MULTIVARIATE ANALYSIS OF EQUITY IN PUBLIC ELEMENTARY AND SECONDARY SCHOOL FINANCE

by

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Abstract

This study approached the concept of equity in public elementary and secondary school finance as a complex, multi-variable phenomena. The purpose of this study was to develop a procedure for determining whether or not an equitable distribution of current expenditure per pupil in a state had been achieved based upon the interrelationships of multiple fiscal, non-fiscal school and community variables, and pupil output measures.

Six orthogonal factors, derived from principal components analysis and varimax rotation of 24 school and community variables from 131 Virginia school districts during the 1987-88 school year, became the independent variables in multiple regression analysis with school finance data and student output data as the dependent variables.

Community Type, Fiscal Capacity, and Economic Composition of a District Population accounted for 61% of the variability in current expenditure per pupil and 63% of the variability in the percentage of students planning to attend a four year college. Over 70% of the variability in Achievement Test Scores was accounted for by Black Family Structure, Fiscal Capacity, Economic Composition of a District Population, and Community Type characteristics.

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Table of Contents

CHAPTER I 1
Introduction 1
Statement Of The Problem 5
Purpose Of The Study 6
Research Question 6
Justification For The Study 6
Procedures 7
Definition of Equity for this Study 8
School Finance Systems Chart 9
Limitations 12
Organization of the Study 13

CHAPTER II 15
Review Of The Literature 15
The Definition of the Concept Of Equity In School Finance . . 15
School Finance Litigation Cases 36
Measurement of Equity 41
Revenue and Allocation 41
Units of Allocation and Need 42
Measurement of State Fiscal Capacity 44
Measurement of Local Fiscal Capacity 45
Socioeconomic Variables 46
Quantitative Measures 47

CHAPTER III 51
Methodology 51
Operationalization of the Research Question 51
Defining the Data 52
Selecting the Data 52
Measuring the Data 54
Missing Data 54
Arithmetical Independence 55
Computer Programs 56
Variables 56
Factor Analysis Variable List 57
Factor Analysis 58
Multiple Linear Regression Analysis 59
Dependent Variable List 61
Independent Variable List 63

CHAPTER IV 64
Results 64
Factor Analysis Data Results 64
Naming the Factor and Factor Description 66
Multiple Regression Tables and Reports 69
Total Current Expenditure Per Pupil 72
Local Support for Current Expenditure Per ADM 75

State Retail Sales and Use Tax Support 77
Federal Support for Current Expenditure Per ADM 79
Achievement Test Score Index 83
Percentage Dropout 86
Percentage High School Graduates 87
Percentage Trade School 89
Percentage Two Year College 90
Percentage Four Year College 92

CHAPTER V 94
Summary, Conclusions, Recommendations 94
Findings 96
Utility of the Equity Analysis Procedure 101
Parameter Estimates. 101
Policy Implications. 108
Other Utilities of the Model 108
Achievement 111
Other Dependent Variables 113
Litigation 113
Final Conclusions 114

Recommendations for Further Study 117

Reference 120

Appendix A 124
Harman's Test of Significant

Appendix B 125
Variable Definitions

Appendix C 130
Missing Data and School District Composition

Appendix D 131
Factor Analysis Data Reports

Appendix E 143
Correlations: Six Orthogonal Factors

Appendix F 144
Factor Scores

Appendix G 153
Multiple Regression Data Reports

List of Tables

Table 1. -- Highest Loadings of Twenty-Four School and Community Variables on Orthogonal Factors 65

Table 2. -- Composite Summary: Public School Finance Variables Regressed Individually Over Six Orthogonal Factors . . 71

Table 3. -- Composite Unit Difference Multiple Regression Report I 74
Total Current Expenditure Per Pupil

Table 4.-- Composite Unit Difference Multiple Regression Report II 76
Local Support for Current Expenditure Per ADM

Table 5. -- Composite Unit Difference Multiple Regression Report III 78
State Retail Sales and Use Tax Support

Table 6. -- Composite Unit Difference Multiple Regression Report IV 80
Federal Support for Expenditure Per ADM

Table 7. -- Composite Summary: Public School Output Variables Regressed Individually Over Six Orthogonal Factors . . 82

Table 8. -- Composite Unit Difference Multiple Regression Report V 85
Achievement Test Score Index

Table 9. -- Composite Unit Difference Multiple Regression Report VI 87
Percentage Dropout

Table 10. --Composite Unit Difference Multiple Regression Report VII 89
Percentage High School Graduates

Table 11. --Composite Unit Difference Multiple Regression Report IX 91
Percentage Two Year College

Table 12. --Composite Unit Difference Multiple Regression Report X 93
Percentage Four Year College

Table 13 -- Parameter Estimates
Public School Fiscal Variables Regressed Individually
Over Six Orthogonal Factors 102

Table 14 -- Actual Total Current Expenditure per ADM
Compared to 90% Equalization of Local Effects on
Total Current Expenditure per ADM 106

Table 15 -- Parameter Estimates: 90% Equalization of Local Effects
on Total Current Expenditure Per Pupil 107

To My Children

Glen David Hughes, Mary Elizabeth Hutchins, Laura Louise Hughes,
Stephen Daniel Hughes and son-in-law, DeWayne Hutchins
for your tremendous support

To My Mother
Nelle Frances Keeling Young
for instilling in me the values of the Ozark Hills

Posthumously to My Father
Henry Vance Young
for instilling in me a quest for the law and politics

To My Cousin
Jane Ann Wilkinson Runyan

and To My Friends

To all, I thank you!

CHAPTER I

INTRODUCTION

Equal, fair, and just define equity. Equal implies equivalent or the same quantity. Fair implies an elimination of personal feelings, interests, or prejudices so as to achieve a proper balance of conflicting needs, rights, or demands, and just implies a standard of what is right and proper. Defining and measuring equity in school finance is a complex problem. Equity is not a single measurable entity but a construct that must be inferred from the measurement of other, directly observable variables.

In the contemporary school finance literature at least twenty conceptual definitions of equity, expressed in terms of "equal educational opportunity" or "equality of educational opportunity", have been proposed by school finance scholars. Wise (1967) stated that the choice of any particular definition of equality of educational opportunity depends primarily upon value judgments rather than upon strictly scientific grounds. Johns and Salmon (1971) observed that equalization of educational opportunity is a concept that has different meaning for different people, depending upon their fields of interest. Alexander (1982) noted that what is equitable depends to a great extent on the orientation of both dispensers and receivers of goods and services. Berne and Stiefel (1984) proposed that equity in school

finance is a multidimensional concept that involves value-laden choices with various ways of conceptualization.

Johns, Morphet, and Alexander (1983) presented the following short historical overview of the concept of equity in The Economics and Financing of Education.

> In the United States, educational equality first meant equal access to education, or that every child should be provided with at least the same, minimally adequate school services. Equality later came to mean equal educational treatment, or that the educationally handicapped should receive special treatment to remediate the handicap and put them in a position equal to that of other students. Most recently, educational equality has referred to equality of educational outcome, or that schools ought to produce students who all have the same minimum or basic skills (p. 42).

Equity issues in education were pushed to the forefront in 1954 when the United States Supreme Court handed down the landmark Brown v. Board of Education decision. The Supreme Court stated that, "Today, education is perhaps the most important function of state and local governments ... a right which must be made available to all on equal terms."[1] In 1967, Arthur Wise formed the ideals of equal equational opportunity into a legal framework to challenge educational finance

[1]347 U.S. 483 (1954)

systems. Coons, Clune, And Sugarman, in 1970, applied the Wise Framework to the intricacies of property taxation and equal educational opportunity and formulated a negative definition in their noted volume, Private Wealth and Public Education: "The quality of public education may not be a function of wealth other than the wealth of the state as a whole" (Salmon and Alexander, 1990).

In school finance litigation cases equal educational opportunity has been interpreted to mean "equal access to full participation in public schools, regardless of race or other classification"[2]; "equal revenues per average daily attendance"[3]; "a basic, adequate education"[4]; "basic minimal educational skills"[5]; "minimum quality education"[6]; and "the level of expenditures per pupil in any district may not vary according to the property wealth of that district[7]." In 1973, the United States Supreme Court sustained the Texas Public Education Finance System and stated that inequality was an unfortunate

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[2]Britt v. North Carolina State Bd. of Educ., 357 S.E.2d 432 (1987).

[3]Kirby v. Edgewood Independent School Dist., 761 S.W.2d 859 (1988).

[4]Fair School Finance Council of Oklahoma, Inc. v. State Okl., 746 P.2d 1135 (1987).

[5]Board of Ed., Levittown Union Free School Dist., Nassau County v. Nyquist, 443 N.Y.S.@d 843 (1981)

[6]Robinson v. Cahill, 355 a.2d 129 (1976).

[7]Serrano v. Priest, 487 P.2d 1241 (1971).

but unavoidable byproduct of the principle of local control over schools[8]. In 1989, state courts overturned funding systems for financing public schools in Montana[9], Kentucky[10], and Texas[11] on the premise that spending disparities among the states' school districts translated into a denial of equality of educational opportunity. In contrast, in the same year, the Supreme Court of Wisconsin[12] upheld the state system for financing public schools. The Wisconsin Court ruled that the interdistrict disparities in per-pupil expenditures were rationally based upon preservation of local control over education.

In summary, equal educational opportunity is a complex, multidimensional, social concept that both the courts and school finance scholars have defined in diverse and sometimes conflicting ways. Furthermore, the complexity of defining equity is confounded by value judgments, politics, and the orientation of both dispensers and receivers of educational services. For the most part, neither school finance scholars nor the courts have approached the concept of school

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[8]San Antonio v. Rodriquez, 411 U.S. 1, rehearing denied, 411 U.S. 959 (1973).

[9]Helena Elementary School District No. 1 v. The State of Montana, 769 P. 684 (Mont. 1989).

[10]Rose v. Council for Better Educ., 1989 West Law 60207 (Ky.)

[11]Edgewood Independent School Dist. v. Kirby, To be reported at: 777 S.W.2d 391 (Tex. 1989).

[12]Kukor v. Grover, 436 N.W.2d 568, (Wis. 1989).

finance equity as a multidimensional phenomena requiring the analysis of interrelationships of multiple variables.

STATEMENT OF THE PROBLEM

The problem of defining and measuring equity in school finance studies and litigation cases is finding a common standard and procedure by which equity can be judged for a state school finance system. Traditional measures for defining equity have been equal dollars per pupil, equal tax rates for taxpayers and relationship measures between total current revenue per pupil and local fiscal capacity. Traditional studies have employed univariate, or a one-variable question (e.g., variability in current expenditure per pupil) described by descriptive statistics and/or bivariate, two-variable questions (e.g., wealth and current expenditure per pupil) addressed by correlation or regression statistics. Multivariate, or many-variable questions (e.g., wealth, allocations, community attributes, current expenditure per pupil, and pupil outputs) utilizing factor analysis and multiple regression analysis rarely have been addressed by school finance research scholars. The problem to be investigated in this study is what method can be developed for evaluating equity in school finance as a multidimensional concept rather than as a single measurable entity.

PURPOSE OF THE STUDY

The purpose of this study is to develop a procedure for evaluating whether or not an equitable distribution of current expenditure per pupil in a state based upon multiple fiscal, non-fiscal school and community variables, and pupil output measures had been achieved.

RESEARCH QUESTION

What fiscal and non-fiscal school and community factors best explain the variability in current expenditure per pupil and in pupil output measures in the public elementary and secondary school districts of Virginia?

JUSTIFICATION FOR THE STUDY

Most school finance research studies traditionally have employed univariate and/or bivariate methods of analysis to measure and define equity. The presentation of a multivariate approach would provide a contribution to school finance research literature in an area that does not appear to have been adequately developed (e.g., analyzing equity as a multidimensional concept employing multiple school and community variables and student output measures).

It is not the intent of this study to add another definition of equity to the literature but to provide a method of analysis that can be used as a standard for defining and measuring equity for a state school

finance system. The devised model would provide an alternate method for researchers, educators, and legislators to evaluate the equity of a state or district public elementary and secondary school funding system.

PROCEDURES

Although past studies of school finance equity have addressed univariate, or a one-variable question, described by descriptive statistics and/or bivariate, two-variable questions, examined by correlation or regression statistics, this study approached the concept of equity as a complex, multi-variable phenomena. The population for the study was all the school districts of the Commonwealth of Virginia during the 1987-88 school year with the school district as the unit of analysis. The method of analysis consisted of four stages: (1) a definition of equity was proposed for this study; (2) a systematic method for selecting fiscal and non-fiscal school and community variables that affect a school finance system was developed; (3) factor analysis was applied to reduce the number of fiscal and non-fiscal school and community variables to a few factors that summarize the information the original variables contain, and (4) the application of multiple regression analysis to identify the relationship between the factors derived from the factor analysis and expenditure per pupil and pupil output measures. The ultimate aim of the research design was to identify those factors that account for a significant portion of the variance in total current expenditure per pupil and in pupil output

measures. The final analysis would indicate whether the school finance system under investigation was equitable or inequitable as judged by the equity definition offered by this study.

Definition of Equity for this Study

Most school finance practitioners would agree that certain factors ought not drive the expenditure per pupil distribution. These are:

(1) differences among school districts in local fiscal capacity;

(2) other differences among school districts that are unrelated to the variance in per pupil revenues required to meet the demands of educational needs and services of clients served.

Also, most school finance practitioners would agree that certain factors ought not determine the outcome of a pupil's education. These are:

(1) differences among school districts in local fiscal capacity;

(2) other differences among school districts that are unrelated to the variance in per pupil revenues required to meet the demands of educational needs and services of clients served.

Therefore, an equitable system can be defined as one in which the variables of fiscal capacity and community attributes do not explain (individually or in various combinations) a significant portion of the variance in current expenditure per pupil in average daily membership (ADM) or in pupil output measures.

More simply stated, an equitable system can be defined as one in which the differences among school districts in current per pupil expenditure and in pupil output would not be due to fiscal capacity, place of residence, group, class, or society membership.

School Finance Systems Chart

A school finance systems chart was formulated to aid in selecting fiscal and non-fiscal school and community variables that may affect a school finance system. Three broad categories of variables that have been associated with variations in educational expenditures were identified from the literature and from consulting experts in the field. Those categories are: (1) Conditions outside the school system which are related directly or indirectly to the amount of current expenditures, summarized as wealth related variables; (2) Conditions within the school system which are related to the amount of current expenditures, summarized as need related variables and (3) output variables of a school system, summarized as pupil output related variables.

The theoretical base for the chart design is General Systems Theory, a descriptive and exploratory framework dealing with how systems <u>do</u> function rather than with how they <u>should</u> function. Theoretically, the outputs of a system are produced by the system, either by intent or design. The system always requires inputs from the environment and always produces outputs. Components of a system are the parts that interact with each other to fulfill the purpose(s) of the system (Silver, 1983).

Input variables of a school finance system would be measures of financial resources, including property valuation, retail sales receipts, and personal income. Educational needs or costs based upon units for revenue allocation would be representative of the fiscal interacting components of the system such as the number of pupils in ADM, pupil-teacher ratio (PTR), and number of clients served by special educational programs. Educational output variables would be measured by student achievement test scores, number of pupils continuing their education, percentage of dropouts, and other such measures.

SCHOOL FINANCE SYSTEMS CHART

STATE OR LOCAL
SCHOOL FINANCE SYSTEM

WEALTH (REVENUE) RELATED VARIABLES	NEED RELATED VARIABLES	OUTPUTS
	School/Pupils/Staff	Pupils
Community	Educational Needs	
State	Services	
Measured by	Units of measurement	Measured by
Real Property Valuation	Number of School	% Drop Outs
Sales Tax Receipts	Age Children	% H.S.Graduates
Personal Income	Total Population	% Trade School
Median Family Income	Weighted Pupil	% 2 yr. college
Education Level	ADM, ADA	% 4 yr. college
Poverty Rate	Salaries	
Race	Classroom Teachers	Achievement
Unemployment Rate	Administration	(State Test
	Service Personal	Scores)
Proxy for other non-property source	Program Weights	Minimum Educ.
a) fiscal effort	Weighted Teacher Unit	(8th grade,
b) fiscal capacity	Pupil/Teacher Ratio	10th grade
	Transportation	Educ. Level)
Municipal Overburden	(Miles per pupil)	
Sparsity/Density Index	(Costs per pupil)	
Cost of Living Index		
Cost of Goods Index		
State Support		
Local Support		
Federal Support		

Limitations

This investigation was an exploratory field study of the equity of the Virginia school finance system and was therefore subject to certain limitations inherent in an ex-post-facto design. The limitations as applied to this study were:

(a) Precision of measurement: Utilization of state department records and national and state census records necessitated the use of tabulated records in secondary source documents.

(b) Lack of control over variables: The confinement of data to that which was available on a school district level may have caused the elimination of variables that would have accounted for certain amounts of variation. Missing data for a given school division necessitated estimations or the elimination of that school division from the study.

(c) Restriction on generalization: The findings of the data analysis could not be generalized to school finance systems in other states or to other school years in Virginia, but, the "procedure" could be utilized by other states or local school systems in a school finance equity analysis.

Organization of the Study

The complexity of defining and measuring the concept of equtiy in school finance, the purpose of the study, and the research question were introduced in Chapter 1.

Chapter 2 presents a review of the literature on the definition of the concept of equity found in contemporary school finance literature and school finance litigation cases. The second section of Chapter 2 reviews the measurement of fiscal equity in school finance literature.

Chapter 3, Methodology, focuses on the methods of analyzing the data. The first part of Chapter 3 discusses the operationalization of the research question, defining, selecting, and measuring the data, and the problems surrounding arithmetical dependence in a factor analysis study. A short title and brief description of each variable selected for the factor analysis statistical procedure is presented, plus, a brief summary of factor analysis and multiple linear regression analysis. The chapter concludes with the dependent and independent variable lists.

Chapter 4, Results, summarizes the factor analysis and the multiple linear regression analysis output. Topics discussed under factor analysis are the number of factors derived, factor loadings, naming the factor and factor description. In addition, Chapter 4 presents a summary of each dependent variable regressed over the derived

factors and twelve tables that array the factor analysis and the multiple regression analysis results.

Summary, conclusions, and recommendations for further study are presented in Chapter 5.

CHAPTER II

REVIEW OF THE LITERATURE

THE DEFINITION OF THE CONCEPT OF EQUITY IN SCHOOL FINANCE

The purpose of this review is to explore the concept of equity in contemporary school finance literature and the courts. This first section will begin with a definition of equity from a standard dictionary, proceed to the various definitions of equity found in school finance literature, and conclude with court interpretations of equity in school finance litigation cases. The second section will explore the measurement of equity.

EQUITY - DEFINITION

The source of the following definition of equity is from Webster's New Collegiate Dictionary (1976).

Equity is defined as: equal, fair, freedom from bias or favoritism.

Fair is defined as: Fair, just, equitable,impartial, unbiased, dispassionate, objective; free from favor toward either or any side.

> Fair implies an elimination of personal feelings, interests, or prejudices so as to achieve a proper balance of conflicting needs, rights, or demands. Just implies a precise following of a standard of what is right and proper. Equitable implies a less rigorous standard than just and usually a fair and equal treatment of all concerned. Impartial stresses absence of favor or prejudice. Unbiased reinforces the notion of freedom from favoritism and prejudice with that of a firm interest to be fair to all. Dispassionate stresses freedom from emotional involvement and tends to imply cool detachment in judging. Objective stresses a tendency to view events or phenomena as apart from oneself and

therefore to be judged dispassionately and with out reference to personal feeling or interests.

Equal is defined as:

1. (1) of the same measure, quantity, amount, or number as another
   (2) identical in mathematical value or logical denotation: (a) equivalent (b) like in quality, nature, or status (c) like for each member of a group, class, or society

2. regarding or affecting all objects in the same way

3. free from extremes: as not showing variation in appearance, structure, or proportion

The following is a summary of selected school finance scholar's concepts of equity as related to equal educational opportunity. The purpose of this summary is to exemplify the various definitions of the concept of equity in school finance literature.

Arthur E. Wise (1967)

Rich Schools Poor Schools

In Rich Schools Poor Schools, Arthur Wise provides nine definitions of equality of educational opportunity. He states that the definition of equality of educational opportunity is used to provide rules for the allocation of educational resources and, as was noted earlier, the particular definition depends primarily upon value judgments rather than upon strictly scientific grounds.

The Negative Definition

Wise states that it is relatively easy to formulate a negative definition of equality of educational opportunity. One such statement could be:

> Equality of educational opportunity exists when a child's educational opportunity does not depend upon either his parents' economic circumstances or his location within the state (p. 147).

Wise elaborates that this definition has the virtue of being precise, as a negative definition, but its usefulness is limited. He states that it is useful for demonstrating that equality of educational opportunity does not exist. He notes that all that need be shown is that two children of the same abilities who happen to live in different parts of a state are receiving different assistance in developing those abilities. He emphasizes that the definition does not specify the conditions for equality.

The Full-Opportunity Definition

This version of equality of educational opportunity is described as "full opportunity" -- every person is to be given full opportunity to develop his abilities to their limit. In this context the schools are to give an individual every conceivable assistance in developing his abilities. Full opportunity represents an ideal standard for equal opportunity and is theoretically the ultimate interpretation of equal educational opportunity. Wise points out that as a realistic standard

for specifying conditions of equality, it is, however, meaningless (p. 148).

The Foundation Definition

The traditional foundation program stipulates a satisfactory minimum offering, expressed in dollars to be spent, which shall be guaranteed to every pupil. Such a program ensures every pupil equal educational opportunity to a prescribed minimum. When a locality cannot supply that minimum offering at the state-mandated tax rate, the state makes up the deficiency. The foundation definition asserts that what is to be equalized is the basic cost of education (pp. 149-150).

The Minimum-Attainment Definition

The minimum-attainment definition of equality of educational opportunity asserts that resources shall be allocated to every pupil until he reaches a specified level of achievement. This standard would require far greater expenditures for some children than for others (p. 151).

The Leveling Definition

The leveling definition of equality of educational opportunity contends that resources should be allocated in inverse proportion to the ability of pupils. This definition is based upon the assumption that pupils should, as nearly as possible, leave school with an equal chance of success. Wise states that because some pupils are more able than others, and/or come from home backgrounds which facilitate their education, the schools should attempt to diminish these differences by concentrating on the less-advantaged students (pp. 152-153).

The Competition Definition

The competition definition of equality of educational opportunity assumes that pupils have different capacities to profit from instruction and maintains that educational resources should be allocated in direct proportion to abilities of pupils. Here, Wise points out that the equality demanded by this definition is equality in the competition for access to educational resources. The more able pupil, the greater should be his access to society's scarce educational resources (pp. 153-154).

The Equal-Dollars-Per-Pupil Definition

The equal-dollars-per-pupil definition views educational opportunity as a grant by society to the individual, and assumes there is no reason for society to grant more to one individual than to another. Under this view, society is obliged to grant an equal amount of its scarce educational resources, as measured in dollars, to the education of every individual- which resources and how they are used varies with the needs of the individual. The equal-dollars-per-pupil definition may be rendered in the slogan: one pupil, one dollar. As a second manifestation of the one-for-one definition of equality, it assumes that differences in ability are not so relevant to education that they constitute grounds for differential allocation of resources. Wise suggests that the major shortcoming of this view is its rigidity--it fails to take into consideration either price-level differences or the effects of school size. Moreover, he states, it assumes that to treat pupils equally by the objective standard of dollars is to treat

all equally in fact. To offer pupils of different abilities similar amounts of resources, as measured in dollars, may, in fact result in unequal treatments (pp. 155-156).

The Maximum-Variance-Ratio Definition

Wise indicates that implementing the equal-dollars-per-pupil formulation could interfere with the educational programs in high per pupil expenditure school districts unless equalized levels were set at the level of the high per pupil expenditure districts. Variation can be justified to a certain degree, as an accommodation to price level differences and differences in the economies of scale. Equivalent services in some parts of a state cost more than in other parts; equivalent services cost more in sparsely populated and, possibly, densely populated areas than in areas of average population density (pp. 156-157).

The Classification Definition

The classification definition is premised on the general idea of the equal treatment of equals with a categorization of pupils based upon their abilities and interests. Wise explains that the classification definition requires first the specification of suitable educational programs for pupils of specified characteristics. It then requires that each program be made available to all pupils with the corresponding set of characteristics in accordance to their residence in the state. The classification definition thus specifies that there is to be equality for all within a classification (pp. 157-158).

John E. Coons, William H. Clune III, and Stephen D. Sugarman (1970)

Private Wealth and Public Education

Coons, Clune, and Sugarman (1970) formulated the following definition for equality of educational opportunity: "The quality of public education may not be a function of wealth other than the wealth of the state as a whole (p. 2)". It is noted by the authors that equality of educational opportunity is equality of training and that equality of training is the primary task of public education. The measure of quality becomes not what is achieved but what is available. What is available becomes whatever goods and services are purchased by school districts to perform their task of education. Quality is the sum of district expenditures per pupil; thus, quality is determined by fiscal resources.

Roe L. Johns and Richard G. Salmon (1971)

"The Financial Equalization of Public School Support Programs in the United States for the School Year, 1968-69, Status and Impact of Educational Finance Programs, Edited by Roe L. Johns, Kern Alexander, Dewey H. Stollar, 1971, National Educational Finance Project, Gainesville, Florida.

The National Educational Finance Project focused its attention primarily on the provision of the financial resources necessary to provide adequate educational opportunity for all children and youth of the nation. For the purpose of their study financial equalization of educational opportunity was defined as follows:

> Financial equalization is most nearly accomplished when the following two factors are met: (1) the varying educational needs of the student population are taken into consideration before the allocations are made, and (2) the variation of the ability of the local school districts to support education is reduced or eliminated through the utilization of state resources (p. 120).

Stephen D. Sugarman (1974)

"Family Choice: The Next Step in the Quest for Equal Educational Opportunity"

Sugarman stated that the family choice plan creates a new form of equal educational opportunity; choice, which is now realistically available only to a few, but would be made available to all. A family choice plan is one which puts into the hands of parents the funds which now go to pay for the education of a child attending public school. With those funds, the parents may choose the kind of education they believe is best for their children.

Lawrence C. Pierce, Walter I. Garms, James W. Guthrie, and Michael W. Kirst (1975)

State School Finance Alternatives: Strategies for Reform

Pierce, Garms, Guthrie and Kirst (1975) provided a definitional continuum of educational equality; beginning with the simplest definitions of equity (those which focus upon school inputs), and moving on to more complicated definitions (those which focus upon school outcomes).

Input Equity: Equity of Opportunity

The authors describe three types of input equity:

(1) Equity of Opportunity is defined as a means for achieving equity by ensuring that local school districts have the ability to spend an equal amount per pupil at equal tax rates. Equal tax rates guarantee equal resources, but the actual level of resources and taxes is left to the discretion of local decision makers (p. 10).

(2) Another approach to input equality involves providing precise dollar parity for each pupil. Advocates of this approach feel the state should allocate the exact same dollar amount for each pupil attending school. Under such a distribution plan it would not matter whether pupils were in kindergarten or high school, were mentally retarded or gifted, had parents who were wealthy and well-educated or poor and illiterate. Regardless of circumstances, the state per pupil dollar allocations would be equal. Whatever its educational and social disadvantages, such a system would meet a test of fiscal neutrality (p. 10).

(3) A more complicated approach to input equality would require the state to provide equal educational services for each pupil, even if doing so necessitated unequal per pupil expenditures. Some school finance plans attempt accomplish this objective through implementation of regional cost-of living multipliers, municipal overburden indices and variable statewide teacher salary schedules (p. 10).

Output Equity

At the opposite end of the definitional continuum is the view that the educational outcomes for all children should be equal. Differences in per pupil expenditures are only a secondary concern under such an arrangement (p.10).

Walter I. Garms, James W. Guthrie and Lawrence C. Pierce (1978)
School Finance, The Economics and Politics of Public Education

The authors stated that the translation of the value "equality" for educational policy purposes has almost always meant "equality of educational opportunity." They suggested that few persons have seriously argued that for each individual, education should itself be absolutely equal. Such an objective, they state, would make outrageous assumptions regarding genetically endowed abilities, the possibility of standardizing instruction, and similarities of environmental effect upon human tastes. In conclusion, they posed that most policy debates have centered on semantic interpretations of "equal educational opportunity" (p. 187).

The following are Garms, Guthrie, and Pierce's definitions of equal educational opportunity:

Equal Access To Education

A. Equal access assumes that providing pupils with at least a minimum level of school resources suffices to ensure equality of educational opportunity. This approach which has been operational far longer and in a far greater number of states than any other, initially implied that schools, of whatever quality, should be made available to

all pupils. The fact that a school was provided was taken to be equal educational opportunity (p. 22).

B. Subsequently, the definition evolved to mean more than simple access. The quality of the services available also was taken into consideration: Every pupil should be provided with at least the same minimally adequate school services. Typically this was translated into a policy whereby the state guaranteed a minimal education expenditure level. Local school districts were then expected to transform these dollars into minimally adequate programs
(p. 22).

Equal Educational Treatment

This definition of equal educational opportunity is based upon the premise that pupils have widely varying characteristics and abilities, from which it logically follows that available school services should be highly tailored to each pupil's specific circumstances. Minimally adequate school services, by this definition, are insufficient because what is adequate for some children does not put less fortunate children at the "starting line" in the race for life's rewards. Under ideal conditions, an assessment would be made of each pupil's school-related strengths and weaknesses. Subsequently, additional services would be supplied those who, for whatever reason, were judged to possess inadequate learning abilities (p. 23).

Equality Of Educational Outcome

Equal pupil learning and equal life chance are discussed under this heading by the authors. Beginning in the early 1970s, a number of

social theorists and policy analysts began to construct a new definition of equal educational opportunity. Their position stemmed from the observation that academic achievement had become crucial for personal success. Consequently, they proposed that the measure of equality be equal student learning, at least in terms of minimum or basic skills. In theory, the authors stated, the objective would be fulfilled if, upon graduating from secondary school, every pupil were able to perform at least at an eighth-grade level in reading, mathematics, and composition. Schools would be held responsible for achieving such equal minimal outcomes regardless of the resource level necessary.

On occasion, the authors point out, this equal outcome concept is extended further to include the schools' responsibility for "equal life chance." By this definition, school services and resources should be deployed so as to assure every normal child, upon graduation from secondary school, an equal opportunity to compete with any other pupil. Success in achieving this goal could be measured by the degree to which race, socioeconomic status, ethnic origin, and similar social measures were no longer predictive of adult income or occupation (pp. 23-24).

Kern Alexander (1982)
"Concepts of Equity"

In "Concepts of Equity", Alexander (1982) stated that equity in its broadest sense encompasses justice, equality, humanity, morality, and right. What is equitable depends to a great extent on the orientation of both the dispensers and receivers of educational services. In referring to equity of educational finance he noted that it

constitutes a complexity of issues related to equal educational opportunity and from both the philosophical and legal viewpoints, equity is much broader than the simple fiscal equalization. Alexander made the following observation:

> Few attempts have been made to fully define what equality of opportunity is, or what a concept of equity implies for school financing mechanisms. Part of the problem has been that there is no overall theoretical base from which to work a problem common to the nebulous concept of equity, whether its application is to educational finance or any other field of endeavor (p. 210).

Alexander presented a hierarchy of equity progressing from the lowest philosophical level of commutative equity upward to the highest level of positivism.

Commutative Equity

Beginning at the lowest level, Alexander explained that commutative equity would simply be an exchange of resources which are indifferent to considerations of equality, educational need, initial endowments, etc. Shifting taxation to the local level produces almost this result, wherein the state and federal systems allow individual districts to retain their own resources regardless of ability. Assets are maintained, and no redistribution takes place (p. 10).

Equal Distribution

At the next-highest step of philosophical equity, seeking a more equal distribution, Alexander stated that we find a presumption that the

educational system is an obligation of the state and that in implementation the state treats all local school districts in a fiscally neutral manner; all have access to the same amount of money per pupil. He further stated that for this level the state is not primarily concerned with uniformity of services, efficiency of operation, or thoroughness of the educational program. An equal fiscal base is provided for all the schools regardless of where they are located, and it is a local prerogative to decide entirely on what level of educational program is desired. For equal distribution, educational equity is defined as full fiscal equalization, the only prescribed standard (pp. 211-212).

Restitution

According to Alexander, the third level of philosophical equity was classified as restitutionary because it requires that the state recompense local school districts for problems created by either economic or social conditions. Restitution conveys the philosophy that education is a state function, and as such has not only the responsibility but also the obligation to rectify and indemnify shortcomings at the local school district level (p. 212).

Positivism

Alexander indicated that the highest level of educational equity, positivism demands that the unique and high-cost programs which are designed to meet individual needs of children be fully financed (p. 212).

Walter W. McMahon (1982)
"Efficiency and Equity Criteria for Educational Budgeting and Finance", Financing Education, Edited by Walter W. McMahon and Terry G. Geske, University of Illinois Press, 1982.

McMahon defined equity as involving a redistribution of resources (or of costs) designed to achieve the community's philosophical and ethical standards of fairness. He stated that such redistributive moves can be designed to achieve either 1) horizontal equity, generally held to require equal treatment of equals ; or 2) intergenerational equity, in-between horizontal and vertical equity, and a case of considerable importance in education; or 3) vertical equity, requiring unequal treatment of unequals. He expanded that a full equitable solution would require that horizontal, intergenerational, and vertical equity be achieved. He also stated that these concepts of equity can be applied to equity among all pupils in each age bracket, whether in school or not, which he refers to as child equity. They can also be applied to equity among teachers, administrators, and other staff members, referred to as staff equity. Equity among taxpayers or others who bear the costs of education would be referred to as tax equity (p. 16).

Horizontal equity

McMahon explained that the most basic operational criterion for horizontal equity among taxpayers is equal tax rates for all who are essentially equal with respect to real income and wealth. This basic criterion has been reinterpreted in many school finance laws to equal property tax rates across districts as a measure of effort and tax equity. But, McMahon stated, this criterion ignores the point that

equity refers to people, and not to districts; it also ignores differences in income which are an important source of differences in the ability to pay and in property tax rates. School districts are normally given real property as their legal tax handle, but taxes are paid out of income and are ultimately paid by individuals in relation to their properly measured ability to pay. When these facts are ignored, horizontal inequity among individual taxpayers results (pp. 16-17).

Intergenerational equity

Under this definition, McMahon discussed equity in the concept of the expected lifetime "full earnings" of the pupil, defined as the pupil's earnings from his labor plus his or her non-monetary returns from education during leisure hours. He tied this concept with vertical equity (p. 18). McMahon stated that fiscal neutrality also can be interpreted as an intergenerational equity concept in the sense that both seek to break the link between the parents' wealth and the pupil's future. Neither, he suggested, undertakes to correct for initial disadvantages that may come from limited learning opportunities in the pupil's home and neighborhood (p. 19).

Vertical Equity

Intergenerational equity and vertical equity are concerned with the unequal treatment of unequals

(pp. 19-20).

An Equity Criteria Hierarchy

McMahon presented a vertical equity hierarchy with principles ranging from commutative equity (which would leave undisturbed the

inequalities produced by inheritance and by markets) to positivism (which would be sharply redistributive, to correct for initial disadvantages). Determining the highest and lowest level of the hierarchy depends upon the philosophical and ethical views of the community, sometimes as reflected through the courts and legislature. The four levels of the Equity Hierarchy are:

1) Commutative Equity.

> This first level of equity implies that the state leaves undisturbed the results of the marketplace. The problem is that the commutative equity criterion allows persistence of unlimited differences in wealth among parents and unlimited differences in expenditure per pupil (p. 20).

2) Fiscal Neutrality.

> At this second level of equity, the state seeks to achieve a degree of equity through transfer payments so that local school districts, or individual pupils are treated as though they had access to an equivalent amount of wealth per pupil (p. 20).

3) Proportionality.

> This requires equal effective tax rates in relation to ability to pay, and benefits that are proportional to need on the expenditure side. Proportional vertical equity does imply that a larger percentage of total expenditure per pupil will go to the disadvantaged pupils through special education programs. This level of equity most closely corresponds to equality of educational opportunity (p. 21).

4) Positivism.

> The fourth-level equity criterion implies progressive rates on both the tax and the benefit sides. Positivist equity could be illustrated by full financing by the state of high-cost special education programs for handicapped or disadvantaged children, large Pell grants for the poor, and affirmative action (pp. 20-21).

Roe L. Johns, Edgar L. Morphet, and Kern Alexander (1983)
The Economics and Financing of Education
Inequality In Opportunity

Johns, Morphet and Alexander stated that the equality of opportunity for all does not mean that every pupil should have the same program of education nor does it mean that all pupils must have the same amount of money expended on them. They defined equality of opportunity in the following manner.

> Equality of opportunity means that every person should have the opportunity for the kind and quality of education that will best meet his needs as an individual and as a member of the society in which he lives (p. 181).

Equity Of School Taxes

The authors stated that the concepts of equity, are largely subjective and that equity taken in its broadest sense covers most tax considerations of fairness, justice, efficiency, effectiveness, uniformity, objectivity, and ability to pay. Horizontal equity applied to equity of school taxes means equal treatment of equals; persons in

the same economic position should be taxed equally. The corollary, vertical equity, requires that persons with unequal ability should be taxed unequally (p. 88). "An important concept of the equity of school taxes is that the quality of a child's education should not be a function of the per-pupil wealth of the school district (p. 216)."

FUNDING THE STANDARDS OF QUALITY, PART II: SOQ COSTS AND DISTRIBUTION, a report in a series on elementary and secondary education in Virginia prepared by the Virginia Joint Legislative Audit and Review Commission (JLARC), January, 1988.

The Virginia Joint Legislative Audit and Review Commission (JLARC) addressed two equity concepts in the January 1988 report, "Funding the Standards of Quality, Part II: SOQ Costs and Distribution". They were pupil equity and tax equity. The following definitions for these two equity concepts were developed for the study:

Pupil equity

> Pupil equity is the provision of the resources necessary for a meaningful foundation education program for the pupils in all school divisions (p. 3).

The JLARC report stated that the "meaningful foundation" education program is defined by the Standards of Quality (SOQ), and the important research activity for achieving pupil equity is to calculate the costs attributed to the SOQ for each school division.

Tax equity

> Tax equity is the apportionment of State and local responsibility for the SOQ program in a manner to ensure that the proportion of local taxable resources required to provide a meaningful foundation program does not vary greatly across localities (pp. 3-4).

The report states that the decision as to how much variance in the consumption of local resources is appropriate in meeting the SOQ mandates is a policy choice (pp. 3-4).

Robert Berne, and Leanna Stiefel (1984)
The Measurement of Equity in School Finance

Berne and Stiefel proposed that almost all the definitions of equity for children can be encompassed under three broad principles:

1. Equal Treatment of Equals: Horizontal Equity

   This principle states that pupils who are alike should receive equal shares (p. 13).

2. Unequal Treatment of Unequals: Vertical Equity

   This principle recognizes that pupils are different and states the positive requirement that unequals receive appropriately unequal treatment (p. 13).

3. Equal Opportunity - No discrimination on the basis of property wealth in school district or other categories. The principle can be formulated in a negative way: there should not be differences according to characteristics that are considered illegitimate,

such as property wealth per pupil, household income, fiscal capacity, or sex. For example, this principle would require that there be no relationship between expenditures, resources, programs, outcomes, and per-pupil wealth or fiscal capacity (p. 17).

Literature Review Summary

Wise (1967) stated that the choice of any particular definition of equality of educational opportunity, depends primarily upon value judgments rather than upon strictly scientific grounds. Coons, Clune, and Sugarman (1970) formulated a negative definition of equality of educational opportunity in Private Wealth and Public Education, namely: "The quality of public education may not be a function of wealth other than the wealth of the state as a whole." Johns and Salmon (1971) remarked that equalization of educational opportunity is a concept that has different meaning for different people, depending upon their field of interest. Sugarman (1974) proposed family choice as the next quest for equal educational opportunity. Garms (1978) pointed out there were many possible definitions of equality of educational opportunity but in practice it has been limited to assuring equal dollars per student or to assuring enough money to provide comparable programs for pupils when their different needs and the costs of providing them have been taken into account. McMahon (1982) defined equity as involving a redistribution of resources (or costs) designed to achieve the communities philosophical and ethical

standards of fairness. Alexander (1982) noted that what is equitable depends a great extent on the orientation of both dispensers and receivers of equity. He stated that equity in its broadest sense encompasses justice, equality, humanity, morality, and right. Berne and Stiefel (1984) proposed that equity in school finance is a multidimensional concept which involves value-laden choices with numerous ways of coceptualization.

Equal Educational Opportunity and School Finance Litigation Cases

In school finance litigation cases, equal educational opportunity has been interpreted to mean "equal access to full participation in public schools, regardless of race or other classification"[13]; "equal revenues per average daily attendance"[14]; "a basic, adequate education"[15]; "basic minimal educational skills"[16]; "minimum quality education"[17]; and in Robinson I, "... educational opportunity ... needed in the contemporary setting to equip a child for his (or her)

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[13]Britt v. North Carolina State Bd. of Educ., 357 S.E.2d 432 (N.C. 1987).

[14]Kirby v. Edgewood Independent School Dist., 761 S.W.2d 859 (Tex. 1988).

[15]Fair School Finance Council of Oklahoma, Inc. b. State Okl., 746 P.2d 1135 (Okla. 1987).

[16]Board of Educ., Levittown Union Free School Dist., Nassau County v. Nyquist, 443 N.Y.S.@d 843 (N.Y. 1981)

[17]Robinson v. Cahill, 355 a.2d 129 (N.J. 1976).

role as a citizen and as a competitor in the labor market."[18] Equal educational opportunity was also defined by the courts in terms of "what it was not". For example in Britt, the state court stated that equal opportunities does not mean that each student has a right to an education substantially equal to that enjoyed by other pupils in the state. Fiscal neutrality[19] quoted in Serrano and other cases as a negative definition of equity indicated that the level of expenditures per pupil in any district may not vary according to the property wealth of that district.

In 1989, the Supreme Court of Wisconsin[20] found that equal opportunity for education ... does not mandate absolute equality in districts' per-pupil expenditures and that the disparities in per-pupil expenditures, which did not interfere with the pupil's right to attend the public school districts at which a basic education could be obtained, ... were rationally based upon preservation of local control over education as mandated by the State Constitution. Wisconsin Supreme Court Justice Bablitch, in his dissenting opinion, made the following remarks concerning the states' constitutional obligation to provide an equal opportunity for education to all children of the state, rich and poor alike[21]:

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[18]Robinson v. Cahill, 303 a.2d 273 (N.J. 1973), cert. denied, 414 U.S. 986 (1973).

[19]Serrano v. Priest, 487 P.2d 1241 (Cal. 1971).

[20]Kukor v. Grover, 436 N.W.2d 568 (Wis. 1989).

[21]Id..593

> The concept of local control over education is at best illusory and at worst a cruel hoax for those low tax base communities which lack the local revenues necessary to provide even basic educational opportunities in their schools. Just as the rich and the poor are equally free to sleep overnight on a park bench in the dead of winter, so too the rich and the poor school districts under the guise of local control are free to decide how much concern they really have toward education. Unfortunately for the district with municipal overburden and/or small tax base, concern for educational opportunities must end when its tax rolls can absorb no more.

Also, in 1989, state courts overturned funding systems for financing public schools in Montana, Kentucky, and Texas. The Montana court[22] held that spending disparities among the State's school districts translate into a denial of equality of educational opportunity. The Kentucky Supreme Court[23], on June 8, 1989, declared the entire state system of common schools unconstitutional. The court stated that the word "efficient," in the Kentucky constitutional sense was defined as a system which required "substantial uniformity, substantial equality of financial resources and substantial equal

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[22]Helena Elementary School District No. 1 v. The State of Montana, 769 P. 684 (Mont. 1989).

[23]Rose v. Council for Better Educ., 1989 West Law 60207 (Ky.)

educational opportunity for all pupils." Kern Alexander testified that an efficient system is one which ... pupils must be given equal educational opportunities, regardless of economic status, or place of residence. In defining the word "efficient" the court stated:

> ... Each child, every child, in this Commonwealth must be provided with an equal opportunity to have an adequate education. Equality is the key word here. The children of the poor and the children of the rich, the children who live in the poor districts and the children who live in the rich districts must be given the same opportunity and access to an adequate education.

The court listed nine essential, and minimal, characteristics of an "efficient" system of common schools with the fifth characteristic stating ... Common schools shall provide equal educational opportunities to all Kentucky children, regardless of place of residence or economic circumstances.

On October 2, 1989, the Texas Supreme Court[24] announced its ruling in Edgewood v. Kirby citing gross disparities in taxable wealth and related expenditures in the existing school funding system. The court noted that the amount of money spent on a pupil's education has a real and meaningful impact on the educational opportunity offered that student. On examining the word "efficient" the court stated that ... Children who live in poor districts and children who live in rich

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[24]Edgewood Independent School Dist. v. Kirby, To be reported at: 777 S.W.2d 391 (Tex. 1989).

districts must be afforded substantially equal opportunity to have access to educational funds.

In both the Kentucky case and the Texas case "efficient" included the concept of equal educational opportunity in the realm of disparities in per-pupil expenditures between children who reside in poor districts and children who reside in rich districts. The concept of equal educational opportunity was not defined as such in either case but appeared to follow the reasoning of three previously cited sources, namely: Wise (1967) ... a child's educational opportunity may not depend upon either his parent's economic circumstances or his location within the state; Coons, Clune, and Sugarman (1970): "The quality of public education may not be a function of wealth other than the wealth of the state as a whole"; and also the premise of the 1971 Serrano case, " The level of expenditures per pupil in any district may not vary according to the property wealth of that district."

As may be concluded from the review of the literature and the school finance litigation cases the concept of equity or "equal educational opportunity" has been defined in diverse and sometimes conflicting ways. More than twenty different concepts of equity were proposed by school finance scholars in this review alone. Also, from the review it becomes evident that the courts have not established a unified definition for equity in school finance. Today, the most congruous definition in the school finance arena appears to follow the precept of Wise (1967): "Equality of educational opportunity exists when

a child's education does not depend upon either his parent's economic circumstances or his location within the state."

The equity definition proposed in this study followed the principles formulated by Wise, and Coons, Clune, and Sugarman in their negative definitions of equity. The proposed definition recognizes ligitimate differences in expenditure per pupil among school districts, such as the cost of providing unequal services to special and gifted pupils. The main thrust of the proposed definition is the illigitimate reasons for unequal expenditures per pupils, such as fiscal capacity, place of residence, and income and education levels of the local community.

MEASUREMENT OF EQUITY

The purpose of this section of the literature review is to explore the measurement of equity of a state public elementary and secondary education finance system. The measurement of equity appears to encompass the three following questions: (1) What to measure (2) How to measure and (3) By what methods? More specifically stated, what variables are to be considered in assessing equity, how are the variables to be measured, and by what statistical method(s) are the variables to be evaluated?

Revenue and Allocation

Most states have chosen to finance public schools by using both state and local tax revenues. As a result of vast equalization problems

created by the use of local tax revenues, states have adopted various types of state-aid formulas that redistribute money from areas with above average wealth to areas with below average wealth. Johns (1975) stated that the extent of equalization among school districts provided in a state is a function of both the method of revenue collection and the process by which funds are distributed back to local school districts. In the revenue and allocation dimensions three primary structural elements are involved: measurement of educational needs, of costs, and of local fiscal capacity.

Units Of Allocation And Need

In 1906, thirty-eight states and territories were using the school census as a basis for apportioning school funds. Cubberley (1906), in School Funds and Their Apportionment, classified various bases of distribution into the following groups and sub-groups, arranged in an approximate order of merit.

1. Distribution with reference to taxes or wealth. Apportionment of aid to the different school units on the basis of:
   (a) The amount of taxes paid by each.
   (b) The relative valuation of the property of each.
2. Distribution with reference to population. Apportionment of aid to the different school units on the basis of:
   (a) The total population of each.

3. Distribution with reference to pupils and schools.

   Apportionment of aid to the different school units on the basis of:

   (a) The number of children of school age. The School Census basis.

   (b) The number of children enrolled in the school.

   (c) The average membership of the school.

   (d) The average daily attendance at the school.

   (e) The aggregate days of attendance at the school.

   (f) The school district or the teacher as a basis.

4. Distribution with reference to effort and need.

   Apportionment of aid to certain school units with direct reference to the needs and burdens borne.

Measurement of educational needs of pupils must be determined by using some measure that is uniformly quantifiable for all school districts in the state. The concept of the teacher unit, developed in 1921 in New York by Harlan Updegraff, introduced the variable of the number of students served by the teacher as a factor in the establishment of the need unit. A more flexible measure of educational need was developed by Paul R. Mort during the 1920's by converting costs per teacher unit to costs per student (Leppert, 1976).

Jordan and Alexander (1975) presented the pros and cons of eight alternative units of measure which may be used to assess the educational needs of a school corporation. Alternative units addressed were: Average

Daily Attendance (ADA), Average Daily Membership (ADM), total population, proportion of total wealth, school-age child, school attending child, weighted ADA (WADA), and weighted participating pupil (WPP) (p. 47).

Jordan and Alexander summarized the eight units of measure as follows: If the unit measure of fiscal capacity is to be neutral of educational need, or if simplicity is the desired goal, the best measure will be proportion of total wealth. If maximum recognition is to be given to the incidence of educational need, WPP will be preferred. If maximum recognition is to be given to the number of pupils attending nonpublic schools, the choice will be school-attending child. If the desire is to recognize the demand for all governmental services, population may well be the best unit of measure. If the intent is to use the unit measure of fiscal capacity to encourage compulsory school attendance, ADA or WADA will be selected. In determining an appropriate unit measure of local district fiscal capacity, attention must be given to the necessity for the measure to serve as a technique for recognizing differences in educational need among school districts. For this reason, WPP has distinct advantages (p. 51).

Measurement of State Fiscal Capacity

Fiscal capacity is the ability of state and local school systems to obtain revenues from their own sources through taxation. Johns (1983) defined fiscal capacity as a quantitative measure of economic resources within a governmental unit which can be used to support public

functions. Relative capacity among states or localities is determined by dividing the measure of capacity by some unit such as per capita or per pupil. Traditionally, personal income and tax revenues have been used as economic indicators of capacity.

Measurement Of Local Fiscal Capacity

Three basic approaches have been used to address the problem of measuring local fiscal capacity: (1) tax base, (2) tax base surrogate, and (3) economic indicator.

Johns (1983) summarized the three basic measures of local fiscal capacity as follows:

The tax base approach determines taxpaying ability by using the available tax base(s). For example, if property is the school tax base, then equalized valuation of property is used as the measure of fiscal capacity. If a sales tax or other nonproperty source is used as the tax base then it is used as the measure of fiscal capacity.

The tax base surrogate, sometimes called an index of taxpaying ability, utilizes selected variables which were predictive of equalized valuation of property at some point in time. For example using a county's percentages of each of the following: assessed valuation of public utilities; total motor vehicle license receipts; state value of farm products; total state personal income; total state gainfully employed nonfarm, nongovernment workers; and state retail sales tax paid.

The economic indicator approach is a theoretical determination of fiscal capacity utilizing measures of income, wealth, and consumption, regardless of whether they are accessible through local taxation. It is not a proxy or surrogate measure for equalized assessed valuation of property. It departs materially from the two above measures in that it presumes that a capacity measurement does not need to be tied to an accessible local tax base. This approach suggests that since all taxes must be paid out of income or accumulated wealth, it really does not matter what particular tax base is used to collect the revenues.

Socioeconomic Variables

Directly and indirectly different variables combine to influence the level of state financial support for public schools. Sparkman (1977), in a study on the relationship between socioeconomic variables and state effort for education, cited four broad categories of variables that have been associated with variations in educational expenditures and effort. The first category included income and wealth. Variables relating to demographic characteristics such as urbanization, density, and population characteristics formed the second category. Sparkman stated that variables indicative of educational attainment or possibly social status might reflect public attitudes, aspirations, or interest in public education and have been shown to have an impact on levels of financial support for public schools. The third broad category included those variables that reflect school characteristics, such as specific educational needs of the client system present in the states. The impact

of nonpublic school attendance also would be a consideration in this category. The fourth broad group of variables was those related to other governmental functions. Sparkman noted that it is possible that large expenditures for other governmental functions would tend to divert disproportionate amounts of state and local revenues from public schools and that the financing of public schools must be considered within the framework of the total public economy. Sparkman selected 28 variables to represent the four categories for his study.

Quantitative Measures of School Finance Equity

In "Concepts of Equity", Alexander (1985) gave a brief history of the development of quantitative measures of school finance equity. Following is Alexander's summary.

The development of quantitative measures of school finance equity was stimulated by Congress in 1974 through the enactment of an amendment to Public Law 81-874 (P.L. 93-380, Sec. 5 d 2). This amendment provided that states with public school finance systems "designed to equalize expenditures" would be permitted to include P.L. 874 funds as a local resource in the calculation of state equalization aid to local school districts. From this enactment two statistical measures were developed: an expenditure disparity test and a wealth neutrality test. The expenditure disparity test requires that the 95th to 5th percentile range in expenditure (or revenue) per educational need unit not exceed 25 percent of the 5th percentile level after adjusting for cost differentials recognized by the state (Federal Register 1977:15540-50).

The wealth neutrality test is satisfied when 85 percent of total state and local revenues are wealth neutral (Federal Register 1977: 65524-27).

Statistics proposed for the measurement of wealth disparity, resource disparity, and resource sufficiency were the P.L. 81-874 wealth neutrality test, the relative mean deviation in expenditure per pupil, and the percentage by which state mean expenditure per pupil falls below national mean expenditure per pupil, respectively.

Other efforts to quantify equity as it relates to school finance have primarily evolved around methodologies that accurately measure the relationship between school district fiscal capacity and educational resource inputs. Employed to do this have been the standard statistical tools of economists, Gini coefficients, and various other measures of relative variation and deviation.

Following is a brief summary of school finance measures of equity as described by Berne and Stiefel in The Measurement of Equity in School Finance.

Range: The difference between the values of a variable in the highest and the lowest districts.

Restricted range: The difference between the values of a variable at the 95th and the 5th percentile. The measure is also known as the federal range ratio. It is the number of times the variable at the 95th percentile is larger than at the 5th percentile.

Mean deviation from the median: The average (mean) absolute deviation from the median divided by the median.

Mean: The sum of the values of the variable over the districts divided by the number of districts.

Standard deviation:
The square root of the sum of the squared differences between the value of the variable in each district and the mean, divided by the number of districts minus one.

Coefficient of variation:
The standard deviation divided by the mean.

Mean deviation from mean:
The average (mean) absolute deviation between the value of the variable in each district and the mean.

Relative mean deviation from the mean:
The mean absolute deviation from the mean divided by the mean.

Gini coefficient: A Lorenz curve showing the cumulative proportion of the aggregate value of a variable plotted against the cumulative proportion of districts, when districts are ranked in ascending order by the variable. It is a straight line, with a positive 45-degree slope, bisecting a unit square, if the variable has the same value in every district. If the variable is not equally distributed across districts, the curve will "sag" below the 45-degree line. The Gini coefficient is one-half the area between the Lorenz curve and the 45-degree line.

Berne and Stiefel also presented eleven regression-based relationship measures grouped into four types: correlation, slopes, elasticities, and adjusted relationship measures

(pp. 27-34).

Summary

The literature indicates that the measurement of fiscal equity involves broad categories of school and community variables that influence the level of state and local financial support for public schools; relative units of measure such as ADM, ADA, or property values per ADM; and a statistical method for assessing the relationship of the variables of concern.

The first section of the literature review explored the definition of equity in school finance. The second section explored the measurement of fiscal equity. Both reviews were necessary in order to more fully comprehend the problems involved in defining, measuring, and assessing a complex, multi-variable social concept, such as equity in school finance.

CHAPTER III

METHODOLOGY

This study is a single state school finance equity analysis involving all the school districts of the Commonwealth of Virginia during the 1987-88 school year with the local school district as the unit of analysis. The concept of equity in school finance was approached as a multivariate concept employing multiple school and community variables, factor analysis, and multiple linear regression analysis as methods to evaluate the status of equity of a state elementary and secondary school funding system.

Operationalization of the Research Question

Research Question

> What fiscal and non-fiscal factors best explain the variability in current expenditure per pupil and in pupil output measures in the public elementary and secondary school divisions of Virginia?

Data operationalization procedures involved translating the factor analysis question (What fiscal and non-fiscal factors) plus the regression analysis question (best account for the variability in current expenditure per pupil and in pupil output measures) into data that could measured. The operationalization steps were: define the area of school finance data to be considered for variable selection; select the data; and measure the data. The greatest operationalization problem encountered was in the numerical translation of the data in a manner

that did not introduce distortion or spurious elements into the factor analysis results.

Defining the Data

From the literature review and from consulting experts in the area of school finance and educational research three board categories of school and community variables that have been associated with variations in educational expenditures were identified. Those categories were: (1) wealth (revenue) related variables of a state and community; (2) need related variables of a school system; and (3) output variables of a school system.

Selecting the Data

The school districts of the Commonwealth of Virginia, during the 1987-88 school year, were selected for this study with the school district as the unit of analysis. Pupils, as the unit of analysis, would have been a more precise measure but data were not available at the pupil or the school building levels. Therefore, aggregate data for the school district were used. Virginia system of public schools designates the county as the school unit, referred to as the school district.

A preliminary list of desired data was compiled that included the three designated areas of the School Finance Systems Chart developed in Chapter 2, namely: wealth related variables, need related variables, and output measures. This compiled list was generated from the literature, consulting experts in the field of school finance and educational

research, practitioners, and personal knowledge of school systems. The preliminary list was then checked with the most reliable data available. Sources of available data were the Virginia State Department of Education, 1986 Virginia Adjusted Gross Income (Cox, 1988), U. S. Bureau of the Census (County and City Data Book, 1988), and Virginia Counties and Cities Data Book 1986. Desired data for price index, cost of living, and absentee land owners were not available in Virginia. Other states may have this data and if so should be considered as important data to be included in the equity analysis.

Many similar types of wealth related data for a state and community can be located. For example, true value of property, true value of real estate per capita, composite index per capita, personal income, adjusted gross income on married couple returns, median income, personal income per capita, median price of a home, local fiscal capacity, and others. To avoid substantive or statistical redundancy only one or two similar types of data of a highly intercorrelated category, such as the wealth related data, should be included in the analysis. Therefore, all income data variables should not be included in the analyses nor should all types of home values or property values. In making the decision which variables to retain, similiar variables may be factor analyzed and the resulting factor scores regressed over the contributing variables. Those variables contributing the most to the prediction of variance in the factor score would be retained.

Measuring the Data

An important methodological consideration is the selection of a common unit by which to reduce the raw data for comparative purposes. Among the several possibilities are units of ADA, ADM, pupil of school age (5-19), 100,000 population, district population, 1,000 pupils, or square mile. Both the ADA and ADM exclude those children attending private schools as well as those who attend no school at all. The time of year the ADA or ADM count was taken is another important consideration. Different ADM counts can be recorded during the same school year depending upon the date of the count. If March 31 ADM count is used for one part of the study it should be used throughout the study. The definition of current expenditure per pupil should remain constant throughout all studies. Current expenditures include only the funds spent for the current operation of public schools and exclude the costs of capital outlay and debt service.

Missing Data

Missing data points in the available data may or may not be a problem depending upon the statistical program utilized for running the analyses. Number Cruncher Statistical Software Program (NCSS) was used for statistical analysis in this study. The NCSS factor analysis program would not accept school districts that had missing data. Therefore, the 131 school districts were reduced to 126 in the final analysis due to missing data in five of the school districts. See

Appendix C for school districts with missing data. It would be best to substitute average data for missing data or, if time permits, contact the school district to obtain actual data rather than have the number of observations reduced. The analysis for this study was completed before the problem of missing data was recognized. An additional analysis was conducted, substituting mean values for missing data. The difference in the outcome was so small that the report was not changed to include all the school districts.

Arithmetical Independence

Variables should be included that are arithmetically independent of each other. Data that are derived from each other through addition, subtraction, multiplication, or division of the basic variables may produce independent factors that are functions of the arithmetical operations on the data and not of the empirical data themselves. For example: A + B = C. If all three variables (A,B,C) are included in a data set to be factor analyzed and the variance of A is much greater than B, there will be a necessarily high positive relationship between A and C. If a number of these arithmetically related phenomena are included in the analyses, factors that are only artifacts of additive phenomena may be forced into the results (Rummel, 1970: 214). There are three relevant arithmetical combinations of data: additive variables, multiplicative variables, and ratio variables. Caution should be made when including variables to make sure they are arithmetically independent. Average daily membership (ADM) was not included as a

variable in the factor analysis because it became the divisor of other variables such as true value of property per ADM, taxable personal income per ADM, total current expenditure per ADM, and local expenditure per ADM.

Computer Programs

The Number Cruncher Statistical System (5.0 version) was used for all computer data analysis in this study. Quattro, a spreadsheet software program, was used for data input, manipulation, and similar functions. Westlaw, a legal data base, was used to identify school finance litigation cases that contained the phrase "equal educational opportunity."

Variables

The criteria for selecting variables to be factor analyzed were: (1) fiscal and non-fiscal school and community variables that were directly or indirectly related to wealth (revenue) , need, and output of a school system; (2) availability of data and (3) appropriateness of the data (year and missing data). Twenty-four fiscal and non-fiscal school and community variables met all three criteria.

A short title and brief description of each variable selected for the factor analysis statistical procedure are presented in the following list. A complete definition for each variable is presented in Appendix B.

Factor Analysis Variable List

Variable Title	Variable Description
1. ADM/5-19	Approximate percentage of school age children in ADM in the public school district
2. AGICOUPL	1986 median Adjusted Gross Income on married couple returns
3. BLACK%	Percentage of blacks, 1980 population
4. CAPACITY	88-89 Local index fiscal capacity. Average Tax Rate Approach, ATRA (Fraser)
5. CRIME/	Serious crime known to police/100,000 population, 1985
6. EFFORT	88-89 Local fiscal effort (Fraser)
7. FEMALEHD	Percentage of households with female householder (no spouse present), 1980
8. INC/CAP	Personal income per capita, 1985
9. INDEXINC	Index of personal income concentration, 1986
10. INS/1000	Instructional personnel per 1000 pupils, 1987-88
11. K-6PTR	Ratio of K-6 pupils to instructional personnel, 1987-88
12. MEDHOME	Median value of occupied housing units, 1980
13. POP86-80	Percentage of population change from 1980 to 1986
14. POP/SQMI	Population density (persons per square mile), 1986
15. SALARY	Average salaries for classroom teachers, 1987-88
16. TPI/ADM	Taxable personal income per ADM, 1986-88
17. TRSINDEX	Factor of retail sales per capita (1982) and taxable retail sales per ADM (86-88)
18. TTVP/ADM	Taxable true value of property per ADM, 1986-88

19.	UNEMPLOY	Civilian labor force unemployment rate, 1986
20.	%12YRS>	Percentage of population with 12 years or more of education, 1980
21.	%16ED=>	Percentage of population with 16 years or more of education, 1980
22.	%HOMEOWN	Percentage of owner occupied housing units, 1980
23.	%POVERTY	Percentage of persons below poverty level, 1979
24.	%SPECEDU	Percentage of special education pupil count in ADM, 12/1/87

Factor Analysis

Factor analysis is a statistical technique used to place into groups or factors those variables that are measuring something in common. Specifically, principal components analysis was used to reduce the large number of selected school and community variables to a few factors that represented the underlying dimensions of the original data. Only components with eigenvalues equal to or greater than one were retained for analysis. The method of orthogonal rotation was varimax.

Factor loadings are the standardized regression coefficients in the multiple regression equation with the original variable as the dependent variable and the factors as the independent variables. Factor scores were estimated by multiplying the standardized value of each variable by the corresponding factor loadings. This method for estimating factor score coefficients refers to the regression estimate method. When the factors are uncorrelated, as they were in this study, the factor loadings represent correlation coefficients (r) between the

factors and the variables. The sign of the factor loading indicates the direction of the relationship (r) between the factor and the variable in context of the factor matrix. A test of significance can be applied to factor loadings to determine at what magnitude loadings are not a chance deviation from zero. The standard errors of factor loadings for differing sample sizes and average correlation between the variables are tabulated by Harman (1976, 443, Table B) presented in Appendix A.

Variables with factor loadings of .50 (absolute value) or greater were selected for identifying the factors. The descriptive approach, which involves selecting a label that best reflects the substance of the variables with high loadings on a factor, was applied for factor identification. Factor loadings equal to or greater than .50 were selected so that at least 25 percent of the variance of an individual variable was explained by the factor.

Multiple Linear Regression Analysis

Multiple regression analysis was applied to identify the relationship between total current expenditure per pupil and pupil output measures with the factors derived from the factor analysis. As previously stated, the ultimate aim of the total analysis was to identify those factors that explain a significant portion of the variance in total current expenditure per pupil in average daily membership and in pupil output measures.

The sample R-Squared, referred to in the data output as R-Squared, is a sample specific index of how well the model fits the sample. The

adjusted R-Squared represents a crude estimate of the population R-Squared. The regression coefficient, denoted b, or slope, indicates the expected change in the dependent variable associated with a unit change in a given independent variable while controlling for the other independent variables. It is inappropriate to interpret the b's as indicators of the relative importance of variables. Most authors recommend that Beta's (standardized regression estimates) be used when it is desired to compare the effects of different variables within a single population, but that b's (parameter estimates) be used when it is desired to compare the effects of given variables across populations (Pedhazur 1982, 249).

Beta is interpreted as the expected change in the dependent variable, expressed in standard scores, associated with a one standard deviation change in an independent variable, while holding the remaining variables constant (Pedhazur 1982, 247). When there is no correlation among the independent variables, Beta, for a given independent variable is equal to the product-moment correlation coefficient (r) of that variable with the dependent variable (Pedhazur 1982, 54). If all independent variables are uncorrelated, the change in R-Squared when a variable is entered into the equation is simply the square of the correlation coefficient between that variable and the dependent variable.

Since the design under consideration is orthogonal it is possible to state unambiguously the proportion of variance accounted for by each variable. Presented in Appendix E is the correlation matrix of the six

orthogonal factors showing zero correlation among the factors. Multicollinearity is absent when a matrix of factors is orthogonal.

Among the procedures for selecting variables in most statistical programs are forward selection, backward elimination, and stepwise regression. The Number Cruncher Statistical System (NCSS) provides automatic and manual Stepwise selection procedures. The automatic selection procedure of the NCSS(5.0) was employed in this study to determine the best subset of independent variables for each regression equation.

Dependent Variable List

Description of the Dependent Variables

Ten dependent variables were regressed on six orthogonal factor scores generated from application of factor analysis to twenty-four school and community variables. The first four dependent variables represent school finance data; the remaining six dependent variables represent school output data. The ten dependent variables are:

1. Total Per Pupil Expenditure for Operations referred to as Total Current Expenditure Per Pupil
   Operations include regular day school, school food services, summer schools, adult education, and other educational programs, but do not include capital outlay, debt service, and refunds. Total current per pupil expenditure was derived by dividing total current expenditures for operations (Commonwealth of Virginia, Department of Education 1989, 45) by March 31 Average Daily Membership (ADM) (Commonwealth of Virginia, Department of Education 1989, 50).

2. Local Support for Total Current Expenditure Per ADM
   Local financial support for total current expenditure divided by March 31 ADM (Commonwealth of Virginia, Department of Education 1989, 45).

3. State Retail Sales and Use Tax Support for Total Current Expenditure Per ADM

State retail sales and use tax support for total current expenditure divided by March 31 ADM (Commonwealth of Virginia, Department of Education 1989, 45).

The state retail sales and use tax is a one percent designated state sales tax that is distributed to local governments that provide for a system of public elementary and secondary schools. A description of the designated state sales tax is found in Section 58.1-638 of the state code. The tax is distributed upon the basis of the number of children in each county and city, according to the most recent census of school population, in a ratio of school population of a county or city to the school population of the entire county.

4. Federal Support for Total Current Expenditure Per ADM

Federal support for expenditures divided by March 31 ADM (Commonwealth of Virginia, Department of Education 1989, 45).

5. Achievement Index

The achievement index was derived by factor analyzing the following nine Virginia State Assessment Results, 1987-88, for each local school division (Commonwealth of Virginia, Department of Education 1989, 24):

a. Grade 4 Reading (Iowa Test Basic Skills)
b. Grade 4 Math (Iowa Test Basic Skills)
c. Grade 4 Science (Iowa Test Basic Skills)
d. Grade 8 Reading (Iowa Test Basic Skills)
e. Grade 8 Math (Iowa Test Basic Skills)
f. Grade 8 Science (Iowa Test Basic Skills)
g. Grade 11 Reading (Tests of Achievement and Proficiency)
h. Grade 11 Math (Tests of Achievement and Proficiency)
i. Grade 11 Science (Tests of Achievement and Proficiency)

The Virginia State Assessment Results are reported in percentile equivalents of average scores; i.e., the average scores (for both the district and the State) are compared with the scores of a national norm group (national sample of pupils). A percentile equivalent of 54 indicates that the average score is higher than the scores of 54% of pupils in the national norm group and that 46% scored as well or better. The 50th percentile represents an average score for pupils nationwide. Test scores are not precise measurements; therefore, differences of several percentile points may not be significant (Commonwealth of Virginia, Department of Education 1989, 28).

The Iowa Tests of Basic Skills and the Tests of Achievement and Proficiency are test batteries designed to measure the status of pupils in the major skill and content areas (Commonwealth of Virginia, Department of Education 1989, 28).

6. Percentage Dropouts Grades 8-12, 1987-88
Dropouts are pupils who withdraw from school for reasons other than promotion, transfer, death, or graduation, and do not enter another school during the school year (Commonwealth of Virginia, Department of Education 1989, 39). Percentage dropouts are calculated by dividing the number of dropouts by the end-of-year membership plus dropouts (grades 8-12). Special education dropouts are included (Commonwealth of Virginia, Department of Education 1989, 34).

7 High School Graduates as Percentage of Ninth Grade Membership
Data include summer, 1988 graduates (Commonwealth of Virginia, Department of Education 1989, 29).

8. Percentage Attending Trade School
Number of high school graduates (1987-88) continuing other education than two-year or four-year colleges (Commonwealth of Virginia, Department of Education 1989, 34).
Attending business schools, trade/technical schools, or participating in apprenticeship programs (Commonwealth of Virginia, Department of Education 1989, 39).

9 Percentage Attending Two-Year Colleges
Percentage of 1987-88 high school graduates attending two-year colleges (Commonwealth of Virginia, Department of Education 1989, 34).

10. Percentage Attending Four-Year Colleges
Percentage of 1987-88 high school graduates attending four-year colleges (Commonwealth of Virginia, Department of Education 1989, 34).

Independent Variable List

The six independent variables used in the multiple regression analysis are the orthogonal factors derived from factor analyzing the 24 school and community variables.

CHAPTER IV
RESULTS

PRESENTATION OF FACTOR ANALYSIS AND MULTIPLE REGRESSION DATA ANALYSIS

Factor Analysis Data Results

The twenty-four school and community variables were factor analyzed for the purpose of placing into factors those variables that were measuring something in common; and to reduce the number of variables to a few factors that represent the original information. Located in Appendix D are the factor analysis output data including correlations, eigenvalue summary, initial and rotated factor loadings. Principal components analysis was used to extract the initial factors; eigenvalues equal to or greater than one was the criterion designated to determine the number of factors to include in the model; varimax rotation was used to transform the initial matrix; and the regression estimates method was applied for estimating the factor scores. Six orthogonal factors were generated from the analysis.

Arrayed in Table 1 are the highest rotated factor loadings of the 24 school and community variables on the six orthogonal factors. All factor loadings less than .50 (absolute value) were deleted from Table 1.

Table 1. -- Highest Loadings of Twenty-Four School and Community Variables on Orthogonal Factors

	Orthogonally Rotated Factors					
VARIABLE	*Commu FACTOR 1	Econ FACTOR 2	Staff FACTOR 3	Cap FACTOR 4	Black FACTOR 5	Pupil FACTOR 6
%HOMEOWN	-0.8658					
POP/SQMI	0.8505					
TRSINDEX	0.8456					
CRIME/	0.8409					
SALARY	0.7322					
TPI/ADM	0.7251					
AGICOUPL		0.9086				
UNEMPLOY		-0.8044				
MEDHOME		0.7950				
%12YRS>		0.7811				
POP86-80		0.7626				
INC/CAP		0.7333				
%POVERTY		-0.6595				
%16ED=>		0.6118				
EFFORT		0.5655				
INS/1000			-0.8124			
K-6PTR			0.7590			
TTVP/ADM				-0.8606		
CAPACITY				-0.8406		
INDEXINC				-0.5055		
BLACK%					0.9107	
FEMALEHD					0.7422	
DM/5-19						0.8115
SPECEDU						-0.5749

* Factor 1 - Community Type (Commu)
Factor 2 - Economic Composition of District Population (Econ)
Factor 3 - Pupil/Professional Staff Ratio (Staff)
Factor 4 - Fiscal Capacity (Cap)
Factor 5 - Black Family Structure (Black)
Factor 6 - Characteristics of Pupil Population (Pupil)

Naming the Factor and Factor Description

The descriptive approach to factor naming involves inspection of the variables that have high loadings on each factor, the direction and magnitude of the factor loadings, and identifying a common source explanation. A criterion for determining a high, medium, or low factor loading would be the associated factor loading squared or r-squared as proposed in the following chart.

Rating	Factor Loadings (r)	r-squared
High	r > .80	.65 or >
Moderately High	r > .65 to .80	.43 to .64
Moderate	r = > .50 < .65	.25 to .42
Moderate	r < -.50 to -.65	.25 to .42
Moderately Low	r < -.65 to -.80	.43 to .64
Low	r < -.80	.65 or >

Variables with absolute value factor loadings less than .50 were not included in the naming of the factors since less than 25% of the variance of an individual variable would be explained by the factor.

Three variables had factor loadings of .50 or greater on two factors. The three variables were salary, loading on factors 1 and 2; %poverty, loading on factors 2 and 5; and %16Ed, loading on factors 1 and 2. By regressing the factors over the associated highest loading variables (r => .50) allowed for the determination of which factor to retain the double loading variable for factor identification purposes.

Several methods may be explored in determining a factor name. Regressing a factor over the highest loading factor variables helps to identify those variables that account for a significant portion of the factor variance. A panel of individuals associated with the field of study can inspect the factor variables and recommend a name and a descriptive converse of the factor loadings is helpful.

The six factors arrayed in Table 1 were inspected by a panel of four individuals associated with school finance and educational research for the purpose of assigning a descriptive label to each factor. The panel members identified the six orthogonal factors as:

Factor 1 - Community Type

Factor 1 represents:

High population density (persons per square mile), high taxable retail sales, high incidence of serious crime known to police per 100,000 population, moderately high average salaries for classroom teachers, moderately high taxable personal income per ADM and low percentage of owner occupied housing units (as opposed to rental).

Factor 2 - Economic Composition of District Population

Factor 2 represents:

High median adjusted gross income on married couple returns, moderately high median value of occupied housing units, moderately high percentage of the district population with 12 or more years of education, moderately high percentage net population change

from 1980 to 1986, moderately high personal income per capita, moderate percentage of the district population with 16 years or more education, moderate local fiscal effort for funding education, low unemployment rates and moderately low percentage of persons below poverty level.

Factor 3 - Pupil/Professional Staff Ratio (PPSR)

Factor 3 represents:

Moderately high ratio of pupils to teachers in grades K-6, and a low ratio of instructional personnel (classroom teachers, counselors, principals) to 1000 pupils.

Factor 4 - Fiscal Capacity

Factor 4 represents:

Low taxable true value of property per ADM, low index of fiscal capacity, and moderate (low) index of income concentration.

Factor 5 - Black Family Structure

Factor 5 represents:

High percentage of blacks in 1980 population, and moderately high percentage of households with female householder (no spouse present).

Factor 6 - Characteristics of Pupil Population

Factor 6 represents:

High percentage of school age children (5-19) in average daily membership in public school, and moderate (low) percentage of special education pupils in average daily membership.

The six factors were used as independent variables in multiple regression linear analysis with elementary and secondary school finance data and school output data as the dependent variables.

Presentation of Multiple Regression Tables and Reports

Arrayed in Table 2 are the results of the multiple regression analysis for each of the four public elementary and secondary school fiscal variables regressed over the six orthogonal factors. In describing the results, Total R-Squared for each dependent variable was partitioned into portions designated by the simple R-Square of each contributing factor. The partitioning of variance in this manner is possible due to the independent variables (factors) being orthogonal or uncorrelated. The direction of the standardized regression estimates (Beta) and the parameter estimates (b) presented in Table 2 are relative to the factor loadings and the dependent variable of concern. To interpret the directional implication of the estimates the context of the factor would have to be consulted. Due to the factors being orthogonal, the standardized regression estimates equal the correlation coefficient (r) of the relative factor and the dependent variable of concern.

The four dependent variables are represented in Table 2 in the following manner: Total current per pupil expenditure in average daily membership (EXP/ADM), Local support for current expenditure per average daily membership (LOCAL), State retail sales and use tax support for current expenditure per average daily membership (RST), and Federal

support for current expenditure per average daily membership (FED). Located in Appendix G are the individual multiple regression output data analysis for each dependent variable.

Table 2. -- Composite Summary: Public School Finance Variables Regressed Individually Over Six Orthogonal Factors

Independent Variable		Dependent Variable EXP/ADM	LOCAL	RST	FED
COMMU TYPE	SIMP R-SQR	0.3558	0.2962	0.0385	ns
	STD EST (Beta)	0.5965***	0.5443***	0.1962***	
	PARAMETER EST	427.25	495.61	8.35	
ECONO COMP	SIMP R-SQR	0.0846	0.1310	ns	0.099
	STD EST	0.2908***	0.3619***		-0.3147***
	PARAMETER EST	208	-330		-35.41
STAFF RATIO	SIMP R-SQR	0.2077	0.1737	ns	ns
	STD EST	-0.4558***	-0.4167***		
	PARAMETER EST	-326	-379		
CAP	SIMP R-SQR	0.1707	0.2991	ns	ns
	STD EST	-0.4132***	-0.5469***		
	PARAMETER EST	-296	-498		
BLACK	SIMP R-SQR	0.0072	ns	0.0164	0.1487
	STD EST	0.0849*		0.1283*	0.3856***
	PARAMETER EST	60.83		5.45	43.38
PUPIL POP	SIMP R-SQR	0.0144	ns	0.6245	0.0226
	STD EST	-0.1201***		-0.7903***	-0.1503*
	PARAMETER EST	-86.02		-33.62	-16.91
TOTAL	R-SQUARED	0.8405***	0.9000***	0.6795***	0.2703**
	ADJ R-SQ	0.8324	0.8967	0.6716	0.2523
N=126	F-RATIO	104.51	272.29	86.2	15.06
	INTERCEPT	3795	1567	405	246
DEPEND VAR SCHOOL DIV N=131	MEAN	3795	1567	405	246
	SD	716	911	43	113
	RANGE	4096	5187	312	740
	MAX	7148	5527	581	833
	MIN	3052	340	269	93
PUPILS N= 972,406	MEAN(WEIGHTED)	4079	1936	409	228
	SD	886	1120	39	118
	COF VAR	0.217	0.578	0.095	0.514

* p < .05 ns = not significant at p < .05
** p < .01
*** p < .001

Total Current Expenditure Per Pupil
Regressed Over Six Orthogonal Factors

Summary of Individual Multiple Regression Report I

The variability in Total Current Expenditure Per Pupil in ADM ranges from a maximum of $7,148 to a minimum of $3,052 in Virginia public school districts. The state average is $3,793 with a standard deviation of $716.

The adjusted R-Squared indicates that approximately 83% of the variance in Total Current Expenditure Per Pupil is accounted for by the six uncorrelated factors. This finding is statistically significant at $p < 0.001$.

The proportion of variance in total current expenditure per pupil in ADM attributed to each factor is:

Community Type	35.58%
Pupil/Professional Staff Ratio	20.77%
Fiscal Capacity	17.07%
Economic Composition of District	8.46%
Pupil Population	1.44%
Black Family Structure	.72%

The standardized regression estimate (Beta coefficients) of each factor is listed in order of relative magnitude.

Community Type	.5965
Pupil/Professional Staff Ratio	-.4558
Fiscal Capacity	-.4132
Economic Composition of District	.2908
Pupil Population	-.1201
Black Family Structure	.0849

Over 61% of total variation in total current expenditure per pupil can be attributed to "attributes of a community" as verified by

the following factors and the amount of variance each contributed to total adjusted

R-Squared.

Community Type	35.58%
Fiscal Capacity	17.07%
Economic Composition	8.46%
	61.11%

An additional 20.77% of the variance in total current expenditure per pupil is attributed to the number of teachers, instructional personnel and ratio of pupils to teachers in a school system. The number of school age children attending public school in an area accounts for 1.44% of the total variance and less than one percent (.72%) is attributed to a combination of percentage blacks in the population and percentage of households with female householder (no spouse present).

One standard deviation difference in each of the factors presented in Table 3 would indicate a dollar amount difference in total current expenditure per pupil. The purpose of the brief statement for each factor is to illustrate the directional relationship between the standardized regression estimate and the factor loadings.

Table 3. -- Composite Unit Difference
Multiple Regression Report I

Total Current Expenditure Per Pupil
Regressed Over Six Orthogonal Factors

One Standard Deviation Difference Factor	Dollar Difference in Expenditure/ADM
(1) Community Type On a continuum from a low density population community type to a high density population community type expenditure per pupil increases.	$427
(2) Pupil/Professional Staff Ratio As class size decreases, teachers and instructional personnel increases, expense or expenditure per pupil increases.	$326
(3) Fiscal Capacity As the fiscal capacity of the area increases expenditure per pupil increases.	$296
(4) Economic Composition of District As income and education levels increase, unemployment and poverty decrease, expenditure per pupil increases.	$208
(5) Pupil Population As the percentage of school age children attending public school increases and the percentage of special education students in ADM decreases, public school expenditure per pupil decreases.	$86
(6) Black Family Structure As the percentage of blacks in the population increase and the percentage of female householder (no spouse present) increase, expenditure per pupil increases.	$61

Local Support for Current Expenditure Per ADM
Regressed Over Six Orthogonal Factors

Summary - Individual Multiple Regression Report II

The variability in Local Support for Expenditure per ADM ranges from $5,187 to $340 among the School Districts in Virginia. The state average is $1,567 with a standard deviation of $911. Approximately 90% of the variance in local support for expenditure per ADM is accounted for by four of the six uncorrelated factors, Fiscal Capacity, Community Type, Pupil/Professional Staff Ratio, and Economic Composition of a District Population. This finding is statistically significant at $p < .001$. Of the total variation approximately 73% can be attributed to "attributes of a community" as confirmed by the following factors and the amount of variance each contributed to total adjusted R-Squared.

Community Type	29.62%
Capacity	29.91%
Economic Composition	13.10%

	72.63%

An additional 17.37% of the variance in local support for expenditure per pupil is attributed to the number of teachers, instructional personnel and ratio of pupils to teachers in a school division. The percentage of school age children attending public school (Factor 6, Pupil Population) and the percentage blacks in the population

(Factor 5, Black Family Structure) did not contribute significantly to total variance in local support for expenditure per pupil.

One standard deviation difference among school districts in each of the factors presented in Table 4 would indicate a dollar amount difference in local support for expenditure per pupil.

Table 4.-- Composite Unit Difference
Multiple Regression Report II

Local Support For Expenditure Per ADM
Regressed Over Six Orthogonal Factors

One Standard Deviation Difference Factor	Dollar Difference in Local Support/ADM
(1) Fiscal Capacity As the fiscal capacity of the area increases local support for expenditure per pupil increases.	$498
(2) Community Type On a continuum from a low population density community type to a high population density community type expenditure per pupil increases.	$495
(3) Pupil/Professional Staff Ratio As class size decreases, teachers and instructional personnel increases, local expenses for expenditure per pupil increases.	$379
(4) Economic Composition of District As income and education levels increase, unemployment and poverty decrease, local support for expenditure per pupil increases.	$330

State Retail Sales and Use Tax Support
for Expenditure Per ADM
Regressed Over Six Orthogonal Factors

Summary - Individual Multiple Regression Report III

The variability in State Retail Sales and Use Tax Support for Expenditure per ADM ranges from $581 to $269 in Virginia School Districts. The state average is $405 with a standard deviation of $43. Approximately 67% of the variance in state retail sales tax support for expenditure per ADM is accounted for by three of the six uncorrelated factors, Pupil Population, Community Type, and Black Family Structure. This finding is statistically significant at $p < 0.001$. Over 62% of the total variation can be attributed to Pupil Population with an additional 3.85% accounted for by Community Type, and 1.64% by Black Family Structure.

The definition of State Retail Sales and Use Tax Support lends an explanation to the 62% of total variance explained by Pupil Population. The state retail sales and use tax is a one percent designated state sales tax that is distributed to local governments on the basis of school age population by the following formula:

(1) $\dfrac{\text{Total One Percent State Sales Tax}}{\text{School Age Population (School Census)}} = \text{Per Pupil Amount}$

(2) Per Pupil Amount X School Age Population = Total Amount Locality Receives

Factor 6, Pupil Population, was also calculated with school age population as the divisor with ADM as the dividend. Factor 6 is indicative of the percentage of school age children attending public schools.

One standard deviation difference among the school districts in each of the factors presented in Table 5 would indicate a dollar amount difference in state retail sales and use tax support for expenditure per ADM.

Table 5. -- Composite Unit Difference
Multiple Regression Report III

State Retail Sales and Use Tax Support for Current Expenditure Per ADM Regressed Over Six Orthogonal Factors	
One Standard Deviation Difference Factor	Dollar Difference in Retail Sales Tax/ADM
(1) Pupil Population	$33.62
As the percentage of school age children in the public schools increase, state retail sales and use tax support for expenditures per ADM decreases. As the percentage of children attending non-public school increases state retail sales and use tax support for expenditure per ADM in the public schools increases.	
(2) Community Type	$8.34
On a continuum from a low population density community type to a high population density community type retail sales and use tax support for expenditure per pupil increases.	
(3) Black Family Structure	$5.46
As the percentage of blacks in the population and households with a female householder increase, state retail sales and use tax support for expenditure per ADM increases.	

Federal Support for Current Expenditure Per ADM
Regressed Over Six Orthogonal Factors

Summary - Individual Multiple Regression Report IV

The variability in Federal Support for Current Expenditure per ADM in Virginia School Districts ranges from $833 to $93. The state average is $246 with a standard deviation of $113. Twenty-five percent of the variance in federal support for current expenditure per ADM is accounted for by three of the six uncorrelated factors, Economic Composition of a District Population, Black Family Structure, and Pupil Population. This finding is statistically significant at $p < 0.001$. Approximately 15% of total variation is attributed to a combination of percentage of blacks in the population and households with female householder. An additional 10% is accounted for by the Economic Composition of a District Population (income and education level, unemployment rates and poverty level) and Pupil Population accounts for 2.2 percent.

One standard deviation difference among the school districts in each of the factors presented in Table 6 would indicate a dollar amount difference in federal support for expenditure per ADM.

Table 6. -- Composite Unit Difference
Multiple Regression Report IV

Federal Support for Current Expenditure Per ADM
Regressed Over Six Orthogonal Factors

One Standard Deviation Difference Factor	Dollar Difference Federal Support/ADM
(1) Black Family Structure As the percentage of blacks in the population and households with a female householder increase, federal support for expenditure per ADM increases.	$43.38
(2) Economic Composition of District As income and education levels increase, unemployment rates and poverty level decrease, federal support for expenditure per ADM decreases.	$35.40
(3) Pupil Population As the percentage of school age children in the public schools increase and the percentage of special education pupils decrease, federal support for expenditure per ADM decreases.	$16.91

Output Measures
Multiple Regression Tables and Reports

Arrayed in Table 7 are the multiple regression results and corresponding descriptive statistics for each of the six public elementary and secondary school output measures regressed over the six factors. The output measures are represented in Table 7 in the following manner: Standardized Achievement Test Score Index (ACHIEVEM), Percentage Dropout (%DROPOUT), Graduates as a Percentage of 1984-85 Ninth Grade Membership (%HSGRADS), Percentage of High School Graduates Planning to Attend a Trade School (%TRADE), Percentage of High School Graduates

Planning to Attend a Two Year College (%2YRCOL), and Percentage of High School Graduates Planning to Attend a Four Year College (%4YRCOL).

In the following output measure reports total R-Squared was partitioned into portions designated by the simple R-Square of each contributing factor. The direction of the standardized regression estimates (Beta) and the parameter estimates (b) presented in Table 7 are relative to the factor loadings and the output measure of concern. To interpret the directional implication of Beta and/or b the context of the factor would have to be consulted. For example, the standardized regression estimate for Capacity and Achievement is -.1245. Without checking the context of Factor 4 (Fiscal Capacity), it would appear there is a negative correlation between fiscal capacity and achievement (low fiscal capacity, high achievement). But, the factor loadings of Fiscal Capacity are negative, indicating low taxable true value of property per ADM. The converse of the factor loadings for Fiscal Capacity would indicate high taxable true value of property per ADM. The negative regression estimate indicates the opposite of or the converse of Fiscal Capacity, which would reflect a relationship between high fiscal capacity and high achievement.

Table 7. -- Composite Summary: Public School Output Variables Regressed Individually Over Six Orthogonal Factors

		Dependent Variables					
		ACHIEVEM	%DROPOUT	%HSGRADS	%TRADE	%2YRCOL	%4YRCOL
TOTAL	R-SQUARED	.7553***	.1401***	.2296***	.1684***	.3618***	.6791***
	ADJ R-SQ	.7451	.1262	.2170	.1617	.3407	.6685
	INTERCEPT	-.00523	4.7857	74.252	7.1087	21.019	33.202
COMMU	SIMP R-SQR	.0789	.0457	ns	ns	ns	.3190
	STD EST	.2809***	.2138**				.5648***
	PARA EST	.2843	.3811				7.518
COM/CP	SIMP R-SQR	.2994	ns	.0974	ns	.1085	.3100
	STD EST	.5471***		.3122**		-.3294***	.5568***
	PARA EST	.5538		3.377		-2.73	7.411
PPSR	SIMP R-SQR	ns	ns	ns	ns	.0731	ns
	STD EST					-.2704***	
	PARA EST					-2.24	
CAP	SIMP R-SQR	.0155	ns	ns	ns	.0196	.0097
	STD EST	-.1245**				.1402*	-0.0987*
	PARA EST	-.1260				1.1617	-1.3140
BLACK	SIMP R-SQR	.3101	.0944	.1322	.1684	.1605	ns
	STD EST	-.5569***	.3073***	-.3637***	.4103***	-.4007***	
	PARA EST	-.5637	.5478	-3.6318	2.075	-3.3211	
PUPIL POP	SIMP R-SQR	.0514	ns	ns	ns	ns	.0404
	STD EST	.2268***					.2009***
	PARA EST	.2296					2.6742
DEPEND VAR N=131	MEAN	0.00	4.79	74.25	7.12	21.02	33.20
	SD	1.00	1.78	12.85	5.06	8.29	13.31
	RANGE	5.75	10.70	86.60	31.60	47.70	69.50
	MAXIMUM	2.96	11.10	118.00	31.60	47.70	69.50
	MINIMUM	-2.78	0.40	31.40	0.00	0.00	0.00

* p < .05
** p < .01
*** p < .001
ns = not significant at p < .05

Achievement Test Score Index
Regressed Over Six Orthogonal Factors

Summary - Individual Multiple Regression Report V

The variability in Achievement Test Score Index ranges from -2.7847 (Sussex) to 2.9625 (Falls Church) with a mean of zero and a standard deviation of one. Sixty-nine of the school districts or 52.7% have a negative factor achievement index indicating moderately low to low achievement in comparison to the remaining 62 school districts.

Approximately 75% of the variance in the Achievement Test Score Index is accounted for by five of the six uncorrelated factors, Black Family Structure, Economic Composition of a District Population, Community Type, Pupil Population, and Fiscal Capacity. This finding is statistically significant at $p < 0.001$.

The proportion of variance attributed to each factor is:

Black Family Structure	31.01%
Economic Composition of District	29.94%
Community Type	7.89%
Pupil Population	5.14%
Fiscal Capacity	1.55%
Pupil/Professional Staff Ratio	NS

The standardized regression estimate (Beta coefficient) of each factor is listed in order of relative magnitude.

Black Family Structure	-0.5569
Economic Composition of District	0.5471
Community Type	0.2809
Pupil Population	0.2268
Fiscal Capacity	-0.1245
Pupil/Professional Staff Ratio	NS

Thirty-nine percent (39%), or over one-third of total variation in Achievement Test Scores among the school districts can be attributed to "community attributes" as revealed by the following factors and the amount of variance each contributed to total adjusted R-Squared.

Economic Composition	29.94%
Community Type	7.89%
Capacity	1.55%
	39.38%

An additional 31% of the variability in Achievement Test Scores among school districts is attributed to the percentage of blacks and female householders in a community. The percentage of school age pupils attending public school in an area accounts for 5.14% of the total variance. From this analysis the number of teachers, instructional personnel and the ratio of pupils to teachers in a school division did not have a significant effect on Achievement Test Scores.

One standard deviation difference in each of the factors presented in Table 8 would indicate a relative partial standard deviation difference in Achievement Test Scores.

Table 8. -- Composite Unit Difference
Multiple Regression Report V

Achievement Test Score Index
Regressed Over Six Orthogonal Factors

One Standard Deviation Difference Factor	Standard Deviation Difference in Achievement
(1) Black Family Structure	-.5569 SD
As the percentage of blacks in the population increase and the percentage of female householder (no spouse present) increase, Achievement Test Scores decrease.	
(2) Economic Composition of District Population	.5538 SD
As income and education levels increase, unemployment and poverty decrease, Achievement Test Scores increase.	
(3) Community Type	.2809 SD
On a continuum from a low population density community type to a high population density community type Achievement Text Scores increase.	
(4) Pupil Population	.2268 SD
As the percentage of school age children attending public school increase Achievement Test Scores increase.	
(5) Fiscal Capacity	-.1260 SD
As the fiscal capacity decreases Achievement Test Scores decrease.	

Percentage Dropout
Regressed Over Six Orthogonal Factors

Summary - Individual Multiple Regression Report VI

The variability in Percentage Dropout ranges from a maximum of 11.10% to a minimum of 0.40% in the school districts of Virginia. The state average is 4.8% with a standard deviation of 1.8 percent. Two of the six uncorrelated factors, Black Family Structure and Community Type, account for approximately 13% of the variance in Percentage Dropout. This finding is statistically significant at $p < .001$.

The standardized regression estimate for Black Family Structure indicates that a one standard deviation difference among school districts in the percentage of blacks in the population and female householders, while holding the other factor constant, would indicate a difference in Percentage Dropout Rate of 0.3073 standard deviations or 0.55% (0.3073 X 1.78%).

Approximately 5% of the variance in Percentage Dropout is accounted for by Factor 1, Community Type. The Standardized estimate indicates that a one standard deviation difference in a low population density community type and a high population density community type would indicate a 0.2138 standard deviations or 0.38% (0.2138 x 1.78%) difference in percentage dropout rate.

As indicated in Table 9, a one standard deviation difference among school districts in the factors, Black Family Structure and Community Type, would indicate a relative percentage difference in Dropout Rates.

Table 9. -- Composite Unit Difference
Multiple Regression Report VI

Percentage Dropout
Regressed Over Six Orthogonal Factors

One Standard Deviation Difference Factor	Percentage Difference in Dropout Rates
(1) Black Family Structure	0.55%
As the percentage of blacks in the population increase and the percentage of female householder (no spouse present) increase, Percentage Dropout increases.	
(2) Community Type	0.38%
On a continuum from a low population density community type to a high population density community type Percentage Dropout increases.	

Percentage High School Graduates
Regressed Over Six Orthogonal Factors

Summary - Individual Multiple Regression Report VII

The variability in the Percentage of High School Graduates ranges from a maximum of all pupils[25] to a minimum of 31.4% in Virginia school districts. The state average is 74% with a standard deviation of 12.85%. Two of the six factors, Black Family Structure and Economic Composition of District Population, account for approximately 22% of the variance in

[25] The calculated percentage was 118. The state data does not make adjustments to reflect the mobility of the population when calculating the percentage of high school graduates.

the Percentage of High School Graduates. This finding is statistically significant at $p < 0.001$.

The percentage of blacks in the population and percentage of households with female householder (no spouse present) account for approximately 13% of the variance in Percentage High School Graduates and approximately 10% is accounted for by the Economic Composition of a District Population.

One standard deviation difference among school districts in the factors, Black Family Structure and the Economic Composition of a District Population, would indicate a relative percentage difference in High School Graduates as indicated in Table 10.

Table 10. -- Composite Unit Difference
Multiple Regression Report VII

Percentage High School Graduates
Regressed Over Six Orthogonal Factors

One Standard Deviation Difference Factor	Percentage Difference in High School Graduates
(1) Black Family Structure	-3.63%
As the percentage of blacks in the population increase and the percentage of female householder (no spouse present) increase, the percentage of high school graduates decreases.	
(2) Economic Composition of District	3.38%
As income and education levels increase, unemployment rates and poverty level decrease, the percentage of high school graduates increase.	

Percentage Trade School
Regressed Over Six Orthogonal Factors

Summary - Individual Multiple Regression Report VIII

The variability in the Percentage of High School Pupils Planning to Attend a Trade School ranges from a maximum of 31.6% to a minimum of 0.0 percent among the school districts in Virginia. The state average is 7.11% with a standard deviation of 5.06%.

One of the six factors, Black Family Structure, accounts for approximately 17% of the variance in the percentage of high school pupils planning to attend a trade school. This finding is statistically significant at $p < 0.001$. The standardized estimate indicates that a one standard deviation difference among school districts in the percentage

of blacks in the population and female householders, would indicate a difference in the percentage of high school pupils planning to attend a trade school by 0.4103 standard deviations or 2.08% (0.4103 x 5.06). A one standard deviation decrease in the percentage of blacks in the population and female householders would indicate a 2.08% decrease in the percentage of high school pupils planning to attend a trade school.

Percentage Two Year College
Regressed Over Six Orthogonal Factors

Summary - Individual Multiple Regression Report IX

The variability in the Percentage of High School Graduates Planning to Attend a Two Year College ranges from 47.7% to 0% among the school districts in Virginia. The state average is 21% with a standard deviation of 8.28 percent. Four of the six factors, Black Family Structure, Economic Composition of a District Population, Pupil/Professional Staff Ratio, and Fiscal Capacity, account for approximately 34% of the variance in the percentage of high school graduates planning to attend a two year college, at $p < .001$. Black Family Structure accounts for approximately 16% of the total variation; Economic Composition of a District Population, approximately 11%; Pupil/Professional Staff Ratio, approximately 7%; and Fiscal Capacity, approximately 2 percent.

One standard deviation difference among the school districts in each of the factors presented in Table 11 would indicate a relative

percentage difference in the percentage of high school graduates planning to attend a two year college.

Table 11. -- Composite Unit Difference
Multiple Regression Report IX

Percentage Two Year College
Regressed Over Six Orthogonal Factors

One Standard Deviation Difference Factor	Percentage Difference in Two Year College
(1) Black Family Structure	3.32%
As the percentage of blacks in the population increase and the percentage of female householder (no spouse present) increase, the percentage of high school graduates planning to attend a two year college increases.	
(2) Economic Composition of District	2.73%
As income and education levels increase, unemployment rates and poverty level decrease, the percentage of high school graduates planning to attend a two year college decreases.	
(3) Pupil/Professional Staff Ratio	2.24%
As class size increases, the percentage of high school graduates planning to attend a two year college decreases.	
(4) Fiscal Capacity	1.16%
As fiscal capacity decreases, the percentage of high school graduates planning to attend a two year college increases.	

Percentage Four Year College
Regressed Over Six Orthogonal Factors

Summary - Individual Multiple Regression Report X

The variability in Percentage of High School Graduates Planning to Attend a Four Year College ranges from 69.5% to 0% in Virginia School Districts. The state average is 33% with a standard deviation of 13.31 percent. Four of the six uncorrelated factors, Economic Composition of a District Population, Fiscal Capacity, and Pupil Population, account for approximately 67% of the variability in the percentage of high school graduates planning to attend a four year college, at $p < 0.001$. Almost sixty-four percent (64%) of the total variability can be attributed to "community attributes" as revealed by the following factors and the amount of variance each contributed to total R-Squared.

Community Type	31.90%
Economic Composition	31.00%
Capacity	0.97%

	63.87%

An additional 4% of the variance in the percentage of high school graduates planning to attend a four year college is attributed to the percentage of school age children attending public school in an area.

One standard deviation difference in each of the factors presented in Table 12 would indicate a relative percentage difference in the percentage of high school pupils planning to attend a four year college.

Table 12. -- Composite Unit Difference
Multiple Regression Report X

Percentage Four Year College
Regressed Over Six Orthogonal Factors

One Standard Deviation Difference Factor	Percentage Difference Four Year College
(1) Community Type	7.5%

On a continuum from a low population density community type to a high population density community type, the percentage of pupils planning to attend a four year college increases.

(2) Economic Composition of District	7.4%

As income and education levels increase, unemployment and poverty decrease, the percentage of pupils planning to attend a four year college increase.

(3) Pupil Population	2.67%

As the percentage of school age pupils attending public school increase the percentage of pupils planning to attend a four year college increase.

(4) Fiscal Capacity	1.31%

As fiscal capacity increases the percentage of high school graduates planning to attend a four year college increases.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS FOR FURTHER STUDY

Summary

Equity, or equal educational opportunity, is a complex, multidimensional, social concept that both the courts and school finance scholars have defined in diverse and sometimes conflicting ways; most often in terms equating a single dimension. Traditional measures for defining equity have been equal dollars per pupil, equal tax rates for taxpayers, and a relationship measure between revenue per pupil and local wealth. Traditional studies have employed univariate and/or bivariate questions addressed by descriptive statistics, correlation, or regression analyses. This study approached the concept of equity as a multivariate phenomena requiring the analysis of interrelationships of multiple school and community variables for an explanation.

It was not the intent of this study to add another definition of equity to the literature but to provide a procedure for determining an equitable distribution of current expenditure per pupil in a state based on multiple fiscal and non-fiscal school and community variables including pupil output measures. The procedural design consisted of four stages: (1) defining equity; (2) developing a school finance systems chart to guide the selection of fiscal and nonfiscal school and

community variables; (3) applying principal components analysis; and (4) applying multiple regression analysis. The ultimate aim of the research design was to identify those factors that individually or in various combinations accounted for a significant portion of the variance in total current expenditure per pupil and in pupil output measures.

Six orthogonal factors, derived from principal components analysis and varimax rotation of 24 school and community variables, became the independent variables in multiple regression analysis with elementary and secondary school finance data and school output data as the dependent variables.

The definition of equity for this equity analysis procedure was:

> An equitable system is one in which the variables of fiscal capacity and community attributes do not explain (individually or in various combinations) a significant portion of the variance in total current expenditure per pupil in average daily membership or in pupil output measures.

More simply stated:

> In an equitable state school finance system differences in per pupil expenditures and in pupil outcomes may not be due to differences in fiscal capacity, residence, group, class, or society membership.

Findings

A significant portion of the differences among school districts in total current expenditure per pupil in ADM was attributed to a combination of factors representing place of residence, fiscal capacity, and income and education levels of a community; these areas should be unrelated to the variance in per pupil revenues required to meet the demands of the educational needs and services of the pupils served. Also, a significant portion of the differences among school districts in pupil achievement measures was explained by a combination of factors representing group membership, place of residence, and fiscal capacity; areas that are uncontrolled by the pupil but showed to be significantly involved in the pupil's educational achievement outcomes, none the less. Specifically, a combination of fiscal capacity and community attributes accounted for a significant portion of the differences among school districts in:

(1) Total Current Expenditure Per Pupil per ADM 61.11%

(2) Local Support for Expenditure per ADM 72.63%

(3) Percentage of High School Graduates
Planning to Attend a Four Year College 63.87%
and with group membership (Black Family Structure)

(4) Achievement Test Score Index 70.38%

Following is a brief summary of the results of the above four dependent variables regressed individually over the six orthogonal factors: Community Type, Economic Composition of a District Population,

Pupil/Professional Staff Ratio, Fiscal Capacity, Black Family Structure, and Pupil Population.

(1) Total Current Expenditure Per Pupil In ADM

Count	Mean	STD	Range	Minimum	Maximum
131	$3793	$716	$4096	$3052	$7148

Eighty-three percent of the variability in Total Current Expenditure Per Pupil in ADM was accounted for by the six factors. Over 61% of total variation was attributed to fiscal capacity and "attributes of a community" as shown by the following factors and the amount of variance each contributed to total adjusted R-Squared.

Community Type	35.58%
Fiscal Capacity	17.07%
Economic Composition of District	8.46%
	61.11%

An additional 20.77% of the variance in Total Current Expenditure Per Pupil was attributed to the number of teachers, instructional personnel and ratio of pupils to teachers in a school system. The percentage of school age children attending public school in an area accounted for 1.44% of the total variance and less than one percent (.72%) was attributed to a combination of percentage blacks in the population and households with female householder (no spouse present).

(2) LOCAL SUPPORT FOR Expenditure PER ADM

Count	Mean	STD	Range	Minimum	Maximum
131	$1567	$911	$5187	$340	$5527

Approximately 90% of the variance in Local Support for Expenditure Per ADM was accounted for by four of the six factors, Fiscal Capacity, Community Type, Pupil/Professional Staff Ratio, and Economic Composition of a District Population. Of the total variation approximately 73% could be attributed to fiscal capacity and "attributes of a community" as confirmed by the following factors and the amount of variance each contributed to total adjusted R-Squared.

Community Type	29.62%
Fiscal Capacity	29.91%
Economic Composition of District	13.10%
	72.63%

An additional 17.37% of the variance in Local Support for Expenditure Per ADM was attributed to the number of teachers, instructional personnel and ratio of pupils to teachers in a school division. The percentage of school age children attending public school (Pupil Population) and the percentage of blacks in the population (Black Family Structure) did not contribute significantly to total variance in Local Support for Expenditure per ADM.

(3) PERCENTAGE FOUR YEAR COLLEGE

Count	Mean	STD	Range	Minimum	Maximum
131	33.2%	13.3%	69.5%	0.0%	69.5%

Four of the six factors, Community Type, Economic Composition of a District Population, Fiscal Capacity, and Pupil Population, accounted for approximately 67% of the variability in the Percentage of High School Graduates Planning to Attend a Four Year College. Almost sixty-three percent (63%) of the total variability could be attributed to "community attributes", with less than one percent attributed to Fiscal Capacity, as shown by the following factors and the amount of variance each contributed to total R-Squared.

Community Type	31.90
Economic Composition of District	31.00%
Fiscal Capacity	0.97%

	63.87%

An additional 4% of the variance in the Percentage of High School Graduates Planning to Attend a Four Year College was attributed to the percentage of school age children attending public school in an area (Pupil Population). Black Family Structure and Pupil/Professional Staff Ratio did not contribute significantly to the variance in Percentage of High School Graduates Planning to Attend a Four Year College.

(4) ACHIEVEMENT TEST SCORE INDEX

Count	Mean	STD	Range	Minimum	Maximum
131	0.0	1.0	5.75 SD	-2.78	2.96

The variability in Standardized Achievement Test Scores ranged from -2.7847 (Sussex) to 2.9625 (Falls Church) with a mean of zero and a standard deviation of one. Sixty-nine of the school districts, or 52.7 percent, had a negative factor index indicating moderately low to low achievement in comparison to the remaining 62 school districts.

Over 70% of the variability in Achievement Test Scores was accounted for by five of the six uncorrelated factors. Thirty-nine percent (39%) of the variation could be attributed to fiscal capacity and "community attributes" as shown by the following factors and the amount of variance each contributed to total adjusted R-Squared.

Community Type	7.89%
Fiscal Capacity	1.55%
Economic Composition of District	29.94%
	39.38%

An additional 31% of the variability in Achievement Test Scores among school districts was attributed to the percentage of blacks in the population and households with female householder (no spouse present). The percentage of pupils attending public school in an area accounted for 5.14% of the total variance. From this analysis the number of teachers, instructional personnel and the ratio of pupils to teachers in a school division did not have a significant effect on Achievement Test Scores.

Utility of the Equity Analysis Procedure

The definition of equity for this study follows the precept of equalization of educational opportunity proposed by Johns, Morphet and Alexander (1960), Wise (1967), Coons, Clune, and Sugarman (1970), that the quality of a child's education should not depend on the wealth of the district in which he lives nor should it depend substantially on the aspiration level of the people of that district. The equity analysis procedure allows for the evaluation of a state's effort to diminish the local effects of undesired factors on total current expenditure per pupil and for the redistribution of current expenditure funds in an equitable manner.

Theoretically, equal educational opportunity can be achieved. The local effects of place of residence, income and education level characteristics, black family structure (group membership) and/or fiscal capacity on total current expenditure per pupil can be diminished or increased to a specified percentage. This can be accomplished by redistributing total current revenue in proportion to the magnitude of the local effects on total current expenditure per pupil. In the redistribution of funds, average current expenditure per pupil and total current revenue (expense) would remain constant.

Parameter Estimates

To compare the effects of given variables across populations the regression coefficient, denoted b, or parameter estimate, is

incorporated. The parameter estimates associated with Virginia public school finance data and the six factors are displayed in Table 13.

Table 13 -- Parameter Estimates
Public School Fiscal Variables
Regressed Individually Over Six Orthogonal Factors

FACTOR		LOCAL	TOTAL	RST	FED
COMMU	Para Estimate	$496	$427	$8	
ECON/C	Para Estimate	330	208		35
PPSR	Para Estimate	379	326		
CAP	Para Estimate	498	296		
BLACK	Para Estimate		61	5	43
PUPIL/	Para Estimate		86	34	17

The amount of state equalization associated with a factor can be estimated by subtracting the parameter estimates of Retail Sales and Use Tax, Federal Support, and Total Current Expenditure per Pupil from Local Support parameter estimate [Local - (Total -RST - Federal)]. The difference would indicate the amount of the state contribution to Total Current Expenditure/ADM and could be interpreted as the state's effort to diminish the effects of place of residence, income and education level characteristics, and/or fiscal capacity on Total Current Expenditure per ADM.

From viewing Table 13 it would appear that the greatest amount of state equalization, referring to the state's effort to diminish the

local effects of undesired factors on total current expenditure per pupil, occurred in the area of Fiscal Capacity. Further investigation indicates that this is not the case. The greatest amount of state equalization occurred in the area of Economic Composition of a District Population (income, education, unemployment, poverty rates) with the least amount in the area of Pupil/Professional Staff Ratio (class size) and Community Type (high/low population density characteristics). The following explains this finding.

The percentage of difference between the parameters of Local Support for Expenditure/ADM and Total Current Expenditure/ADM (minus RST and FED) would allow a relative comparison of the magnitude of state equalization between the factors. The percentage of difference, or the magnitude of the state's effort to diminish undesired factor effects, would be as follows:

(a) 15% of the local effects of Community Type on the variability of total current expenditure per pupil have been diminished by the state ($77 out of $496).

```
Local - (Total - RST - FED) = State
$496 - ( 427  -  8  -  0 ) = $77
```

Percentage of state equalization: $77 out of $496 = 15%

85% of the effects of Community Type have not been diminished.

(b) 14% of the local effects of Pupil/Professional Staff Ratio (PPSR) on the variability of total current expenditure per pupil have been diminished by the state ($53 out of $379).

```
Local - (Total - RST - FED) = State
$379 - ( 326  -  0   - 0 ) = $53
```

Percentage of state equalization: $53 out of $379 = 14%

86% of the effects of PPSR have not been diminished.

(c) 40.6% of the local effects of Fiscal Capacity on the variability of total current expenditure per pupil have been diminished by the state ($202 out of $498).

Local - (Total - RST - FED) = State
$498 - (296 - 0 - 0) = $202

Percentage of state equalization: $202 out of $498 = 40.56%

59% of the effects of Fiscal Capacity have not been diminished.

(d) 47.6% of the local effects of the Economic Composition of a District Population on the variability of total current expenditure per pupil have been diminished by the state ($157 out of $330).

Local - (Total - RST - FED) = State
$330 - (208 - 0 - 35) = $157

Percentage of state equalization: $157 out of $330 = 47.6%

52% of the effects of the Economic Composition of a District Population have not been diminished.

The parameter estimate indicates that the state has contributed $12 per pupil in the area of Black Family Structure, with no designation from the local area; and the state has contributed $35 per pupil in the area of Pupil Population, which includes special education pupils.

For total state equalization the parameter estimates for Total Current Expenditure Per Pupil, for each of the undesired local effects, would equal or approach zero after retail sales and use tax and federal support had been subtracted. Theoretically, it is possible for the state to reduce or increase the local effects on Total Current Expenditure per

Pupil to a specified percentage. This is accomplished by structuring a new regression equation.

The purpose of the following exercise is to structure a new regression equation that will reduce 90% of the undesired effects the local community has on the variability of total current expenditure per pupil. The intended results are parameter estimates for total current expenditure per pupil that approach ten percent of local parameter estimates for each factor. Table 13 and the associated multiple regression equation for total current expenditure per pupil regressed over the six factors are both important components for developing the new regression equation. The following is the original multiple regression equation generated for total current expenditure per pupil regressed over the six factors.

$$Y' = 3793 + (427 * \text{Community Type}) + (208 * \text{Economic Composition}) - (326 * \text{PPSR}) - (296 * \text{Capacity}) + (61 * \text{Black/Family}) - (86 * \text{Pupil Population})$$

The multiple regression equation structured to diminish 90% of the undesired local effects on total current expenditure per pupil, while holding the mean and total revenue (expense) constant, would be as follows:

$$Y'' = 3793 + (58 * \text{Community Type}) + (65 * \text{Economic Composition}) - (38 * \text{PPSR}) - (50 * \text{Capacity}) + (61 * \text{Black/Family}) - (86 * \text{Pupil Population})$$

The parameter estimates for the structured equation, Y", were obtained by multiplying each of the Local parameter estimates (see Table 13) by 10 % and adding the results to RST and FED.

[(10% * Local Parameter Estimate) + RST + FED]

For example, the parameter estimate of Local and Community Type is 496. The Y" parameter estimate for Local and Community Type would be: [(10% * 496) + 8 + 0] = 57.6 or approximately 58. The Y" percentage of difference between the parameter estimates of Local and Total (minus RST and FED) would be 90%, indicating the state has diminished 90% of the local effects of Community Type on total current expenditure per pupil. The new multiple regression equation generates total current expenditure per pupil for each of the 126 school districts in the model, correcting for the undesired local effects on total current expenditure per pupil.

Arrayed in Table 14 is a comparison of the descriptive statistics of the two regression equations, Y' and Y".

Table 14 -- Actual Total Current Expenditure per ADM Compared to 90% Equalization of Local Effects on Total Current Expenditure per ADM

	Actual Exp/ADM	90% Equalized Exp/ADM
Mean	3793	3793
Standard Deviation	708	150
Range	4096	887
Maximum	7148	4359
Minimum	3052	3472
Coefficient of Variation	.1866	.0396

The range in total current expenditure per ADM (Y') was reduced from $4,096 to $887 in Y" (90% Equalization of Funds). In the redistribution of funds, thirty-one percent of the 126 school districts (39) had a reduction in total current expenditure per pupil while 61% had an increase in funds. Displayed in Table 15 are the new parameter estimates for Y" total current expenditure per pupil. Additional analysis of the distribution of Y" funds is left for further studies.

Table 15 -- Parameter Estimates: 90% Equalization of Local Effects on Total Current Expenditure Per Pupil

FACTOR		LOCAL	90% Equalized Total Exp/ADM	RST	FED
COMMU	Para Est	$496	$58	$8	
ECON/C	Para Est	330	65	35	
PPSR	Para Est	379	38		
CAP	Para Est	498	50		
BLACK	Para Est		61	5	43
PU/POP	Para Est		86	34	17

This exercise demonstrates the utility of the model for pinpointing and correcting the effects of place of residence, income and education level, and fiscal capacity on the disparities in per pupil expenditure. The factor variables cannot be changed or manipulated but the effect of the factors on total current expenditure per pupil can be reduced or increased to a specified percentage.

Policy Implication

Equal educational opportunity is a complex, multidimensional, social concept that is not easy to obtain. To diminish the effects of place of residence, income and education characteristics, and fiscal capacity on the variability of current expenditure per pupil, as described in the above example, would compel communities to share their local wealth with less wealthy parts of the state. In most states or communities this is not a political reality. If the state offset the reduced funded schools with equal amounts of loss the inequitable situation would again be present.

The solution to equal educational opportunity in Virginia may be, there is no solution with the present system of funding public elementary and secondary education combined with the political reality of the state. Full state funding may be the only viable solution to achieve equal educational opportunity or a court order of a redistribution of school district wealth.

Other Utilities of the Model

(1) Factor Scores

The factor scores combined with the standardized regression estimates offer policy makers a picture of the 126 school districts relative to total current expenditure per pupil in ADM. Each of the factor scores has a mean of zero and a standard deviation of one (see Appendix F for factor scores).

(a) Community Type

On a continuum from a low population density community type to a high population density community type total current expenditure per pupil increases.

The Community Type factor scores for the 126 school districts ranged from -1.46 (Charles City) to 3.37 (Falls Church) with a mean of zero and a standard deviation of one. Eighty-two (65%) of the school districts have a factor score less than zero, reflecting low population density community characteristics. The standardized regression estimate combined with the factor scores indicate that $2,062 ($427 x 4.83 SD Range) of the difference in expenditure per pupil between Charles City and Falls Church is accounted for by differences in their Community Type characteristics.

(b) Pupil/Professional Staff Ratio

As class size decreases and teacher and other instructional personnel increase, expense or expenditure per pupil increases.

Pupil/Professional Staff Ratio Factor scores for the school districts ranged from -4.49 (Bath County) to 2.56 (Williamsburg). Fifty-three (42%) of the school districts have a factor score less than zero which reflects low class size and a high ratio of instructional personnel to 1000 pupils. The factor scores combined with the standardized regression estimate indicate that Bath County has an expense of $2,300 ($326 x 7.05 SD Range) more per pupil than Williamsburg due to their small class size and high ratio of instructional personnel to 1000 pupils.

(c) Fiscal Capacity

As the fiscal capacity of the area increases expenditure per pupil also increases.

Fiscal Capacity factor scores for each of the 126 school districts ranged from -4.20 (Surry County) to 1.98 (Manassas Park). Fifty-one (40%) of the school districts have a factor score less than zero, reflecting high fiscal capacity. The factor scores combined with the standardized regression estimate indicate that Surry County has $1829 ($296 x 6.18 SD) more for per pupil expenditures than Manassas Park due to the differences in the Fiscal Capacity of their local school districts.

(d) Economic Composition of District Population

As income and education levels increase, unemployment and poverty decrease, expenditure per pupil increases.

Economic Composition of District Population factor scores of the 126 school districts ranged from -2.15 (Buchanan County) to 3.44 (Fairfax County). Seventy-three (58%) of the school districts have a factor score less than zero, indicating low income and education levels, high unemployment, and moderately high percent of persons below poverty level. The factor scores combined with the standardized regression estimate indicate that Buchanan County has $1,163 ($208 x 5.59 SD) less for expenditure per pupil than Fairfax County due to the differences in the income and education characteristics of their communities.

(e) Pupil Population

As the percentage of school age children attending public school decrease and the percentage of special education pupils in ADM increase expenditure per pupil increases.

Pupil Population factor scores of the 126 school districts ranged from -2.50 (Manassas Park) to 3.54 (Franklin County). Sixty-two (49%) of the school districts have a factor score less than zero, indicating a low percentage of school age children attending public school and moderately high percentage of special education pupils in ADM (public schools). The factor scores combined with the standardized regression estimate indicate that Manassas Park has $519 ($86 x 6.04 SD) more for per pupil expenditure than Franklin County due to the differences in the percentage of school age children attending public schools and the percentage of special education pupils in ADM.

(f) Black Family Structure

As the percentage of blacks and the percentage of female householder (no spouse present) increase, expenditure per pupil increases.

The Black Family Structure factor scores for the 126 school districts ranged from -1.99 (Falls Church) to 2.70 (Charles City County). Seventy-three (58%) of the school districts have a factor score less than zero, reflecting a low percentage of blacks in the population and low percentage of households with female householder. The factor scores

combined with the standardized regression estimate indicate that $286 ($61 x 4.69 SD) of the difference in expenditure per pupil between Charles City and Falls Church is due to the differences in Black Family Structure of their communities.

Achievement

One striking disparity among school districts appears to be in the relationship between achievement measures, state allocations, and Black Family Structure. Thirty-one percent of the variability in achievement outcomes was found to be attributed to Black Family Structure. Less than one percent of the variability in total current expenditure per pupil was found to be attributed to the same factor. Parameter estimates indicate the state contributes $12 per pupil to Black Family Structure. The $12 per pupil appears to be an indication of the inequity between state funds for Black Family Structure and the effect Black Family Structure has on achievement outcomes. Or an indication the state is not meeting the needs of a "group" of pupils it serves.

The following offers substantive evidence of the effect Black Family Structure has on the differences among school districts on achievement measure results. Twenty-one school districts have an achievement factor score equal to or greater than one standard deviation above the state mean. Of these 21 school districts, 19 have a corresponding negative factor score for Black Family Structure. This indicates that 19 of the 21 highest ranking school districts in the state on achievement measures have below the state mean in the

percentage of blacks and female householders in their communities. Twenty school districts have an achievement factor score one standard deviation or more below the state mean. Of these 20 school districts, 17 have above the mean in the percentage of blacks and female householders in their communities. The highest achievement ranking school division (Falls Church) has the lowest percentage of blacks and female householders in the population; and the two lowest achievement ranking school districts (Sussex and Charles City) have the two highest rankings of percentage of blacks and female householders in the population.

Policy Implications

The policy implications of this finding suggest that the state is ignoring the magnitude Black Family Structure has on achievement output measures. The real issue is not the variability in achievement measures but what is causing that variability in terms of pupil needs, and is that issue being addressed in monetary terms? The greater policy question is what can $12 of state funds purchase to offset the magnitude of this school problem? The legal implications appear to be: Is this group, as represented by Black Family Structure, receiving an equal educational opportunity? Would this group constitute a suspect classification? In monetary terms, is the state trying to offset the achievement disparities displayed by this group? The answer to two of the questions appears to be "no."

A greater in depth study of the problem of achievement outcomes, state allocations, and group membership would need to be conducted

before specific policy recommendations could be made. On the surface, it appears the state should be allocating greater funds to this group of pupils to address their academic needs.

Other Dependent Variables

Approximately 13 percent of the variability among school districts in the Percentage of Dropouts was attributed to Black Family Structure and Community Type. Twenty-two percent of the difference among school districts in the Percentage of High School Graduates was accounted for by Black Family Structure and Economic Composition of District Population. The only factor that had a significant effect on the Percentage of Pupils Planning to Attend a Trade School was Black Family Structure.

Litigation

The state of Virginia appears to be open for an equal educational opportunity suit in three areas: (1) in the disparity among school districts in expenditure per pupil in ADM; (2) in the disparity among school districts in achievement measures due to Black Family Structure, and community attributes and (3) in inequities due to group membership (the lack of state funds allocated to address low achievement measures in communities with a high percentage of blacks and female householders).

Should a court determine that a legislative classification was based on suspect criteria or that a fundamental right was implicated by

the operation of a statutory scheme, it will require the state to demonstrate a compelling interest in the differential classification (Sparkman, 1990). What compelling interest does the state have in wealth related disparities in expenditure per pupil and/or in achievement measure disparities due to community attributes and race? Past state court decisions in school finance litigation provide little basis for predicting what the outcomes might be if a school finance case was brought against the Commonwealth of Virginia.

Final Conclusions

This study has shown that a significant portion of the total amount of per pupil expenditure is dependent upon place of residence, fiscal capacity, and the income/education levels of an area, all factors that should be unrelated to the variance in per pupil revenues required to meet the demands of the educational needs and services of the pupils served. This study also has shown that pupil outcomes in the area of pupil achievement and percentage of pupils planning to attend a four year college are dependent upon place of residence, fiscal capacity and income/education levels of a community plus group membership. All of these are areas over which a pupil has no control, even though these areas appear to be controlling his educational outcomes. Finally, this study proposed to develop an equity analysis procedure. That was accomplished. The procedure has the capability of determining the equity of the distribution of expenditure per pupil of a state based on multiple school and community variables, plus the capability of

evaluating and correcting the local effects of fiscal capacity and community attributes on expenditure per pupil.

Demonstrably, financial equational opportunity can be achieved. The local effects of place of residence, income and education levels, group membership, and/or fiscal capacity on total current expenditure per pupil can be diminished or increased to a specified percentage. The quality of a child's education, as influenced by expenditure per pupil, does not have to depend upon place of residence or upon local aspirations, but can depend upon the wealth of the state as a whole. This can be accomplished by a redistribution of total current school funds in relation to the magnitude of the local effects of place of residence, income and education levels, and fiscal capacity on the variability of total current expenditure per pupil or by full state funding. Either method appears to be the only equitable way of providing an equal educational opportunity to every pupil in the state based upon the definition of equity constructed by this study.

The 1987-88 Virginia public elementary and secondary education funding system was found to be inequitable as measured by the equity analysis procedure proposed by this study, and that condition does not appear to be correctable by conventional means.

Final Thoughts

The next quest for proposing equal educational opportunity within states may come form the Federal Government. The Federal Fair Chance Act, 1990, addresses this issue.

> The United States, as a whole, is spending a substantial amount of money to support a system of public schools, but these funds are being spent in an unfair manner in that children are receiving a substantially unequal education depending on the State, county, or municipality where they live. Therefore, the Congress, in exercising its spending power and in carrying out the 14th amendment to the Constitution of the United States, proposes that all children be offered a fair chance for a good education (H.R. 3850, The Fair Chance Act, January 24,1990, pp. 1-2).

The ultimate quest for equal educational opportunity will be across states not just within states. The ultimate equal educational opportunity statement will be: The quality of public education may not be dependent upon the wealth of the state but upon the wealth of the United States as a whole.

Recommendations for Further Study

As a result of this study the following recommendations are made:

1. Recommendation to the Commonwealth of Virginia concerning the inequitable distribution of state retail sales and use tax

The state retail sales and use tax is a one percent designated state sales tax that is distributed to local governments on the basis of school age population. In areas where a high percentage of school age children attend private schools the public schools receive funds from the state retail sales and use tax for pupils they do not have in membership. A more equitable distribution of state retail sales and use tax would be on actual enrollment of each school division instead of school age population. The formula for allocation of funds would be changed to:

(1) $$\frac{\text{Total One Percent State Sales Tax}}{\text{Total State Average Daily Membership}} = \text{Per Pupil Amount}$$

(2) Per Pupil Amount X Local ADM = Total Amount Locality Receives

By this formula the Per Pupil Amount would increase and the distribution of funds would be equitable to all school districts.

2. To the Commonwealth of Virginia: Provide equal educational opportunity to each of the pupils in the state by removing the local effects of place of residence, income and education levels, and fiscal capacity on the variability of total current expenditure per pupil.

Specifically, redistribute total current school revenue where by 90% of the local effects of place of residence, income and education levels, and/or fiscal capacity on the variability of total current expenditure per pupil would be equalized.

3. For researchers: Replicate the study using 1988-89 Virginia public elementary and secondary education data. In 1988-89, Virginia changed their state school funding formula with the objective of obtaining a more equitable funding system. A follow up study using the 1988-89 or 1989-90 data would enable a before and after equity analysis of the new funding formula. A follow up comparison would determine if the factors of Community Type, Economic Composition of District Population, Fiscal Capacity, and Black Family Structure account for the same amount of variance of total current expenditure per pupil or if the changed funding formula improved equity.

4. Replicate the equity analysis procedure in other states to determine if the procedure is Virginia specific or applicable to all state elementary and secondary education funding systems.

5. Replicate the study using building level data.
Building level data would pinpoint state plus intra-district areas of inequality.

6. Employ pupil output measures of the percentage of high school graduates who actually attend a two year college, four year college, trade school, or no additional educational training in place of the percentage of pupils who plan to attend different educational programs.

7. Recommendation for further deliberations on the relationship between total expenditure per pupil and output measures combined with the inter-relationships of community and school variables. This may shed greater insight into the effectiveness of schools.

8. Replicate the study to test the factor composition.

9. Analyze the redistribution of total current expenditure per pupil funds generated from a structured percentage equalization regression formula as developed in this study. Equalization refers to diminishing the local effects of place of residence, income and education levels, fiscal capacity and other illegitimate factors on total current expenditure per pupil.

10. Examine the relationship between Black Family Structure, Achievement Test Scores, and total current expenditure per pupil in ADM to determine if an inequity in equal educational opportunity is occurring for a group of pupils in the Commonwealth of Virginia.

11. Discuss the findings of this study with policymakers of Virginia to assess their reaction to a redistribution of current expenditure funds to achieve equal educational opportunity for the pupils of the state.

12. Discuss the findings of this study with a legal scholar to assess their reaction to the position of the pupils in the state with regards to equal educational opportunity.

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Appendix A

Harman's Test of Significance

A test of significance can be applied to factor loadings to determine at what magnitude loadings are not a chance deviation from zero. The standard errors of factor loadings for differing sample sizes and average correlation between the variables are tabulated by Harman (1976, 443, Table B). The standard error of a factor coefficient "a" is given in Harman's Table B for samples from N = 20 to N = 500 for an average correlation from r = .10 to r = .75. When N = 130 , the average correlation from r = .30 to r = .60 would have the following standard errors:

N=130	TEST OF SIGNIFICANCE						
r	.30	.35	.40	.45	.50	.55	.60
Standard error	.115	.101	.089	.079	.069	.061	.053

Using Harman's test of significance table, factor loadings were chosen for this study that had an average value of "r" equal to or greater than .50 when N = 130. This would indicate that a factor loading of .50 or greater would have a probability of .069 or less of equaling zero.

Appendix B

Variable Definitions

Following is a comprehensive description of the twenty-four variables utilized in the factor analysis. The definition of average daily membership (ADM) is included with the variable definitions for clarification purposes. ADM is used as the divisor in several computations.

1. ADM/5-19

Percentage of resident school age children attending public elementary and secondary education for the schools by school division. Computations: March 31 ADM divided by Child Count 5-19 and multiplied by 100. (a) Count of children for Sales Tax Distribution, all children ages 5-19, as of January 1, 1987. The Virginia School Census is taken every three years (triennially) as prescribed by Sections 22.1-286 of the Virginia Code. One of the more important uses of the school census data is for the distribution of one cent of the dedicated state sales tax funds to school districts. Distribution of the state sales tax is based on the number of resident persons age 5 through 19 inclusive, plus handicapped persons of ages 2,3,4,20, and 21. (Virginia School Census 1987, 1).

2. AGICOUPL

Median Adjusted Gross Income for Married Couples per Return, 1986. In 1986 returns filed by married couples accounted for 49.2 percent of all returns and 72.5 percent of the AGI. Married couple returns are composed of all returns filed by husband-wife families, including those with dependents. Historically, married couple returns have most closely matched changes in median family income (Cox 1988, 3).

3. Percentage Black

Percentage of blacks in 1980 population. The percentages of Black are based on the count from the 1980 Census of Population, U. S. Department of Commerce (Virginia Counties and Cities 1986, DC-3).

4. CAPACITY

ATRA Fiscal Capacity Index, 1988-89

Average Tax Rate Approach (ATRA). For this index, the localities' ability to raise local revenues from thirteen tax bases was used. The

ATRA measure is sensitive to statutory differences in taxing authority granted the various forms of Virginia local governments (Salmon 1989).

5. CRIME

Serious Crime known to police, per 100,000 resident population as of July 1, 1985. Serious crimes include murder, nonnegligent manslaughter, forcible rape, robbery, and aggravated assault (U.S. Bureau of Census 1988, Item 56).

6. EFFORT

Local Fiscal Effort

Ratio of each locality's public school current expenditures to local measure of fiscal capacity and the state average fiscal effort for funding current expenditures of the public schools (Fraser 1988).

7. FEMALEHD

Female Family Householder, 1980

Percent of female family householder (no spouse present). A household with a female family householder, has no husband present (U.S. Bureau of the Census 1988, G-3).

8. INC/CAP

Personal Income Per Capita, 1985

Per capita personal income is based upon the resident population enumerated as of April 1, 1980, for 1979 and estimated as of July 1, 1986 for 1985. Total personal income is defined by the Bureau of the Census for statistical purposes as the sum of the following: wage or salary income; net nonfarm self-employment income; net farm self-employment income; Social Security and railroad retirement income; public assistance income; and all other regularly received income such as interest, dividends, veterans' payments, pensions, unemployment compensation, and alimony. The total represents the amount of personal income received before deductions for personal income taxes, Social Security, bond purchases, union dues, Medicare deductions, etc. (U.S. Bureau of Census 1988, G-7).

9. INDEXINC

Index of Personal Income Concentration, 1986

The index is a measure of the equality of personal income distribution. If all taxpayers had the same income, the index would be zero. The greater the inequality of personal income distribution, the higher the value of the index
(Cox 1988, 6).

10. INS/1000

Instructional Personnel Per 1,000 Pupils in ADM 1987-88

Beginning in 1986-87, instructional personnel positions include principals, assistant principals, guidance counselors, librarians, and teachers.

Standard 8 A of the 1986-88 Standards of Quality states:
Each school division shall employ with state and local basic, special education, and vocational education funds a minimum number of certified instructional personnel (full-time equivalent) for each 1,000 pupils in average daily membership as set forth in the Appropriations Act; certain of such full-time equivalent (FTE) instructional positions shall be funded from basic school aid pursuant to the Appropriations Act. [The Appropriations Act requires 58.3 certified instructional personnel per 1,000 pupils in ADM] For 1987-88, instructional supervisor and visiting teacher FTEs may be used in meeting the requirements of the Standards of Quality (Commonwealth of Virginia 1989, 18).

11. K-6P/STAFF

K-6 Ratio of Pupils to Instructional Personnel, 1987-88

Standard 8B of the 1986-88 Standards of Quality states:
Certified instructional personnel employed by a school division shall be assigned in such a way as to result in a division-wide ratio of pupils in average daily membership to full-time equivalent teaching positions in grades K-6 which is not greater than 25 to 1, excluding special education teachers, principals, assistant principals, counselors, and librarians (Commonwealth of Virginia, Department of Education 1989, 13).

12. MEDHOME

Median value of specified owner occupied housing units, 1980 (U.S. Bureau of Census 1988, Item 75).

13. POP86-80

Percent Population Change, 1980 to 1986 (Net Change)

Net migration represents the difference between the number of persons moving into a particular area and the number of persons moving away from the area. A positive figure indicates net immigration to the area; a negative figure indicates net outmigration from the area. Natural increase represents the difference between the number of births and deaths in a particular area. Estimates of natural increase are based upon reported vital statistics (birth certificates and death certificates) (U.S. Bureau of Census 1988, G-2).

14. POP/SQMI

Population per square mile, 1986

Total persons divided by Land area per square mile (1980). Figures on total persons for 1980 are based upon a complete, or 100 percent, count of the population as of April 1, 1980 (U.S. Bureau of Census 1988, Item 4, G-2).

15. SALARY

Average Salary of Classroom Teaching Positions 1987-88
(Commonwealth of Virginia 1989, 8).

16. TPI/ADM

Taxable personal income per ADM, 1986-88 (Commonwealth of Virginia, Department of Education 1989,40).

17. TRSINDEX

Taxable Retail Sales Index

A composite score was computed for each locality for taxable retail sales by factor analyzing two measures of taxable retail sales, Retail Sales per Capita and Taxable Retail Sales per ADM.
Source: Taxable Retail Sales divided by March 31 ADM and multiplied by 100 (Commonwealth of Virginia 1989, 40).
Retail Sales Per Capita 1982, based upon resident population estimated as of July 1, 1982. (U.S. Bureau of Census 1987, Item 155).

18. TTVP/ADM

Taxable True Value of Property (Base Year: 1983)

Real estate property taxes are levied on land from urban and suburban family residences, multi-family residences, commercial and industrial properties, and agricultural properties, as well as on buildings and improvements to these properties. Represents 42 percent of Local Revenue sources (Joint Legislative Audit and Review Commission 1988, 44).
Indicators of Ability-to-Pay Costs of Standards of Quality (Commonwealth of Virginia, Department of Education 1989,40).

19. UNEMPLOY

Unemployment, as percentage of total civilian labor force (U.S. Bureau of Census 1988, Item 82).

20. %12yrs>

Percentage of population with 12 years or more of education, 1980 (U.S. Bureau of Census 1988, Item 59).

21. %16ED=>

Percentage of population with 16 years or more of education, 1980 (U.S. Bureau of Census 1988, Item 60).

Definition of Educational Attainment, U.S. Bureau of Census: Data for educational attainment are shown for persons 25 years of age and over. The data were derived from two questions on the 1980 census questionnaire, one identifying the highest grade attended in regular school and the other asking whether the respondent finished that grade. Persons who passed a high school equivalency examination were marked "12" under the highest grade completed (if they had not completed or were not enrolled in a higher grade) (U.S. Bureau of Census 1988, G-7).

22. %HOMEOWN

Percentage of owner occupied housing units, 1980 (U.S. Bureau of Census 1988, Item 73).

23. %POVERTY

Percentage Below Poverty Level, 1979 (Persons)

For persons not in families, poverty status is determined by their personal income in relation to the appropriate poverty threshold. Inmates of institutions, persons in military group quarters and college dormitories, and unrelated individuals under 15 years old are excluded (U.S. Bureau of Census 1988, Item 68, G-7).

24. %SPECEDU

Percentage of Special Education Child Count in ADM, 1987.

Computations: Special Education Child Count by School Division divided by March 31 ADM and multiplied by 100.
Special Education Child Count by School Division, 12-1-1987 (Commonwealth of Virginia, Department of Education, Division of Management Information Services, 1989).

AVERAGE DAILY MEMBERSHIP (ADM), 1987-88

March 31 Average Daily Membership, 1987-88, is the average daily membership for the first seven months (or equivalent period) of the school year (Commonwealth of Virginia, Department of Education 1989, 2, 50).

Appendix C

Missing Data and District Composition

The following five school districts had missing data on one or more than one of the 24 variables used in the factor analysis:

District	ADM
1. Essex	1664
2. Prince George	4884
3. Colonial Beach	525
4. Grayson/Town of Fries	2487
5. West Point	681

One hundred thirty-one (131) school districts were used in computing descriptive statistics. Nine of the school district entries had combined data of two districts. They are:

1. Alleghany Highlands County & Clifton Forge City
2. Bedford County & Bedford City
3. Fairfax County & Fairfax City
4. Grayson County & Town of Fries
5. Greensville County & Emporia City
6. Halifax & Boston City
7. James City County & Williamsburg City
8. North Hampton County & Town Cape Charles
9. Rockbridge County & Lexington City

Appendix D

Factor Analysis

Descriptive Statistics

Variable	Mean	Standard Deviation	Communality
TTVP/ADM	178424.6	113289.4	0.81125
TPI/ADM	62043.91	28778.99	0.84813
FEMALEHD	10.2873	2.782652	0.88519
INC/CAP	9866.721	2509.243	0.89837
%HOMEOWN	72.25237	11.41597	0.82538
MEDHOME	40278.96	13560.01	0.92453
UNEMPLOY	6.872223	3.46661	0.71046
CRIME/	2620.087	1852.186	0.82188
%12YRS>	51.88017	12.74906	0.90353
%16ED=>	12.80952	8.032956	0.86793
%POVERTY	13.96706	5.122348	0.77178
SALARY	24675.71	2925.811	0.80523
CAPACITY	.4588586	.1459362	0.87875
EFFORT	.4019247	.1213322	0.76368
K-6PTR	19.64921	1.892501	0.66126
POP/SQMI	827.0403	1397.573	0.81693
%BLACK	20.08175	17.64463	0.87691
%SPECEDU	11.30437	2.369391	0.59120
ADM/5-19	81.48402	8.522874	0.69850
POP86-80	4.694444	8.096402	0.73326
INDEXINC	.3380951	2.642345E-02	0.64372
INS/1000	69.76191	6.598131	0.81421
AGICOUPL	27379.61	6068.18	0.91349
TRSINDEX	8.055272E-03	1.004782	0.79044

Factor Analysis

Correlations

	TTVP/ADM	TPI/ADM	FEMALEHD	INC/CAP	%HOMEOWN	MEDHOME
TTVP/ADM	1.0000	0.4906	-.1950	0.3597	-.1820	0.3106
TPI/ADM	0.4906	1.0000	0.0802	0.7554	-.6599	0.6312
FEMALEHD	-.1950	0.0802	1.0000	-.1752	-.4045	-.3239
INC/CAP	0.3597	0.7554	-.1752	1.0000	-.4214	0.8966
%HOMEOWN	-.1820	-.6599	-.4045	-.4214	1.0000	-.4227
MEDHOME	0.3106	.6312	-.323	0.8966	-.4227	1.0000
UNEMPLOY	-.0613	-.2498	0.1268	-.5508	0.2192	-.5887
CRIME/	0.0036	0.5753	0.4851	0.4602	-.7935	0.3716
%12YRS>	0.1906	0.5858	-.2069	0.8499	-.4908	0.8830
%16ED=>	0.3355	0.7334	-.1670	0.8458	-.6324	0.8798
%POVERTY	-.0390	-.2755	0.4644	-.6576	-.0639	-.6157
SALARY	0.2025	0.7137	0.1191	0.7920	-.6135	0.7187
CAPACITY	0.7872	0.5924	-.1683	0.5065	-.4151	0.4727
EFFORT	-.0351	0.3029	0.1951	0.4993	-.3325	0.4023
K-6PTR	-.2405	-.3563	0.1637	-.3304	0.1520	-.2577
POP/SQMI	0.2052	0.7953	0.3385	0.5594	-.7880	0.4950
%BLACK	0.1021	-.0608	0.6387	-.2109	-.0759	-.2865
%SPECEDU	0.2117	0.2538	-.1686	0.1618	-.0585	0.1432
ADM/5-19	0.0086	-.2097	-.0638	0.0205	0.1254	0.0261
POP86-80	-.0121	-.0658	-.3092	0.3994	0.0384	0.5573
INDEXINC	0.2420	0.2600	0.2803	0.2022	-.3703	0.1191
INS/1000	0.3999	0.3995	-.0886	0.1985	-.1854	0.0941
AGICOUPL	0.1771	0.4667	-.1810	0.8420	-.3189	0.8809
TRSINDEX	0.1685	0.6479	0.2449	0.5118	-.7048	0.4249

Factor Analysis Correlations

	UNEMPLOY	CRIME/	%12YRS>	%16ED=>	%POVERTY	SALARY
TTVP/ADM	-.0613	0.0036	0.1906	0.3355	-.0390	0.2025
TPI/ADM	-.2498	0.5753	0.5858	0.7334	-.2755	0.7137
FEMALEHD	0.1268	0.4851	-.2069	-.1670	0.4644	0.1191
INC/CAP	-.5508	0.4602	0.8499	0.8458	-.6576	0.7920
%HOMEOWN	0.2192	-.7935	-.4908	-.6324	-.0639	-.6135
MEDHOME	-.5887	0.3716	0.8830	0.8798	-.6157	0.7187
UNEMPLOY	1.0000	-.2858	-.6021	-.4893	0.4326	-.3553
CRIME/	-.2858	1.0000	0.5139	0.5443	-.0576	0.6042
%12YRS>	-.6021	0.5139	1.0000	0.8612	-.6696	0.7176
%16ED=>	-.4893	0.5443	0.8612	1.0000	-.4261	0.7501
%POVERTY	0.4326	-.0576	-.6696	-.4261	1.0000	-.4188
SALARY	-.3553	0.6042	0.7176	0.7501	-.4188	1.0000
CAPACITY	-.1820	0.2914	0.4161	0.5546	-.1496	0.3187
EFFORT	-.3612	0.4699	0.5235	0.4121	-.3151	0.5083
K-6PTR	0.1119	-.1178	-.2404	-.3186	0.2583	-.2168
POP/SQMI	-.2501	0.7570	0.5633	0.6110	-.1633	0.7065
%BLACK	0.0086	0.0618	-.3199	-.2040	0.5279	-.1324
%SPECEDU	-.1890	0.0627	0.1218	0.1263	-.1453	-.0559
ADM/5-19	0.0216	-.1494	0.0225	-.0501	-.1247	-.0630
POP86-80	-.5736	0.0872	0.5242	0.3672	-.3962	0.2223
INDEXINC	0.0822	0.2866	0.1173	0.2721	0.1770	0.2541
INS/1000	0.0416	0.0933	0.1516	0.2363	-.0629	-.0110
AGICOUPL	-.6558	0.3496	0.8470	0.7447	-.6679	0.6622
TRSINDEX	-.1177	0.6924	0.4614	0.5919	-.1434	0.6099

Factor Analysis

Correlations

	CAPACITY	EFFORT	K-6P/STAFF	POP/SQMI	%BLACK	%SPECEDU
TTVP/ADM	0.7872	-.0351	-.2405	0.2052	0.1021	0.2117
TPI/ADM	0.5924	0.3029	-.3563	0.7953	-.0608	0.2538
FEMALEHD	-.1683	0.1951	0.1637	0.3385	0.6387	-.1686
INC/CAP	0.5065	0.4993	-.3304	0.5594	-.2109	0.1618
%HOMEOWN	-.4151	-.3325	0.1520	-.7880	-.0759	-.0585
MEDHOME	0.4727	0.4023	-.2577	0.4950	-.2865	0.1432
UNEMPLOY	-.1820	-.3612	0.1119	-.2501	0.0086	-.1890
CRIME/	0.2914	0.4699	-.1178	0.7570	0.0618	0.0627
%12YRS>	0.4161	0.5235	-.2404	0.5633	-.3199	0.1218
%16ED=>	0.5546	0.4121	-.3186	0.6110	-.2040	0.1263
%POVERTY	-.1496	-.3151	0.2583	-.1633	0.5279	-.1453
SALARY	0.3187	0.5083	-.2168	0.7065	-.1324	-.0559
CAPACITY	1.0000	0.0856	-.2956	0.3601	-.0239	0.2529
EFFORT	0.0856	1.0000	-.2173	0.3887	0.0679	0.0984
K-6PTR	-.2956	-.2173	1.0000	-.2512	0.2007	-.2106
POP/SQMI	0.3601	0.3887	-.2512	1.0000	-.0532	0.1666
%BLACK	-.0239	0.0679	0.2007	-.0532	1.0000	-.1884
%SPECEDU	0.2529	0.0984	-.2106	0.1666	-.1884	1.0000
ADM/5-19	0.0072	0.0044	-.0092	-.0944	-.0467	-.1964
POP86-80	0.1361	0.1840	0.0986	-.0094	-.1426	-.0399
INDEXINC	0.4451	0.1021	0.0253	0.1641	0.3031	-.1189
INS/1000	0.4506	0.1976	-.5484	0.2437	-.0720	0.4697
AGICOUPL	0.3060	0.5958	-.2216	0.4015	-.1287	0.1107
TRSINDEX	0.4913	0.1640	-.2535	0.6650	-.1565	0.1285

Factor Analysis

Correlations

	ADM/5-19	POP86-80	INDEXINC	INS/1000	AGICOUPL	TRSINDEX
TTVP/ADM	0.0086	-.0121	0.2420	0.3999	0.1771	0.1685
TPI/ADM	-.2097	-.0658	0.2600	0.3995	0.4667	0.6479
FEMALEHD	-.0638	-.3092	0.2803	-.0886	-.1810	0.2449
INC/CAP	0.0205	0.3994	0.2022	0.1985	0.8420	0.5118
%HOMEOWN	0.1254	0.0384	-.3703	-.1854	-.3189	-.7048
MEDHOME	0.0261	0.5573	0.1191	0.0941	0.8809	0.4249
UNEMPLOY	0.0216	-.5736	0.0822	0.0416	-.6558	-.1177
CRIME/	-.1494	0.0872	0.2866	0.0933	0.3496	0.6924
%12YRS>	0.0225	0.5242	0.1173	0.1516	0.8470	0.4614
%16ED=>	-.0501	0.3672	0.2721	0.2363	0.7447	0.5919
%POVERTY	-.1247	-.3962	0.1770	-.0629	-.6679	-.1434
SALARY	-.0630	0.2223	0.2541	-.0110	0.6622	0.6099
CAPACITY	0.0072	0.1361	0.4451	0.4506	0.3060	0.4913
EFFORT	0.0044	0.1840	0.1021	0.1976	0.5958	0.1640
K-6PTR	-.0092	0.0986	0.0253	-.5484	-.2216	-.2535
POP/SQMI	-.0944	-.0094	0.1641	0.2437	0.4015	0.6650
%BLACK	-.0467	-.1426	0.3031	-.0720	-.1287	-.1565
%SPECEDU	-.1964	-.0399	-.1189	0.4697	0.1107	0.1285
ADM/5-19	1.0000	0.1615	0.0950	-.1169	0.0918	-.0013
POP86-80	0.1615	1.0000	-.0216	-.2754	0.5831	-.0245
INDEXINC	0.0950	-.0216	1.0000	0.0317	0.0937	0.4037
INS/1000	-.1169	-.2754	0.0317	1.0000	0.0315	0.2249
AGICOUPL	0.0918	0.5831	0.0937	0.0315	1.0000	0.2466
TRSINDEX	-.0013	-.0245	0.4037	0.2249	0.2466	1.0000

Factor Analysis

Eigen Value Summary

No.	Eigenvalue	Percent	Cumulative Percent
1	9.0834	37.85	37.85
2	3.5518	14.80	52.65
3	2.5313	10.55	63.19
4	1.6608	6.92	70.11
5	1.3201	5.50	75.61
6	1.1086	4.62	80.23
7	0.8422	3.51	83.74
8	0.6665	2.78	86.52
9	0.6219	2.59	89.11
10	0.4829	2.01	91.12
11	0.3711	1.55	92.67
12	0.3326	1.39	94.06
13	0.2983	1.24	95.30
14	0.2221	0.93	96.22
15	0.1917	0.80	97.02
16	0.1594	0.66	97.69
17	0.1188	0.49	98.18
18	0.0974	0.41	98.59
19	0.0864	0.36	98.95
20	0.0709	0.30	99.24
21	0.0687	0.29	99.53
22	0.0470	0.20	99.72
23	0.0361	0.15	99.88
24	0.0300	0.12	100.00

Factor Analysis

Eigen Vectors

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Communality
TTVP/ADM	0.1229	-.0647	-.3756	-.4057	0.1254	0.8112
TPI/ADM	0.2718	-.1698	-.1497	0.0454	-.0424	0.8481
FEMALEHD	-.0179	-.4114	0.2873	0.0654	0.1852	0.8852
INC/CAP	0.3065	0.1040	0.0001	-.0522	0.0117	0.8984
%HOMEOWN	-.2228	0.3039	-.0909	-.0538	0.0880	0.8254
MEDHOME	0.2943	0.1791	0.0282	-.0890	-.0230	0.9245
UNEMPLOY	-.1838	-.1953	-.1594	0.0055	-.3663	0.7105
CRIME/	0.2179	-.2614	0.1983	0.1638	-.0214	0.8219
%12YRS>	0.2982	0.1474	0.0823	0.0222	-.0195	0.9035
%16ED=>	0.3054	0.0243	-.0065	-.0662	-.0622	0.8679
%POVERTY	-.1787	-.3414	0.0175	-.1331	0.1037	0.7718
SALARY	0.2775	-.0548	0.1571	0.0348	-.1506	0.8052
CAPACITY	0.1980	-.0929	-.3181	-.3698	0.0135	0.8787
EFFORT	0.1800	-.0026	0.1766	0.1832	0.3625	0.7637
K-6PTR	-.1239	-.0058	0.3092	-.1952	-.0468	0.6613
POP/SQMI	0.2471	-.2276	0.0457	0.1946	-.0832	0.8169
%BLACK	-.0660	-.2727	0.1708	-.2956	0.5144	0.8769
%SPECEDU	0.0708	0.0236	-.3245	0.2493	0.3081	0.5912
ADM/5-19	-.0122	0.1086	0.0713	-.2892	-.2194	0.6985
POP86-80	0.1191	0.3120	0.2235	-.2316	0.1129	0.7333
INDEXINC	0.0876	-.2454	0.0372	-.4484	-.0810	0.6437
INS/1000	0.0925	-.1077	-.4548	0.1601	0.2276	0.8142
AGICOUPL	0.2678	0.2073	0.1418	-.0575	0.1805	0.9135
TRSINDEX	0.2200	-.2339	-.0209	0.0410	-.3398	0.7904

Factor Analysis

Eigen Vectors

Variable	Factor 6	Communality
TTVP/ADM	-.0852	0.8112
TPI/ADM	-.1052	0.8481
FEMALEHD	0.1336	0.8852
INC/CAP	0.0439	0.8984
%HOMEOWN	0.0967	0.8254
MEDHOME	-.0845	0.9245
UNEMPLOY	0.1552	0.7105
CRIME/	-.0531	0.8219
%12YRS>	-.0062	0.9035
%16ED=>	-.0738	0.8679
%POVERTY	-.1446	0.7718
SALARY	0.0208	0.8052
CAPACITY	-.0877	0.8787
EFFORT	0.3812	0.7637
K-6PTR	-.4388	0.6613
POP/SQMI	-.0295	0.8169
%BLACK	0.0664	0.8769
%SPECEDU	-.2095	0.5912
ADM/5-19	0.6299	0.6985
POP86-80	-.1534	0.7333
INDEXINC	0.1128	0.6437
INS/1000	0.2338	0.8142
AGICOUPL	0.0948	0.9135
TRSINDEX	-.0127	0.7904

Factor Analysis

Initial Factor Loadings

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Communality
TTVP/ADM	0.3703	-.1219	-.5976	-.5229	0.1440	0.8112
TPI/ADM	0.8191	-.3200	-.2382	0.0585	-.0487	0.8481
FEMALEHD	-.0539	-.7754	0.4571	0.0843	0.2128	0.8852
INC/CAP	0.9236	0.1961	0.0001	-.0672	0.0135	0.8984
%HOMEOWN	-.6716	0.5727	-.1446	-.0694	0.1012	0.8254
MEDHOME	0.8870	0.3375	0.0449	-.1148	-.0264	0.9245
UNEMPLOY	-.5539	-.3681	-.2535	0.0071	-.4208	0.7105
CRIME/	0.6568	-.4927	0.3154	0.2111	-.0246	0.8219
%12YRS>	0.8988	0.2777	0.1310	0.0286	-.0224	0.9035
%16ED=>	0.9205	0.0458	-.0103	-.0853	-.0714	0.8679
%POVERTY	-.5387	-.6434	0.0279	-.1716	0.1192	0.7718
SALARY	0.8364	-.1033	0.2500	0.0449	-.1730	0.8052
CAPACITY	0.5967	-.1752	-.5061	-.4765	0.0155	0.8787
EFFORT	0.5426	-.0048	0.2809	0.2361	0.4165	0.7637
K-6PTR	-.3734	-.0109	0.4920	-.2515	-.0538	0.6613
POP/SQMI	0.7447	-.4290	0.0727	0.2508	-.0956	0.8169
%BLACK	-.1990	-.5140	0.2718	-.3809	0.5910	0.8769
%SPECEDU	0.2135	0.0444	-.5162	0.3213	0.3540	0.5912
ADM/5-19	-.0368	0.2047	0.1134	-.3727	-.2520	0.6985
POP86-80	0.3590	0.5881	0.3557	-.2985	0.1297	0.7333
INDEXINC	0.2639	-.4624	0.0591	-.5779	-.0931	0.6437
INS/1000	0.2788	-.2031	-.7237	0.2063	0.2615	0.8142
AGICOUPL	0.8071	0.3908	0.2257	-.0741	0.2074	0.9135
TRSINDEX	0.6631	-.4408	-.0332	0.0528	-.3904	0.7904

Factor Analysis

Initial Factor Loadings

Variable	Factor 6	Communality
TTVP/ADM	-.0897	0.8112
TPI/ADM	-.1108	0.8481
FEMALEHD	0.1406	0.8852
INC/CAP	0.0462	0.8984
%HOMEOWN	0.1018	0.8254
MEDHOME	-.0890	0.9245
UNEMPLOY	0.1634	0.7105
CRIME/	-.0559	0.8219
%12YRS>	-.0065	0.9035
%16ED=>	-.0777	0.8679
%POVERTY	-.1523	0.7718
SALARY	0.0219	0.8052
CAPACITY	-.0923	0.8787
EFFORT	0.4014	0.7637
K-6PTR	-.4620	0.6613
POP/SQMI	-.0310	0.8169
%BLACK	0.0699	0.8769
%SPECEDU	-.2206	0.5912
ADM/5-19	0.6633	0.6985
POP86-80	-.1616	0.7333
INDEXINC	0.1187	0.6437
INS/1000	0.2462	0.8142
AGICOUPL	0.0999	0.9135
TRSINDEX	-.0134	0.7904

Factor Analysis

Rotated Factor Loadings

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Communality
TTVP/ADM	0.0463	0.0964	-.2330	-.8606	0.0199	0.8112
TPI/ADM	0.7251	0.2558	-.2805	-.3748	-.0662	0.8481
FEMALEHD	0.4340	-.2781	0.0635	0.2492	0.7422	0.8852
INC/CAP	0.4755	0.7333	-.1923	-.2561	-.1711	0.8984
%HOMEOWN	-.8658	-.1094	0.0250	0.1451	-.1891	0.8254
MEDHOME	0.3893	0.7950	-.0404	-.2628	-.2652	0.9245
UNEMPLOY	-.0553	-.8044	-.0184	-.0058	-.1008	0.7105
CRIME/	0.8409	0.2107	-.0212	0.0801	0.2357	0.8219
%12YRS>	0.4727	0.7811	-.0998	-.1029	-.2213	0.9035
%16ED=>	0.5942	0.6118	-.1006	-.3198	-.1673	0.8679
%POVERTY	-.0468	-.6595	0.2161	-.0940	0.5155	0.7718
SALARY	0.7322	0.5002	-.0108	-.0538	-.0681	0.8052
CAPACITY	0.3013	0.1917	-.2058	-.8406	-.0421	0.8787
EFFORT	0.2895	0.5655	-.4038	0.2651	0.3426	0.7637
K-6PTR	-.1574	-.0972	0.7590	0.0961	0.1754	0.6613
POP/SQMI	0.8505	0.2020	-.1905	-.0357	0.0484	0.8169
%BLACK	-.0839	-.0950	0.1029	-.1443	0.9107	0.8769
%SPECEDU	-.0213	0.0986	-.4649	-.1532	-.1044	0.5912
ADM/5-19	-.1580	0.0839	-.0696	-.0357	-.0431	0.6985
POP86-80	-.1432	0.7626	0.3391	-.0650	-.0905	0.7333
INDEXINC	0.3549	-.0476	0.1427	-.5055	0.3390	0.6437
INS/1000	0.1065	-.0827	-.8124	-.3129	-.0143	0.8142
AGICOUPL	0.2502	0.9086	-.1101	-.0669	-.0376	0.9135
TRSINDEX	0.8456	0.0256	-.0768	-.2147	-.1281	0.7904

Factor Analysis

Rotated Factor Loadings

Variable	Factor 6	Communality
TTVP/ADM	-.0666	0.8112
TPI/ADM	-.1828	0.8481
FEMALEHD	0.0499	0.8852
INC/CAP	0.0519	0.8984
%HOMEOWN	0.0796	0.8254
MEDHOME	0.0038	0.9245
UNEMPLOY	0.2231	0.7105
CRIME/	-.0889	0.8219
%12YRS>	0.0225	0.9035
%16ED=>	-.0129	0.8679
%POVERTY	-.1158	0.7718
SALARY	0.1059	0.8052
CAPACITY	-.0214	0.8787
EFFORT	0.0968	0.7637
K-6PTR	-.1044	0.6613
POP/SQMI	-.1134	0.8169
%BLACK	0.0102	0.8769
%SPECEDU	-.5749	0.5912
ADM/5-19	0.8115	0.6985
POP86-80	0.0612	0.7333
INDEXINC	0.3531	0.6437
INS/1Q00	-.1946	0.8142
AGICOUPL	0.0851	0.9135
TRSINDEX	0.0793	0.7904

Appendix E

Correlations -- SIX ORTHOGONAL FACTORS

Descriptive Statistics

Variable	Mean	Standard Deviation
COM/TYPE	-1.289993E-07	1
ECON/COM	1.654122E-08	1
P/STAFF	-1.146644E-08	1
CAPACITY	-1.379785E-06	1.000001
BLACK	8.563884E-08	1
PUPIL/PO	1.818599E-06	1

Correlation Matrix

	COM/TYPE	ECON/COM	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-.0000	0.0000	0.0000	-.0000	-.0000
ECON/COM	-.0000	1.0000	0.0000	-.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-.0000	0.0000	0.0000
CAPACITY	0.0000	-.0000	-.0000	1.0000	0.0000	-.0000
BLACK	-.0000	0.0000	0.0000	0.0000	1.0000	0.0000
PUPIL/PO	-.0000	0.0000	0.0000	-.0000	0.0000	1.0000

Appendix F

Factor Scores

Due to a lack of space on the following two pages an explanation of the negative factor scores for Factor 1 (Community Type) and for Factor 2 (Economic Composition of a District Population) is presented here. An explanation of the negative factor scores relative to Factors 3, 4, and 5, will be presented on the same page as the factor scores.

Factor Scores - Community Type (Factor 1)

Negative score indicates: Low population density, low taxable retail sales, low incidence of serious crime known to police per 100,000 population, moderately low average classroom teaching salary, moderately low taxable personal income per average daily membership and high percentage of owner occupied housing units.

Factor Scores - Economic Composition of District Population (Factor 2)

Negative scores indicate: High unemployment rates, moderately high percentage of persons below poverty level, low median adjusted gross income on married couple returns, low median value of occupied housing units, moderately low percentage of the population with 12 or more years of education, moderately low percentage net population change from 1980 to 1986, moderately low personal income per capita, moderate percentage of the population with 16 years or more education, and moderate (low) fiscal effort for funding education.

Factor Scores

SORT: Factor Scores - Community Type (Factor 1)

(See page 147 for School District Code Name)

code			code			code		
19	Charles	-1.456	34	Frederic	-0.5399	87	Sussex	0.1348
86	Surry	-1.395	75	Richmond	-0.5293	62	Northamp	0.1460
53	Louisa	-1.383	63	Northumb	-0.5120	127	Suffolk	0.2083
61	New	-1.240	81	Shenando	-0.5102	88	Tazewell	0.2243
69	Powhatan	-1.150	5	Amherst	-0.4966	73	Pulaski	0.2538
37	Goochlan	-1.142	64	Lunenbur	-0.4840	113	Manassas	0.2540
56	Mathews	-1.138	13	Brunswic	-0.4790	99	Buena	0.2972
48	King	-1.129	79	Russell	-0.4626	102	Colonial	0.3282
45	Highland	-1.104	16	Campbell	-0.4606	92	Wise	0.3456
36	Gloucest	-1.028	24	Culpeper	-0.4521	77	Rockbrid	0.4360
32	Fluvanna	-1.023	42	Hanover	-0.4439	111	Hopewell	0.5192
31	Floyd	-1.006	78	Rockingh	-0.4321	59	Montgome	0.5469
74	Rappahan	-0.998	41	Halifax/	-0.4193	128	Virginia	0.6151
58	Middlese	-0.979	22	Clarke	-0.3932	43	Henrico	0.6236
11	Bland	-0.959	20	Charlott	-0.3837	122	Radford	0.7493
49	King	-0.944	52	Loudoun	-0.3740	106	Franklin	0.8135
23	Craig	-0.930	21	Chesterf	-0.3725	125	Salem	0.8819
4	Amelia	-0.929	40	Greensvi	-0.3557	116	Newport	0.9033
47	King	-0.877	44	Henry	-0.3498	29	Fairfax	0.9114
55	Isle	-0.839	80	Scott	-0.3461	103	Covingto	0.9443
25	Madison	-0.839	1	Accomack	-0.3244	108	Galax	0.9539
39	Cumberla	-0.811	2	Albemarl	-0.3219	126	Staunton	0.9686
85	Greene	-0.802	66	Page	-0.3199	109	Hampton	1.1374
60	Stafford	-0.801	68	Pittsylv	-0.3085	121	Portsmou	1.1837
12	Nelson	-0.800	50	Lancaste	-0.2171	112	Lynchbur	1.2067
15	Botetour	-0.799	94	York	-0.2142	129	Waynesbo	1.2106
6	Buckingh	-0.795	90	Washingt	-0.2124	115	Martinsv	1.2571
18	Appomatt	-0.778	114	Manassas	-0.1819	98	Bristol	1.3256
67	Carroll	-0.762	35	Giles	-0.1788	131	Winchest	1.3604
83	Patrick	-0.692	26	Dickenso	-0.1688	104	Danville	1.3896
120	Southamp	-0.691	72	Prince	-0.1581	118	Norton	1.3954
10	Poquoson	-0.686	64	Nottoway	-0.1175	119	Petersbu	1.6669
10	Bedford/	-0.686	76	Roanoke	-0.1111	124	Roanoke	1.8010
33	Franklin	-0.671	93	Wythe	-0.1021	110	Harrison	1.8140
8	Augusta	-0.667	14	Buchanan	-0.0722	130	Williams	2.0617
27	Dinwiddi	-0.636	89	Warren	-0.0631	100	Charlott	2.1532
30	Fauquier	-0.607	51	Lee	-0.0580	117	Norfolk	2.1721
17	Caroline	-0.594	82	Smyth	-0.0520	107	Frederic	2.1969
9	Bath	-0.573	3	Alleghan	-0.0394	123	Richmond	2.2439
84	Spotsylv	-0.567	101	Chesapea	-0.0124	7	Arlingto	2.8251
65	Orange	-0.557	57	Mecklenb	0.0139	97	Alexandr	3.1850
91	Westmore	-0.550	70	Prince	0.0141	105	Falls	3.3661

Sort: Factor Scores - Economic Composition of District Population (Factor 2)

(See page 147 for School District Code Name)

code			code			code		
14	Buchanan	-2.151	50	Lancas	-0.5000	111	Hopew	0.2200
9	Bath	-2.023	11	Bland	-0.4690	10	Bedford/	0.2400
26	Dickenso	-1.630	124	Roanok	-0.4480	47	King	0.2483
51	Lee	-1.555	129	Waynes	-0.4120	89	Warren	0.2658
118	Norton	-1.494	91	Westmo	-0.4030	65	Orange	0.3011
103	Covingto	-1.318	75	Richmo	-0.3870	19	Charles	0.3019
45	Highland	-1.277	112	Lynchb	-0.3860	24	Culpeper	0.4054
79	Russell	-1.259	3	Allegh	-0.3760	69	Powhatan	0.4519
92	Wise	-1.256	115	Martin	-0.3650	109	Hampton	0.4721
88	Tazewell	-1.213	81	Shenan	-0.3620	49	King	0.5322
98	Bristol	-1.185	87	Sussex	-0.3300	56	Mathews	0.5486
20	Charlott	-1.116	44	Henry	-0.3290	22	Clarke	0.5548
54	Lunenbur	-1.081	126	Staunt	-0.3130	34	Frederic	0.6001
62	Northamp	-1.049	106	Frankl	-0.2950	12	Botetour	0.6372
108	Galax	-1.034	110	Harris	-0.2850	46	Isle	0.6556
57	Mecklenb	-1.010	122	Radfor	-0.2390	39	Greene	0.6593
82	Smyth	-0.995	131	Winche	-0.2170	116	Newport	0.6939
104	Danville	-0.970	33	Frankl	-0.2150	37	Goochlan	0.7680
80	Scott	-0.933	86	Surry	-0.1890	102	Colonial	0.8186
25	Cumberla	-0.927	4	Amelia	-0.1830	48	King	0.8843
18	Carroll	-0.903	117	Norfol	-0.1790	105	Falls	0.8974
41	Halifax/	-0.835	74	Rappah	-0.1770	114	Manassas	0.9634
13	Brunswic	-0.811	83	Southa	-0.1740	42	Hanover	1.0854
93	Wythe	-0.788	130	Willia	-0.1670	101	Chesapea	1.1563
64	Nottoway	-0.762	53	Louisa	-0.1500	61	New	1.1573
99	Buena	-0.759	107	Freder	-0.1250	76	Roanoke	1.1824
68	Pittsylv	-0.743	59	Montgo	-0.1220	43	Henrico	1.2582
70	Prince	-0.713	23	Craig	-0.0860	84	Spotsylv	1.2990
60	Nelson	-0.700	100	Charlo	-0.0460	2	Albemarl	1.4495
66	Page	-0.696	5	Amhers	-0.0420	97	Alexandr	1.4497
1	Accomack	-0.688	121	Portsm	-0.0240	36	Gloucest	1.4604
63	Northumb	-0.652	6	Appoma	0.0067	128	Virginia	1.5969
67	Patrick	-0.627	17	Caroli	0.0126	30	Fauquier	1.6483
119	Petersbu	-0.626	55	Madiso	0.0174	7	Arlingto	1.7223
73	Pulaski	-0.612	123	Richmo	0.0552	120	Poquoson	1.7677
31	Floyd	-0.605	16	Campbe	0.0651	94	York	1.7799
35	Giles	-0.605	32	Fluvan	0.0724	85	Stafford	2.0551
90	Washingt	-0.588	125	Salem	0.0843	21	Chesterf	2.2051
27	Dinwiddi	-0.574	58	Middle	0.1104	113	Manassas	2.2561
40	Greensvi	-0.551	8	August	0.1487	52	Loudoun	2.4941
15	Buckingh	-0.533	78	Rockin	0.2010	72	Prince	2.7962
77	Rockbrid	-0.526	127	Suffol	0.2128	29	Fairfax	3.4440

Commonwealth of Virginia School Districts with code number. Code number corresponds with the number to the left of the school districts on pages 145, 146, 149-151.

1 Accomack
2 Albemarle
3 Alleghany H./Ct/Clifton F.
4 Amelia
5 Amherst
6 Appomattox
7 Arlington
8 Augusta
9 Bath
10 Bedford/Ct&City
11 Bland
12 Botetourt
13 Brunswick
14 Buchanan
15 Buckingham
16 Campbell
17 Caroline
18 Carroll
19 Charles City
20 Charlotte
21 Chesterfield
22 Clarke
23 Craig
24 Culpeper
25 Cumberland
26 Dickenson
27 Dinwiddie
28 Essex
29 Fairfax County/City
30 Fauquier
31 Floyd
32 Fluvanna
33 Franklin County
34 Frederick
35 Giles
36 Gloucester
37 Goochland
38 Grayson/Town of Fries
39 Greene
40 Greensville/Emporia
41 Halifax/S.Boston City
42 Hanover
43 Henrico
44 Henry
45 Highland
46 Isle of Wight
47 King George
48 King and Queen
49 King William
50 Lancaster
51 Lee
52 Loudoun
53 Louisa
54 Lunenburg
55 Madison
56 Mathews
57 Mecklenburg
58 Middlesex
59 Montgomery
60 Nelson
61 New Kent
62 Northampton/Town Cape Ch
63 Northumberland
64 Nottoway
65 Orange
66 Page
67 Patrick
68 Pittsylvania
69 Powhatan
70 Prince Edward
71 Prince George
72 Prince William
73 Pulaski
74 Rappahannock
75 Richmond County
76 Roanoke County
77 Rockbridge/Lexington Cit
78 Rockingham
79 Russell
80 Scott
81 Shenandoah
82 Smyth
83 Southampton
84 Spotsylvania
85 Stafford
86 Surry

Continued -

Commonwealth of Virginia School Districts and code number.

87 Sussex
88 Tazewell
89 Warren
90 Washington
91 Westmoreland
92 Wise
93 Wythe
94 York
95 Colonial Beach
96 West Point
97 Alexandria
98 Bristol
99 Buena Vista
100 Charlottesville
101 Chesapeake
102 Colonial Heights
103 Covington
104 Danville
105 Falls Church
106 Franklin City
107 Fredericksburg
108 Galax
109 Hampton
110 Harrisonburg
111 Hopewell
112 Lynchburg
113 Manassas City
114 Manassas Park
115 Martinsville
116 Newport News
117 Norfolk
118 Norton
119 Petersburg
120 Poquoson
121 Portsmouth
122 Radford
123 Richmond City
124 Roanoke City
125 Salem
126 Staunton
127 Suffolk
128 Virginia Beach
129 Waynesboro
130 Williamsburg/James City
131 Winchester

SORT: Factor Scores - Pupil/Professional Staff Ratio (Factor 3)

code			code			code		
9	Bath	-4.495	32	Fluvanna	-0.2730	17	Caroline	0.408
19	Charles	-3.007	46	Isle	-0.2230	66	Page	0.433
103	Covingto	-2.161	72	Prince	-0.2200	22	Clarke	0.434
100	Charlott	-2.082	56	Mathew	-0.1900	108	Galax	0.441
27	Dinwiddi	-1.917	44	Henry	-0.1710	1	Accomack	0.465
48	King	-1.899	114	Manassas	-0.1420	42	Hanover	0.470
102	Colonial	-1.704	47	King	-0.1200	34	Frederic	0.507
76	Roanoke	-1.664	55	Madison	-0.0760	117	Norfolk	0.520
97	Alexandr	-1.609	18	Carro	-0.0600	10	Bedford/	0.522
60	Nelson	-1.535	91	Westmor	-0.0160	24	Culpeper	0.545
3	Alleghan	-1.433	11	Bland	-0.0140	59	Montgome	0.552
111	Hopewell	-1.397	41	Halifax/	0.0084	15	Buckingh	0.605
45	Highland	-1.359	23	Craig	0.0149	14	Buchanan	0.644
105	Falls	-1.306	12	Botetour	0.0441	85	Stafford	0.689
131	Winchest	-1.170	29	Fairfax	0.0476	101	Chesapea	0.705
125	Salem	-1.156	93	Wythe	0.0529	57	Mecklenb	0.720
37	Goochlan	-1.118	81	Shenando	0.0631	90	Washingt	0.733
74	Rappahan	-1.064	53	Louisa	0.0721	94	York	0.773
99	Buena	-0.981	69	Powhatan	0.0759	121	Portsmou	0.823
8	Augusta	-0.810	65	Orange	0.0902	13	Brunswic	0.826
129	Waynesbo	-0.752	123	Richmond	0.1343	120	Poquoson	0.834
79	Russell	-0.730	73	Pulaski	0.1457	63	Northumb	0.847
115	Martinsv	-0.720	58	Middlese	0.1850	64	Nottoway	0.886
122	Radford	-0.718	6	Appomatt	0.1967	86	Surry	0.907
67	Patrick	-0.617	16	Campbell	0.2194	104	Danville	0.924
40	Greensvi	-0.603	54	Lunenbur	0.2220	127	Suffolk	0.932
49	King	-0.561	35	Giles	0.2343	75	Richmond	0.951
31	Floyd	-0.537	33	Franklin	0.2427	80	Scott	0.952
52	Loudoun	-0.525	20	Charlott	0.2568	89	Warren	0.994
5	Amherst	-0.507	4	Amelia	0.2588	87	Sussex	0.998
126	Staunton	-0.441	30	Fauquier	0.2689	68	Pittsylv	1.056
77	Rockbrid	-0.434	110	Harrison	0.2837	84	Spotsylv	1.057
83	Southamp	-0.412	124	Roanoke	0.3050	51	Lee	1.165
116	Newport	-0.383	25	Cumberla	0.3153	88	Tazewell	1.19
112	Lynchbur	-0.381	21	Chesterf	0.3195	70	Prince	1.216
106	Franklin	-0.365	107	Frederic	0.3302	92	Wise	1.29
39	Greene	-0.361	26	Dickenso	0.3354	50	Lancaste	1.496
98	Bristol	-0.358	78	Rockingh	0.3438	62	Northamp	1.566
7	Arlingto	-0.349	118	Norton	0.3644	36	Gloucest	1.705
43	Henrico	-0.317	61	New	0.3746	119	Petersbu	1.814
113	Manassas	-0.307	109	Hampton	0.3942	128	Virginia	2.309
2	Albemarl	-0.306	82	Smyth	0.3982	130	Williams	2.555

Negative scores indicate: Low ratio of pupils to teachers in grades K-6, and a high ratio of instructional personnel (classroom teachers, counselors, principals) to 1000 pupils.

SORT: Factor Scores: Fiscal Capacity (Factor 4)

code			code			code		
86	Surry	-4.202	65	Orange	-0.118	129	Waynesbo	0.479
53	Louisa	-2.902	123	Richmond	-0.114	20	Charlott	0.482
7	Arlingto	-2.377	15	Buckingh	-0.102	6	Appomatt	0.535
50	Lancaste	-2.274	62	Northamp	-0.061	93	Wythe	0.538
105	Falls	-2.239	4	Amelia	-0.056	120	Poquoson	0.560
130	Williams	-2.216	29	Fairfax	-0.052	127	Suffolk	0.560
9	Bath	-2.165	42	Hanover	-0.042	79	Russell	0.572
97	Alexandr	-2.125	26	Dickenso	-0.014	98	Bristol	0.590
45	Highland	-2.061	87	Sussex	0.010	68	Pittsylv	0.607
63	Northumb	-1.998	113	Manassas	0.046	8	Augusta	0.611
37	Goochlan	-1.932	115	Martinsv	0.084	16	Campbell	0.633
58	Middlese	-1.807	64	Nottoway	0.086	84	Spotsylv	0.651
74	Rappahan	-1.642	10	Bedford/	0.105	18	Carroll	0.658
2	Albemarl	-1.451	118	Norton	0.107	27	Dinwiddi	0.696
56	Mathews	-1.211	126	Staunton	0.121	35	Giles	0.746
30	Fauquier	-1.130	77	Rockbrid	0.132	103	Covingto	0.772
110	Harrison	-1.060	46	Isle	0.134	41	Halifax/	0.772
22	Clarke	-1.037	128	Virginia	0.141	5	Amherst	0.778
107	Frederic	-0.857	31	Floyd	0.192	80	Scott	0.783
75	Richmond	-0.732	17	Caroline	0.194	11	Bland	0.798
91	Westmore	-0.723	92	Wise	0.209	44	Henry	0.822
49	King	-0.493	108	Galax	0.248	39	Greene	0.844
14	Buchanan	-0.488	54	Lunenbur	0.249	85	Stafford	0.873
60	Nelson	-0.485	88	Tazewell	0.261	67	Patrick	0.879
57	Mecklenb	-0.446	33	Franklin	0.263	76	Roanoke	0.924
83	Southamp	-0.429	122	Radford	0.281	21	Chesterf	0.956
13	Brunswic	-0.417	12	Botetour	0.308	116	Newport	0.990
48	King	-0.358	66	Page	0.308	117	Norfolk	1.010
32	Fluvanna	-0.35	90	Washingt	0.334	82	Smyth	1.014
70	Prince	-0.349	78	Rockingh	0.347	106	Franklin	1.040
59	Montgome	-0.291	104	Danville	0.347	40	Greensvi	1.061
81	Shenando	-0.272	89	Warren	0.350	73	Pulaski	1.075
36	Gloucest	-0.267	19	Charles	0.384	102	Colonial	1.117
69	Powhatan	-0.263	94	York	0.395	109	Hampton	1.206
1	Accomack	-0.241	125	Salem	0.401	72	Prince	1.359
24	Culpeper	-0.232	43	Henrico	0.419	121	Portsmou	1.387
61	New	-0.232	47	King	0.429	3	Alleghan	1.391
131	Winchest	-0.211	51	Lee	0.437	111	Hopewell	1.506
25	Cumberla	-0.203	101	Chesapea	0.440	99	Buena	1.563
52	Loudoun	-0.188	124	Roanoke	0.442	114	Manassas	1.984
55	Madison	-0.184	119	Petersbu	0.445			
112	Lynchbur	-0.181	23	Craig	0.468			
100	Charlott	-0.133	34	Frederic	0.468			

Negative scores indicate: High taxable true value of property per average daily membership, high local index of fiscal capacity, and moderately high index of income concentration.

SORT: Factor Scores - Black Family Structure (Factor 5)

code			code			code		
105	Falls	-1.991	102	Colonial	-0.561	60	Nelson	0.337
14	Buchanan	-1.556	85	Stafford	-0.544	104	Danville	0.356
130	Williams	-1.512	10	Bedford/	-0.541	30	Fauquier	0.402
88	Tazewell	-1.330	128	Virginia	-0.534	112	Lynchbur	0.423
120	Poquoson	-1.314	99	Buena	-0.507	48	King	0.431
18	Carroll	-1.264	98	Bristol	-0.476	32	Fluvanna	0.446
79	Russell	-1.258	51	Lee	-0.469	64	Nottoway	0.456
23	Craig	-1.242	3	Alleghan	-0.454	70	Prince	0.538
31	Floyd	-1.228	21	Chesterf	-0.452	49	King	0.551
7	Arlingto	-1.218	84	Spotsylv	-0.422	41	Halifax/	0.600
92	Wise	-1.201	36	Gloucest	-0.397	124	Roanoke	0.670
45	Highland	-1.158	76	Roanoke	-0.362	91	Westmore	0.688
81	Shenando	-1.130	69	Powhatan	-0.349	100	Charlott	0.697
82	Smyth	-1.128	63	Northumb	-0.347	20	Charlott	0.703
78	Rockingh	-1.087	97	Alexandr	-0.325	109	Hampton	0.752
67	Patrick	-1.063	6	Appomatt	-0.321	53	Louisa	0.766
11	Bland	-1.056	56	Mathews	-0.307	27	Dinwiddi	0.802
35	Giles	-1.049	113	Manassas	-0.300	111	Hopewell	0.805
90	Washingt	-0.975	74	Rappahan	-0.266	57	Mecklenb	0.818
26	Dickenso	-0.953	44	Henry	-0.258	46	Isle	0.834
80	Scott	-0.949	94	York	-0.244	17	Caroline	0.842
73	Pulaski	-0.903	68	Pittsylv	-0.232	15	Buckingh	0.870
8	Augusta	-0.900	5	Amherst	-0.231	25	Cumberla	0.909
12	Botetour	-0.863	29	Fairfax	-0.226	101	Chesapea	0.983
2	Albemarl	-0.853	103	Covingto	-0.144	1	Accomack	1.049
66	Page	-0.846	72	Prince	-0.050	116	Newport	1.052
34	Frederic	-0.819	61	New	-0.045	47	King	1.080
33	Franklin	-0.790	22	Clarke	-0.044	115	Martinsv	1.190
93	Wythe	-0.770	50	Lancaste	-0.027	37	Goochlan	1.365
16	Campbell	-0.763	114	Manassas	-0.016	117	Norfolk	1.582
77	Rockbrid	-0.756	52	Loudoun	-0.003	83	Southamp	1.650
126	Staunton	-0.728	43	Henrico	0.006	127	Suffolk	1.651
108	Galax	-0.686	39	Greene	0.028	13	Brunswic	1.666
110	Harrison	-0.668	107	Frederic	0.028	121	Portsmou	1.744
118	Norton	-0.654	131	Winchest	0.079	62	Northamp	1.795
9	Bath	-0.647	65	Orange	0.113	40	Greensvi	2.113
129	Waynesbo	-0.646	24	Culpeper	0.161	86	Surry	2.155
89	Warren	-0.639	55	Madison	0.175	119	Petersbu	2.429
42	Hanover	-0.605	54	Lunenbur	0.244	106	Franklin	2.519
125	Salem	-0.595	58	Middlese	0.283	87	Sussex	2.537
59	Montgome	-0.580	75	Richmond	0.321	123	Richmond	2.668
122	Radford	-0.566	4	Amelia	0.336	19	Charles	2.698

Negative scores indicate: Low percentage black of 1980 population, low percentage of households with female householder (no spouse present), and moderately low percentage of persons below poverty level.

SORT: Factor Scores - Pupil Population (Factor 6)

code			code			code		
114	Manassas	-2.501	37	Goochlan	-0.410	122	Radford	0.427
83	Southamp	-2.292	59	Montgome	-0.402	84	Spotsylv	0.427
124	Roanoke	-2.063	69	Powhatan	-0.354	8	Augusta	0.428
39	Greene	-2.029	20	Charlott	-0.335	125	Salem	0.467
61	New	-1.757	116	Newport	-0.328	126	Staunton	0.482
97	Alexandr	-1.621	16	Campbell	-0.289	30	Fauquier	0.498
4	Amelia	-1.582	41	Halifax/	-0.257	43	Henrico	0.504
48	King	-1.560	66	Page	-0.224	14	Buchanan	0.534
18	Carroll	-1.537	107	Frederic	-0.224	72	Prince	0.561
70	Prince	-1.491	103	Covingto	-0.168	21	Chesterf	0.571
7	Arlingto	-1.412	58	Middlese	-0.155	85	Stafford	0.586
23	Craig	-1.350	74	Rappahan	-0.127	76	Roanoke	0.588
31	Floyd	-1.276	2	Albemarl	-0.124	49	King	0.630
25	Cumberla	-1.219	111	Hopewell	-0.121	121	Portsmou	0.642
123	Richmond	-1.174	98	Bristol	-0.113	102	Colonial	0.662
15	Buckingh	-1.174	32	Fluvanna	-0.072	99	Buena	0.724
100	Charlott	-1.156	65	Orange	-0.067	3	Alleghan	0.725
89	Warren	-1.141	112	Lynchbur	-0.048	47	King	0.726
45	Highland	-1.116	68	Pittsylv	-0.034	60	Nelson	0.735
51	Lee	-1.062	34	Frederic	-0.025	129	Waynesbo	0.781
64	Nottoway	-1.020	10	Bedford/	-0.018	92	Wise	0.794
11	Bland	-0.891	128	Virginia	-0.009	130	Williams	0.857
87	Sussex	-0.880	109	Hampton	0.047	19	Charles	0.897
62	Northamp	-0.832	35	Giles	0.086	52	Loudoun	0.906
117	Norfolk	-0.832	90	Washingt	0.112	54	Lunenbur	0.957
56	Mathews	-0.812	42	Hanover	0.134	57	Mecklenb	1.068
93	Wythe	-0.776	82	Smyth	0.142	26	Dickenso	1.198
81	Shenando	-0.722	24	Culpeper	0.144	9	Bath	1.204
127	Suffolk	-0.718	6	Appomatt	0.209	27	Dinwiddi	1.288
105	Falls	-0.692	77	Rockbrid	0.229	79	Russell	1.331
46	Isle	-0.650	40	Greensvi	0.241	88	Tazewell	1.356
78	Rockingh	-0.642	118	Norton	0.248	120	Poquoson	1.403
55	Madison	-0.556	91	Westmore	0.258	113	Manassas	1.411
13	Brunswic	-0.556	73	Pulaski	0.269	75	Richmond	1.455
22	Clarke	-0.549	5	Amherst	0.283	115	Martinsv	1.477
53	Louisa	-0.537	110	Harrison	0.320	101	Chesapea	1.510
67	Patrick	-0.508	33	Franklin	0.339	86	Surry	1.607
12	Botetour	-0.506	63	Northumb	0.349	1	Accomack	1.706
80	Scott	-0.491	36	Gloucest	0.367	94	York	1.807
44	Henry	-0.458	104	Danville	0.372	108	Galax	2.029
17	Caroline	-0.457	131	Winchest	0.378	50	Lancaste	2.500
119	Petersbu	-0.451	29	Fairfax	0.424	106	Franklin	3.540

Negative scores indicate: Low percentage of pupils in average daily membership to the number of school age children 5-19, and moderately high percentage of special education pupils to average daily membership.

Appendix G

Multiple Regression Data Output

Multiple Regression Report I

(1) TOTAL CURRENT EXPENDITURE PER ADM

Descriptive Statistics

Column	Mean	Standard Deviation
COM/TYPE	-1.537302E-07	1
ECON/CP	-1.49127E-08	1
P/STAFF	2.084921E-08	1
CAPACITY	-1.368651E-06	1
BLACK	7.402381E-08	1
PUPIL/PO	1.85231E-06	1
TEXP/ADM	3793.072	716.2734

Correlations

	COM/TYPE	ECON/CP	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
ECON/CP	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-0.0000	0.0000	0.0000
CAPACITY	0.0000	-0.0000	-0.0000	1.0000	-0.0000	-0.0000
BLACK	-0.0000	0.0000	0.0000	-0.0000	1.0000	0.0000
PUPIL/PO	-0.0000	0.0000	0.0000	-0.0000	0.0000	1.0000
TEXP/ADM	0.5965	0.2908	-0.4558	-0.4132	0.0849	-0.1201

	TEXP/ADM
COM/TYPE	0.5965
ECON/CP	0.2908
P/STAFF	-0.4558
CAPACITY	-0.4132
BLACK	0.0849
PUPIL/PO	-0.1201
TEXP/ADM	1.0000

Multiple Regression Report I

Dependent Variable: Total Current Expenditure Per Pupil in ADM

Independent Variable	Parameter Estimate	Stndized Estimate	Standard Error	t-value (b=0)	Prob. Level	Seq. R-Sqr	Simple R-Sqr
Intercept	3793.071	0.0000	26.11977	145.22	0.0000		
COM/TYPE	427.2583	0.5965	26.22404	16.29	0.0000	0.3558	0.3558
ECON/CP	208.2883	0.2908	26.22404	7.94	0.0000	0.4404	0.0846
P/STAFF	-26.4729	-0.4558	26.22404	-12.45	0.0000	0.6481	0.2077
CAPACITY	-295.9631	-0.4132	26.22403	-11.29	0.0000	0.8189	0.1707
BLACK	60.82755	0.0849	26.22404	2.32	0.0221	0.8261	0.0072
PUPIL/PO	-86.01569	-0.1201	26.22404	-3.28	0.0014	0.8405	0.0144

Analysis of Variance Report

Dependent Variable: Total Current Expenditure Per Pupil in ADM

Source	df	Sums of Squares (Sequential)	Mean Square	F-Ratio	Prob. Level
Constant	1	1.812811E+09	1.812811E+09		
Model	6	5.390139E+07	8983565	104.51	0.000
Error	119	1.022954E+07	85962.55		
Total	125	6.413094E+07	513047.5		
Root Mean Square Error			293.1937		
Mean of Dependent Variable			3793.072		
Coefficient of Variation			7.729718E-02		
R Squared			0.8405		
Adjusted R Squared			0.8324		

Multiple Regression Report II

(2) LOCAL SUPPORT FOR EXPENDITURE PER ADM

Descriptive Statistics

Column	Mean	Standard Deviation
COM/TYPE	-1.537302E-07	1
ECON/CP	-1.49127E-08	1
P/STAFF	2.084921E-08	1
CAPACITY	-1.368651E-06	1
BLACK	7.402381E-08	1
PUPIL/PO	1.85231E-06	1
LEXP/ADM	1566.976	910.6052

Correlations

	COM/TYPE	ECON/CP	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
ECON/CP	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-0.0000	0.0000	0.0000
CAPACITY	0.0000	-0.0000	-0.0000	1.0000	-0.0000	-0.0000
BLACK	-0.0000	0.0000	0.0000	-0.0000	1.0000	0.0000
PUPIL/PO	-0.0000	0.0000	0.0000	-0.0000	0.0000	1.0000
LEXP/ADM	0.5443	0.3619	-0.4167	-0.5469	0.0119	-0.0379

	LEXP/ADM
COM/TYPE	0.5443
ECON/CP	0.3619
P/STAFF	-0.4167
CAPACITY	-0.5469
BLACK	0.0119
PUPIL/PO	-0.0379
LEXP/ADM	1.0000

Multiple Regression Report II

Dependent Variable: Local Support for Expenditure Per ADM

Independent Variable	Parameter Estimate	Stndized Estimate	Standard Error	t-value (b=0)	Prob. Level	Seq. R-Sqr	Simple R-Sqr
Intercept	1566.976	0.0000	26.07233	60.10	0.0000		
COM/TYPE	495.6119	0.5443	26.1764	18.93	0.0000	0.2962	0.2962
ECON/CP	329.5633	0.3619	26.17641	12.59	0.0000	0.4272	0.1310
P/STAFF	-379.4655	-0.4167	26.1764	-14.50	0.0000	0.6009	0.1737
CAPACITY	-498.051	-0.5469	26.1764	-19.03	0.0000	0.9000	0.2991

Analysis of Variance Report

Dependent Variable: Local Support for Expenditure Per ADM

Source	df	Sums of Squares (Sequential)	Mean Square	F-Ratio	Prob. Level
Constant	1	3.093822E+08	3.093822E+08		
Model	4	9.328652E+07	2.332163E+07	272.29	0.000
Error	121	1.036372E+07	85650.56		
Total	125	1.036502E+08	829201.9		

Root Mean Square Error	292.6612
Mean of Dependent Variable	1566.976
Coefficient of Variation	.1867681
R Squared	0.9000
Adjusted R Squared	0.8967

Multiple Regression Report III

(3) RETAIL SALES AND USE TAX PER ADM

Descriptive Statistics

Column	Mean	Standard Deviation
COM/TYPE	-1.537302E-07	1
ECON/CP	-1.49127E-08	1
P/STAFF	2.084921E-08	1
CAPACITY	-1.368651E-06	1
BLACK	7.402381E-08	1
PUPIL/PO	1.85231E-06	1
RST/ADM	404.881	42.53706

Correlations

	COM/TYPE	ECON/CP	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
ECON/CP	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-0.0000	0.0000	0.0000
CAPACITY	0.0000	-0.0000	-0.0000	1.0000	-0.0000	-0.0000
BLACK	-0.0000	0.0000	0.0000	-0.0000	1.0000	0.0000
PUPIL/PO	-0.0000	0.0000	0.0000	-0.0000	0.0000	1.0000
RST/ADM	0.1962	-0.0865	0.0809	0.0212	0.1283	-0.7903

	RST/ADM
COM/TYPE	0.1962
ECON/CP	-0.0865
P/STAFF	0.0809
CAPACITY	0.0212
BLACK	0.1283
PUPIL/PO	-0.7903
RST/ADM	1.0000

Multiple Regression Report III

Dependent Variable: Retail Sales and Use Tax Per ADM

Independent Variable	Parameter Estimate	Stndized Estimate	Standard Error	t-value (b=0)	Prob. Level	Seq. R-Sqr	Simple R-Sqr
Intercept	404.881	0.0000	2.171689	186.44	0.0000		
COM/TYPE	8.346455	0.1962	2.180358	3.83	0.0002	0.0385	0.0385
BLACK	5.455436	0.1283	2.180358	2.50	0.0137	0.0549	0.0164
PUPIL/PO	-33.61536	-0.7903	2.180358	-15.42	0.0000	0.6795	0.6245

Analysis of Variance Report

Dependent Variable: Retail Sales and Use Tax Per ADM

Source	df	Sums of Squares (Sequential)	Mean Square	F-Ratio	Prob. Level
Constant	1	2.0655E+07	2.0655E+07		
Model	3	153677.3	51225.75	86.20	0.000
Error	122	72497.95	594.2455		
Total	125	226175.2	1809.402		

Root Mean Square Error	24.37715
Mean of Dependent Variable	404.881
Coefficient of Variation	6.020819E-02
R Squared	0.6795
Adjusted R Squared	0.6716

Multiple Regression Report IV

(4) FEDERAL SUPPORT PER ADM

Descriptive Statistics

Column	Mean	Standard Deviation
COM/TYPE	-1.537302E-07	1
ECON/CP	-1.49127E-08	1
P/STAFF	2.084921E-08	1
CAPACITY	-1.368651E-06	1
BLACK	7.402381E-08	1
PUPIL/PO	1.85231E-06	1
FED/ADM	246.1825	112.5088

Correlations

	COM/TYPE	ECON/CP	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
ECON/CP	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-0.0000	0.0000	0.0000
CAPACITY	0.0000	-0.0000	-0.0000	1.0000	-0.0000	-0.0000
BLACK	-0.0000	0.0000	0.0000	-0.0000	1.0000	0.0000
PUPIL/PO	-0.0000	0.0000	0.0000	-0.0000	0.0000	1.0000
FED/ADM	0.0286	-0.3147	0.0788	0.0129	0.3856	-0.1503

	FED/ADM
COM/TYPE	0.0286
ECON/CP	-0.3147
P/STAFF	0.0788
CAPACITY	0.0129
BLACK	0.3856
PUPIL/PO	-0.1503
FED/ADM	1.0000

Multiple Regression Report IV

Dependent Variable: FED/ADM

Independent Variable	Parameter Estimate	Stndized Estimate	Standard Error	t-value (b=0)	Prob. Level	Seq. R-Sqr	Simple R-Sqr
Intercept	246.1826	0.0000	8.666732	28.41	0.0000		
ECON/CP	-35.4052	-0.3147	8.701328	-4.07	0.0001	0.0990	0.0990
BLACK	43.37944	0.3856	8.701327	4.99	0.0000	0.2477	0.1487
PUPIL/PO	-16.9093	-0.1503	8.701326	-1.94	0.0543	0.2703	0.0226

Analysis of Variance Report

Dependent Variable: FED/ADM

Source	df	Sums of Squares (Sequential)	Mean Square	F-Ratio	Prob. Level
Constant	1	7636336	7636336		
Model	3	427653.5	142551.2	15.06	0.000
Error	122	1154625	9464.142		
Total	125	1582279	12658.23		

Root Mean Square Error	97.28382
Mean of Dependent Variable	246.1825
Coefficient of Variation	.3951695
R Squared	0.2703
Adjusted R Squared	0.2523

Multiple Regression Report V

(5) ACHIEVEMENT TEST SCORE INDEX

Descriptive Statistics

Column	Mean	Standard Deviation
COM/TYPE	-1.537302E-07	1
ECON/CP	-1.49127E-08	1
P/STAFF	2.084921E-08	1
CAPACITY	-1.368651E-06	1
BLACK	7.402381E-08	1
PUPIL/PO	1.85231E-06	1
ACHIEVEM	-5.226303E-03	1.012329

Correlations

	COM/TYPE	ECON/CP	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
ECON/CP	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-0.0000	0.0000	0.0000
CAPACITY	0.0000	-0.0000	-0.0000	1.0000	-0.0000	-0.0000
BLACK	-0.0000	0.0000	0.0000	-0.0000	1.0000	0.0000
PUPIL/PO	-0.0000	0.0000	0.0000	-0.0000	0.0000	1.0000
ACHIEVEM	0.2809	0.5471	-0.0638	-0.1245	-0.5569	0.2268

	ACHIEVEM
COM/TYPE	0.2809
ECON/CP	0.5471
P/STAFF	-0.0638
CAPACITY	-0.1245
BLACK	-0.5569
PUPIL/PO	0.2268
ACHIEVEM	1.0000

Multiple Regression Report V

Dependent Variable: ACHIEVEMENT TEST SCORE INDEX

Independent Variable	Parameter Estimate	Stndized Estimate	Standard Error	t-value (b=0)	Prob. Level	Seq. R-Sqr	Simple R-Sqr
Intercept	-.523E-02	0.0000	.4553E-01	-0.11	0.9088		
COM/TYPE	.2843572	0.2809	.4571E-01	6.22	0.0000	0.0789	0.0789
ECON/CP	.553891	0.5471	.4571E-01	12.12	0.0000	0.3783	0.2994
CAPACITY	-.1260268	-0.1245	.4571E-01	-2.76	0.0067	0.3938	0.0155
BLACK	-.5637253	-0.5569	.4571E-01	-12.33	0.0000	0.7039	0.3101
PUPIL/PO	.229622	0.2268	.4571E-01	5.02	0.0000	0.7553	0.0514

Analysis of Variance Report

Dependent Variable: ACHIEVEMENT TEST SCORE INDEX

Source	df	Sums of Squares (Sequential)	Mean Square	F-Ratio	Prob. Level
Constant	1	3.441595E-03	3.441595E-03		
Model	5	96.7562	19.35124	74.08	0.000
Error	120	31.34509	.2612091		
Total	125	128.1013	1.02481		

Root Mean Square Error	.5110862
Mean of Dependent Variable	-5.226303E-03
Coefficient of Variation	-97.79116
R Squared	0.7553
Adjusted R Squared	0.7451

Multiple Regression Report VI

(6) PERCENTAGE DROPOUT

Multiple Regression Report VI

(6) PERCENTAGE DROPOUT

Descriptive Statistics

Column	Mean	Standard Deviation
COM/TYPE	-1.537302E-07	1
ECON/CP	-1.49127E-08	1
P/STAFF	2.084921E-08	1
CAPACITY	-1.368651E-06	1
BLACK	7.402381E-08	1
PUPIL/PO	1.85231E-06	1
%DROPOUT	4.785714	1.78257

Correlations

	COM/TYPE	ECON/CP	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
ECON/CP	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-0.0000	0.0000	0.0000
CAPACITY	0.0000	-0.0000	-0.0000	1.0000	-0.0000	-0.0000
BLACK	-0.0000	0.0000	0.0000	-0.0000	1.0000	0.0000
PUPIL/PO	-0.0000	0.0000	0.0000	-0.0000	0.0000	1.0000
%DROPOUT	0.2138	-0.1023	0.1014	0.0755	0.3073	-0.1485

	%DROPOUT
COM/TYPE	0.2138
ECON/CP	-0.1023
P/STAFF	0.1014
CAPACITY	0.0755
BLACK	0.3073
PUPIL/PO	-0.1485
%DROPOUT	1.0000

Multiple Regression Report VI

Dependent Variable: %DROPOUT

Independent Variable	Parameter Estimate	Stndized Estimate	Standard Error	t-value (b=0)	Prob. Level	Seq. R-Sqr	Simple R-Sqr
Intercept	4.785714	0.0000	.1484483	32.24	0.0000		
COM/TYPE	.3811419	0.2138	.1490409	2.56	0.0118	0.0457	0.0457
BLACK	.5477785	0.3073	.1490409	3.68	0.0004	0.1401	0.0944

Analysis of Variance Report

Dependent Variable: %DROPOUT

Source	df	Sums of Squares (Sequential)	Mean Square	F-Ratio	Prob. Level
Constant	1	2885.786	2885.786		
Model	2	55.66632	27.83316	10.02	0.000
Error	123	341.528	2.77665		
Total	125	397.1943	3.177554		

Root Mean Square Error	1.666328
Mean of Dependent Variable	4.785714
Coefficient of Variation	.348188
R Squared	0.1401
Adjusted R Squared	0.1262

Multiple Regression Report VII

(7) PERCENTAGE HIGH SCHOOL GRADUATES

Descriptive Statistics

Column	Mean	Standard Deviation
COM/TYPE	-1.537302E-07	1
ECON/CP	-1.49127E-08	1
P/STAFF	2.084921E-08	1
CAPACITY	-1.368651E-06	1
BLACK	7.402381E-08	1
PUPIL/PO	1.85231E-06	1
%HSGRADS	74.25238	12.85138

Correlations

	COM/TYPE	ECON/CP	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
ECON/CP	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-0.0000	0.0000	0.0000
CAPACITY	0.0000	-0.0000	-0.0000	1.0000	-0.0000	-0.0000
BLACK	-0.0000	0.0000	0.0000	-0.0000	1.0000	0.0000
PUPIL/PO	-0.0000	0.0000	0.0000	-0.0000	0.0000	1.0000
%HSGRADS	-0.0927	0.2628	-0.0423	0.0545	-0.2826	0.0049

Correlations

	%HSGRADS
COM/TYPE	-0.0927
ECON/CP	0.2628
P/STAFF	-0.0423
CAPACITY	0.0545
BLACK	-0.2826
PUPIL/PO	0.0049
%HSGRADS	1.0000

Multiple Regression Report VII

Dependent Variable: %HSGRADS

Independent Variable	Parameter Estimate	Stndized Estimate	Standard Error	t-value (b=0)	Prob. Level	Seq. R-Sqr	Simple R-Sqr
Intercept	74.25238	0.0000	1.064753	69.74	0.0000		
ECON/CP	3.377424	0.2628	1.069004	3.16	0.0020	0.0691	0.0691
BLACK	-3.631862	-0.2826	1.069004	-3.40	0.0009	0.1489	0.0799

Analysis of Variance Report

Dependent Variable: %HSGRADS

Source	df	Sums of Squares (Sequential)	Mean Square	F-Ratio	Prob. Level
Constant	1	694690.4	694690.4		
Model	2	3074.678	1537.339	10.76	0.000
Error	123	17570.08	142.8461		
Total	125	20644.75	165.158		

Root Mean Square Error	11.95183
Mean of Dependent Variable	74.25238
Coefficient of Variation	.1609622
R Squared	0.1489
Adjusted R Squared	0.1351

Multiple Regression Report VIII

(8) PERCENTAGE TRADE SCHOOL

Descriptive Statistics

Column	Mean	Standard Deviation
COM/TYPE	-1.537302E-07	1
ECON/CP	-1.49127E-08	1
P/STAFF	2.084921E-08	1
CAPACITY	-1.368651E-06	1
BLACK	7.402381E-08	1
PUPIL/PO	1.85231E-06	1
%TRADE/	7.10873	5.05849

Correlations

	COM/TYPE	ECON/CP	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
ECON/CP	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-0.0000	0.0000	0.0000
CAPACITY	0.0000	-0.0000	-0.0000	1.0000	-0.0000	-0.0000
BLACK	-0.0000	0.0000	0.0000	-0.0000	1.0000	0.0000
PUPIL/PO	-0.0000	0.0000	0.0000	-0.0000	0.0000	1.0000
%TRADE/	-0.0489	-0.0417	0.1186	0.1159	0.4103	-0.0339

	%TRADE/
COM/TYPE	-0.0489
ECON/CP	-0.0417
P/STAFF	0.1186
CAPACITY	0.1159
BLACK	0.4103
PUPIL/PO	-0.0339
%TRADE/	1.0000

Multiple Regression Report VIII

Dependent Variable: %TRADE/

Independent Variable	Parameter Estimate	Stndized Estimate	Standard Error	t-value (b=0)	Prob. Level	Seq. R-Sqr	Simple R-Sqr
Intercept	7.10873	0.0000	.4126124	17.23	0.0000		
BLACK	2.075707	0.4103	.4142595	5.01	0.0000	0.1684	0.1684

Analysis of Variance Report

Dependent Variable: %TRADE/

Source	df	Sums of Squares (Sequential)	Mean Square	F-Ratio	Prob. Level
Constant	1	6367.29	6367.29		
Model	1	538.5704	538.5704	25.11	0.000
Error	124	2659.97	21.45137		
Total	125	3198.54	25.58832		

Root Mean Square Error	4.631563
Mean of Dependent Variable	7.10873
Coefficient of Variation	.6515316
R Squared	0.1684
Adjusted R Squared	0.1617

Multiple Regression Report IX

(9) PERCENTAGE TWO YEAR COLLEGE

Descriptive Statistics

Column	Mean	Standard Deviation
COM/TYPE	-1.537302E-07	1
ECON/CP	-1.49127E-08	1
P/STAFF	2.084921E-08	1
CAPACITY	-1.368651E-06	1
BLACK	7.402381E-08	1
PUPIL/PO	1.85231E-06	1
%2YR	21.01905	8.288708

Correlations

	COM/TYPE	ECON/CP	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
ECON/CP	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-0.0000	0.0000	0.0000
CAPACITY	0.0000	-0.0000	-0.0000	1.0000	-0.0000	-0.0000
BLACK	-0.0000	0.0000	0.0000	-0.0000	1.0000	0.0000
PUPIL/PO	-0.0000	0.0000	0.0000	-0.0000	0.0000	1.0000
%2YR	-0.0283	-0.3294	-0.2704	0.1402	-0.4007	0.1229

	%2YR
COM/TYPE	-0.0283
ECON/CP	-0.3294
P/STAFF	-0.2704
CAPACITY	0.1402
BLACK	-0.4007
PUPIL/PO	0.1229
%2YR	1.0000

Multiple Regression Report IX

Dependent Variable: %2YR

Independent Variable	Parameter Estimate	Stndized Estimate	Standard Error	t-value (b=0)	Prob. Level	Seq. R-Sqr	Simple R-Sqr
Intercept	21.01905	0.0000	.5995672	35.06	0.0000		
ECON/CP	-2.730063	-0.3294	.6019607	-4.54	0.0000	0.1085	0.1085
P/STAFF	-2.241654	-0.2704	.6019605	-3.72	0.0003	0.1816	0.0731
CAPACITY	1.161717	0.1402	.6019604	1.93	0.0560	0.2013	0.0196
BLACK	-3.321092	-0.4007	.6019605	-5.52	0.0000	0.3618	0.1605

Analysis of Variance Report

Dependent Variable: %2YR

Source	df	Sums of Squares (Sequential)	Mean Square	F-Ratio	Prob. Level
Constant	1	55666.85	55666.85		
Model	4	3107.189	776.7974	17.15	0.000
Error	121	5480.645	45.29459		
Total	125	8587.834	68.70267		

Root Mean Square Error	6.730125
Mean of Dependent Variable	21.01905
Coefficient of Variation	.3201917
R Squared	0.3618
Adjusted R Squared	0.3407

Multiple Regression Report X

(10) PERCENTAGE FOUR YEAR COLLEGE

Descriptive Statistics

Column	Mean	Standard Deviation
COM/TYPE	-1.537302E-07	1
ECON/CP	-1.49127E-08	1
P/STAFF	2.084921E-08	1
CAPACITY	-1.368651E-06	1
BLACK	7.402381E-08	1
PUPIL/PO	1.85231E-06	1
%4YR	33.20238	13.31154

Correlations

	COM/TYPE	ECON/CP	P/STAFF	CAPACITY	BLACK	PUPIL/PO
COM/TYPE	1.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
ECON/CP	-0.0000	1.0000	0.0000	-0.0000	0.0000	0.0000
P/STAFF	0.0000	0.0000	1.0000	-0.0000	0.0000	0.0000
CAPACITY	0.0000	-0.0000	-0.0000	1.0000	-0.0000	-0.0000
BLACK	-0.0000	0.0000	0.0000	-0.0000	1.0000	0.0000
PUPIL/PO	-0.0000	0.0000	0.0000	-0.0000	0.0000	1.0000
%4YR	0.5648	0.5568	0.0830	-0.0987	0.0017	0.2009

	%4YR
COM/TYPE	0.5648
ECON/CP	0.5568
P/STAFF	0.0830
CAPACITY	-0.0987
BLACK	0.0017
PUPIL/PO	0.2009
%4YR	1.0000

Multiple Regression Report X

Dependent Variable: %4YR

Independent Variable	Parameter Estimate	Stndized Estimate	Standard Error	t-value (b=0)	Prob. Level	Seq. R-Sqr	Simple R-Sqr
Intercept	33.20238	0.0000	.6828334	48.62	0.0000		
COM/TYPE	7.518233	0.5648	.6855591	10.97	0.0000	0.3190	0.3190
ECON/CP	7.411228	0.5568	.6855592	10.81	0.0000	0.6290	0.3100
CAPACITY	-1.314068	-0.0987	.6855589	-1.92	0.0576	0.6387	0.0097
PUPIL/PO	2.674165	0.2009	.685559	3.90	0.0002	0.6791	0.0404

Analysis of Variance Report

Dependent Variable: %4YR

Source	df	Sums of Squares (Sequential)	Mean Square	F-Ratio	Prob. Level
Constant	1	138902.2	138902.2		
Model	4	15041.01	3760.252	64.01	0.000
Error	121	7108.622	58.74894		
Total	125	22149.63	177.197		

Root Mean Square Error	7.664786
Mean of Dependent Variable	33.20238
Coefficient of Variation	.2308505
R Squared	0.6791
Adjusted R Squared	0.6685

Vita

Mary F. Hughes
22 Arlington Court
Charleston, West Virginia

As of October, 1989, employed by the Appalachian Educational Laboratory in Charleston, West Virginia, as a Research and Development Specialist. Prior to October of 1989, was a graduate research assistant in the Division of Educational Research and Evaluation (one year) and the Division of Educational Administration (two years) at Virginia Polytechnic Institute and State University, Blacksburg, Virginia. From 1977 to May of 1986 was a public school math teacher in Stillwater, Oklahoma. Other public school employment was three years in Missouri and one year in Texas.

Place of birth was Yellville, Arkansas, which is located in northwest Arkansas in the Ozark Hills. I have moved approximately twenty-four times and have lived in eight different states.

My mother started her career as a public school teacher in a one room schoolhouse in the Ozark Hills (Arkansas) at the age of eighteen. My father was a lawyer, a member of the Arkansas House of Representatives (eight years), and business man. I have four grown children and three grandchildren.

MARY F. HUGHES

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Education

Ph.D.	Educational Research, Evaluation, and Policy studies, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, May, 1990.
M.S.	Education Administration, Oklahoma State University, Stillwater, Oklahoma, July, 1985
B.S.	Education, Northeastern State University, Tahlequah, Oklahoma, January, 1969

Work History

Oct. 1989-Present	RESEARCH AND DEVELOPMENT SPECIALIST, Rural Small Schools Program, Appalachia Educational Laboratory
1988-89	GRADUATE ASSISTANT, EDUCATIONAL RESEARCH, Virginia Polytechnic Institute and State University,Blacksburg, Virginia
Spring 1988	INTERN, AMERICAN ASSOCIATION OF COLLEGES FOR TEACHER EDUCATION, Governmental Relations, Washington, D.C.
1986-1988	GRADUATE ASSISTANT, EDUCATIONAL ADMINISTRATION, Virginia Polytechnic Institute and State University, Blacksburg, Virginia
1977-1986	MATH TEACHER, Stillwater Middle School, Stillwater, Oklahoma Development of Math Curriculum K-8; Development of Math Placement Test 5-7; Teaching Remedial, Regular, and High Math Classes

1976-1977	MATH TEACHER, Panhandle High School, Panhandle, Texas
1972-1976	LIFE INSURANCE SALES AND TRAINER, Fidelity Union Life Insurance Company, Tahlequah, Oklahoma; Fayetteville, Arkansas; Stillwater, Oklahoma One of first women life insurance sales representatives with the company. One million in sales.
1970-1972	MATH AND SCIENCE TEACHER, Lincoln R-2 Schools, 4th Grade, High School, Lincoln, Missouri
1969-1970	MATH AND SCIENCE TEACHER, Adrian High School, Adrian, Missouri
1978-1985	ADMINISTRATOR SUMMER PROGRAM, Stillwater Public Library, Stillwater, Oklahoma Supervision of three assistants and eight volunteers; select and engage special large group programs for children; prepare media coverage, program statistics and reports. Program attendance increased from 1,000 in summer of 1979 to over 7,000 in summer of 1985.

Responsibilities at Virginia Tech, 1986-89

CONFERENCE COORDINATOR with M. David Alexander, **Legal and Policy Issues in Education**, November 22-24, 1987, Blacksburg, Virginia.

PROJECT FOR WEST VIRGINIA STATE DEPARTMENT OF EDUCATION with Richard G. Salmon on the assessment of public school service personnel compensation in West Virginia, January, 1988.

CONFERENCE COORDINATOR with Wayne Worner, **First and Second Annual Administrative Conference for Educational Administration**, July, 1988 and 1989.

COORDINATOR, FALL FACULTY WORKSHOP with Glen Earthman, Education Administration Faculty, December, 1987

COMPUTER LAB COORDINATOR with Karl Hereford. Weekly computer software seminars for faculty and students; student tutorials on statistical software programs. Software programs include Westlaw, Quattro, WordPerfect, Number Cruncher, Harvard Graphics, AskSam, and StatPac Gold, 1988-89.

INSTRUCTION

Public School Law
Legal Research
Public School Finance
Intermediate Statistics
Computer Tutorials for Educational Statistics

Publications

"The Public School Administrator, The Courts, and Chronic Infectious Diseases." Richard G. Salmon & Mary F. Hughes, National Organization of Legal Problems of Education Publication, Principal's New Law Book, September, 1988.

"Sexual Harassment in the Workplace." M. David Alexander & Mary F. Hughes, National Organization of Legal Problems of Education Publication, Principal's New Law Book, September, 1988.

"An Assessment of Public School Service Personnel Compensation in West Virginia: 1986-87." Richard G. Salmon, Mary F. Hughes, & Jim Armstrong, West Virginia State Department of Education, January, 1988.

"Parade Article Misleads Public." Oklahoma Education Association Focus, Vol. 3, No. 9, June, 1985, p. 14.

Presenter

1990 Presenter, Southern Rural Education Association, Fifth Annual Conference, Atlanta, Georgia, "Assessing Classroom Environment"

1987 Presenter, Legal & Policy Issues in Education,

Blacksburg, Virginia, "Connick v. Myers: Protected Speech/Dismissal"

1984 Featured Speaker, Young Author's Fair, Stillwater, Oklahoma

1984 Presenter, Professional Center, Stillwater, Oklahoma, "On the Road to Publication"

Research Interests

Fiscal Policy in Education
Legal Policy in Education

Service to Community and State

1980 House Bill 1881, Oklahoma Blood Exchange, Act. Instrumental in the formulation and passage of HB 1881.

1981, 1982 Governors Conference on Education (Oklahoma)

1981-1986 Board of Directors, Oklahoma Eastern Division, American Red Cross, Tulsa, Oklahoma
1985, Nomination to National Committee; 1985, Chairman, Capital Fund Drive, Stillwater, Oklahoma. Raised $10,000 for ARC building in Tulsa; 1982, Representative to National ARC Meeting

1981-1986 Oklahoma Blood Exchange Council, Appointed by Governor (Oklahoma)

1984-1986 Library Trust Board, Appointment by Stillwater City Commission (Stillwater, Oklahoma)

1980-1986 Friends of the Library, Officer, Board Member (Stillwater, Oklahoma)

1980-1983 Run for the Arts, Community Arts and Crafts Show, Stillwater, Oklahoma
1980-1982, Chairman: Purchase Awards; Duties: Raise money
1983, Chairman: Entertainment; Duties: Work with professional and lay musicians

Summer, 1985	State-wide Meeting Coordinator, American Red Cross, Oklahoma Blood Institute, State Department of Health, members of the Oklahoma Blood Exchange Council, Oklahoma
1983-1985	First United Methodist Church, Stillwater, Oklahoma 1983-85, Chairman: Worship Commission 1984-85, Administrative Board 1983-85, Pastor-Parish Committee

Service to Local School District, Stillwater, Oklahoma

Math Curriculum Development Committee, 1977-78; 1982-83
Math Book Selection Committee, 1981-82
Entry Year Teacher Committee, 1982-83
Student Teacher Supervisor, 1978-86

Service to University

1986-1987	Awards and Evaluation Committee, Virginia Polytechnic Institute and State University, Blacksburg, Virginia

Honors

1982-83	Teacher of the Year - Middle School
1984-85	Oklahoma Mathematics League Contest (178 Schools), Students Place First
1985-86	Oklahoma Mathematics League Contest (178 Schools), Students Place Second
1985	Nomination to National Red Cross Committee
1986	Nomination for the 1986 National PTA Phoebe Apperson Hearst Outstanding Educator of the Year Award
1986	Delta Kappa Gamma Scholarship, Iota Chapter, Stillwater, Oklahoma

Professional Organizations

1978-1986	Stillwater Education Association 1980-81; 1981-82, Chairman: Legislative Committee 1980-82, Member, Executive Committee 1980-82, Political Action Committee

1982-83, Building Representative

1978-1986	Oklahoma Education Association
1978-1986	National Education Association
1984-1986	National Council of Teachers of Mathematics
1984-1986	Oklahoma Council of Teachers of Mathematics
1983-Present	Delta Kappa Gamma
1987-Present	American Education Finance Association
1988-Present	American Educational Research Association
1989-Present	Southern Rural Education Association

Mary Frances Young Hughes