

THE IMPACT OF STATE LEVEL EDUCATIONAL
FUNDING STRUCTURE ON STUDENT ACHIEVEMENT IN
SELECTED STATES IN THE UNITED STATES

By

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ABSTRACT

Purpose

This study examined the impact of state level educational financial structure on student achievement in selected states to determine which of these structures, if any, may affect student academic performance the most.

Methods

NAEP Reading scores of 10 selected states that have adopted new equity financial structures after 1990 were obtained. Data were analyzed using the analyses of variance (ANOVA) and the descriptive analysis method (line charts).

Findings

The first research question was designed to see if the change of financial structure cause significant enhancement on students' NAEP scores in these ten states. An Independent T-test was conducted and revealed a statistical significance.

The second research question examined the differences on the change of NAEP scores among the ten states to see which structure influenced student academic achievement the most. The data were tested using ANOVA and the result showed that one financial structure (Full State Funding) outperformed the others. However, the SPSS was not able to conduct the Post Hoc test to detail the difference because one group only contains one case.

The third question examined the differences on the change of NAEP scores among white student groups. The result is $F=3.926$ and $p>0.05$. At the alpha level of 0.05, the result is not statistically significant.

In the fourth research question, an ANOVA was performed to see if there is a significant difference on the change of NAEP scores among black student groups in those ten states that chose different financial structures. The test result showed significance.

CHAPTER I

Introduction

Financial disparities have existed throughout the history of the public education system in the United States. All 50 states have their public school systems that are generally organized into local school districts and rely heavily on financing from local property taxes (Berne & Stiefel, 1999). Property taxes, in turn, are based on property values that have large disparities caused by historical, constitutional, or social factors and that are unequally distributed across school districts and states (Berne & Stiefel, 1999). These inequalities between rich and poor public school districts eventually led to a long journey from the late 1960s to pursue a desirable school finance system, which would ultimately guarantee every child in America the opportunity for equal education. Courts became school finance battlefields again this time and therefore, brought about three revolutionary waves.

The “First Wave”: Establishing a Fundamental Right to an Education

The first wave began soon after Arthur Wise published a book titled *Rich Schools, Poor Schools: The Promise of Equal Educational Opportunity* (1967). In his book, Wise outlined the inequalities inherent in the current system of financing public schools. There are two cases featured in this period: *Serrano v. Priest I* (California)¹ and *San Antonio School District v. Rodriguez* (Texas)². In the former, the California Supreme Court ruled in favor of the advocates’ equal protection claims by declaring that the U. S. Constitution

¹ *Serrano v. Priest*, 96 Cal. Rptr. 601, 487 P.2d 1241, 5 Cal. 3d 584 (1971). A group of parents challenging the constitutionality of the public school financial system of California for failing to provide the children equal opportunity and quality of education.

² *San Antonio School District v. Rodriguez*, 411 U.S. 1. (1973). Mexican-American parents suing a School District in San Antonio claiming that the public education financial system of Texas violated their constitutional rights under the Equal Protection Clause by failing to distribute funding equally among its school districts. The Supreme Court held that education is not a constitutional right.

guaranteed all children a right to a public education. The state therefore had a responsibility to provide this education equally. In *Rodriguez*, however, when the Mexican-American parents in the Edgewood School District, San Antonio, initiated the suit by arguing the Texas' public education finance system violates the Fourteenth Amendment's Equal Protection Clause by failing to distribute funding equally among its school districts, the U. S. Supreme Court held that the Texas system did not violate the U. S. Constitution. The majority held that as important as education was for U. S. citizens and for discharging the responsibilities of citizenship, it was not mentioned in the Constitution, and the Court was unwilling, on its own, to recognize it as a fundamental right (Odden & Picus, 2000). Thus, *Rodriguez* literally closed the federal equal protection argument for advocates of equality (Bosworth, 2001).

The "Second Wave": State Legislation 1971-1989

All fifty states mention education in their constitution. Even though the wording of most education provisions is unique, the clauses fall into three general patterns: (1) some merely provide for a "system of free public schools"; (2) others require that the school system be "general and uniform" (Bosworth, 2001); (3) most important for litigation, several states are mandated to create and support a "thorough and efficient" public school system (Hubsch, 1992). After *Rodriguez*, the advocates for poor districts decided to employ these state educational clauses as evidence that each state was obligated to provide education equally. There was a case noteworthy in this period: *Robinson v. Cahill* (1973)³ in New Jersey. In this litigation, the New Jersey court declared the school

³ *Robinson v. Cahill*, 118 N.J. Super. 223, 1972. Group made up by parents, taxpayers, and city officials suing the state government of New Jersey challenging the constitutionality of the state education financial system based on the Fourteenth Amendment Equal Protection Clause. The court rule in favor of the plaintiffs.

funding system unconstitutional on the basis of the state education clause, although it refused to delineate statewide changes.

The “Third Wave”: 1989 to the Present: Equity, Adequacy, and Efficiency

In 1983, the publication of *A Nation at Risk* (National Commission on Excellence in Education, 1983) ignited a raging fire that spread rapidly to the whole country in the effort of concerning the quality of public education that many children were receiving. This report gave the perception that our education system was in dire trouble, and the United States was quickly falling behind other nations (Clark, 2002). Under this circumstance, came the third wave of school finance reform movement, featuring equity and adequacy. In the late 1980s and throughout the 1990s, the litigation has been undergoing a slow shift away from traditional “fiscal equity” cases (concerned with inequalities in school district per-pupil property tax bases and the per-pupil spending inequalities they yield), toward arguments focused on ensuring that all students have access to educational resources and opportunities adequate to achieve desired educational outcomes (Clune, 1993; Heise, 1995; Underwood, 1995). In 1989, the Kentucky Supreme Court declared the entire state system of public elementary and secondary education unconstitutional and held that all Kentucky schoolchildren had a constitutional right to an adequate education. The decision resulted in a dramatic overhaul of the state’s entire public school system and sparked what many scholars called the “adequacy movement” in courts, state houses, and education policy circles around the country (Clune, 1993; Underwood, 1995). The movement has spread rapidly. Since 1989, courts in Alabama, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Ohio, Tennessee, Texas, and Wyoming also have ruled that their state constitutions’ education

clause guarantee students an adequate level of educational opportunities that should allow them to achieve certain desired educational outcomes. Table I summarizes the status of finance reform litigation. By 1998, supreme courts in 43 states had heard cases on the constitutionality of school finance systems (Evans, Murray, & Schwab, 1999).

Table I

Summary of States with Court-Ordered Reforms, 1971-1997

Alabama	1993
Arizona	1994
Arkansas	1983
California	1971
Connecticut	1977
Kansas	1976
Kentucky	1989
Massachusetts	1993
Montana	1989
New Hampshire	1997
New Jersey	1973
Ohio	1997
Tennessee	1993
Texas	1989
Vermont	1997
Washington	1978
West Virginia	1979
Wisconsin	1976
Wyoming	1980

Source: Summary of Legislative and Court-Ordered Reforms; Evans, Murray, and Schwab (1997). *Journal of Public Policy Analysis and Management*, Copyright 1997.

In the education policy context, the shift has led to efforts to define what educational outcomes all students should attain and what resources are necessary to permit all students to achieve those outcomes (Clune, 1993).

Funding and Achievement

In addition to equity and adequacy in financing, conceptual issues about the extent to which finance inputs are related to improving performance also runs headlong into American's minds. Researchers have begun to focus on whether additional revenue can really make a difference in student achievement (Ferguson, 1991; Hanshuek, 1986). There are distinctive conclusions found by the leading researchers (Hanshuek, 1986; Hedges, Laine, & Greewald, 1994). In Hanshuek's research, he concluded, "there appears to be no strong or systematic relationship between school expenditures and student performance (p. 162)." This finding, however, was refuted by later researches as being flawed in its methodology and statistical analysis (Hedges, Laine, & Greewald, 1994). Hedges and Greenwald employed the National Assessment of Educational Progress(NAEP) in their research, since in their view, the college entrance examinations cannot provide reliable evidence about average student performance. They interpreted the statistical tests to show that reduction in class size and additions to teacher experience result in improvements in student outcomes, that school resources are systematically related to student achievement, and that the statistical relationship is large enough to be educationally important (1994).

The Problem

The research on the correlation between funding and student's achievement so far mostly focuses on the detailed process and destination of the money flow. For example,

many researchers indicated a positive relationship between achievement and school level expenditures (Burkhead 1967; Cooper et al., 1994; Deller & Rudnicki 1993; Dugan 1976; Grimes 1994; Lopus 1990; Register & Grimes, 1991; Ritzan & Winkler 1977; Thomas 1962; Winkler, 1975). Some studies suggested that school expenditures, especially those directly related to instruction, are likely to show a significant association with achievement (Cooper et al., 1994; Deller & Rudnicki, 1993; Grimes, 1884; Grimes & Lopus, 1990; Register, 1990; Register & Grimes, 1991). But there is still not a systematic analysis to address the correlation between the student's achievement and the state's financial structure in general.

As shown in the literature review, a state's financial structure (especially educational funding structure) has been the topic of legal review and legislative debate for years. But most of these concerns were politically oriented and presented more philosophical aspirations than practical methodology. The courts, when mandating state legislatures to make amendments to their financial structure, usually laid out certain benchmarks in terms of students' achievement for the purpose of evaluating the state's legislative proposal. But those benchmarks were usually overshadowed by constitutional or political scrutiny and will not be put to use. For example, in Texas, the state Supreme Court rejected the state's legislative proposal for the educational financial structure three times (including House Bill 72 in 1984, Senate Bill 1 in 1990, and Senate Bill 351 in 1991) before it finally approved Senate Bill 7 in 1995. But all these rejections were based on constitutional or legal reasoning. The Court did not, for once, let the state try the proposed structure and evaluate the outcome against those benchmarks.

As a result of this practice, there is still no established agreement on the type of financial structure that works most effectively on students' academic achievement. States keep experimenting on ways of putting money into schools, while at the same time, they have no clear idea about what kind of educational quality enhancement or degradation is lying ahead of them.

Logically, it is safe to believe that a general structure of educational financial system can make a difference to the students' achievement because it determines how effectively the money is spent, how closely the school's activity is supervised, and how quick the emerging problems can be addressed. Therefore, an empirical study on the correlation between a state's educational financial structure and the student's academic achievement is justified.

The Purpose

The purpose of this study is to test the impact of different state level funding structure on the students' academic achievement. One or more structures that have the most impact on enhancing student academic performance will be identified and analyzed.

Research Questions

1. Does the change of financial structure cause significant enhancement on students' NAEP scores in selected states?
2. Is there a significant difference on the change of students' NAEP scores among the groups of selected states that chose different financial structures?
3. Is there a significant difference on the change of NAEP score among the race or ethnicity groups, in terms of white students, in selected states that chose different financial structures?

4. Is there a significant difference on the change of NAEP score among the race/ethnicity groups, in terms of black students, in selected states that chose different financial structures?

Definition of Terms

Certain terms used in this study were defined to better facilitate common understandings.

Financial Structure - Financial structure means the prototype, or model, which specifies the formulas of distributing intergovernmental transfer payments. Financial structure in a state may include general aid, categorical grants, or block grants, depending on the degree of latitude given to recipients (King, Swanson, & Sweetland, 2003). For the purpose of this study, state level financial structures are mainly referred to the prototypes of general aids, more specifically, the foundation program, the combination foundation and tax-base-equalization program, and the full-state-funding program employed in 11 selected states.

General Aids - General aids account for the largest proportion of state support for school operations. General aid flows from state governments with few limitations on the school districts (King, Swanson, & Sweetland, 2003) and it is allocated via basic finance formulas: flat grants, foundation programs, tax-base-equalizing programs, combination of foundation and tax-base-equalizing programs, and full state funding.

Categorical Aids - A categorical aid program links grants to specific objectives of the government providing the funds (King, Swanson, & Sweetland, 2003). To qualify for such aid, a district or school must comply with program requirements. Categorical grants can be used only for a certain group of students (e.g., those with disabilities), a specific

purpose (e.g., to improve literacy), or a particular project (e.g., construction of a school building).

Flat Grants - Flat grant is one of the general aid formulas through which states allocate funds on a per capita (per pupil or per teacher) basis. The flat grants ignore local fiscal capacity referring to the amount of taxable property value per pupil, and effort referring to the local tax rate, by distributing equal monies to educate all students. Under a flat grant, the state alone funds the uniform per-pupil or per-classroom amount. In 1998-1999, three states utilized this formula (King, Swanson, & Sweetland, 2003).

Foundation Program - A foundation program finances a minimum base education program in each school district, provides general aid in a manner that is fiscal-capacity equalizing (i.e., increases as property value per pupil decreases), and requires a local contribution as the condition of receiving state aid as well (Odden & Picus, 2000). The difference between these prototypes of this formula lies in responsibilities for financing the base or foundation level. The state determines the level of local participation. State aid per pupil is the difference between the foundation per-pupil expenditure and the per-pupil revenues raised by the required local tax rate. In 1998-1999, thirty six states used this formula in designing educational financial policies (King, Swanson, & Sweetland, 2003).

Tax-Base-Equalization Programs - In contrast to foundation programs, rather than having the state determine a guaranteed funding level for all districts, the tax-base-equalizing programs stress local determination of a desired level of spending (King, Swanson, & Sweetland, 2003). Three types of tax base equalization are evident in state policies: percentage equalization, guaranteed tax base, and guaranteed yield. According

to King et al (2003), there were seven states employing these plans of tax base equalization as the primary funding mechanism and six others relying on this form of equalization as a secondary funding that builds on a flat grant or foundation program.

Combination Foundation and Tax-Base-Equalization Programs - These two tier school finance plans usually include two different school finance formulas in the overall approach to provide general education aid through a fiscal capacity equalizing program. One type of formula is used for the base, or tier-one program, and another type of formula is used for spending above the base, or tier-two program.

Full State Funding - In contrast to the shared state-local partnership evident in foundation and tax-base-equalization programs, state provides the complete full support of all costs to public education. This approach parallels the flat grant program, except that there is no local-option tax permitted beyond the state guaranteed per-pupil operating revenue (King, Swanson, & Sweetland, 2003).

Student Achievement - Student achievement in this study is measured by the aggregated mean scores of National Assessment of Education Progress (NAEP) on Reading of grade 4 of the selected states. Students in special education and second language programs were included. There were, however, several years when assessments with accommodations were not permitted. This study will conduct longitudinal analysis regardless of such discrepancy.

Race/Ethnicity - In this study, race or ethnicity only contains two categories: “white” and “black”. The reasoning was that data of other ethnic groups were frequently missing from year to year. If the year with missing data on these groups were to be

excluded, a valid analysis would be rendered impossible. Therefore the only solution would be to exclude those ethnic groups with missing data.

NAEP - Also known as “the Nation’s Report Card”. NAEP is a nationally representative and continuing assessment of what America’s students know and do in various subject areas. Since 1969, NAEP assessments have been conducted periodically in reading, mathematics, science, writing, U.S. history, civics, geography, and arts. In this study, the Reading scores of grade 4, with the most complete dataset, were used as measurement of student academic achievement.

Limitations and Delimitations

This study was limited to states that adopted new educational financial structures after 1990. Before 1990, *NAEP* data were not collected at the state level, and location information indicating state was removed from public access for confidentiality reasons. The researcher was not able to obtain permission to access that information in the time frame of this thesis. For this reason, states that adopted current educational financial structures before 1990 were not included in the analysis.

This study was also limited by the small sample size that reduces the sensitivity of the statistical tools. There were altogether ten states included in this study, which were further divided into three groups that adopted different financial structures. The sizes of group range from seven to one. This is not the perfect sample to conduct a quantitative analysis. In order to avoid Type I error (falsely reporting significance), potential significant differences might have been missed.

This study was further limited by variables that may influence *NAEP* score variance other than the financial structure. Such variables might include historical changes that

coincided with the change of financial structure and demographic/ethnic distribution that coincided with the different types of financial structure. A longitudinal method was employed to strengthen the analysis against potential rival causal factors. However, because this is already a small sample, it was impossible to completely control for such variables in the analysis.

This study was delimited to the selected components of *NAEP* score (Reading in Grade 4). Due to an incomplete data set, Mathematics, Writing, Art and History as well as Reading in other grades were not included. This study was conducted in a span of ten states, which have used three types of different financial structures: Foundation, Combination of Foundation and Tax-Base-Equalization, and Full State Funding. The states adopting Flat Grant structure were not included in this research.

Summary

Financial disparities, which are caused by historical, constitutional, or social factors, have been an inherent controversial topic throughout the history of the public education in the United States. Three waves emerged during the battle of seeking a desirable school financial system, which would ultimately guarantee every child in America the equal opportunity for education. The first wave began in 1967 and ended in 1970, featuring the efforts to establish a fundamental right to public education. The second wave was marked by litigations that employed the state educational clauses as evidence that each state was obligated to provide education equally. With the publication of *A Nation at Risk* (National Commission on Excellence in Education) in 1983, the third wave of school finance reform movement began, requiring an equity and adequacy system. In the meanwhile, researchers began to study the relationship between school funding and student

achievement. However, these researches, so far, mostly focused on the detailed process and destination of the money flow. And the concerns regarding financial structure in the legal field were politically oriented and presented more philosophical aspirations than practical methodology. As a result of this practice, there is still no established agreement on the type of financial structure that works most effectively on students' academic achievement. Therefore, the purpose of this study is to test the impact of different state level funding structures on the students' achievement.

Organization of the Study

This study is divided into five chapters. Chapter I contains an introduction to the study, in details with the background of the study, statement of the problem, statement of purpose and research significance, research questions, definitions of terms, and limitations and delimitations of this study.

Chapter II includes a review of literature addressing the recent history of school finance development in the United States. It includes sections on ideological concepts related to school finance, relevant legal challenges for the last half century, and researches concerning the relationship between funding and student achievement.

Chapter III consists of the methodology used in this study. It contains a description of research design, methods of data collection, and data analysis.

Chapter IV is a presentation and analysis of the data. Chapter V provides a summary of the findings, conclusions, interpretations, and implications for further research.

CHAPTER II

Review of Related Literature

Differences in educational expenditures per pupil across school districts in a state, identified as a problem as early as 1905, remains a concern in most states (Cubberly, 1905). Since then, school finance has been the center of analytic attention and policy debate across the country, and became the subject of court litigation. The issue of fiscal equity, often guided by principles of equal opportunity and equal access to schooling, has been prominent in cases of racial, ethnic, and socioeconomic discrimination (Madaus, 1985).

Concepts of School Finance Equity

Equal opportunity. The idea that public policy can be designed to improve or equalize the opportunity for some Americans makes the concept of equal opportunity the logical place to start a discussion of equity concepts (Berne & Stiefel, 1999). The general idea of equal opportunity can be interpreted in both positive and negative terms. In positive terms, equal opportunity means that all students should have an equal chance to succeed, with actual observed success dependent on certain personal characteristics, such as motivation, desire, effort, and to some extent ability. In negative terms, equal opportunity means that success should not depend on circumstances outside the control of the child, such as the financial position of the family, geographic location, ethnic or racial identity, gender, and disability. In *Brown v. Board of Education* (1954), the black children residing in Topeka sought the aid through courts in obtaining admission to the public schools of their community on a nonsegregated basis (Alexanders, 1998). It riveted the nation's attention to inequality in educational opportunity, focusing on

inequalities due to differences in racial composition of schools (Enrich, 1995; Wise, 1968).

The report, *Equality of Education Opportunity* (Coleman, Campbell, Hobson, McPartland, Mead, Weinfeld, & York, 1966), pointed out a very controversial conclusion, indicating that students' family and other background characteristics were more important than school resources in determining school achievement. A series of researchers (Bartlett, Corcoran, Crouse, Eaglesfield, Jackson, Mueser, & Williams, 1979; Jencks, Smith, Acland, Bane, Cohen, Ginitis, Heynes, & Michelson, 1972) followed the work of Coleman et al. questioning the link between resources and effects in education and tried to convince those working with school finance equity to focus more closely on inputs and processes (Berne & Stiefel, 1999). Wise and Gendler (1989) disagreed with these findings. They noted that on the average, schools with more money can buy more and better resources-textbooks, buildings, and most important, faculty that in combination provide a better quality of education for all students. In Wise's dissertation, *Rich Schools Poor Schools: The Promise of Equal Educational Opportunity*, he directly targeted the equity issue in the financing of schools by stating that his purpose was "to determine whether the absence of equal educational opportunity within a state, as evidenced by unequal per-pupil expenditures, may constitute a denial by the state of the equal protection of its laws (1968, p. 4)".

Wealth neutrality. Wealth neutrality as a school finance equity concept specifies that no relationship should exist between the education of children and the property wealth (or other fiscal capacity) that supports the public funding of that education (Berne & Stiefel, 1999). Wealth neutrality has been argued in the Serrano (1971) court cases

suggesting no child's education should depend on the wealth of his neighbors. This case led to the formulation of the guaranteed tax base (GTB) formula for distributing state aid to school districts, which is constructed so that districts that levy the same tax rates will spend the same amount of money per pupil (Berne & Stiefel, 1999). Research using the wealth neutrality concept continues today. Using 1992-92 data, the U. S. General Accounting Office recently completed a study that concluded that fiscal neutrality has not been achieved in most states: "Although most states pursued strategies to supplement local funding of poor school districts, wealthier districts in 37 states had more total (state and local combined) funding than poor districts in the 1991-92 school year. This disparity existed even after adjusting for differences in geographic and student need-related education costs (1997, p. 2)".

Horizontal equity. Horizontal equity provides that students who are alike should be treated the same. "Equal treatment of equals" reflects the horizontal equity principle (Odden & Picus, 2000). According to Odden and Picus,

Horizontal equity requires that all students receive equal shares of an object such as total local and state general revenues per pupil, total current operating expenditure per pupil, instructional expenditure per pupil, instruction in the intended curriculum, focus on thinking and problem solving, and equal minimum scores on student criterion-referenced assessment. (p. 60)

There have been several studies of the degree of horizontal equity within a state analyzing the status of school finance equity within the 50 states (Brown, Ginsburg, Killalea, Rosthal, & Tron, 1977; Evans, Murray, & Schwab, 199; 7Odden, Berne, &

Stiefel, 1979). Brown (1977) was one of the first studies that used a 50-state sample, finding that expenditure disparities actually increased nationwide from 1970 to 1975. The Odden, Berne, and Stiefel study (1979), using data from only 35 states, showed that several school finance reform states improved both horizontal and fiscal neutrality during the mid-1970s. Wyckoff (1992) then found that although fiscal neutrality was stable, horizontal equity improved modestly between 1980 and 1987. The 1997 General Accounting Office study (1997) identified bigger improvements in fiscal equity, but Hertert, Busch, and Odden (1994) showed that substantial disparities remain.

Vertical equity. Vertical equity specifically recognizes differences among children and addresses the education imperative that some students deserve or need more services than others (Odden & Stiefel, 2000). “Unequal treatment of unequals” has been a traditional public finance explanation to express the vertical equity principle. Odden and Stiefel (2000) interpreted vertical equity by stating “in some circumstances or for some reasons, it is acceptable to treat students differently, or to provide more services to some students (or districts) than others (p. 66)”.

The most commonly applied way to assess vertical equity is to weight all students who need extra services and then conduct a horizontal equity analysis using the number of weighted pupil as the pupil measure. School finance legislation in the states has addressed vertical equity by weighting students according to needs or costs (37 states in 1993-94), by funding special needs programs categorically, or both (Gold et al., 1995).

In a special report to Congressional requesters, the United States General Accounting Office (1995) identified four issues policymakers must address in determining if a state’s system of school finance is to be equitable (Johnson, 1999). From

case studies involving the three states of Tennessee, Texas, and Minnesota, the General Accounting Office reported that establishment of an equity system of school finance is determined by:

1. Policymakers must decide who is to benefit from an equitable school finance system, taxpayers or public school students.
2. The object that is to be equitably distributed must be determined. These objects may be revenues or other resources.
3. The principle to be used to determine whether the distribution is equitable must be chosen. School finance experts have identified four principles for defining equity:
 - a. Horizontal equity, in which all members of the group are equal;
 - b. Vertical equity, in which legitimate differences in resource distribution among members of the group are recognized;
 - c. Equal opportunity, also known as fiscal neutrality, which means that differences in expenditures per pupil cannot be related to local school district wealth; and
 - d. Effectiveness, which assesses the degree to which resources are used in ways that research has shown to be effective.
4. Determine what statistic will be used to measure the degree of equity in the school finance system (p. 5).

Adequacy. A Nation at Risk (National Commission on Excellence in Education, 1983) changed the nature of the debate about the goals of public education, shifting it from its origin concern with equity to achievement, especially achievement of U.S. students compared to those in other countries. Adequacy could be defined in a number of

ways. One definition specifies a level of resources that is sufficient to meet defined or absolute, rather than relative, output standards (Berne & Stiefel, 1999). In the words of Clune (1995, p. 481), “adequacy refers to resources which are sufficient (or adequate) to achieve some educational result, such as a minimum passing grade on a state achievement test.” To the scholars, the distinction between adequacy and equity concepts is the focus on sufficient and absolute levels in adequacy and on relative levels or distributions in equity (Berne & Stiefel, 1999).

School Finance Litigation

School finance equal protection litigation. In the late 1960s, two court cases were filed—*McInnis v. Shapiro* (1968) in Illinois and *Burruss v. Wilkerson* (1970) in Virginia—challenging the constitutionality of differences in educational expenditures across each state’s school districts (Odden & Picus, 2000). In the wake of *McInnis* and *Burruss*, Wise (1968) argued that education was a fundamental right, and that equal protection clause required that education must be provided equally across all school districts. About the same time, Coons, Clune, and Sugarman began to argue that education funding created a suspect classification defined by district property wealth per pupil and that school financing systems needed to be “fiscally neutral” (Coons, Clune, & Sugarman, 1970).

The first case filed using the Coons, Clune, and Sugarman strategy was *Serrano v. Priest* (1971) in California. The California Supreme Court rendered an opinion in August 1971, ruling that: (1) the case was justiciable, using the fiscal neutral standard, (2) education was a fundamental right and property wealth per pupil was a suspect class, and

(3) if the facts were as alleged, the California school finance system would be unconstitutional.

One case filed after the Serrano opinion was *San Antonio School District v. Rodriguez* (1973) in Texas. In March 1973, the U.S. Supreme Court held that the Texas system did not violate the U. S. Constitution. The Court interpreted equal protection in terms of providing educational opportunity by writing:

Education, perhaps more than welfare, presents a myriad of intractable economic, social, and even philosophical problems. The very complexity of the problems of financing and managing a statewide public school system suggests that there will be more than one constitutionally permissible method of solving them, and that, within limits of rationality, the legislature's efforts to tackle the problems should be entitled to respect (as cited in Thompson, Wood, & Honeyman, 1994, p. 273).

The Supreme Court ruling in *San Antonio School District v. Rodriguez* (1973) case had two particular effects on school finance litigation. The first effect was a refocus of efforts in federal lawsuits, while the other was to turn attention to state courts in hopes of finding greater sympathy for reform (Thompson, Wood, & Honeyman, 1994).

School finance litigation based on state education clauses. Cases that have attempted to establish education as a fundamental right that is explicitly guaranteed by U.S. Constitution equal protection clause were not very successful. Challenging state school finance structures under the state education clause became additional legal strategies other than those used for equal protection litigation (Odden & Picus, 2000). The cases in both Arkansas (*Dupree v. Alma School District*, 1983) and Wyoming

(*Washakie County School District No. 1 v. Herschler*, 1980) in the early 1980s were largely based on the state education clause arguments, as were the Texas (*Edgewood Independent School District v. Kirby*, 1989) decisions from the late 1980s until the mid 1990s, and the Vermont case (*Brigham v. State*, 1997) in 1997 (Odden & Picus, 2000).

The *Dupree v. Alma* (1983)⁴ case in Arkansas provided an approach in which the focus was not on an analysis of equal protection. Rather, the court used a rational basis test to determine if the Arkansas government had a rational basis for financing the school system as it stated in the state constitution (Johnson, 1999). The court found that the Arkansas system was irrational by writing: “Even without deciding whether the right to a public education is fundamental, we can find no constitutional basis for the present system, as it has no rational bearing on the education needs of the districts (*Dupree v. Alma*, 651 S.W.2d 93, 1983)”.

The Texas *Edgewood v. Kirby* decisions entailed some fascinating interactions between the court and the legislature, and led to a legal decision and new finance structure that was unique (Odden & Picus, 2000). Under this case, Texas joined California, New Jersey, Massachusetts, West Virginia, Wyoming, Washington, and Arkansas on the lists of states whose finance systems had been declared unconstitutional by their state courts (Walker & Kirby, 1988). As the legislature submitted plan after plan to create a new structure for the overall system, the court kept rejecting these proposals. When the legislature then enacted a system that “recaptured” funds from the highest wealth districts, the court found the system in violation of another section of the constitution prohibiting

⁴ *Dupree v. Alma*, 651 S.W.2d 90 (1983). Eleven School Districts (headed by Alma School District) brought suit against the Arkansas State Board (headed by Jim DuPree) charging that the present system violates the state constitution’s guarantee of equal protection and its requirement that the state provide a general, suitable and efficient system of education. The court held in favor of the school districts.

the legislature from reallocating local revenues. Finally, the legislature created a two-tiered pupil-weighted system (Picus & Toenjes, 1994) that was similar to the original system, but required the wealthiest districts to voluntarily, with voter approval, give some of their wealth or revenues to lower-wealth districts as a condition for receiving any state aid. This system, which largely focused on the top and bottom 50 districts and which the court identified as the core of the problem at the beginning of the litigation process, was finally approved (Odden & Picus, 2000).

Nevertheless, the use of the state education clause to make the same arguments as the traditional fiscal neutrality cases has met little success (Van Slyke, 1995). Several cases of the court decisions of many states in the 1990s (e.g., Maine, Minnesota, Virginia, & Wyoming) suggested they might be more sympathetic to a different type of argument: an adequacy argument.

State litigation based on the adequacy argument. The language of education clauses varies substantially across the states, with some calling for the creation of an education system, and others calling for “thorough and efficient,” “thorough and uniform,” or “general and uniform” school systems, yet all states have some requirement for the state to create a system of public schools (Odden & Picus, 2000). Though McUsic (1991) argued that the specific wording of the education clause could lead to stronger or weaker interpretations of the substantive meaning of the clause, both Sparkman (1994) and Underwood (1995) concluded that the meaning of the education clause is state specific and depends on its political history and prior interpretation.

In *Rose v. Council for Better Education* (1989), the Kentucky Supreme Court not only overturned the state’s school finance system, but also found the entire state

education system to be unconstitutional, including its curriculum, governance, and its management. This decision is unprecedented in the history of school finance reform in that the entire system of common schools was unconstitutional (Johnson, 1999). The court held that school finance equity required that all students should have access to an adequate education program, and included the following language about what such a program would include:

1. Sufficient oral and written communication skills to enable students to function in a complex and rapidly changing civilization,
2. Sufficient knowledge of economic, social, and political systems to enable the student to make informed choice,
3. Sufficient understanding of governmental processes to enable the student to understand the issues that affect his or her community, state, and nation,
4. Sufficient self-knowledge and knowledge of his or her mental and physical wellness,
5. Sufficient grounding in the arts to enable each student to appreciate his or her cultural and historical heritage,
6. Sufficient training or preparation for advanced training in either academic or vocational fields so as to enable each child to choose and pursue life work intelligently, and
7. Sufficient levels of academic or vocational skills to enable to public school students to compete favorably with their counterparts in surrounding states, in academics or in the job market (as cited in Odden & Picus, 2000, p. 39).

After the 1989 Kentucky decision, other seven state courts overturned school finance system on the basis of adequacy arguments—Alabama (*Alabama Coalition for Equity, Inc. v. Hunt*, 1993), Massachusetts (*McDuffy v. Secretary of the Executive Office of Education*, 1993), Arizona (*Roosevelt Elementary School District v. Bishop*, 1994), Ohio (*DeRolph, et al. v. State*, 1997), New Hampshire (*Claremont School District v. Governor*, 1993), North Carolina (*Leandro v. State*, 1996), and Tennessee (*Tennessee Small School System v. McWherter*, 1993; *Tennessee Small School System v. McWherter*, 1995). The courts in Florida (*Coalition for Adequacy & Fairness in School Funding v. Chiles*, 1996), Illinois (*Committee v. Edgar*, 1996), and Rhode Island (*Pawtucket v. Sundlun*, 1994) rejected cases based on the adequacy argument, and four state courts—Maine, Virginia, Minnesota, and Wisconsin—suggested successful arguments could be made on the basis of educational adequacy when rejecting plaintiffs’ arguments in fiscal neutrality cases (Odden & Picus, 2000).

Does adequacy require equal outcomes? In other words, do adequacy cases require having all students actually achieve to some high minimum standards? Legal analysts claim that they do not (Clune, 1994a, 1994b; Minorini and Sugarman, 1999; Underwood, 1995). They argue that adequacy means a level of resources for a district or school that would allow for provision of the type of program that would be sufficient to teach students to high minimum standards. At the same time, they suggest that it is entirely possible that some court in the future might require some uniform, minimum but high level of student achievement results, resulting in a natural evolution of the adequacy issue.

Funding and Achievement

Since publication of *A Nation At Risk* (National Commission on Excellence in Education) in 1983, Americans have become increasingly concerned about the quality of their schools (Burtless, 1996). This publication did not occur in a vacuum. The average Scholastic Aptitude Test (SAT) scores between 1963 and 1979 had fell significantly. The direction in average scores on tests administered to younger students also delined (Koretz, 1986). Although some of the discouraging achievement trends of the late 1960s and early 1970s were reversed by the middle of the 1980s, average American students continue to rank low in international comparisons of student knowledge and ability (Burtless, 1996). In science and mathematics, junior and senior high school students fare dismally on international tests of achievement. American seventeen-year-olds score below average students in nearly all other countries surveyed in tests of mathematics competence (Baily, Burtless, & Litan, 1993). Contrast to these facts, calculations by Chubb and Hanushek (1990) show that average U.S. spending per student, controlling for the effect of inflation, rose more than 60 percent between 1966 and 1980, when most of the test score decline occurred. Since 1960 spending per pupil has tripled, the student-teacher ratio has fallen more than a third, and teacher's salaries have risen by half (Burtless, 1996). The perception that average school quality is slipping has pushed educators and policymakers to ask whether expenditures for educational purposes actually influence student achievement in a meaningful, positive way (Conn, 1994).

One of the best-known studies was the government-sponsored study, *Equality of Educational Opportunity*, prepared by James Coleman and his collaborators (1966). As a response report to the mandate of the 1964 Civil Rights Act, this report assembled

information on detailed characteristics of schools, teachers, and students that might help explain individual student performance. It reached two surprising conclusions. First, the difference in educational resources available to black and white youngsters was far smaller than commonly supposed, and second, it found very small and uncertain effects of school resources on student achievement (Coleman, 1966). The authors concluded that the measurable characteristics of teachers and schools played only a negligible role in determining student outcomes, and that socioeconomic background variables and the composition of the student body played a more important role in determining student success (Coleman, 1966).

Equality of Educational Opportunity sparked fierce controversy among educators and social scientists. Since 1966, a large number of data sets have been analyzed in an attempt to measure the impact of school inputs and teacher, student, and parental characteristics on measures of student performance, including scores on standardized tests, school attendance, promotion, and graduation (Burtless, 1996). A lot of analysts (Bennett, 1993; Bracey, 1995; Hanushek, 1986; Will, 1993) agree with Coleman and his collaborators in finding that school resources do not have a consistent or powerful effect on student performance. William Bennett (1993) conducted a study using state per pupil expenditures and state level SAT scores and reported that his research found no relationship between dollars spent and SAT scores.

Among those following researchers since Coleman, Hanushek's analysis is the most influential one. In his researches, Hanushek concludes that there is no evidence that teacher-pupil ratios, teacher education, teacher experience, teacher pay, or spending per pupil has a consistent or significant effect in improving school achievement (Hanushek,

1986; 1989). Table II shows a tabulation of his findings from 377 statistical relationships, estimated in many separate studies, of the effect of school inputs on student performance.

Table II

Percentage Distribution of Estimated Effects of Key Resources on Student Performance, Based on 377 Studies

Percent, except where indicated

Resources	Number of estimates	Statistically significant		Statistically insignificant		
		Positive	Negative	Positive	Negative	Unknown
Teacher-pupil ratio	277	15	13	27	25	20
Teacher education	171	9	5	33	27	26
Teacher experience	207	29	5	30	24	12
Teacher salary	119	20	7	25	20	28
Expenditure per pupil	163	27	7	34	19	13
Administrative inputs	75	12	5	23	28	32
Facilities	91	9	5	23	19	44

Source: Eric A. Hanushek (1996), School resources and student performance, in *Does Money Matter: The Effect of School Resources on Student Achievement and Adult Success*, Gary Burtless (Ed.). Washington, DC: Brookings Institution Press.

Hanushek's interpretation of the evidence has not gone unchallenged. Larry Hedges and two coauthors have reexamined the studies analyzed by Hanushek to suggest that a \$500—or roughly 10%—increase in average spending per pupil would increase student achievement by 0.7 standard deviations, a meaningful amount (Hedges, Laine, & Greenwald, 1994). They argue that even a casual examination of the studies summarized in Hanushek's table shows that resource inputs probably have a positive influence on school outcomes.

In addition to Hedges and the coauthors, other researchers also rejected Hanushek's findings because they believe that there is a positive relationship between educational

resources and the advancement of educational attainment. This relationship is based on the premise that as more money is available, schools have a better opportunity to increase the quantity and quality of their resources, thus impacting student achievement (Harter, 1998). For example, Ferguson (1991) has used unusually information about the instructional qualification of Texas teachers to argue that higher literacy skills among instructors, reductions in class size, and more experienced teaching staffs all lead to improvements in average student scores on standardized tests. Moreover, he argues that higher teacher salaries can improve the average qualifications of a school district's teaching staff (Ferguson, 1991). His analysis strongly suggests that larger school budgets, holding the number of students constant, can improve average student outcomes (Burtless, 1996).

Summary

Financial disparities, which are caused by historical, constitutional, or social factors, have been an inherent controversial topic throughout the history of the public education in the United States. Since 1905, school finance has been the center of analytic attention and policy debate across the country, and became the subject of court litigation (Johnson, 1999). Whether or not the school finance reform was court-ordered, policymakers in most states developed strategies that attempted to reduce spending differences, including flat grants, foundation programs, tax-base-equalization programs, combination of foundation and tax-base-equalization programs, and full state funding (King, Swanson, & Sweetland, 2003). The creation of fiscally neutral environment was the target of many policy makers.

Since publication of *A Nation At Risk* (National Commission on Excellence in Education) in 1983, Americans have become increasingly concerned about the quality of

their schools (Burtless, 1996). Equality of Educational Opportunity sparked fierce controversy among educators and social scientists. Earlier researches on the relationship between funding and student achievement revealed a finding that school resources do not have a consistent or powerful effect on student performance (Bennett, 1993; Bracey, 1995; Hanushek, 1986; Will, 1993). However, other researchers (Hedges, Laine, & Greenwald, 1994) have challenged this finding by arguing that resource inputs have a positive influence on school outcomes.

CHAPTER III

Methodology

This research was a multi-stage research. At the first stage, there was a descriptive research that reviews the trend of student achievement status of various states around the year of financial structural change. At the later stage, the data were used in an Analysis of Variance (ANOVA) in order to test the hypotheses regarding the causal relationship between the state level financial structure change and student achievement improvement (or retrogression, if possible). This research went through several basic steps: (a) identify a problem, (b) select an appropriate sample of participants, (c) collect valid and reliable data, (d) analyze the data and test the hypothesis, and (e) report conclusions. This research was conducted to answer three identified questions listed earlier.

Data Collection

The research was a second-hand data analysis. No questionnaires, telephone surveys, or interviews were involved in this research. All the data collected are existing NAEP scores, which were downloaded from the official NAEP web site in order to measure the change of student achievement before and after the adoption of a new state level financial structure. Scores representing years before and after the adoption were utilized to see a longitudinal change, if any, thus the degree of the impact.

Data Analysis

The unit of analysis was the states that adopt different educational financial structures. Using Analysis of Variance, the independent variable is the given types of state financial structure, and the dependent variable is the change of student achievement illustrated by the change of NAEP scores around the year of a state's adoption of its new financial structure.

To find the answer for question 1: “Does the change of financial structure cause significant enhancement on students’ NAEP scores?” A t-test was conducted to test the significance of difference between the average score before the new structure’s adoption and the average score after that year. To provide a more detailed understanding of this change, longitudinal data analysis method was employed as well.

To determine which financial structure would influence students’ achievement the most, an ANOVA test was conducted. The purpose of this test was to find out whether there is a significant difference on the change of students’ NAEP scores among the groups of states that chose different financial structure. If the result of the ANOVA test were significant, a Tukey Post Hoc test would usually be used to identify the exact location of the significant difference. However, in this study, Post Hoc was not allowed by SPSS because one of the groups (Full State Funding) only contains one case while at least two cases were required in each group. Instead, a direct comparison of group means was the substitute solution.

The ANOVA test also will be utilized to answer the third and fourth questions and the variables are financial structure and the change NAEP scores of race/ethnicity student groups: white and black students (other ethnic groups were not included due to incomplete dataset).

Summary

The impact of state level financial structure on student achievement is a new and important topic to policy makers and educators. This study contributed to the body of knowledge regarding financial structure and student achievement by gathering

longitudinal data for selected 10 states that adopted newest equity and adequacy financial structures in 1990s.

In Analysis of Variance, the independent variable is the given types of state financial structure, and the dependent variable is the change of student achievement illustrated by the change of NAEP scores around the year of a state's adoption of its new financial structure. A t-test was conducted to test the significant change between the average score before the new structure's adoption and the average score after that year. And an ANOVA test was used to determine which financial structure would influence students' achievement the most. The ANOVA test also will be utilized to answer the third and fourth questions.

CHAPTER IV

Data Presentation and Analysis

No state level NAEP data were collected before the year 1990. Therefore the only states available for this study of statewide NAEP score are those states that adopted new financial structures after 1990. Those states are Alabama, Arizona, Arkansas, Massachusetts, Michigan, Mississippi, Missouri, Texas, Washington, and Wyoming. Table III presents the type of the financial structure and the year in which the given structure was adopted.

Table III

The Adoption Year of New Financial Structure for 10 States

State	Financial Structure	Year
Alabama	FND	1995
Arizona	FND	1998
Arkansas	FND	1995
Massachusetts	FND	1993
Michigan	FND	1994
Mississippi	FND	1999
Missouri	CFND	1994
Texas	CFND	1995
Washington	FULL	1997
Wyoming	FND	1995

FND *Foundation* *FULL* *Full state funding*
CFND *Combination of Foundation and Tax-Base-Equalization*

Source: National Conference of State Legislatures (2004). *Education Finance Database*, <http://www.ncsl.org/programs/educ/edu.htm>

The variables investigated in research question 2 included the student achievement change, in terms of NAEP Reading scores of grade 4 for all student groups, and three types of financial structures: Foundation Programs, Combination Foundation and Tax-Base-Equalization Programs, and Full State Funding Programs. Table IV presents the average NAEP reading scores of grade 4 for those 10 states before the new financial structure's adoption and after.

Table IV

Average NAEP Reading Scores of the 4th Grade for the selected 10 States

State	Average Before Adoption	Average After Adoption
Alabama	207.5	208.3
Arizona	207.5	206.7
Arkansas	210	212
Massachusetts	226	227
Michigan	216	218
Mississippi	201.3	204.8
Missouri	220	218.8
Texas	212.5	215.3
Washington	213	221
Wyoming	222	220.3

Source: National Center for Education Statistics (2004). Retrieved from <http://nces.ed.gov/nationsreportcard/naepdata/getdata.asp>

The variables investigated in research questions 3 and 4 included the student achievement change, in terms of average NAEP Reading scores of grade 4 for white and

black students, and the different types of financial structures. Table V presents the average NAEP reading scores of grade 4 for those 10 states before and after the new financial structure's adoption for white students. Table VI presents the same set of scores for the black students.

Table V

Average NAEP Reading Scores of Grade 4 for the White Group in the 10 States

State	Average Before Adoption	Average After Adoption
Alabama	218	219.7
Arizona	219.5	220.7
Arkansas	217.5	220.3
Massachusetts	230	232.8
Michigan	222	225.7
Mississippi	216.7	219.5
Missouri	225	223.8
Texas	224.5	229.7
Washington	216	224.7
Wyoming	224	222.8

Source: National Center for Education Statistics (2004). Retrieved from <http://nces.ed.gov/nationsreportcard/naepdata/getdata.asp>

Table VI

Average NAEP Reading Scores of Grade 4 for the Black Group in the 10 States

State	Average Before Adoption	Average After Adoption
Alabama	186	189
Arizona	193	195.3
Arkansas	185.5	187.3
Massachusetts	204	204.2
Michigan	187	190.3
Mississippi	186.7	190.5
Missouri	195	194.8
Texas	194.5	198.3
Washington	198	209.7
Wyoming	N/A	N/A

Source: National Center for Education Statistics (2004). Retrieved from <http://nces.ed.gov/nationsreportcard/naepdata/getdata.asp>

Statistical Analysis

The purpose of this study was to identify the impact of state level financial structures on student achievement in selected states. Longitudinal and variation analytical methods have been utilized to see if there is a statistical significance supporting the researcher's hypothesis. Specifically, this investigation examined the following questions:

1. Does the change of financial structure cause significant enhancement on students' NAEP scores in selected states?

2. Is there a significant difference on the change of students' NAEP scores among the groups of selected states that chose different financial structures?
3. Is there a significant difference on the change of NAEP score among the race or ethnicity groups, in terms of white students, in selected states that chose different financial structures?
4. Is there a significant difference on the change of NAEP score among the race/ethnicity groups, in terms of black students, in selected states that chose different financial structures?

To demonstrate the year-by-year trend of change of student achievement before and after the new financial structure's adoption, a line chart was used as supplementation. As to questions 2, 3, and 4, an ANOVA test was performed. In each ANOVA analysis, the independent variable was the financial structure, and the dependent variable was student achievement, measured by NAEP Reading score of grade 4. The analytical outcomes of the research questions are as follows:

Question 1. The question is: Does the change of financial structure cause significant enhancement on students' NAEP scores in selected states?

A one-sample t-test was conducted on the difference between the ten states' average NAEP scores before and after the year of financial structure change. Average score before the year of change among the ten states was 213.58; after the year of change, was 215.22 (see Table VII).

Table VII

T-test Analysis of Average Scores Before and After the New Structure's Adoption

Test Value =						
0						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
BEF_TOT	89.610	9	.000	213.5800	208.1883	218.9717
AFT_TOT	95.410	9	.000	215.2200	210.1171	220.3229

As the table shows, there was a significant enhancement ($p < 0.05$) on students' NAEP scores across the year of the financial structure change in these states.

However, a simple comparison of two numbers would not sufficiently demonstrate the pattern of the change from year to year. The higher score in the later time can also be caused by the historical increase of NAEP score in general; a simple comparison of two numbers is not able to single out the effect of the financial structure change from it. To solve this problem, a set of line charts is generated to illustrate the longitudinal change of the NAEP score across the year of financial structure change (see Figures 1 to 10).

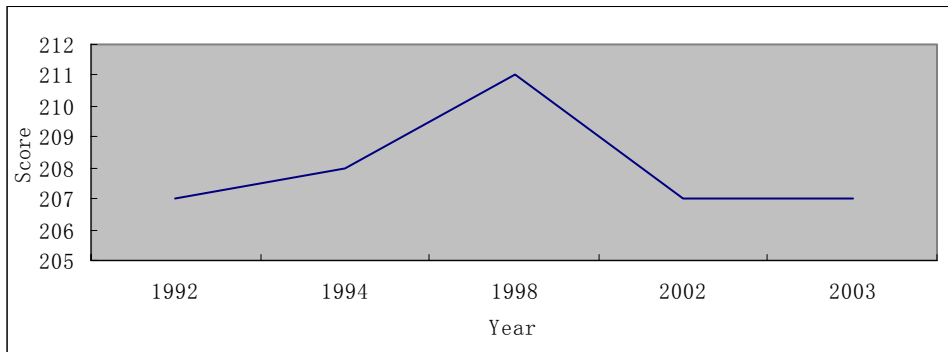


Figure 1. Alabama (Change in Year 1995)

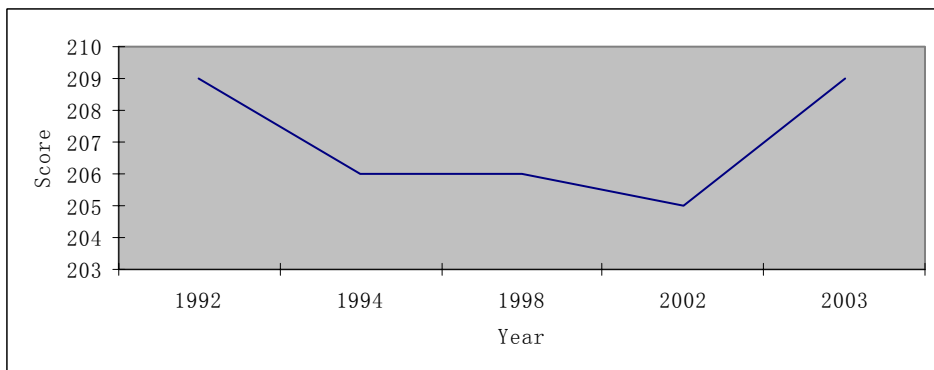


Figure 2. Arizona (Change in Year 1998)

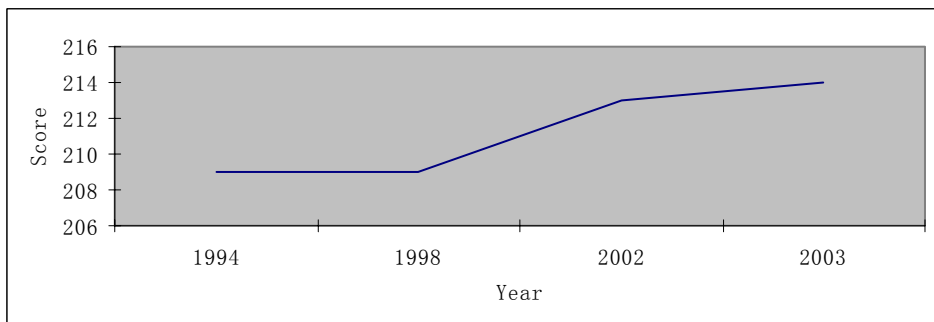


Figure 3. Arkansas (Change in Year 1995)

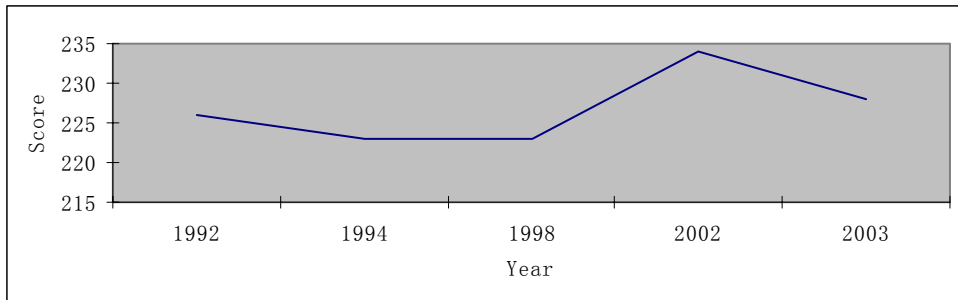


Figure 4. Massachusetts (Change in Year 1993)

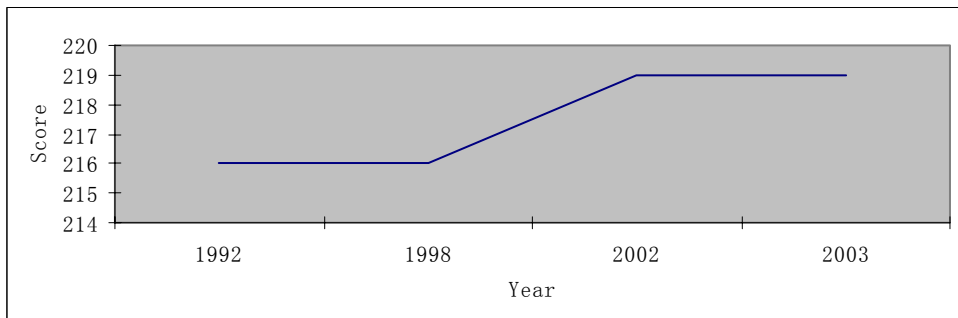


Figure 5. Michigan (Change in Year 1994)

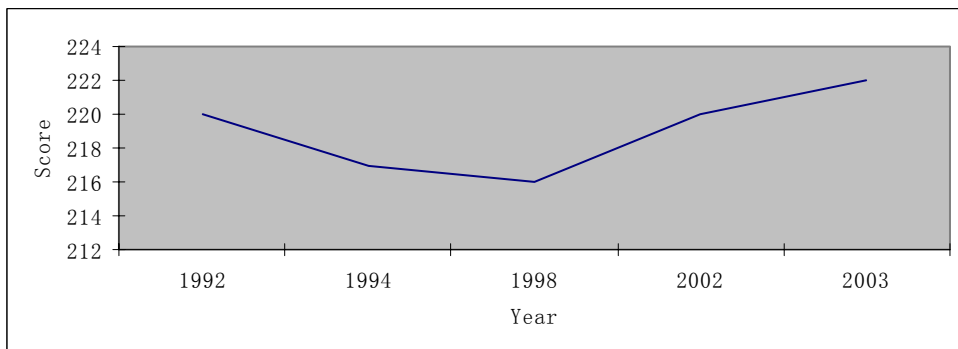


Figure 6. Missouri (Change in Year 1994)

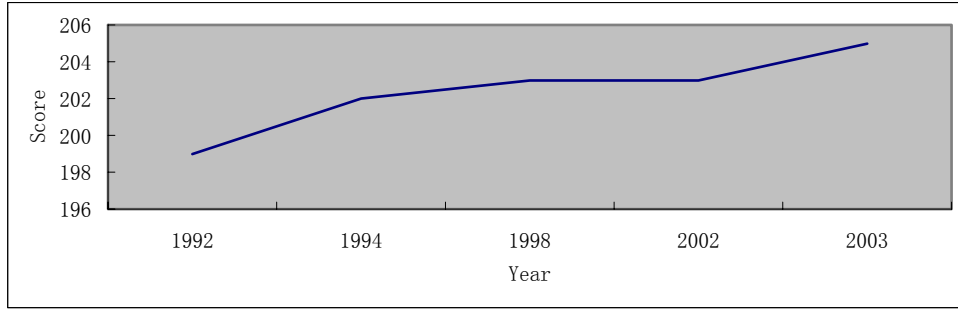


Figure 7. Mississippi (Change in Year 1999)

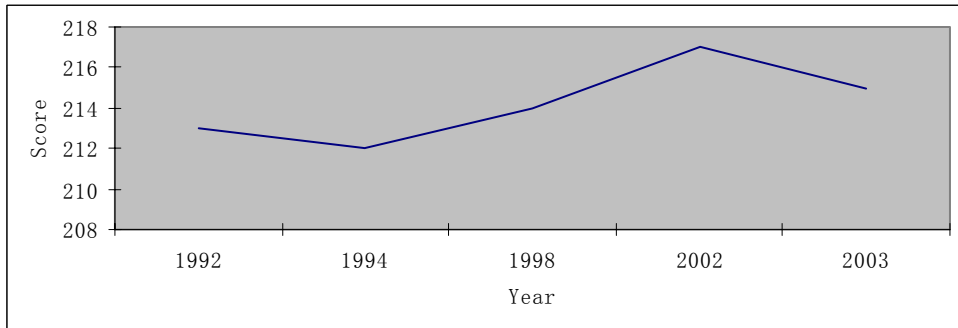


Figure 8. Texas (Change in Year 1995)

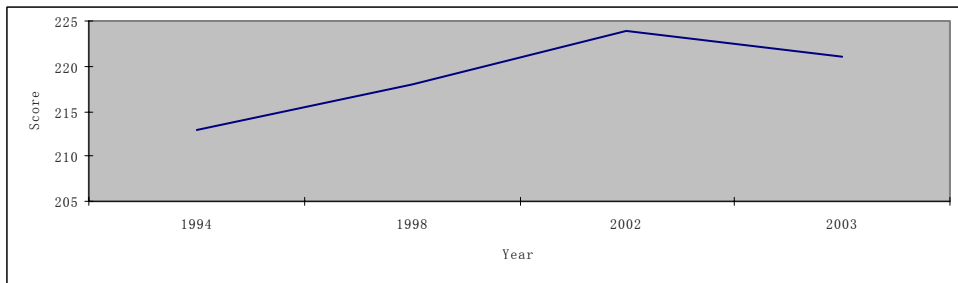


Figure 9. Washington (Change in Year 1997)

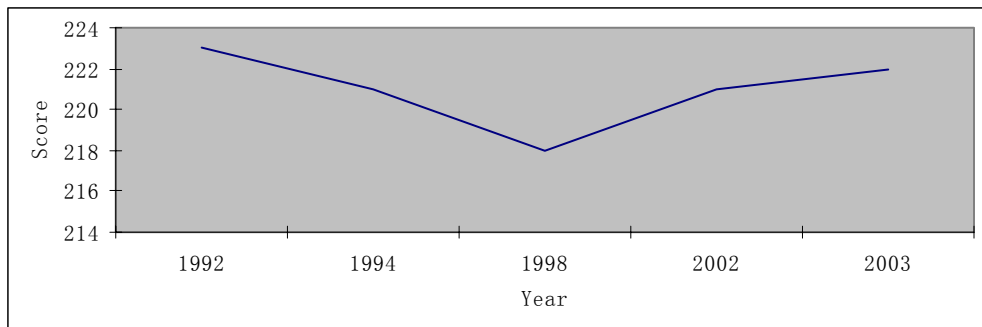


Figure 10. Wyoming (Change in Year 1995)

Question 2. The question is: Is there a significant difference on the change of students' NAEP scores among the groups of selected states that chose different financial structures?

There are basically three groups in this 10 state sample: group 1 containing 7 states that chose the Foundation structure; group 2 containing 2 states that chose the Combination of Foundation and Tax-Base-Equalization structure; and group 3 containing 1 state that chose the Full State Funding structure. A one-way ANOVA was conducted to test the difference of group means of scoring change across the year of financial structure adoption. The result is $F=5.872$, and $p<0.05$. (See Table VIII).

Table VIII

ANOVA Analysis of Score Change Difference between Financial Structures

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	44.990	2	22.495	5.872	.032
Within Groups	26.814	7	3.831		
Total	71.804	9			

There is a significant difference on change of students' NAEP scores among the groups. Because one group only contains one case, the SPSS was not able to conduct the

Post Hoc test to detail the difference. But the data showed that the significance is caused by the remarkable rise of NAEP score in Washington after the financial structure renovation. The group means of the FDN and CFDN states are not substantially different.

Question 3. The question is: Is there a significant difference on the change of NAEP score among the race or ethnicity groups, in terms of white students, in selected states that chose different financial structures?

A one-way ANOVA was conducted to test the difference of scoring change in white students among states adopting different structures. The result is $F=3.926$ and $p>0.05$. At the Alpha level of 0.05, the result is not statistically significant. (See table IX)

Table IX

ANOVA Analysis of Score Change Difference of White Student Groups in State Adopting Different Financial Structures

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	40.671	2	20.335	3.926	.072
Within Groups	36.254	7	5.179		
Total	76.925	9			

Question 4. The question is: Is there a significant difference on the change of NAEP score among the race/ethnicity groups, in terms of black students, in selected states that chose different financial structures?

A one-way ANOVA was conducted to test the difference of scoring change in black students among states adopting different structures. The result is $F=14.673$, and $p < 0.05$, even significant at the 0.01 level.

Table X

ANOVA Analysis of Score Change Difference of Black Student Groups in State Adopting Different Financial Structures

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	79.920	2	39.960	14.673	.005
Within Groups	16.340	6	2.723		
Total	96.260	8			

Summary

The analysis of variance (ANOVA), the one-sample t-test, and descriptive analysis (line charts) in this study revealed the following:

1. There is a significant enhancement on students' NAEP scores across the year of the financial structure change in these states.
2. There is a significant difference on change of students' NAEP score among three groups of states that utilize different types of financial structures.
3. There is no significant difference on the change of NAEP score among the white student groups in selected states that chose different financial structures.

4. There is a statistically significant difference of scoring change in black students among states adopting different structures.

CHAPTER V

Findings and Implications

Introduction

The purpose of this study was to identify the impact of state level financial structures on student achievement in selected states in the United States. Specifically, this study examined the following questions:

1. Does the change of financial structure cause significant enhancement on students' NAEP scores in selected states?
2. Is there a significant difference on the change of students' NAEP scores among the groups of selected states that chose different financial structures?
3. Is there a significant difference on the change of NAEP score among the race or ethnicity groups, in terms of white students, in selected states that chose different financial structures?
4. Is there a significant difference on the change of NAEP score among the race/ethnicity groups, in terms of black students, in selected states that chose different financial structures?

Findings

Finding one. The data analyzed in the sample states for this study indicate that the average NAEP score was significantly improved after adopting new financial structures. As shown by most charts in Chapter IV, the pattern of score change was shifted around the year of financial structure adoption. For the majority of the 10 states, before the year of adoption, the scores were dropping; after the year of adoption, it started a pattern of

increasing. In some states where the scores were already in a climbing pattern, the lines show an increased speed of climbing after the year of adoption.

It is safe to conclude that, within the scope of this study, the change of financial structure, in most cases, worked as it was intended to. It either helped the states to stop the NAEP scores from dropping, or strengthened the trend of improvement. And such a conclusion is valid even when the effect of historical score increase is taken into consideration.

Finding two. The core task of this study is to evaluate the effectiveness of different types of financial structure. The goal is to identify the structure that makes the biggest difference. The statistical test did indicate that there were significant differences among the changes of NAEP scores different structures managed to achieve. However, because one of the structures (FULL) is represented by only one state (Washington) in the study, the statistical test was not able to generate a Post Hoc result that can detail the differences among the structures. Through direct comparison of group means, it was revealed that it was the FULL structure that achieved a significantly higher margin of score improvement than the other two types. Meanwhile, the other two types, the FDN and CFDN structure, do not differentiate from each other significantly in terms of score improvement.

Since the test has already taken into consideration the low degree of freedom (df) caused by small sample, it can be concluded that the higher margin of score improvement achieved by the FULL structure was not due to sampling error. In the scope of this study, the FULL structure of state education financial system outperformed the other types.

However, it is imprudent to conclude the supremacy of the FULL structure over the other two in this study based on only one case, even if it is statistically significant. Some other historical, geographical, demographical, or economic factors might be involved in the remarkable increase of NAEP score in Washington State and invalidate the finding of this study. It is strongly suggested that future study would increase the size of this group and therefore control for individual peculiarity.

Finding three. Based on result 3 and 4, although financial structure renovation improved NAEP scores of both white and black students, the level of responsiveness of these two ethnic groups to different financial structures is not identical. In the white group, there is no significant difference among different financial structures, whereas there is a significant difference in the black group.

Future Implications

It is not enough only to make decisions on whether or not to change financial structure for public education. We should also be concerned about the effectiveness of our financial structure renovation. Attention should be given to the search for the most effective type of financial structure that could improve student achievement, while at the same time make the best use of the state's financial resources.

The validity of this study was limited by its small sample size and incomplete data. Future study should try to improve on these ends. The majority of the states adopted their new financial structures under the equity and adequacy principle during the 70s and the 80s. Although the NAEP data were not collected at the state level for those years, we can still compare student performance among different states using location variable contained in individual cases.

In terms of control for rival causal factors, the most attention should be given to the history effect. A number of researches on student achievement mentioned potential rival causal factors such as teacher quality, teacher-student ratio, class size, demographic distribution, and so forth. But in this study, the researcher had two reasons to exclude them as rival causal factors: a) some of these factors are just reflections of a state's capacity to fund its schools sufficiently, which in this research is considered closely related to the effectiveness of a state's financial structure, b) instead of a directly comparison of NAEP among states, which might be influenced by the demographic differences from state to state, this research used the longitudinal data to compare the change of NAEP scores across the year of new structure's adoption. It is much more robust against rival causal factors that represent differences from state to state.

However, the validity of this study might be threatened by the historical variation of NAEP scores regardless of financial structure. There are a number of reasons that NAEP score can vary from year to year without any particular reason: students might become more accustomed to the test because schools emphasize on it, the test might get easier or harder, or grading standard might be tighten up or loosen up.

To control for the history effect, future research should work on to two directions: a) the refinement of current dataset. Because the interval between tests was too long and number of tests before and after the adoption of new structure was too small, a lot of the subtle change of trend was lost. But if the data collection can include 10 tests before and 10 tests after the new structure's adoption, it would be much easier to see the effect of the new structure on the historical variation of NAEP score; b) the search for a new measurement. The capacity of this study was limited by the nature of the dataset in this

study. There were too few NAEP tests conducted in the given period of time and the interval between two tests were too long. It was not able to provide a measurement of a state's student achievement on a continuous basis. An ideal measurement for future study on this subject should utilize tests that are held more frequently. It is not necessary to measure the entire population, but just a representative sample.

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