. In model four state fiscal effort coefficients were ranked into tertiles of high medium and low. This change failed to yield an increase of a proportion of the variance explained by state fiscal effort compared to the first two models.

Table 20

Least Square Dummy Variable Model Summaries for NAEP Grade 8 Reading

Model	R^2	SE
#1 Covariance	.762	3.40609
#2 Covariance + Effort	.772	3.37147
#3 Covariance + Effort + States	.979	1.27498
#4 Effort Tertile+ Covariance	.771	3.38645

Examining the models in further detail for grade eight reading reveals many noteworthy findings. Table 21 depicts least square dummy variable coefficients for model #1 which examined the effect of race, gender and socio economic status on achievement. In examining the race variable it was found that when compared to the achievement of white students, Black, Hispanic and students of other races all scored significantly lower. In investigating the impact of socio economic status found that students eligible for reduced lunch score significantly lower compared to students that were ineligible. Lastly, it was found that females did not score significantly higher compared to males on NAEP grade eight reading assessments.

Table 21

Model #1 Least Square Dummy Variable Covariance Coefficients NAEP Grade 8 Reading

Covariance	B	SE	P
Race Other	-.173	.025	.000
Race Hispanic	-.150	.026	.000
Race Black	-.170	.025	.000
Eligible Reduced Lunch	-.315	.036	.000
Gender Female	.194	.248	.435

In examining eighth grade reading for model #2 when the fiscal effort variable is included as one of the coefficients it was found that differing levels of fiscal effort did not significantly impact achievement. In fact, as shown in Table 22 when fiscal effort was higher the coefficient score revealed that achievement fell by 4.876 compared to instances of lower fiscal effort. However, all races still scored significantly lower compared to whites and those eligible for reduced lunch score still scored significantly lower compared to students that were ineligible even with effort added to the model. Females did not score significantly higher compared to males when adding the fiscal effort variable to the model.

Table 22

Model #2 Least Square Dummy Variable Covariance and State Fiscal Effort Coefficients NAEP Grade 8 Reading

Variables	B	SE	P
Effort	-4.876	7.236	.502
Race Other	-.166	.026	.000
Race Hispanic	-.155	.028	.000
Race Black	-.169	.025	.000
Eligible Reduced Lunch	-.322	.037	.000
Gender Female	.201	.248	.419

The third least square dummy variable model for eighth grade reading included states as a coefficient to the previous models. In the analysis state level achievement was compared to Virginia. When state differences are included into the model the fiscal effort coefficient increases in significance and showed that higher levels of fiscal effort had a positive impact on achievement although this was not a statistically significant finding.

In examining Table 23, it is revealed that including all state differences within the model impacted race. The achievement levels of Blacks, Hispanics and other races are no longer significantly different compared to whites.

Additionally, females still achieved better compared to males while accounting for these variables but not significantly. Eligibility for free and reduced lunch is also not significant on achievement when state differences are added to the model.

Lastly, when comparing achievement of the states to Virginia only one state achieved significantly higher results than Virginia while twenty states achieve significantly lower results.

Table 23

Model #3 Least Square Dummy Variable Coefficients Inclusive of States, Effort and Covariance for NAEP Grade 8 Reading

Variables	B	SE	P
Effort	11.685	14.084	.409
Race Other	.175	.166	.295
Race Hispanic	.005	.120	.968
Race Black	-.012	.089	.894
Eligible Reduced Lunch	-.053	.061	.389
Gender Female	.310	.117	.010
Alabama	-13.722	2.133	.000
Alaska	-14.842	4.850	.003
Arizona	-12.690	4.303	.004
Arkansas	-8.525	2.277	.000
California	-18.002	5.266	.001
Colorado	-.614	2.729	.822
Connecticut	-1.278	1.719	.459
Delaware	-1.700	1.264	.182
Washington D.C.	-25.922	5.572	.000
Florida	-8.911	2.415	.000
Georgia	-8.485	1.846	.000
Hawaii	-31.668	12.178	.011
Idaho	-2.894	3.020	.340
Illinois	-2.467	1.719	.155
Indiana	-4.109	2.103	.054
Iowa	.171	2.555	.947
Kansas	-.910	2.361	.701
Kentucky	-2.853	2.768	.305
Louisiana	-12.574	2.387	.000
Maine	2.041	3.130	.516
Maryland	-4.614	1.362	.001
Massachusetts	5.321	2.002	.009
Michigan	-6.287	1.891	.001
Minnesota	-.683	2.379	.775
Mississippi	-13.288	3.053	.000
Missouri	-1.643	1.791	.361
Montana	1.229	2.774	.659
Nebraska	-.297	2.239	.895
Nevada	-15.449	3.072	.000
New Hampshire	2.340	2.768	.400
New Jersey	.637	1.832	.729
New Mexico	-17.140	6.601	.011
New York	-2.999	2.359	.207

Variables	B	SE	P
North Carolina	-6.926	1.471	.000
North Dakota	1.149	2.587	.658
Ohio	-.499	1.698	.770
Oklahoma	-8.897	3.189	.006
Oregon	-3.976	2.495	.114
Pennsylvania	-.765	1.786	.669
Rhode Island	-7.520	2.328	.002
South Carolina	-9.123	2.002	.000
South Dakota	1.464	2.649	.582
Tennessee	-6.975	1.701	.000
Texas	-6.708	4.310	.123
Utah	-5.045	2.587	.054
Vermont	1.449	4.169	.729
Washington	-4.331	2.329	.066
West Virginia	-10.223	3.797	.008
Wisconsin	-2.311	2.181	.292
Wyoming	-.816	2.666	.760

The final model utilizing the least squares dummy variable technique for grade eight reading replaced the variable of state fiscal effort by establishing tertiles of the scores. Effort scores were ranked as high, medium or low in comparison of each other.

In examining Table 24, cases of high and middle levels of effort were shown to have no significant impact on achievement. Cases of high effort were actually associated with decreased achievement. However, when the fiscal effort variable is categorized; race, socio economic status and gender are again significant. Black, Hispanic and students of other races all score significantly lower than white students. Students eligible for reduced lunch score significantly lower compared to students that were ineligible but females did not score significantly higher compared to males.

Table 24

Model #4 Least Square Dummy Variable Coefficients Inclusive of State Fiscal Effort Tertiles and Covariance for NAEP Grade 8 Reading

Variables	B	SE	P
Effort High	-.027	.762	.971
Effort Middle	.234	.692	.736
Race Other	-.173	.025	.000
Race Hispanic	-.150	.028	.000
Race Black	-.166	.026	.000
Eligible Reduced Lunch	-.327	.039	.000
Gender Female	.211	.251	.403

Findings from the analysis of fourth grade math are shown in Tables 25-29. Specifically, Table 25 provides a summary of the four models used in the least squares dummy variable analysis in fourth grade math.

The first model, which examined the effect of race, gender and socio economic status on achievement found that just above 61% of variance (R^2) in fourth grade math achievement is explained in the model.

The second model added the variable of state fiscal effort and the proportion of the variance explained rose to above 72%. State differences were added to model three and proportion of the variance explained increased to above 97%. In model four state fiscal effort coefficients were ranked into tertiles of high medium and low. This change increased of a proportion of the variance explained from 72% to 73%.

Table 25

Least Square Dummy Variable Model Summaries for NAEP Grade 4 Math

Model	R^2	SE
#1 Covariance	.613	4.46200
#2 Covariance + Effort	.729	3.77475
#3 Covariance + Effort + States	.979	1.30809
#4 Effort Tertile + Covariance	.736	3.73466

Each model is examined in further detail for fourth grade mathematics. Significant findings were discovered for multiple variables. Table 26 depicts least square dummy variable coefficients for model #1 which examined the effect of race, gender and socio economic status on achievement. In examining the race variable it was found that when compared to the achievement of white students, Black and students of other races all scored significantly lower. In this model Hispanics did not score significantly lower when compared to whites. Investigating the impact of socio economic status found that students eligible for reduced lunch score significantly lower compared to students that were ineligible. Lastly, it was found that females did not score significantly higher compared to males on NAEP grade four math assessments.

Table 26

Model #1 Least Square Dummy Variable Covariance Coefficients NAEP Grade 4 Math

Covariance	B	SE	P
Race Other	-.106	.034	.002
Race Hispanic	-.046	.032	.155
Race Black	-.135	.032	.000
Eligible Reduced Lunch	-.358	.044	.000
Gender Female	.858	.457	.063

In examining fourth grade math using model #2 it was found that differing levels of fiscal effort did not significantly impact achievement. However, as shown in Table 27 when fiscal effort was higher it was determined that achievement rose by 7.022 compared to those with lower fiscal effort. All races except Hispanics scored significantly lower compared to whites and those eligible for reduced lunch score still scored significantly lower compared to students that were ineligible. Females did not score significantly higher compared to males when adding the fiscal effort variable to the model.

Table 27

Model #2 Least Square Dummy Variable Covariance and State Fiscal Effort Coefficients NAEP Grade 4 Math

Variables	B	SE	P
Effort	7.022	8.090	.387
Race Other	-.113	.030	.000
Race Hispanic	-.042	.029	.145
Race Black	-.112	.028	.000
Eligible Reduced Lunch	-.384	.039	.000
Gender Female	.550	.393	.164

The third least square dummy variable model for fourth grade math included states as a coefficient to the previous models. In the analysis state level achievement was compared to Virginia. When state differences are included into the model the fiscal effort coefficient decreases in significance although it was shown that higher levels of fiscal effort had a positive but not statistically significant impact on achievement. In examining Table 28, it is revealed that including all state differences within the model impacted race. The achievement levels of Blacks, Hispanics and other races are still lower but no

longer significantly different compared to whites. Additionally, females still achieved better compared to males while accounting for these variables but not significantly.

Eligibility for free and reduced lunch was also found not to be significant on achievement when state differences are added to the model. Lastly, when comparing achievement of the states to Virginia only one state achieved significantly higher results than Virginia while 22 states achieve significantly lower results.

Table 28

Model #3 Least Square Dummy Variable Coefficients Inclusive of States, Effort and Covariance for NAEP Grade 4 Math

Variables	B	SE	P
Effort	6.497	13.931	.642
Race Other	-.077	.160	.632
Race Hispanic	-.112	.110	.313
Race Black	-.312	.118	.010
Eligible Reduced Lunch	-.173	.067	.011
Gender Female	.249	.161	.125
Alabama	-8.905	2.475	.001
Alaska	-9.380	4.760	.052
Arizona	-10.523	4.154	.013
Arkansas	-4.217	2.469	.091
California	-9.126	5.068	.075
Colorado	-6.424	3.047	.038
Connecticut	-2.472	1.859	.187
Delaware	1.389	1.462	.345
Washington D.C.	-6.124	6.872	.375
Florida	1.224	2.122	.565
Georgia	-.857	2.080	.681
Hawaii	-11.657	11.099	.296
Idaho	-7.229	3.444	.038
Illinois	-5.287	1.823	.005
Indiana	-3.354	2.265	.142
Iowa	-7.156	2.886	.015
Kansas	.923	2.522	.715
Kentucky	-11.451	3.182	.001
Louisiana	.250	3.549	.944

Variables	B	SE	P
Maine	-9.449	3.735	.013
Maryland	-.675	1.593	.673
Massachusetts	.245	2.235	.913
Michigan	-5.506	1.910	.005
Minnesota	-2.426	2.511	.336
Mississippi	-1.843	3.888	.637
Missouri	-6.077	2.122	.005
Montana	-7.736	3.295	.021
Nebraska	-7.834	2.548	.003
Nevada	-10.358	3.272	.002
New Hampshire	-5.300	3.231	.104
New Jersey	.775	1.879	.681
New Mexico	-11.831	6.014	.052
New York	-.055	2.104	.979
North Carolina	3.440	1.432	.018
North Dakota	-6.995	3.146	.029
Ohio	-1.469	1.827	.424
Oklahoma	-6.998	3.226	.033
Oregon	-9.006	2.924	.003
Pennsylvania	-3.344	1.917	.084
Rhode Island	-11.522	2.585	.000
South Carolina	2.564	2.359	.280
South Dakota	-7.400	3.189	.022
Tennessee	-8.537	1.868	.000
Texas	3.647	4.132	.380
Utah	-9.755	3.121	.002
Vermont	-6.959	4.436	.120
Washington	-4.048	2.640	.129
West Virginia	-13.050	4.322	.003
Wisconsin	-5.008	2.265	.029
Wyoming	-5.393	3.223	.098

The final model utilizing the least squares dummy variable technique for fourth grade math replaced the variable of state fiscal effort by establishing tertiles of the scores. Effort scores were ranked as high, medium or low in comparison of each other. In examining Table 29, cases of high effort levels were shown to have no significant impact on achievement. However, cases of middle levels of effort were statistically significant. In this model cases of middle levels of effort were associated with higher levels of

achievement. However, when the fiscal effort variable is categorized; race and socio economic status are again significant. Blacks and students of other races scored significantly lower than white students. Students eligible for reduced lunch score significantly lower compared to students that were ineligible and females did not score significantly higher compared to males.

Table 29

Model #4 Least Square Dummy Variable Coefficients Inclusive of State Fiscal Effort Tertiles and Covariance for NAEP Grade 4 Math

Variables	B	SE	P
Effort High	1.207	.828	.147
Effort Middle	1.674	.768	.031
Race Other	-.107	.028	.000
Race Hispanic	-.037	.029	.199
Race Black	-.103	.029	.001
Eligible Reduced Lunch	-.388	.040	.000
Gender Female	.415	.390	.290

Findings from the analysis of eighth grade math are shown in Tables 30-34. Specifically, Table 30 provides a summary of the four models used in the least squares dummy variable analysis in eighth grade math. The first model, which examined the effect of race, gender and socio economic status on achievement found that just above 88% of variance (R^2) in achievement in eighth grade mathematics, is explained in the model. The second model added the variable of state fiscal effort and the proportion of the variance explained rose to 90 %. State differences were added to model three and proportion of the variance explained increased to above 96%. In model four state fiscal

effort coefficients were ranked into tertiles of high medium and low. This change had no impact on the proportion of the variance explained within the model.

Table 30

Least Square Dummy Variable Model Summaries for NAEP Grade 8 Math

Model	R^2	SE
#1 Covariance	.888	8.18073
#2 Covariance + Effort	.899	7.85953
#3 Covariance + Effort + States	.964	5.78166
#4 Effort Tertile + Covariance	.902	7.75819

Each model is examined in further detail for eighth grade mathematics. Significant findings were discovered for multiple variables. Table 31 depicts least square dummy variable coefficients for model #1 which examined the effect of race, gender and socio economic status on achievement.

In examining the race variable it was found that when compared to the achievement of white students, only Hispanics scored significantly lower. In this model Blacks and students of other races did not score significantly lower when compared to whites. Investigating the impact of socio-economic status found that students eligible for reduced lunch score significantly lower compared to students that were ineligible. Lastly, it was found that females scored significantly higher compared to males on NAEP grade eight math assessments.

Table 31

Model #1 Least Square Dummy Variable Covariance Coefficients NAEP Grade 8 Math

Covariance	B	SE	P
Race Other	-.042	.059	.477
Race Hispanic	-.403	.056	.000
Race Black	-.102	.063	.108
Eligible Reduced Lunch	-.422	.085	.000
Gender Female	5.690	.169	.000

In examining eighth grade math using model #2 it was found that differing levels of fiscal effort did not significantly impact achievement. In fact, as shown in Table 32 when fiscal effort was higher it was determined that achievement decreased by -17.547compared to those with lower fiscal effort. Hispanics still scored significantly lower compared to whites and those eligible for reduced lunch score still scored significantly lower compared to students that were ineligible. Females still scored significantly higher compared to males when adding the fiscal effort variable to the model.

Table 32

Model #2 Least Square Dummy Variable Covariance and State Fiscal Effort Coefficients NAEP Grade 8 Math

Variables	B	SE	P
Effort	-17.547	16.959	.303
Race Other	-.018	.061	.773
Race Hispanic	-.399	.057	.000
Race Black	-.121	.063	.059
Eligible Reduced Lunch	-.456	.087	.000
Gender Female	5.698	.166	.000

The third least square dummy variable model for grade eight math included states as a coefficient to the previous models. In the analysis state level achievement was compared to Virginia. When state differences are included into the model the fiscal effort coefficient increases in significance and it was determined that higher levels of fiscal effort had a positive but not statistically significant impact on achievement. In examining Table 33, it is revealed that including all state differences within the model impacted the race variable. The achievement of Hispanics has become higher and significantly different compared to whites. Additionally, females still achieved significantly better compared to males while accounting for these variables. Eligibility for free and reduced lunch was found not to be significant on achievement when state differences are added to the model. Lastly, when comparing achievement of the states to Virginia nine states achieved significantly higher results than Virginia while eleven states achieve significantly lower results.

Table 33

Model #3 Least Square Dummy Variable Coefficients Inclusive of States, Effort and Covariance for NAEP Grade 8 Math

Variables	B	SE	P
Effort	85.344	61.978	.172
Race Other	.533	.725	.464
Race Hispanic	1.146	.430	.009
Race Black	.744	.504	.143
Eligible Reduced Lunch	.487	.272	.076
Gender Female	4.348	.316	.000
Alabama	-41.888	9.406	.000
Alaska	8.917	20.601	.666
Arizona	-18.643	19.061	.331
Arkansas	-22.516	10.155	.029
California	-36.402	22.718	.112

Variables	B	SE	P
Colorado	10.193	12.573	.420
Connecticut	5.563	8.217	.500
Delaware	-13.173	5.762	.024
Washington, DC	-143.076	25.506	.000
Florida	-26.028	10.199	.012
Georgia	-37.252	8.349	.000
Hawaii	-42.910	52.367	.415
Idaho	12.862	14.156	.366
Illinois	-8.020	7.968	.317
Indiana	12.672	9.704	.195
Iowa	28.483	11.835	.018
Kansas	13.176	10.724	.222
Kentucky	4.420	12.737	.729
Louisiana	-49.690	10.945	.000
Maine	22.219	14.957	.141
Maryland	-19.990	6.107	.001
Massachusetts	21.358	9.572	.028
Michigan	-5.595	8.385	.506
Minnesota	24.152	10.785	.027
Mississippi	-71.889	13.625	.000
Missouri	4.813	8.464	.571
Montana	28.455	12.475	.025
Nebraska	23.988	10.726	.028
Nevada	-14.185	13.875	.309
New Hampshire	39.280	13.199	.004
New Jersey	.652	8.426	.939
New Mexico	-53.140	27.958	.060
New York	-15.992	10.347	.126
North Carolina	-14.952	6.324	.020
North Dakota	40.082	11.789	.001
Ohio	10.921	8.092	.180
Oklahoma	-14.926	13.948	.287
Oregon	17.366	11.592	.137
Pennsylvania	13.956	8.034	.086
Rhode Island	4.922	10.608	.644
South Carolina	-30.182	9.005	.001
South Dakota	35.280	11.990	.004
Tennessee	-15.815	8.301	.060
Texas	-22.963	18.357	.214
Utah	27.530	11.985	.024
Vermont	21.638	19.001	.258
Washington	12.238	11.108	.273
West Virginia	.883	17.542	.960
Wisconsin	19.845	9.897	.048
Wyoming	33.095	12.501	.009

The final model utilizing the least squares dummy variable technique for eighth grade math replaced the variable of state fiscal effort by establishing tertiles of the scores. Effort scores were ranked as high, medium or low in comparison of each other. In examining Table 34, cases of high effort levels were shown to have no significant impact on achievement and were associated with lower levels of achievement. In comparison, cases of middle levels of effort were associated with higher levels of achievement although the finding was not statistically significant. However, when the fiscal effort variable is categorized; race and socio economic status are again significant. Hispanics scored significantly lower than white students. Students eligible for reduced lunch score significantly lower compared to students that were ineligible and females scored significantly higher compared to males.

Table 34

Model #4 Least Square Dummy Variable Coefficients Inclusive of State Fiscal Effort Tertiles and Covariance for NAEP Grade 8 Math

Variables	B	SE	P
Effort High	-.746	1.727	.666
Effort Middle	2.845	1.579	.074
Race Other	-.048	.057	.401
Race Hispanic	-.395	.057	.000
Race Black	-.113	.063	.074
Eligible Reduced Lunch	-.442	.089	.000
Gender Female	5.638	.161	.000

The results presented in chapter four provide little evidence to support the hypothesis that state fiscal effort and academic achievement are correlated. Additionally,

data were deficient in providing support of the premise that the variable of state fiscal effort is a significant predictor of achievement. The historical relationship between the variables of state fiscal effort and academic achievement negligible given the lack of significant time lagged correlations and the breadth of lead times to achievement. Furthermore, in the historical panel data analysis the amount of variance explained by other variables such as race and socio economic status were much more significant compared to fiscal effort. A more detailed summary and discussion of the findings are presented in Chapter 5.

Chapter 5: Discussion

Introduction

As a support to the reader this final chapter of the dissertation restates the research problem and major research methods employed in the study. As discussed in the first two chapters the academic debate over various measures of education funding and its impact on student achievement is longstanding and at a stalemate. Historically, The U.S. Constitution leaves the responsibility for funding public K-12 education with the states. At the state level, education is the largest budget item for each of the fifty states. The individual total share of education funding varies widely from state to state. This variability in state funding is a topic of great concern for those involved within the United States public school systems. Mandates exist to afford every student an equitable education and in many instances states shift the education funding burden to localities. All too often, these localities rely on local property taxes to fund gaps in the education budget created from state level fiscal policies. Inequities among and within the states arise because local property values vary widely. Education funding disparity is caused within states when property-rich districts can raise large amounts of revenue with low tax rates and property-poor districts struggle to rely on insufficient funding with high property tax rates on citizens that commonly cannot afford increases (Holahan et al, 2004). The focus of this study looks at one of the problems that arise with these current funding practices of public schools. This study investigates incidences of interstate funding disparity and subsequent impact on student academic achievement. Interstate funding disparity is where inequities in educational spending occur among the different states. In summation, this investigation sought to determine if states that bestow a greater

proportion of their capital towards education achieve better results on measured assessments.

Prior research with regards to the impact of education spending on student achievement is mixed in findings and diverse in perspective. Many empirical studies exist where various education spending practices were investigated for their impact on achievement. These studies looked at spending increases associated with class size reduction, teacher salaries and facilities, and ensuing impact on student academic achievement. Findings varied in concluding the significance of these practices but it should be noted a that negative impact was rarely found. Common threads among this prior research are weaknesses in generalizability. Limits to generalizability were due to the populations studied because research took place in a single locality or state. Often, findings were generalized back to larger populations. Additionally, many of these studies had threats to external validity due to the measurement instrument of the dependent variable. In these cases single subject and grade level assessments were used to gauge achievement which was subsequently generalized beyond the scope of the research. To improve upon prior limitations this study expands on previous research by investigating a common independent variable measure of state fiscal effort for each of the fifty states. State fiscal effort is computed as a ratio of a state level per pupil spending (utility) over gross state product per capita (capacity). The result of this calculation is a percentage of each state's fiscal capacity that it has earmarked for education. This measure is uncommon in education finance research and gives this study an exploratory perspective. Student academic achievement is measured on a common national assessment for the subjects of math and reading at the fourth and eighth grade levels. The scope of the

research addresses data for more than ten years, from 1996-2007 to account for interaction of time on measurements. In essence, the study establishes the extent to which the effects of the independent variable on the dependent variable maintain through time.

The primary objective of this study was to provide details of the exploratory study of the relationship between state fiscal effort and student academic achievement. The goal of this study was to expand upon the previous empirical research on school funding and academic achievement at the state level. Given these objectives this study addressed the following research questions.

1. Are state fiscal effort and state level student achievement correlated?
2. Is state fiscal effort towards education a predictor of student academic achievement?
3. What historical trends are present in relation to a state's fiscal effort and student academic achievement?

To address these research questions the methodology employed within this study sought to find significant relationships, explain predictive tendencies and validate historical connections between the variables of state fiscal effort and state level NAEP achievement in reading and mathematics. To do this statistical measures such as bivariate correlation, simple linear regression, time lagged correlation, predictive linear regression modeling and historical panel data analysis via a least square dummy variable model were utilized. These measures analyzed data on state fiscal effort and NAEP achievement from 1996-2007 for every state and the District of Columbia. The strength of this

research is the evidence provided in the state to state differences in funding and succeeding impact on student achievement.

Summary of Results

In general, findings related to the first research question did not support the hypothesis that the variables of state fiscal effort and academic achievement are correlated. In examining reading achievement eight instances of statistically significant positive correlations were found for the NAEP fourth grade assessments while eighth grade had four. NAEP math achievement in fourth grade found eight states with statistically significant positive correlations and two states with significant negative correlations. Eighth grade math revealed seven states that showed statistically significant positive correlations and one state that had a significant negative correlation. In the 204 examples explored, only 27 were found to be statistically significant. In total 13% of the cases across fourth and eighth grade reading and math were found to have a substantial positive relationship. A weakness associated with correlation analysis is that it fails to account for covariance shared among the variables and outcomes can be falsely attributed solely to the independent variable. The reported statistics were derived from a bivariate correlation and possible sources of covariance were not included within the analysis. Provided the small percentage of statistically significant correlations and the inconsistent findings among the states it can be accurately stated that the variables of state fiscal effort and academic achievement are not significantly correlated.

Analysis of findings associated with the second research question provided unconvincing evidence supporting the hypothesis that state fiscal effort towards education is a predictor of student academic achievement. In NAEP reading achievement

there was a total of six states that had significant linear regression relationships in grade four and five states in grade eight. Looking at NAEP mathematics achievement there was a total of nine states that had significant linear regression relationships in fourth grade and eighth grade. These few examples provided evidence that over 90% of the variance in various achievement measures is predicted by state fiscal effort. In contrast, it must be noted that the multiple sources of variance that could possibly explain differences in test scores were not accounted for in the linear regression model. In the 204 examples explored, only 29 were found to be statistically significant. In total, 14% of the cases across fourth and eighth grade reading and math were found to have a significant relationship. Provided the extreme range in proportion of the variance and the lack of substantial statistically significant linear regression relationships it is difficult to definitively summate that effort is a noteworthy predictor of academic achievement.

Findings associated with the final research question revealed alternative variables associated with achievement other than state fiscal effort. Specifically, the use of time lagged correlation and a linear regression prediction model was purely theoretical given the outcomes from the first two research questions. These techniques were employed to investigate the historical relationship that could not be explored via un-lagged bivariate correlation and simple linear regression. The time series technique of time lagged correlation assumes that the dependent variable's response or change will occur after a delay in time (Warner, 1998). A small amount of significant relationships from the previous un-lagged bivariate correlation provides legitimacy to the exploration for significant time lags. In this study the ability to detect time-lagged relationships was limited by the sampling frequency. NAEP achievement data are collected biennially. To

match this sampling strategy state fiscal effort was lagged by two years. Typically, observations involved with time series data should occur in great frequency to detect a breadth of time related differences (Warner, 1998). A limitation of this study is that only three measurements for both time series variables were available across all fifty states and the District of Columbia. Achievement for all grades and subjects was measured at years 2007, 2005 and 2003 and correlated at a two-year lag representative of state fiscal effort measures for 2005, 2003 and 2001. Findings had the potential to be positively time lagged where changes in achievement occur later than changes in fiscal effort or negatively time lagged where achievement changes occur before changes in effort (Warner, 1998). To build upon findings from the time lagged correlation analysis a predictive linear regression model was utilized. Theoretical lead times were calculated for each state to reach their previous maximum level of achievement and the overall highest level achievement inclusive of all fifty states and the District of Columbia. Once more, the findings from this analysis must not be overstated given the small set of sample data and lack of significant findings in the time lagged correlation analysis.

Findings from the time-lagged correlation analysis and predictive linear regression model were mixed in significance. With regards to the time-lagged correlation analysis in fourth grade reading three states were found to have statistically significant time lagged correlations two of which were negative. Eighth grade reading had three states that were found to have statistically significant time lagged correlations two of which were positive. In fourth grade math it was found that three states had statistically significant time lagged correlations two of which were positive. Lastly, in eighth grade math two states were found to have statistically significant time lagged correlations one

of which was positive and the other was negative. In total, there were eleven instances of significant time lagged correlations. In this total five were negative and six were positive demonstrating balanced outcomes. However, these eleven instances compute to 5% of the cases having significant time-lagged correlations, which is a good deal smaller than the un-lagged bivariate correlation. Overall, 70 time-lagged correlations were positive and 114 negative. Provided this data, it could be generally stated that achievement increases prior to increases in state fiscal effort within the two year lag. Calculating lead times to prior state level maximum achievement via predictive linear regression found mixed results similar to the time lagged correlations. In total 113 of 204 case examined showed that states were theoretically putting forth enough effort to reach their maximum achievement value. These cases are demonstrated within the instances of negative time lagged correlations. Remaining cases where lead time was able to be calculated found wide ranging times most of which were under two years.

Initial findings of the predictive linear regression established that many states were already theoretically achieving their maximum achievement. To expand upon the initial findings of the predictive linear regression model each state was analyzed with maximum achievement level being set to the equivalent of the highest performing state. This was done because in essence some states were already achieving a low level of maximum achievement compared to others that scored much higher on various NAEP assessments. This analysis would set a high achievement bar for all states. To analyze the linear regression prediction model further the prior achievement variables and state fiscal effort scores for each state used that make the best fit line will be extended forward until the new maximum achievement standard is reached. Findings in this new analysis

showed a general increase in lead time for most states for each NAEP assessment. In total, 41 states or 20% of the 204 cases examined were theoretically putting forth enough effort to reach the new maximum achievement value. The remaining cases have wide ranging lead times which in some instances were calculated to be infinite. Nonetheless, these new lead times must be taken informally due to a myriad of factors that include instances of low fiscal effort or low achievement scores. These instances could decrease the slope of the best fit line and therefore extend the amount of time for these states to reach this new maximum achievement. Additionally, the lack of substantive significant time lagged correlations negatively impacts the validity and reliability of the forecasts.

Lastly, the historic relationships between state fiscal effort and academic achievement was analyzed via a fixed effects least squares dummy variable model. The variables of state fiscal effort and academic achievement were placed within a panel data set in which variable measurements were taken for the years of 2007, 2005 and 2003. In addition, the panel data set included measurements associated with race, gender and socio economic status. Analysis of panel data allows for longitudinal investigation of the variables and covariance. In this study, four different models were used to investigate the panel data. The first model analyzes the predictive impact of covariance factors of race, socio economic status and gender on achievement. The second model included the fiscal effort variable with the covariates to determine its level of significance. The third model included state level data on achievement and effort and calculated the significance that these differences had on achievement. Lastly, the states' fiscal effort scores are ranked into three tertiles and ran in final model that is inclusive of the possible covariance.

In examining the results from the first model in fourth grade reading Black, Hispanic and students of other races all score significantly lower compared to the achievement of white students. Also students eligible for reduced lunch score significantly lower compared to students that were ineligible and females scored significantly higher compared to males. In eighth grade reading it was found that compared to the achievement of white students, Black, Hispanic and students of other races all scored significantly lower. Additionally, students eligible for reduced lunch score significantly lower compared to students that were ineligible but females did not score significantly higher compared to males. In fourth grade math, Blacks and students of other races all scored significantly lower compared to white students. Students eligible for reduced lunch score significantly lower compared to students that were ineligible and females did not score significantly higher compared to males. Lastly, in eighth grade math compared to the achievement of white students, only Hispanics scored significantly lower. Students eligible for reduced lunch scored significantly lower compared to students that were ineligible and females scored significantly higher compared to males.

The second model included the variable of fiscal effort within the covariance from model one. In fourth grade reading it was found that differing levels of fiscal effort did not significantly impact achievement. However, all races still scored significantly lower compared to whites and those eligible for reduced lunch score still scored significantly lower compared to students that were ineligible even and females stilled scored significantly higher compared to males. In examining eighth grade reading differing levels of fiscal effort did not significantly impact achievement. All races still scored significantly lower compared to whites and those eligible for reduced lunch scored

significantly lower compared to students that were ineligible but females did not score significantly higher compared to males. Fourth grade math showed that differing levels of fiscal effort did not significantly impact achievement. All races except Hispanics scored significantly lower compared to whites and those eligible for reduced lunch score still scored significantly lower compared to students that were ineligible. Females did not score significantly higher compared to males. Eighth grade math findings determined that differing levels of fiscal effort did not significantly impact achievement. Hispanics still scored significantly lower compared to whites and those eligible for reduced lunch score still scored significantly lower compared to students that were ineligible. Females scored significantly higher compared to males.

The third model included the state level differences for all the variables and compared findings to the state of Virginia. In fourth grade reading states with higher levels of fiscal effort had higher levels of achievement although not statistically significant. The model showed a discernable impact on race. Blacks and Hispanics achieved significantly compared to prior models. Additionally, females achieved significantly better compared to males but eligibility for free and reduced lunch is no longer significant on achievement. Lastly, when comparing achievement of the states to Virginia 21 states achieved significantly higher results than Virginia while nine states achieve significantly lower. In examining eighth grade reading states with higher levels of fiscal effort had higher levels of achievement although this finding was not statistically significant. Achievement levels of Blacks, Hispanics and other races along with gender and socioeconomic differences were no longer significantly different. In comparing achievement of the states to Virginia only one state achieved significantly higher results

than Virginia while twenty states achieve significantly lower results. In exploring the findings for fourth grade math it was shown that higher levels of fiscal effort had a positive but not statistically significant impact on achievement. Achievement levels of Blacks, Hispanics and other races along with gender and socioeconomic differences were no longer significantly different. In comparing achievement of the states to Virginia only one state achieved significantly higher results than Virginia while 22 states achieve significantly lower results. Lastly, in examining eighth grade math higher levels of fiscal effort had a positive but not statistically significant impact on achievement. The achievement of Hispanics was significantly higher compared to prior models and females achieved significantly better compared to males. Eligibility for free and reduced lunch was found not to be significant on achievement. Finally, when comparing achievement of the states to Virginia nine states achieved significantly higher results than Virginia while eleven states achieve significantly lower results.

The fourth and final model using a fixed effects least square dummy variable technique failed to yield significant differences by placing state fiscal effort scores within tertiles. Specifically, instances of high and middle state fiscal effort levels had no significant impact on fourth and eighth grade reading and eighth grade math. However, in fourth grade math middle levels of fiscal effort were positively influencing and statistically significant. Examples of high fiscal effort were not neither positively influencing nor statistically significant. In most cases higher and middle levels of state fiscal effort were associated with higher levels of achievement. The two instances of negative impact were solely associated with high levels of fiscal effort.

In summation, findings from the study provided little evidence in support of the first two research questions. There were very few instances of statistically significant correlations between state fiscal effort and achievement on any of the NAEP assessments. Likewise, simple linear regression failed to yield significant findings that would support the hypothesis that state fiscal effort is a significant predictor of academic achievement. Investigating the historical relationship between state fiscal effort and achievement found very few instances of significant time lagged correlations and in general achievement increased prior to increases in state fiscal effort within the investigated two year lag. Lastly, exploring panel data via a fixed-effect dummy variable model found that covariance such as race, gender and socio economic status had a much more significant impact on achievement compared to varying levels of state fiscal effort.

Discussion

Provided that much of the findings were not significant, there are still some examples of utility that can be derived from the study. The research design employed was comprehensive especially in comparison to most studies in the education finance literature. This study expands upon most other studies by increasing the scope of the dependent variable of achievement. In investigating the broad influence of money on achievement it is equally important to take a similar broad perspective for achievement. In related research, the outcomes of a single subject or grade level assessment are a poor indicator of a student population's general achievement level. Student performance on a single assessment, in a lone subject for a singularly sampled population does not paint an extensive picture of comprehensive achievement levels. Additionally, the influences of studied variables on achievement are difficult to generalize given the narrow scope.

The use of a common fiscal measure to compare states is also a novel approach that is scarce in most education finance literature. State fiscal effort is measured uniformly on the areas of state wealth and spending towards education across all fifty states and the District of Columbia. This consistency in a state level funding measure is rare in most studies due to the range of educational funding formulas used to determine funds needed for students. States vary widely in the amount of money provided for education and previous literature fails to capture these differences in policy. As revealed in chapter two, most prior empirical research has investigated the impact of spending initiatives aimed to reduce class size, recruit experienced teachers or close achievement gaps. In comparison, the methods employed in this study provide an approach to evaluate state and local level fiscal policy and subsequent impact on achievement.

The time frame of this study adds to the current body of literature in that the research spans multiple years and the relationships investigated are validated over time. Much like the previous variables, achievement performance over a single year is not an accurate assessment of a student population's aptitude or a state's long term policy towards funding education.

The far-reaching research design utilized in this study may have hindered the potential possibilities of obtaining significant findings. It is much more difficult to find and determine relationships across additional achievement variables that span multiple years. Provided a narrower scope this study may have found substantial findings. For example, if the study investigated the relationship of state fiscal effort on math achievement in the state of Massachusetts it would have been possible to conclude the

variables were correlated and predictors of each other. However, the external validity of these findings would have been diminutive.

The statistical models used within the study could have some utility in future studies. A limitation that confronted the study was the small sample of historical data on NAEP achievement that was inclusive of all fifty states and the District of Columbia. Given a larger and more comprehensive data set states and localities could use a linear regression prediction model to predict achievement and gauge accuracy of the model and actual performance. In addition, panel data analysis can be used to determine significant factors that influence achievement at the state, local and federal level. Specifically, the analysis of panel data via a least squares dummy variable model would be useful in identifying causes of gaps in achievement. In an era of accountability and with mounting pressure to close gaps in achievement associated with race and poverty, a comprehensive panel data analysis could help states and localities target the most influential sources of variance among student populations.

Various findings from the study are informative and could be of use to some practitioners. The relationship between race, gender and socio economic status and differing levels of achievement have been further validated. Linear regression predictive models indicated that many states have a lengthy gap to close with regards to lead time necessary to reach a level equal to the highest performers. Lastly, investigating the panel data analysis further revealed instances where increased levels of fiscal effort were associated with lower levels of academic achievement. These examples were often seen in states with high levels of student poverty or higher populations of minorities. In contrast, some states showed lower levels of fiscal effort but had higher levels of

achievement. In these examples these states have lower levels of poverty and smaller populations of minorities. An interesting note to this trend is that the states that were putting forth higher levels of fiscal effort may have been increasing spending to close achievement gaps associated with the variables of race and socio economic status. In essence, these states may have been implementing better policies to improve educational equity but could be labeled as ineffective due to uninspiring achievement at the state level.

Researcher's Insight

The concept of state fiscal effort is complicated in its utilization for interstate comparisons. Simply comparing disparities in fiscal effort would alone be telling in differences among states with respect to available wealth and policy towards public education. States vary widely in fiscal needs or the amount of services required by its citizens and capacity the availability of capital to provide these services (Tannenwald, 1999). However, taking these differences in state fiscal effort and projecting them against associated relationships with achievement adds other dimensions of complexity. By measuring the fiscal effort of a state to expend public resources for education, problematic comparisons in state spending in simple dollar terms are avoided (Alexander, 2001). Primarily, the measure of fiscal effort allows researchers to accurately determine how economically disadvantaged states invest in education and other government services when compared to more economically advantaged states (Alexander, 2001). However, these differences in educational investment grow more complex when comparing their impacts on achievement. For example, states may be showing high effort but given low capacity and high needs of its population services such as education

achievement may show low efficiency and productivity (Tannenwald, 1999). This could in part be due to covariance associated with SES and race; therefore at times high fiscal effort may be a better indicator of high needs citizens rather than a policy of increased effort to funding many services (Tannenwald, 1999). In a study that investigated the many influences on academic achievement it was found that covariance between students' impacted achievement more than other investigated variables (Rivkin, Hanushek, & Kain, 2005). Student differences in race, gender and socio economic status are considered influential constructs that can impact student achievement (Anderson, 2005; Sirin, 2005; McGraw, Lubienski, & Strutchens, 2006).

Within the current study there were some instances where states with smaller amounts of wealth had higher proportions of their populations living in poverty. States such as West Virginia, New Mexico, Arkansas and Mississippi may have high levels of fiscal effort but are not achieving at a high level. This could be due to the higher proportions of students that live in poverty in these states (U.S. Census Bureau, 2008a). As shown in the panel data analysis in chapter four, students associated with poverty often performed lower than their counterparts.

Additionally, states that exhibit high levels of fiscal effort may have larger portions of their populations that are identified minorities. Higher effort states such as New Mexico and Alabama also have higher proportions of Hispanic and Black populations, as shown in the panel data analysis in chapter four, students from these backgrounds often achieved at lower levels compared to their counterparts (U.S. Census Bureau, 2008b).

In contrast, Vermont the highest ranking state with regard to effort also has the least amount of wealth as measured by gross state product (U.S. Bureau of Economic

Analysis, 2006). Vermont's high level of effort can be attributed to this lack of wealth and its subsequent impact on the ratio measurement. Even with its high fiscal effort towards education and lack of wealth Vermont has neither a large proportion of its population living in poverty or of minority descent (U.S. Census Bureau, 2008a, U.S. Census Bureau, 2008b). Interestingly, Vermont is one of the top achieving states across all NAEP assessments. It could be argued that this high level of achievement is due to lack of poverty and racial diversity within the state.

Finally, comparing fiscal effort and achievement when considering actual per pupil spending brings about some interesting findings. New York was the only wealthy state as measured by gross state product that ranked high in per pupil spending (U.S. Bureau of Economic Analysis, 2006; Ave & Zhou 2008). However, New York ranks in the middle with respect to effort but ranks in the top quartile of achievement. In contrast, wealthy states such as California and Texas rank at the bottom of per pupil spending and effort and achieve at the bottom quartiles of achievement (U.S. Bureau of Economic Analysis, 2006; Ave, & Zhou 2008). Remarkably, the states of Vermont and Wyoming which are among the poorest states as measured by gross state product rank at the top with respect to per pupil spending (U.S. Bureau of Economic Analysis, 2006; Ave & Zhou 2008). These two instances are prime examples of states committing high levels of fiscal effort. The two states also ranked in the top quartiles of achievement across all NAEP assessments. Informally, in these instances state fiscal effort may be an indicator of academic achievement. However, it must be noted that both Vermont and Wyoming do not have a significant proportion of their populations that live in poverty or high levels of minorities (U.S. Census Bureau, 2008a, U.S. Census Bureau, 2008b). Once more, the

relationship between state fiscal effort and academic achievement is ambiguous and there are few instances where the variables are significantly related.

As revealed in chapter four, the most prominent factors associated with achievement were race, gender and socio economic status. The variable of fiscal effort failed to establish significance in most statistical analyses. This was most evident within the panel data analysis by a least squares dummy variable (LSDV) model which produces coefficients with good statistical properties (Boardman & Murnane, 1979). The panel data analysis of the variables of state fiscal effort, achievement and associated covariance spanned over five years. The least squares dummy variable analysis was used to examine group effects in regression. Frequently, single equation models of education achievement tend to ignore effects of relevant variables, whereas LSDV allows the examination of the effects of variables across cross-sectional units of data (Boardman & Murnane, 1979). In models that included effort, race, gender and socio economic status it was found that differences associated with the covariance were much more significant in influencing achievement. The independent variable of state fiscal effort was in no way a significant predictor of achievement. In fact, in some cases increased levels of fiscal effort were associated with lower achievement. Some of these instances could be attributed to a state's increased proportions of people living in poverty or of minority descent. However, recently, state fiscal effort for education services has increased over expenditures in other social services (Lee, 1996). This policy trend is directed to decrease fiscal resource disparity among localities to assist in achieving higher accountability mandates established by the federal government (Lee, 1996). Principal objectives of federal mandates are to increase accountability among the public schools and close achievement

gaps associated with student differences in race and poverty. In essence, many states are putting forth increased effort to combat issues involved with equity and to follow mandates. Moreover, in these instances the states may be shifting policy to increase education spending in order to address the growing demands placed upon the public schools. It is important to note that instances of increased fiscal effort and inadequate achievement are not definitive examples of inefficiency but may be an acknowledgment of need for disadvantaged student populations. High effort states such as New Mexico, West Virginia and Arkansas could be trying to curb intrastate equity issues and assist schools with student populations facing achievement gaps. In any case, little time has passed since the standards based reform emerged through the No Child Left Behind Act of 2001. It is too soon to tell if states that have increased fiscal effort are seeing significant gains in closing achievement gaps or in overall performance. As previously noted in most instances increased spending is scarcely a detriment to achievement and time and future studies may prove that states proactive in increasing effort could see the biggest gains in achievement.

Finally, historical relationships were difficult to establish due to the narrow availability of inclusive achievement data. NAEP results for all fifty states and the District of Columbia are only available for the years 2003, 2005 and 2007. Although the duration of these assessments spans five years there is essentially a sample population of three from which to run statistical analysis. Procedures such as bivariate correlation and linear regression necessitate larger sample sizes. A greater sample size will reduce the standard error which in turn improves the reliability of the finding (Cohen & Cohen, 1983). This study would have benefited from more expansive and frequent data

collection to improve reliability of findings. Much of the findings from time lagged correlation are hindered due to the lack of comprehensive historical data and frequency of measurements. Time series analysis is better served with numerous measurements to extrapolate intricate patterns within historical data or to increase reliability in predicting future trends. Many of the findings from the time lagged correlation and predictive regression models are speculative. Provided a much more comprehensive data set, utility can be developed from the models. Much of the literature in education finance lacks thorough investigation of historical relationships between variables and lacks predictive functions. Potential findings from such research could be valuable to leaders in the education community. The ability to identify influential factors of achievement or to model projected outcomes would serve as valuable tools within the accountability culture of public schools.

Relationship of Current Study to Prior Research

To relate the current study to previous research connections are made between relevant fiscal factors that influence achievement. Research that investigated various fiscal measures and their subsequent impact on achievement are linked to the current study via relevant outcomes. Important findings on the influence of race, gender and socio economic status on are noted within respective education finance studies. In all cases relevant findings are contrasted to the current study in terms of research design and generalizabiliy.

In contrast to the current study, much of the previous research has either investigated different spending measures or outcome variables associated with achievement. Major studies have typically examined fiscal variables such as resource

reallocation, broad spending initiatives and specific education strategies associated with increased funding. Additionally, much of the past research has measured achievement through state level assessments of reading.

Research that has investigated the impact of resource reallocation generally seeks to determine the effect of transferring budget resources from administration and overhead to policies aimed to reduce class sizes, improve teacher quality and establish tutoring programs. These studies have generally found that increased spending is not necessary to boost achievement (Odden & Archibald, 2000; Archibald, 2006). Findings from these studies have suggested that better management of available resources can improve achievement. These outcomes are similar to the current study in that instances of increased fiscal effort did not necessarily equate to higher levels of achievement. States that allocated more of their budget money towards education generally did not have higher levels of achievement. However, the current study is different than the resource reallocation research in regards to variables examined. Specifically, the resource reallocation studies analyzed funding and achievement variables at the school level. In contrast, the current study explored these variables at the state level. In addition, in the resource reallocation studies funding was explored as school expenditures towards instructional practices whereas in the current study it was examined as state-level fiscal effort towards K-12 education. In summation the variables within the resource reallocation studies are dissimilar compared to the current study and connections are difficult to establish. Findings from the resource reallocation studies are promising but the local focus restricts generalizability to similar schools within the examined state. The relationship between the current study and the resource reallocation studies is weak given

the vast differences in scope and variables. However, it is important to note the related findings in that increased funding did not relate to higher levels of achievement.

Prior research that is most similar to the current study includes investigations that explored the impact of broad spending initiatives on achievement. These studies commonly look at large state-level increases in spending and subsequent impact on achievement. Commonality between the current study and research on broad spending initiatives begins with varying amounts of funding at the state level. In addition, these studies often investigate achievement on a large scale and look at the impact of funding over a course of years.

A prime example of a study that investigated broad spending initiatives looked at a state sponsored school improvement funding program in California. It was determined that the extra money allocated at specific under-performing schools had minimal impact on achievement (Goe, 2006). Another study investigated total school budget increases and its impact on achievement. Within the analysis fifteen Texas schools were allocated substantial extra funds through litigation over the course of four years. During the influx of money only two of the schools showed improvement in achievement (Murname & Levy, 1996). In contrast, another study found that increases in the amount of state aid available to poorer districts led to a narrowing of SAT test score gaps across background groups of differing socio economic status (Card & Payne, 1998). Lastly, Sebold & Dato (1981) determined that increased educational expenditures yielded positive and significant effects on achievement in California. These previous studies are similar to the current study in that broad levels of funding differences were examined. While findings were at a specified state level, instances of increased funding have had mixed influences

on achievement. Outcomes from the current study tend to side with studies that have shown little positive impact of increased spending on achievement.

In addition to these previous studies, Jefferson (2005) and Greenwald, Hedges & Laine, (1996) have conducted comprehensive literature reviews that examined the total system expenditure of schools and its connection with student achievement. Findings from Jefferson's (2005) review of the literature noted a preponderance of instances where high expenditure was associated with under-performing students and schools. Conversely, Greenwald, Hedges & Laine (1996) determined that a broad range of resources were positively related to student outcomes, with effect sizes large enough to suggest that moderate increases in spending may be associated with significant increases in achievement. It should be noted that much of the reviewed research determined that student and school characteristics have a greater impact on student achievement compared to levels of funding. These findings are similar the current study in that instances of higher levels of spending were sometimes associated with lower performing states. Interestingly, many of the studies cited student characteristics such as race and socio economic status as key factors impacting achievement. Using data from the current study it could be hypothesized that the examined schools with lower levels of achievement may have higher proportions of students that are Black and Hispanic or come from economically disadvantaged households. Additionally, these schools may have larger class sizes or teachers with less experience compared to higher achieving schools.

A final study that investigated the impact of broad spending initiatives on achievement examined student achievement across a seven-year period in which funding

for education in South Carolina increased for four years then dwindled. Findings determined that the impact of the increased funding on student achievement was low during the first two years then dramatically increased during the following two years (Flanigan, Marion & Richardson, 1996). Achievement subsequently leveled after the peak years of funding. The findings from this study provide credence to the idea that a time lag between funding and achievement may exist. The historical perspective of the current study failed to determine significance in a two year lag between state fiscal effort and academic achievement. Findings from Flanigan, Marion & Richardson associate well with the current study in that a long term trend analysis was conducted to substantiate the relationship between funding and achievement. However, none of the studies are definitive in providing evidence in support of higher levels of funding positively impacting achievement.

Much of the past research with respect to the impact of broad spending initiatives on achievement have failed to yield significant findings supporting the hypothesis that increased spending is associated with higher levels of achievement. These findings are comparable to the current study. Conversely, the current study deviates from prior research by taking an inclusive approach by comparing the funding and achievement variables for the fifty United States and the District of Columbia. Additionally, appropriate statistical models include the impact of race, gender and socio economic status on achievement. A poignant difference found in the current study is the isolation of each states share towards the total education budget. This variable is uncommon in school finance research. This key difference in funding variables must be noted in drawing comparisons between the current study and prior research. Provided these crucial

differences it is still noteworthy that the comparable studies have both found that increased levels of spending is not commonly associated with higher levels of achievement.

The majority of education finance research focuses on specific fiscal strategies aimed to reduce class sizes, improve teacher effectiveness or enhance school resources. Most studies investigate one of these strategies which are usually associated with increased spending and its subsequent impact on academic achievement. Compared to resource reallocation and broad spending initiatives the current study is weakly associated to research that investigates specific fiscal strategies. For the most part, these studies investigate the school and state level polices of reducing class sizes, offering teacher initiatives to improve effectiveness or allocating money to increase school resources. Increases in money are hard to isolate in most of these studies because it is simply assumed that the practices increases educational spending. In essence, these studies investigate the influence of the strategies on achievement and not necessarily the impact of increased spending.

Overall, the educational policies associated with increased spending have positively impacted academic achievement. Reducing class size was found to positively impact achievement by Hanushek (1986), Grubb (2006), and Wenglinsky (1997). Nyhan & Alkadry (1999) found that reducing class size had little to no impact on improving achievement. Polices that aimed improve teacher effectiveness through increased professional development or increased pay have generally positively impacted student achievement. Hanushek (1986), Verstegen & King (1998), O'Connell-Smith (2004), Ilon & Normore (2006), and Grubb (2006) concluded that various polices intended to improve

teacher effectiveness positively influence achievement as measured by respective assessments. In contrast LeFevre & Hederman (2001) found that a correlation between states expenditure per pupil and increased teacher salaries with educational performance did not exist. Finally, increased spending intended to expand school resources is generally associated with higher achievement. Hanushek (1986), Verstegen & King (1998), Okpala (2002), and Wenglinsky (1998) all concluded that increased levels of educational resources positively influence student achievement. In contrast, Picus et al (2006) concluded that there is essentially no relationship between the quality of school facilities and student performance when accounting for variance known to impact student performance.

It is difficult to determine relationships between the current study and the findings from research on specific fiscal strategies. This is attributed the specific focus of these studies on school level policies. The current study focused on state level spending policy and sought to determine interstate differences in the dollars that eventually reached the schools. Provided this broad perspective, the current study determined that increased funding as measured by levels of fiscal effort was not associated with higher levels of achievement. However, findings from the specific fiscal strategy studies indicate that policies at the local level seem to have significant impacts on achievement. These findings are contradicted by the resource reallocation studies which show that many of these policies can be enacted without increasing funding.

In summation, the expansive field of education finance research has shown diverse findings with respect to the impact of increased funding on academic achievement. The current study does little to provide substantive evidence to settle the

school funding debate. The literature will remain diverse given the wide range of concentrations in the field of education finance. The novel focus of the current study makes it difficult to draw parallels to prior research. This is primarily due to the fact that the funding variable of state fiscal is scarcely used in the field. State fiscal effort is not a measure of an actual dollar amount. Specifically, state fiscal effort is a measure of a state's policy towards funding education. This study sought to establish a research dialogue to determine if a specific source of funding is associated with higher levels of achievement. Money for U.S. public schools comes from three government sources, federal, state and local governments. The focus of the current study investigated differences in portions of state budget allocations towards education. That lack of substantial findings with the portion of school funding could lead to investigations that look at the impact of local fiscal effort on achievement. However, the only definitive finding from the current study is that student related differences associated with race gender and socio economic status explain differences in achievement much more significantly compared to variations in state fiscal effort.

Explanation of Unexpected Findings

There were several unexpected findings based on previous research outcomes in the education finance discipline. First, a preponderance of prior research has determined that circumstances that required increased funds have typically been positively associated with achievement. This conclusion was not established in the current study. In fact, findings were generally mixed with respect to the correlation of the variables of state fiscal effort and academic achievement. The few significant correlations were mostly positive but just about half of all the relationships were shown to have a negative

correlation. The varied correlation outcomes make it difficult to establish that a state level policy of increasing effort would improve achievement. Once more, a bivariate correlation simply looks at the relationship between the two studied variables. In the current study they were state fiscal effort and achievement on several NAEP assessments. Nonetheless, even in the absence of alternative variables state fiscal effort failed to yield a substantive relationship with achievement. The extreme variation among states in wealth, fiscal policy of funding education and population demographic could be a reason for the inconclusiveness of the correlation findings. The presence of such covariance would make it difficult to establish consistent findings in such a broad investigation.

At times, state fiscal effort was also found to be a negative predictor of achievement. In both the linear regression analysis and the panel data analysis instances of increased effort were sometimes associated with lower levels of achievement. In prior studies it was a rarity to find instances of higher levels of funding associated with lower achievement. Studies that have shown increased levels of funding being a negative predictor of achievement typically note higher populations of at-risk student populations (Biniaminov & Glasman, 1983). In the current study this explanation of negative prediction between the variables has merit. As previously discussed, many states that were found to have higher levels of fiscal effort and low levels of achievement usually had higher populations of minorities (Black or Hispanic) or people living in poverty. A good deal of research has shown that students of lower socio economic status have generally underperformed their counterparts (Sirin, 2005). In addition, research has confirmed that Black and Hispanic students often score significantly lower on math and reading assessments (Stevenson, Chen & Uttal, 1990). However, even in examples of

high effort or funding and lower levels of achievement, it is encouraging that some states are placing an emphasis on education and are striving to close achievement gaps commonly associated with race and socio economic factors. As previously cited, education provides positive returns to society as more education leads to higher productivity and wages (Angrist & Krueger, 1991; Ashenfelter & Krueger, 1994; Card, 1995). It is important that states continue to strive to close achievement gaps and provide an equitable education experience for all public school students.

A concluding unanticipated finding was the lack of substantial time lagged correlations between state fiscal effort and achievement. In addition, the sizeable lead time for most states to reach the overall highest level achievement provided predictors of past fiscal effort and achievement was surprising. It was hypothesized that increases achievement would lag increases in effort. Research has backed this assumption by concluding that student ability is a product of years of development (Hanushek, 1986). A possible explanation for the lack of a time lagged correlation could be that higher levels of fiscal effort does not always equate to higher amounts of actual money being put forth towards education. Often states with less wealth have to put forth more of their available capital towards education. As previously confirmed in the correlation and regression analysis there are many instances of high levels of fiscal effort and low levels of achievement. These examples may have reduced the quantity of significant time lagged correlations for the examined assessments. Additionally, in these types of analyses the researcher's ability to detect time lagged dependence is limited by sampling frequency (Warner, 1998). In the case of the current study, NAEP examinations are administered every two years. This makes finding time sensitive trends difficult to determine in a

broad analysis of states. Lastly, the considerable lead times that were calculated should be taken cautiously. These times were calculated with unproven variables that were sparsely sampled over the course of the ten years examined. The linear regression lead time forecasting would be best utilized in future research that has access to comprehensive data sets with frequent measures of financial and achievement variables.

Implications for Practice

Findings from this study could have implications for practice in three areas. First, previous research has effectively established that reducing class size and improving teacher effectiveness has raised student achievement. Underperforming states should allocate more of their fiscal effort to support localities in implementing these strategies. Research at the state level should be conducted to monitor the continual effectiveness of these strategies in improving academic achievement. Recognizing the findings from the resource reallocation studies, states could offer incentives to localities that would influence them to revise their budgets to adopt policy that emphasizes class size reduction and improving teacher effectiveness. Money from the state level could have mandates to encourage localities to adopt effective strategies that are linked to improved achievement. It would be interesting to examine the impact of such policies on traditionally underperforming student populations.

Findings from this study have demonstrated that higher levels of fiscal effort are often found in states with larger populations of people living in poverty or of minority descent. Frequently, poverty is a local problem and equity issues arise in education due to wealth disparities across respective states. A second implication for practice could have states increase their fiscal effort to reduce the funding burdens on localities and

enhance the equitable education opportunities for its citizens. This practice is supported through findings from the current study. In some instances, states that had high populations of poverty and minority composition but high levels of fiscal effort achieved one quartile better compared to similar states with lower levels of effort. This practice would not be recommended blindly for all states as findings also showed that some states were achieving in top quartile while putting forth low levels of fiscal effort at the state level. Increasing effort would only be recommended for states that have higher proportions of their populations living in poverty or of minority (Black or Hispanic) descent.

A third implication for practice would be to increase the amount of econometric analysis of education outcomes. This is especially true at the state and local government level. Comparisons among localities and states in determining efficiency would be helpful for policy makers. Analyses such as a time lagged correlation would provide information about return on investment and comparisons could subsequently be made on which localities are seeing the most rapid improvement in achievement. This is would be truly beneficial in identifying strategies that help close achievement gaps. Additionally, cost function methodologies could allow for comparative cost analysis of education between localities and states. In this analysis findings would help identify schools that are the most efficient in garnering high levels of achievement with lower amounts of money. This would help identify school level strategies that improve achievement without increasing costs. If states and localities could provide taxpayers information about the efficiency of their school systems and expected time for achievement improvements there could be a decrease in public outrage about the expense of public education. In essence,

the increase utilization of econometric analysis would improve communication about the costs and outcomes of education between the public and leaders within the public schools.

Recommendation for Further Research

Based on the findings from this study there are three recommendations for further research. The first recommendation calls for investigating different achievement variables within the context of the current study. Essentially, research would look at the impact of state fiscal effort in narrowing the achievement gap associated with socio economic status and race. It would be intriguing to see if states with higher levels of fiscal effort are more effective in closing achievement gaps. In the current study it was found that differences in race, gender and socio economic status were more significant predictors of achievement compared to state fiscal effort. If achievement is associated with relevant gains among these groups state fiscal effort may prove to be a more significant predictor of success. This recommendation is based on findings which confirmed that states that had high proportions of poverty and minority populations but high levels of fiscal effort achieved better compared to similar states. It would be interesting to see if this trend continued across all states.

In contrast to the current study, a second recommendation for further research could investigate the effect of local fiscal effort on academic achievement. State fiscal effort failed to establish significant relationships on most research parameters. The next logical fiscal variable to investigate could involve differences in local effort. Achievement differences associated with poverty and student demographics is a common concern facing most school localities. Research within this area could examine if

increased local effort has a more direct impact on achievement compared to the state level. Education is the largest budget item for both states and localities. Differences in monetary inputs at the local level may provide more insight into achievement variations of examined student populations.

A third and final recommendation for further research would involve examining academic achievement of at-risk students in states with large proportions of these populations. Specifically, differences in fiscal effort among these states could be examined to see if there is substantial impact on achievement within the at-risk student populations. As previously citied in this study, Black, Hispanic and students of low socio economic status demonstrated significantly lower levels of achievement compared to their counterparts. Findings from a study such as this would determine if increased fiscal effort in states with high proportions of at risk populations is a positive indicator of achievement. In effect, in typically underperforming states it could be determined if higher levels of effort has a significant impact on at-risk populations.

Conclusion

The results presented in within this study provide little evidence to support the hypothesis that the variables of state fiscal effort and academic achievement are correlated. Additionally, data was deficient in providing support of the premise that the variable of state fiscal effort is a significant predictor of achievement. The historical relationship between the variables of state fiscal effort and academic achievement negligible given the lack of significant time lagged correlations and the breadth of lead times to achievement. Furthermore, in the historical panel data analysis the amount of variance explained by other variables such as race and socio economic status were much

more significant compared to fiscal effort. However, all findings were not useless. In fact, some interesting directions for future research can be commenced. Findings suggest instances of increased state fiscal effort were commonly associated with states with lower levels of academic achievement. Upon further investigation it was found that many of these states have high proportions of their populations living in poverty or of minority descent. As found in this and other studies these populations regularly achieve at lower levels in comparison to their counterparts. Future investigations may establish relationships between local or state fiscal effort and achievement of at-risk populations.

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