1974

Equality of educational opportunity and educational finance: a question of the applicability of the Serrano v Priest decision

Dickie Ray Murphy
Iowa State University

Equality of educational opportunity and educational finance: a question of the applicability of the Serrano v. Priest decision

by

Dickie Ray Murphy

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Major: Economics

Approved:

Signature was redacted for privacy.

In Charge of Major Work

Signature was redacted for privacy.

For the Major Department

Signature was redacted for privacy.

For the Graduate College

Iowa State University
Ames, Iowa

1974

CONTENTS

		Page
CHAPTER I:	INTRODUCTION	1
	The Serrano v. Priest Decision	1
	The Situation	7
	The Problem	9
	Need for Study	13
	Proposal	14
CHAPTER II:	FOUNDATION PROGRAMS AND FISCAL NEUTRALITY	16
	Iowa House File 654	18
	Guaranteed Minimum Aid	19
	Millage Constraints	22
	Miscellaneous Income	23
	Maximum Allowable Growth	24
	Summary	30
CHAPTER III:	ALTERNATE AID PROGRAMS	31
	Foundation Aid Concepts	31
	Redistricting	34
	Percentage Equalizing Grants	37
	Full State Funding	47
	Conclusion	55
CHAPTER IV:	EDUCATIONAL EXPENDITURE AND EDUCATIONAL QUALITY	57
	Review of Supporting Literature	57
	Regional Teacher Salary Variation in Iowa	64
	School District Long Run Cost	68
	Size and Quality	75
	Conclusion	78
CHAPTER V:	ADJUSTMENTS TO ATTAIN COMPARABLE PER PUPIL COSTS	79
	Cost Adjustments	80
	Summary	83
CHAPTER VI:	SUMMARY AND CONCLUSIONS	85
	Findings	87
	Policy Implications	89

APPENDIX A: MATRIX OF SIMPLE CORRELATION COEFFICIENTS. 91

APPENDIX B: ANALYSIS OF REGIONAL TEACHER SALARY VARIATION: RANDOMIZED COMPLETE BLOCK DESIGN 92

SELECTED BIBLIOGRAPHY 95

ACKNOWLEDGMENTS 99

LIST OF TABLES

Table		Page
2-1	Regression Estimates of Spending Functions of 50 Iowa School Districts	28
3-1	Percentage Equalizing Using Surtax and Redistribution Compared with Percentage Equalizing with Only Positive Aid.	43
3-2	Size Class Distribution of Schools with Lower Than Average Fiscal Capacity	45
3-3	Size Class Distribution of Schools with Larger Than Average Fiscal Capacity	46
3-4	Size Class Distribution of Schools Paying Surtax.	46
3-5	Overall Breakdown of Full State Funding	53
3-6	Size Class Distribution of Districts Not Receiving Budget Growth and/or Paying Surtax.	54
3-7	Size Class Distribution of Districts Allowed Growth and/or Receiving Aid Under Full State Funding	55
4-1	Merged Area Average Teacher Salary and Merged Area Average Teacher Salary as a Percent of State Average Teacher Salary, 1970-71	65
4-2	Analysis of Variance of Teacher Salaries.	66
4-3	Size Class and Per Pupil Expenditure.	68
4-4	Regression Estimates of Cost Functions for a Stratified Random Sample of 50 Iowa School Districts	73
4-5	Analysis of Variance of Cost for a Sample of 50 Iowa School Districts.	76
5-1	Size Class Distribution of School Districts Allowed Per Pupil Cost Increase Under Full State Funding Using Adjusted and Unadjusted Data.	82

CHAPTER I: INTRODUCTION

The Serrano v. Priest Decision

The early part of the decade of the 1970's has been marked by a flurry of lawsuits across the United States questioning the constitutionality of fiscal systems currently in use for funding elementary and secondary education. Present interpretation of the United States Constitution places the responsibility for education with the individual state. Most states today have some sort of school finance system drawing revenues heavily from local property taxes.

Educational finance has long been considered an area of importance, interest and controversy. Ellwood P. Cubberly, an early writer on educational finance, felt it of primary importance. In 1906, Cubberly wrote:

> One of the most important administrative problems of today is how properly to finance the school systems of a state, as the question of sufficient revenue lies back of almost every other problem. . . .[1]

This attitude holds today. The basis of the constitutionality lawsuits, which numbered 37 in 24 states as of March 1, 1972, is the relation between Cubberly's "sufficient revenue" and "other problems."[2]

More specifically, the typical educational finance litigation of the early 1970's questioned the constitutionality of a fiscal system on the

---

[1]Ellwood P. Cubberly, School Funds and Their Apportionment (New York: Teachers College, Columbia University, 1906), p. 3.

[2]See Lawyers' Committee for Civil Rights Under Law, "Committee Report," Report No. 9, (Washington, D.C.: The Committee, March, 1972).

grounds that the system, as it functions, denies equal educational opportunity to certain groups of students. This is not a new criticism. Cubberly recognized the possibility of such a problem and expressed concern over disparities in educational opportunity. He noted:

> Theoretically, all children of the state are equally important and are entitled to have the same advantages; practically this can never be quite true. The duty of the state is to secure for all as high a minimum of good instruction as is possible, but not to reduce all to this minimum; to equalize the advantages to all as nearly as can be done with the resources at hand. . . .[3]

Thus, the allocation of funds for educational purposes has, in addition to the constraint of limited funds, an implicit constraint that the distribution be deemed socially equitable.

Most significant educational finance litigations of the early 1970's were based heavily on precedent set by the California Supreme Court in Serrano v. Priest.[4] The case was brought by plaintiffs, school children and parents from a number of Los Angeles school districts against defendants, county and state officials in charge of administering the school finance system of California.

The plaintiffs' complaint alleged that the California system of educational finance was in violation of the equal protection clauses of both the California and United States Constitutions. By making the generation of revenue for funding local schools a primary responsibility of the local district, the State of California has made the amount of money spent per child vary widely among districts, the plaintiffs claimed. This wide

---

[3]Cubberly, School Funds and Their Apportionment, p. 17.

[4]Serrano, et al. v. Priest, et al, California Supreme Court, August 30, 1971.

spending variation results from disparities in ability and willingness of local districts to tax themselves. Property tax revenue is the basic source of school funding in California, as in most states.

In the action brought by the plaintiffs, three separate allegations were made. First, the amount of money a district can spend was alleged to be a function of the property tax base of the district and the willingness of the district constituents to tax themselves. Second, property wealth per student was alleged to be distributed non-homogeneously among districts.

These two allegations form one basis of the complaint. If spending per pupil is taken as a proxy for educational opportunity, and if spending per pupil bears a positive relation to property values per pupil, educational opportunity depends on the geographic location of the child's residence. A child in a rich district has a greater educational opportunity than a child in a district which is poor in terms of property wealth.

The final allegation was that taxpayers in low property value districts were unable to provide their children with an equal education. Only by its taxing property at a rate higher than a more wealthy district can a poor district spend the same amount per student as the more wealthy district. The higher tax rates necessary for such a program would, in many cases, be prohibitive for the constituents of the poor district.[5]

A three-part opinion was offered by the California Supreme Court. The analysis by the court followed very closely the argument presented by

---

[5] Ibid., 20-24.

Coons, Clune and Sugarman in their recent book on educational opportunity.[6] This analysis is based on the legal concept of "new equal protection," as explained by Kenneth Karst, Professor of Law at the University of California.[7]

Karst explains the concept basically as follows: all laws classify people into various categories. Prior to certain civil rights cases (dealing primarily with integration and poll taxes), the only test of constitutionality for a classification brought about by a law was rationality. If a law has a rational basis for classification, it was considered constitutional.

The new concept of equal protection consists of three ideas. If a law, by the classification it creates, discriminates against a fundamental interest of a group, the law must be based on a compelling state interest rather than just being rational to remain constitutional.[8] The Court has to determine if (a) discrimination resulted from the property tax financing of schools, (b) if a fundamental interest of the group being discriminated against was involved, and (c) if a compelling state interest existed that would justify the law given that (a) and (b) were true.

Initially, the California Supreme Court addressed the question of

---

[6]John E. Coons, William H. Clune, III, and Stephen Sugarman, Private Wealth and Public Education (Cambridge, Mass.: Harvard University Press, 1970).

[7]Kenneth Karst, "Description of the Litigation in Serrano v. Priest," in Serrano v. Priest: Implications for Equal Educational Opportunity, ed. by J. Scribner (Los Angeles: U.C.L.A. Education Extension, 1971).

[8]Ibid., pp. 5-6.

whether or not education is a fundamental interest of the individual.[9] In an eloquent essay on the value of education to the individual and to society, the Court concluded that education is a fundamental interest of the individual in American society today. Five primary reasons were cited. Education is necessary for equality of economic opportunity. Everyone needs education. It is a governmental service that extends over a long period of time. The state ranks it high enough in importance to make attendance compulsory. Finally, education is "unmatched in the extent to which it molds the personality of the youth of society."[10]

Discrimination, in such a case, is dependent on the fundamental interest being distributed among groups on the basis of a suspect classification. A suspect classification is a classification which categorizes groups or individuals on the basis of a descriptive parameter which should have no relevance to the classification. A ludicrous example would be giving all red-haired people life prison sentences. Wealth, race and religious ethic are examples of suspect classifications.

By studying expenditure and property value patterns among California school districts, the Court determined that expenditures per pupil were positively related to property wealth per pupil. Examples were readily evident in which a district with a low assessed value per pupil could spend the same as a neighboring district with high assessed value only by taxing itself at a rate several times as high as the more wealthy district.[11]

---

[9]Serrano v. Priest, 33-45.

[10]Ibid., 44.

[11]Ibid., 20-21.

State equalization aid did not make up for the differences in fiscal capacity. Certain aspects of the California grants system actually contained biases which were disequalizing rather than equalizing.[12]

The Court concluded that the State of California, by devising the arbitrary boundaries of school districts which varied in property value per student, and by designing a fiscal system to fund elementary and secondary education that was primarily based on school district property taxes, had been an active agent in causing discrimination. Wealth in the form of property values was the distinguishing feature among the groups. Groups of students in low property value districts were, as a result of this state imposed categorization based on a suspect classification, being denied equal access to education--a fundamental interest.

After such a conclusion, the Court had to address the question of whether or not a compelling state interest existed to justify the existence of such a discriminatory fiscal system. As a compelling state interest, defense council presented the argument that the system had been designed to encourage local responsibility. Decentralization, the defense contended, would foster efficiency in decision making. Thus, efficiency in local district administration was the state's compelling interest for retention of the fiscal system.[13]

This argument was broken down into two components by the Court. Local administration of schools regarding educational policy matters (hiring, dismissal, educational offerings, etc.) is one aspect of local

---

[12] Ibid., 17-19.

[13] Ibid., 45.

decision making. The second aspect is that the local district can decide how much it wishes to spend per child.

Local educational policy administration need not in any way be affected by the fiscal system used to fund the school, according to the Court. The Court asserted that, indeed, local officials were in the best position for this sort of decision making. The financing system cannot be considered necessary for this aspect of local responsibility.[14]

According to the defense, allowing a district to choose how much it wishes to spend enables the district to tailor its tax-expenditure pattern to the desires of the local community. The Court, citing an example of a poor district which, at an equal tax rate, is only able to spend half as much as a more wealthy district, refused to accept the defense argument. In answer, it said ". . . such fiscal freewill is (but) a cruel illusion for the poor school districts."[15] The actual choice of level of expenditures is available only to those districts with a relatively large fiscal capacity. In terms of tax rate as a measure of effort, poor districts have to put forth maximum effort to provide minimal offerings under the California fiscal system.

The Situation

Practically all of the major school finance litigation in the United States in this decade has been based on the Serrano v. Priest precedent. The basic rulings of Serrano v. Priest can be summed up by one statement: the quality of a child's education cannot be restricted by the wealth of

---

[14] Ibid., 46.

[15] Ibid., 47.

the school district in which he resides. This is the definition of fiscal neutrality of educational finance as interpreted by the California Supreme Court. Unless otherwise noted, use of the term, neutrality, refers to this concept.

A case entitled Rodriguez v. San Antonio, based heavily on the Serrano precedent, was filed in the U.S. District Court of the Western District of Texas.[16] The plea of the plaintiffs was upheld by the Court. Upon appeal to the U.S. Supreme Court, the lower court decision was overturned by a five to four vote. Justice Lewis F. Powell, speaking for the majority, said, "It is not the province of this court to create substantive constitutional right in the name of guaranteeing equal protection of the laws. Education . . . is not among the rights afforded explicit protection under our Constitution, nor do we find any basis for saying it is implicitly so protected."[17]

The Supreme Court had not ruled on the case by studying the question of discrimination alleged to exist by the plaintiffs. It had ruled that education was not protected as a fundamental right of the individual. Thus, the criterion for application of the "new equal protection" concept was not met. Since equal protection under the law requires only rationality for a law to be constitutional, this ruling meant that the existing property tax financing in most states was constitutional.

An attack on the decision had been anticipated but not the nature of

---

[16]Rodriguez v. San Antonio, U.S. District Court of the Western District of Texas, 1971.

[17]Associated Press, "High Court Upholds Property Tax for Financing of Schools," Des Moines Register, March 22, 1973, p. 2.

the ruling of the Supreme Court. Initial reaction among proponents of the Serrano v. Priest type of reform was one of disbelief, then shock. Roy Wilkins, Executive Director of the National Association for the Advancement of Colored People, assailed the U.S. Supreme Court for taking a step back toward social inequality.[18] Education associations across the nation cried out that the Court had delayed equal access to educational opportunity for years to come.[19]

After the initial reaction of dismay, school finance reformers began to realize that the fight was not lost, but the location had changed. The fight had been dumped back in the laps of the states. The decision in California was based on the California Constitution. Michigan also had had a similar State Supreme Court ruling. Since the U.S. Supreme Court ruling on Rodriguez v. San Antonio, the New Jersey Supreme Court has ruled that New Jersey's school finance system violates the New Jersey Constitution. The Oregon and Utah state legislatures have passed reform legislation, and groups in many states are moving litigation from federal to state courts.[20]

The Problem

Continued educational finance activity after the U.S. Supreme Court ruling provides evidence of the deep interest in an equitable system of

---

[18]Roy Wilkins, "Inequality Wins in Court," Des Moines Register, April 2, 1973, p. 16.

[19]"ISEA Assails School-Aid Rule," Des Moines Register, March 23, 1973, p. 24.

[20]"School Finance Reform Isn't Dead," (editorial), Des Moines Register, April 16, 1973, p. 16.

financing education in the United States. However, the continued use of the Serrano v. Priest precedent, with its emphasis on dollar expenditures could yield undesirable problems. These problems are found in the assumptions made by the California Supreme Court and adopted by most courts following the Serrano v. Priest precedent. The assumptions constituted the expected line of attack on the Serrano logic which the U.S. Supreme Court failed to pursue.

The hypothesis that diminished financing damages the quality of school education was accepted at face value by the California Court.[21] In studying the complaints of the plaintiffs, the Court used unadjusted per pupil expenditure and unadjusted per pupil assessed valuation as primary variables of analysis. By utilizing such gross dollar figures, by assuming a positive relationship between quality and spending, and by not reviewing possible alternate concepts of educational opportunity, the California Supreme Court has implicitly equated educational opportunity with educational expenditure.

Educational expenditure per pupil may be a valid proxy for educational opportunity. It is, however, a relatively unsophisticated measure. David Kirp, in a critique of Arthur Wise's article, "The Constitutional Challenge to Inequalities in School Finance"[22] (an early argument of the Serrano type), says that this argument gives ". . . insufficient attention

---

[21]Serrano v. Priest, 26.

[22]Arthur Wise, "The Constitutional Challenge to Inequalities in School Finance," Phi Delta Kappan, November, 1969, pp. 145-48.

to the complexities of defining equality. . . ."[23] When one studies the implicit assumptions of the Serrano argument, the strength of Kirp's criticism becomes more evident. Educational, economic and sociological factors could cause disparities between educational expenditure and educational opportunity, regardless of the definition of the latter.

Utilizing per pupil expenditure as a criterion of equality requires homogeneity assumptions about many descriptive parameters of public school districts. For example, its use requires one to assume that the quality of the educational process is equivalent in any two schools spending the same amount of money per student. It assumes that there is no need variation resulting from student sociological characteristics, that is to say, there is no more money required to educate a ghetto student than a student from a middle-class suburb, and it assumes there are no economies of scale resulting from district size or school plant size.

The combined effects of school process quality variations, need variations due to socioeconomic status of the student population, and cost variations due to district size or non-quality factors could make the application of the "money spent per pupil equals quality" criterion of Serrano v. Priest questionable. It is possible to conceptualize certain types of cost which, although normally included in per pupil expenditure, do not affect the quality of a child's education. For example, in many states transportation costs, which are large in rural districts, are included in per pupil expenditure. Transportation costs are necessary expenditures of rural districts, but are not directly related to the

---

[23]David Kirp, "A Critique of Wise's Thesis," Phi Delta Kappan, November, 1969, pp. 148-51.

to the complexities of defining equality. . . ."[23] When one studies the implicit assumptions of the Serrano argument, the strength of Kirp's criticism becomes more evident. Educational, economic and sociological factors could cause disparities between educational expenditure and educational opportunity, regardless of the definition of the latter.

Utilizing per pupil expenditure as a criterion of equality requires homogeneity assumptions about many descriptive parameters of public school districts. For example, its use requires one to assume that the quality of the educational process is equivalent in any two schools spending the same amount of money per student. It assumes that there is no need variation resulting from student sociological characteristics, that is to say, there is no more money required to educate a ghetto student than a student from a middle-class suburb, and it assumes there are no economies of scale resulting from district size or school plant size.

The combined effects of school process quality variations, need variations due to socioeconomic status of the student population, and cost variations due to district size or non-quality factors could make the application of the "money spent per pupil equals quality" criterion of Serrano v. Priest questionable. It is possible to conceptualize certain types of cost which, although normally included in per pupil expenditure, do not affect the quality of a child's education. For example, in many states transportation costs, which are large in rural districts, are included in per pupil expenditure. Transportation costs are necessary expenditures of rural districts, but are not directly related to the

---

[23]David Kirp, "A Critique of Wise's Thesis," Phi Delta Kappan, November, 1969, pp. 148-51.

quality of education in those districts.

Age composition of the student population could cause per pupil expenditure to vary for a given quality education. High school students are more expensive to educate than elementary or middle school students. Schools with relatively large elementary and middle school populations should have lower per pupil costs than schools with large concentrations of high school students, assuming quality constant.

Variables which could indicate and/or affect quality could also show large variation. Breadth of course offerings often varies widely among school districts with nearly equal expenditure patterns. Pupil-teacher and pupil-professional ratios tend to vary more with size of school than with per pupil expenditure.

Use of the Serrano v. Priest criterion implicitly assumes that low expenditure by a district indicates low quality of educational offering and therefore, high educational need of that district. Educational need, however vague the concept may be, undoubtedly varies among districts. The Illinois Supreme Court ruled in the case of McInnis v. Ogilvie, that educational need was too vague a concept to use as a sole basis for aid distribution. The U.S. Supreme Court concurred in a summary opinion.[24] If low spending levels were indicative of need, it is doubtful that these rulings would have been made. Today, however, educational finance literature is stressing the importance of needs estimation in educational finance. "The number of dollars spent on education should be based on the

---

[24]McInnis v. Ogilvie, 37 U.S.L.W. 3350 (U.S. Mar. 25, 1969).

educational needs of the children rather than the wealth of the district.[25]

The spirit of the Serrano decision, that educational quality cannot be limited by wealth, is in accord with the emphasis on needs as determinant of funding found in current literature. The use of unadjusted per pupil expenditure as a proxy for educational quality obscures this need emphasis. Needs are a function of characteristics of the client population. Using this sort of measure, two districts with different needs, as determined by student characteristics, would have "equal educational opportunity" if they had equal expenditure.

If a measure of educational opportunity more refined than unadjusted per pupil expenditure can be developed, such a measure can be utilized to design fiscal systems for financing elementary and secondary education which conform to the Serrano v. Priest decision. Educational opportunity should not be restricted by school district wealth. The emphasis, however, should be on opportunity rather than expenditure.

Need for Study

July 1, 1972, Iowa officially implemented a foundation program for financing elementary and secondary education.[26] This is the fourth school financing system under which Iowa has operated in the last five years.[27] House File 654, the newly implemented Iowa law, is similar in concept and

---

[25]National Educational Finance Project, Future Directions for School Financing (Gainesville, Florida: National Educational Finance Project, 1971), p. 8.

[26]House File 654, Iowa 64th General Assembly, June 30, 1971.

[27]Iowa Code, School Aid Laws, 1966-72.

form to the California law found unconstitutional in the Serrano v. Priest case. A case based on Serrano v. Priest could possibly be brought under the Iowa Constitution.

Following Serrano v. Priest precedent and ignoring cost and quality variations among districts could increase equality of educational opportunity. However, the use of an unsophisticated measure, such as per pupil expenditure, as a proxy for educational opportunity could have adverse effects. Programs that use this measure, and conform to the letter of the Serrano case, could violate the spirit of the law if they simply equalize expenditures and if expenditures are not good proxies of educational opportunity.

Proposal

This paper proposes to study educational finance in Iowa. Evaluation of the assumptions of Serrano v. Priest will be undertaken. An analysis of the current school finance law, House File 654, will point out problems in the existing fiscal structure. A step toward refining the relation between educational expenditure and educational opportunity will be taken by studying the relations among cost, quality and district size in Iowa. Programs conforming to the letter of the Serrano v. Priest criterion that expenditures not be limited by wealth will be evaluated, through the use of simulations models, in light of the spirit of the decision that educational opportunities not be limited by factors such as wealth, race or religious ethic. Finally, a program based on a more refined concept of educational opportunity will be designed and simulated. The overall aim is to generate information about the relevant parameters

to be considered in devising an equitable fiscal structure to finance public education at the elementary and secondary levels.

CHAPTER II: FOUNDATION PROGRAMS AND FISCAL NEUTRALITY

The fiscal neutrality concept of the Serrano v. Priest decision underlies much of the continuing reform and pressure for reform in educational finance found in the U.S. today. Foundation plans, currently the most common type of grant in aid for elementary and secondary education, are being questioned as a result of this concept. This chapter is an analysis of one such foundation plan, Iowa's House File 654.[1]

Iowa's grant in aid law is a foundation program much like the one declared unconstitutional in California by the Serrano v. Priest decision. A Serrano type case was filed in the U.S. District Court of Des Moines in early March, 1972.[#] After the U.S. Supreme Court ruling on Rodriguez v. San Antonio, if the case is to be continued, it will be necessary to substantially revise it or move it to a state court.

Benson generalizes foundation plans as those grants systems which institute a spending floor in the state below which no district may spend.[2] Aid is distributed by a formula such as:

$$(1) \quad A_i = n_i F - rB_i$$

---

[1]House File 654, Iowa 64th General Assembly, June, 1971, hereafter to be referred to as H.F. 654.

[2]Charles Benson, The Economics of Education (Boston: Houghton-Mifflin Co., 1968), pp. 146-150.

[#]The suit was brought by the Iowa Property Taxpayers Association against the State Department of Public Instruction, the State Department of Revenue, and numerous state officials.

where

$A_i \equiv$ aid to district i,

$N_i \equiv$ enrollment of district i,

$F \equiv$ dollar value of the per pupil foundation,

$r \equiv$ foundation millage levy, and

$B_i \equiv$ assessed valuation of district i.

If total district costs are greater than the amount funded by the foundation, the difference in the total cost and the total foundation is funded by an additional levy on property or income. That is, if

$$(2) \quad C_i - n_i F = L_i > 0$$

then

$$(3) \quad r_i^* = \frac{L_i}{B_i} \text{ (property levy), or}$$

$$(4) \quad t_i = \frac{L_i}{Y_i} \text{ (income levy),}$$

where

$C_i \equiv$ total district cost,

$L_i \equiv$ additional cost to be locally funded,

$r_i^* \equiv$ additional local property levy,

$t_i \equiv$ additional local income tax rate, and

$Y_i \equiv$ local taxable income.

In funding additional local effort, the relation between the fiscal capacity of the district and the rate of taxation is inverse. This is the source of the Serrano v. Priest argument. Wealthy school districts are able to provide a given dollar expenditure for a much lower tax rate than are poorer districts. If the foundation provides equal educational opportunity the grant system is neutral in the Serrano v. Priest sense.

However, if any portion of the equal educational opportunity must be funded by the additional local levy, a foundation program would not be considered neutral in the Serrano v. Priest sense.[3]

Benson, in discussing foundation programs, implicitly assumes that the foundation provides equal educational opportunity. He views rate variations as an indication of either local inefficiency or local preference for a more expensive educational program. Both of these causes of cost variation should be borne by the local district in the form of higher rates.[4]

For foundation plans to fulfill the spirit of the Serrano v. Priest decision the foundation must be set at a high enough level that it provides what all would interpret as equality of educational opportunity. Because of difficulty in defining the concept of educational opportunity, this would be and is being interpreted as full state funding with inter-district equalization of expenditures as a goal.

Iowa House File 654

Iowa House File 654 was signed into law June 30, 1971. It was to take effect July 1, 1972 with the beginning of fiscal year 1973. Prior to the effective date of H.F. 654, several errors were discovered in the law. House File 1269 was passed in June, 1972 to correct the errors found in H.F. 654.[5] Reference to H.F. 654 hereafter means House File 654 as

---

[3]Serrano, et al. v. Priest, et al., California Supreme Court, August 30, 1971, pp. 17-55.

[4]Benson, Economics of Education, p. 152.

[5]House File 1269, Iowa 64th General Assembly, June, 1972.

modified by House File 1269 unless otherwise noted.

House File 654 is a foundation plan of the type previously described except for four modifications. These modifications are guaranteed minimum per student aid distribution, a constraint on budget growth, deduction of miscellaneous income from state aid, and general fund millage constraints. Each of these modifications alters the interdistrict aid distribution of the foundation plan. The following is an analysis of the impact of these four modifications.

Guaranteed Minimum Aid

Foundation programs implicitly assume that the financial needs of a school district are indicated by the number of students enrolled in that district and that the ability of the district to meet these financial needs is indicated by the district property tax base.

H.F. 654 guarantees a minimum of $200 per public school student in average daily membership. Average daily membership is the total number of students enrolled for a specified period of time divided by the total number of days school was actually held during that period. Average daily membership will generally be referred to as ADM.

As previously noted, foundation plans tend to be "non-neutral" in the Serrano v. Priest sense if the foundation does not cover total district costs. A guaranteed minimum increases this problem. For example, consider two school districts which are identical in everything except taxable property. Let both schools be spending $200 per pupil above the foundation.[#] Let School 1 have taxable property such that

---

[#]$200 per pupil is the guaranteed minimum in Iowa.

$$(5)\quad A_1 = n_1F - rB_1 = 0$$

while School 2 has taxable property such that

$$(6)\quad A_2 = n_2F - rB_2 > 0.^{\#}$$

An unmodified foundation plan would distribute aid to School 2 but not to School 1.

The additional local levy (assuming a property levy) of each school would be

$$(7)\quad L_1 = C_1 - n_1F = \$200\ n_1$$

$$(8)\quad r_1^* = \frac{L_1}{B_1}$$

for School 1 and

$$(9)\quad L_2 = C_2 - n_2F = \$200n_2$$

$$(10)\quad r_2^* = \frac{L_2}{B_2}$$

for School 2. Because of the larger value of B_1, School 1 will have a lower additional millage levy (the Serrano v. Priest non-neutrality).

With the guaranteed minimum of \$200 per student, School 1 would receive $n_1\$200$ in state aid. School 2 would receive A_2 subject to $A_2 \geq n_2\$200$. Assume that $A_2 \geq n_2\$200$. The additional local effort now becomes

$$(11)\quad L_1 = C_1 - n_1(F + \$200) = 0$$

$$(12)\quad r_1^* = \frac{L_1}{B_1} = 0$$

for School 1, while School 2 has the same additional local effort as prior to the guaranteed minimum, or

$$(13)\quad L_2 = C_2 - n_2F = \$200\ n_2$$

$^{\#}$A definition of symbols is found on page 17 of this chapter.

$$(14) \quad r_2^* = \frac{L_2}{B_2}$$

for School 2. The addition of a guaranteed minimum aid distribution to a foundation plan benefits the school with high taxable property more than the school with low taxable property. In the above case, the total millage rates without the guaranteed minimum would be $r + r_1^*$ for School 1 and $r + r_2^*$ for District 2. Normal foundation plan "non-neutrality" will make $r + r_2^* > r + r_1^*$. The addition of the guaranteed minimum yields r as the total millage for School 1, and $r + r_2^*$ as the total millage for School 2. The guaranteed minimum increases Serrano type "non-neutrality" by benefiting only schools relatively wealthy in property value.

Two reasons could explain the existence of such a seemingly inequitable clause in H.F. 654. First, in Iowa, school districts with high assessed valuation are primarily small, rural school districts.# At the time H.F. 654 was passed, rural Iowa played a dominant role in the state legislature.

A second reason for inclusion of such a modification is recognition of the fact that enrollment and taxable property may be imperfect measures of the financial needs and ability of a school district. Districts with high assessed valuation per pupil in average daily membership in Iowa also tend to be small districts. Small districts tend to have higher than average costs due to lack of economies of scale available to larger districts. In other words, a large portion of the total cost of the school district does not vary with enrollment. Therefore, each student enrolled

---

#See Appendix A for correlation of size and assessed valuation.

in a small district bears a larger portion of this cost than does a student in a larger district. For this reason, the guaranteed minimum, while increasing the susceptibility of H.F. 654 to Serrano v. Priest type criticism, could actually increase the equity of the law. It also could open the criticism that the law fosters inefficient schools in that it helps perpetuate the existence of small, high cost schools.

Millage Constraints

There are two general fund millage constraints in H.F. 654 which are intended to serve as buffers to aid the local districts and the state in adjusting to the new law. The maximum millage reduction, to last until school year 1974-75, is intended to keep the State of Iowa from paying enormous aid increases in the first few years of the foundation program. The second millage constraint, guaranteed state aid, is intended to insure that no local property tax rate increases result from H.F. 654.

In order to qualify for state aid (including the $200 minimum), the general fund millage of a district must be at least 90 percent of the previous year's general fund millage for all school years through 1974-75. If a district's millage is reduced to below 90 percent of the previous year's millage due to the working of the foundation plan, state aid is reduced until the millage is 90 percent of the previous year's millage. If the district has not reached the 90 percent maximum millage reduction constraint when state aid is zero, it funds its entire cost out of local property taxes. After 1974-75, such districts will receive at least $200 per student regardless of the amount of millage reduction.

To insure that no school district would have its general fund millage

increased as a result of the operation of H.F. 654, general fund millages are constrained, for the period from 1972-73 to 1976-77, to being no greater than the 1970-71 general fund millage. The year 1970-71 was chosen as a base year because school spending was frozen at that level for school year 1971-72.

Unofficially known as "buy-out" aid, the guaranteed aid portion of H.F. 654 actually affected very few districts. To qualify for this type of aid, a district must have a millage rate higher than the rate of the 1970-71 school year. For a total of five years beginning with school year 1972-73, these funds will be available to reduce the millage of any district with a millage rate higher than the 1970-71 general fund millage rate to a rate equal to the 1970-71 rate. Because of increased state share of total elementary-secondary funding, which is a result of H.F. 654, few schools actually qualified for guaranteed state aid.

Miscellaneous Income

The third modification of H.F. 654 which is a departure from conventional foundation programs is the inclusion of miscellaneous income as a measure of district financial ability. With the initial writing of H.F. 654, miscellaneous income included school district income from all sources except the foundation property tax, state foundation aid, Federal Title I and Public Law 874 aid, and any tax specifically provided for in H.F. 654.

Revenues from all federal sources except Title I and P.L. 874, all state categorical aids, local fines designated to go to school spending, etc., were to be deducted from state aid on a dollar for dollar basis. This resulted in direct supplantation of state funds. Federal aid was

being used to replace state aid. The result was a threatened freeze on federal aid to elementary and secondary education to the State of Iowa. As noted by the U.S. District Court in Rodriguez v. San Antonio, federal aid to elementary and secondary education is ". . . manifestly intended to provide extraordinary services at the schools . . . ."[6]

House File 1269 corrected the problem of supplantation of state funds by excluding all federal funds from the definition of miscellaneous income. State categorical aid is still included in miscellaneous income. This effectively reduces the span of state control over local educational expenditure. Categorical aid represents specific purchasing power for the local district. Foundation aid is generalized purchasing power. Since the two types of aid are mutually exclusive, most local districts will choose foundation aid rather than categorical aid for two reasons. First, the set of expenditure alternatives is greater with foundation aid; second, the conditions to qualify for foundation aid are less stringent than those necessary to qualify for most types of categorical aid. Foundation aid involves less red tape.

Maximum Allowable Growth

The per pupil expenditures of school districts are constrained to increase at a rate no greater than the three-year moving average of the increase of state general fund revenues and statewide assessed valuation of taxable property, adjusted for changes in rates, basis, or assessment practices. This growth constraint is the fourth modification which

---

[6]Rodriguez v. San Antonio, U.S. District Court of the Western District of Texas, 1971.

differentiates Iowa's H.F. 654 from a conventional foundation program.

All school districts are constrained by this maximum allowable growth figure. The state comptroller determines the maximum allowable growth. Not all schools may increase expenditures by this maximum figure. If the per pupil expenditure of a district is greater than 110 percent of the state average per pupil expenditure, or if the allowable growth would place the district above the 110 percent figure, the district is allowed no growth or only that portion of the allowable growth which would equate its cost to 110 percent of state average cost.

For purposes of analysis here, the assumption is made that all schools desire to grow at the maximum allowable rate. If districts did not desire a higher rate of budget growth than the one allowed by the growth constraint, the growth constraint would be unnecessary.

A growth constraint applied across the board like this one ties all schools which grow at the maximum allowable rate to the relative spending positions they occupied at the beginning of the growth constraint. This means that high spending schools will remain high spenders and low spending schools will remain low spending schools. The 110 percent cost constraint for allowable growth will narrow the gap between the highest spending schools and the rest but will not eliminate spending differentials or alter relative spending positions.

While such a growth constraint effectively keeps educational spending under control, it can be criticized for several reasons. First, it assumes that the rate of increase in the cost of education is the same as the rate of increase in revenues from the state general fund and property taxes. There is no apparent basis for this assumption.

Second, legislated cost increases of this type do not permit cost increases for purposes of quality improvement. If a school is a low spending school because of low quality inputs, it cannot increase the quality of its educational process by spending more money for higher quality inputs unless this can be done within the allowable growth constraint. However, if higher spending does not improve the quality of a school's educational offering, such a criticism would not be valid.

A third criticism of this growth constraint is that inequities which exist at the beginning of the period in which the constraint takes effect are maintained throughout the period. If the relative spending positions of school districts in Iowa were determined on the basis of a suspect classification such as wealth, these positions would be maintained throughout the time period of H.F. 654.

To see how the initial spending positions were determined, the following test was made. Per pupil expenditure net of federal funds was chosen as a measure of state-local expenditures. To see what determined the relative spending positions for school year 1970-71, this per pupil expenditure figure was used as a dependent variable in a multiple regression model. Independent variables selected were district assessed valuation, courses offered per district, average teacher salary, average daily membership of the district, and courses taught per teacher. Units offered, enrollment, average teacher salary, and average number of courses taught per teacher were intended as proxies for the cost and quality elements of the local district expenditures. Property value is included to isolate the effect district wealth has on local district expenditures.

A stratified random sample of 50 districts was drawn from the 453 districts of the State of Iowa. The stratification was such that each size class district was represented in the sample by the same proportion it is in the population of districts. Expenditure per student was chosen as the dependent variable and regressed on assessed valuation per student, enrollment, courses taught per teacher, total different courses taught by the district, and average teacher salary. Both linear and multiplicative equations were used with the multiplicative showing a "better" fit. The relationship between expenditures per pupil, property values, enrollment, and the variables used for quality proxies was essentially non-linear. The results of the regression estimates of the spending function of the local districts are shown in Table 2-1.

The results indicate that property wealth of the local school district plays a major role in determining the level of per pupil expenditures. In both the linear and non-linear estimates, stepwise regression indicated assessed valuation per pupil in average daily membership as the independent variable with primary explanatory power. The addition to the total R^2 made by assessed valuation was in excess of 0.41 for both equations. Based on this evidence, the relative spending differentials which the growth constraint of H.F. 654 will maintain are differentials which are determined by property values rather than cost variations. If this is the case and one assumes, as the California Supreme Court did, that higher spending means better schools, Iowa's H.F. 654 insures the continuation of a system which has its initial distribution based on a suspect classification, property wealth.

Another problem caused by the growth constraint surfaced with the

Table 2-1

Regression Estimates of Spending Functions
of 50 Iowa School Districts[a]

Variables:

Dependent: $C \equiv$ Cost per pupil

Independent: $X_1 \equiv$ Assessed valuation per student
$X_2 \equiv$ Average daily membership
$X_3 \equiv$ Average courses taught per teacher
$X_4 \equiv$ Total different courses taught
$X_5 \equiv$ Average teacher salary

Functions estimated:

(1) $C = B_o + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5$

(2) $C = B_oX_1^{B_1}X_2^{B_2}X_3^{B_3}X_4^{B_4}X_5^{B_5}$

Function	Estimates[b]			
	B_o	B_1	B_2	B_3
1	799.76	0.0126 (0.003)	-0.0505 (0.0458)	-60.3631 (51.9811)
2	60.68	0.1039 (0.0398)	-0.6322 (0.1041)	-0.6322 (0.1128)
	B_4	B_5	R_2	
1	0.8422	N.S.[c] N.S.[c]	0.448	
2	0.6097 (0.1534)	0.3790 (0.1519)	0.6828	

[a]Sample data from Iowa, Secretary's Annual Report, 1970-71.
[b]Numbers in parentheses are standard errors of the B coefficients.
[c]Average teacher salary was not significant in the linear estimate.

passage of H.F. 1269. Prior to the passage of 1269, Federal Title I and P.L. 874 funds were not included in the cost figure used to compute the maximum budget for allowable growth. All other federal funds were. Passage of 1269 removed all federal funds from miscellaneous income and

placed all federal funds including Title I and P.L. 874 funds in the cost figure used to compute the budget growth ceiling.

Funds coming to the local district as a result of P.L. 874 are known as impacted area funds. They are intended to supplement the tax base of those school districts containing large areas of federal land. Federal land pre-empts the local property tax base and could place hardship on such local districts in the absence of 874 type aid.

The major portion of federal aid to education in the State of Iowa for school year 1970-71 was Title I aid.[7] Title I aid is intended ". . . to expand and improve elementary and secondary school programs for educationally deprived children in low income areas."[8]

The effect of including all federal funds in the cost figure used to compute the budget growth ceiling is to push those marginal schools which receive large amounts of Title I and P.L. 874 funds into the category of schools allowed partial or no growth. Since the purpose of the growth constraint is to limit local property taxes by limiting school expenditures, the inclusion of either type of aid in such a constraint is questionable. A school district could be denied growth because it is so unfortunate as to be in an area containing large amounts of federal land, because it is a low income area, or because it has an aggressive, fund seeking superintendent.

---

[7]Iowa Department of Public Instruction, Iowa Secretary's Annual Report Summary (Des Moines, Iowa: Iowa Department of Public Instruction, 1971), p. 3.

[8]U.S. Department of Health, Education and Welfare, School Programs for Educationally Deprived Children (Washington, D.C.: U.S. Government Printing Office, 1965), p. 1.

Summary

Iowa's basic grant-in-aid system for elementary and secondary education is a constrained, modified, foundation program. Foundation programs are subject to criticism of the Serrano v. Priest type. The modifications and constraints of Iowa House File 654 do not enhance the ability of the law to withstand Serrano v. Priest type criticism.

CHAPTER III: ALTERNATE AID PROGRAMS

Foundation Aid Concepts

Foundation program aid plans, originally suggested for educational use by Strayer and Haig in 1923,[1] are designed to provide a minimum level of money per child at equal tax rates, regardless of district fiscal capacity. Presently, foundation plans are the most widespread type of educational grant. Foundation programs do not, the way they are most generally used, conform to the Serrano v. Priest criteria for aid distribution.

Charles Benson presents a generalization of foundation aid plans as those plans characterized by an aid distribution of the form:

$$A_i = n_i F - rB_i$$

where

$A_i \equiv$ foundation aid to district i,

$n_i \equiv$ enrollment of district i,

$F \equiv$ per student foundation (dollar terms),

$r \equiv$ compulsory local millage rate, and

$B_i \equiv$ property tax base of district i.

Variation in local tax rates can arise from spending more per student than the amount provided by the foundation plan. This type of tax rate variation is supposed to reflect either local district inefficiency or local

---

[1]George D. Strayer and Robert M. Haig, Financing of Education in the State of New York (New York: The Macmillan Co., 1923).

desire for a higher per student expenditure.[2]

In Iowa, all school districts spend a per pupil amount greater than the foundation provided by H.F. 654. This additional local effort is funded by a property levy in addition to the required foundation levy.[3] This additional local levy is:

$$r_i^* = \frac{L_i}{B_i}$$

where

$r_i^* \equiv$ additional millage in district i,

$L_i \equiv$ additional expenditure to be funded, and

$B_i \equiv$ local property tax base of district i.

Utilization of an additional property levy on an unadjusted tax base causes a type of tax rate variation not mentioned by Benson. In funding the amount spent above the foundation, rates can vary due to property tax base variations.

The Serrano v. Priest criteria do not preclude interdistrict tax rate variations due to spending variations. Rate variations caused by tax base variations would be precluded by the Serrano criteria because of the possibility that this type of variation could place limits on educational expenditure (and by the Court's assumption, educational quality).[4]

---

[2]Charles Benson, The Economics of Education (Boston: Houghton-Mifflin Co., 1968), pp. 146-50.

[3]House File 654, Iowa 64th General Assembly, June 30, 1971.

[4]John Coons, "What the Court Decided and What It Did Not Decide," in California Supreme Court Decision: Serrano v. Priest, ed. by J. Scribner (Los Angeles: U.C.L.A. Education Extension, 1971), p. 18.

Only in the extreme case where the level of the foundation is so high no district has an additional amount to be funded, or in the case where no interdistrict tax base variation exists, would an unmodified foundation plan pass the Serrano v. Priest test for constitutionality, given a strict interpretation of the criterion.

There are three alternatives to the Strayer-Haig foundation programs which are generally accepted as meeting the Serrano-Priest criteria.[5] Redistricting and restructuring the geographic size of districts for the purpose of equalization of district per pupil property values is one proposed alternative. The second is the implementation of a percentage equalizing formula for aid distribution.[#] Full state funding, with the state being totally responsible for the collection and distribution of school revenues is the third alternative.

All three of these proposals totally ignore the foundation concept. The strong points of a foundation program, providing a minimum level of resources at equal rates while maintaining a large degree of decentralization, are points that should not be ignored. Certain modifications of the foundation concept and incorporation of a percentage (power) equalizing program with it could possibly meet the Serrano criteria while maintaining the foundation program's strong points. The implication of these alternatives will now be explored.

Due to problems of inter-governmental coordination such as those

---

[5]Charles Benson, "Selecting a School Finance Alternative," in California Supreme Court Decision: Serrano v. Priest, ed. by J. Scribner (Los Angeles: U.C.L.A. Education Extension, 1971), pp. 9-16.

[#]Percentage equalizing grants are now commonly called power equalizing grants. The two terms will be used interchangeably here.

previously discussed, all federal funds will be subtracted from cost figures prior to computation of any aid distribution in the following sections. The rationale for this is essentially twofold. First, as previously noted, most federal funds are categorical grants to be utilized for specific purposes. To include them in cost-aid computations could negate the purpose of distribution of such funds. Second, the social and economic externalities of education are such that each level of government should pay a portion of the educational cost for reasons of economic efficiency if a benefit principle of taxation is used.[6] Separate accounting for the federal, state and local funds could ease the computation of costs and benefits for each level of government, and increase the overall efficiency of the aid distribution system.

Redistricting

Charles Benson feels redistricting would be a very difficult program to pass politically, and predicts that it is "not a likely prospect."[7] In the absence of legislative or judicial action forcing it, massive school district reorganization is deemed impossible in states with a large number of districts.

William Inman says, when speaking of the causes of this reluctance to reorganize, "Increased school size is often a threat to the autonomy of many units of a state school system; it may even be a threat to the

---

[6]J. Ronnie Davis, "The Social and Economic Externalities of Education," in Economic Factors Affecting the Financing of Education, ed. by Roe Johns, et al. (Gainesville, Florida: National Educational Finance Project, 1970), pp. 59-80.

[7]Benson, "Selecting a School Finance Alternative," pp. 6-7.

existence of many units." The school is often an ego extension of the "school administrators of small school districts and the members of the boards of education in such districts." Reorganization threatens the loss of current positions for these individuals.[8]

Assuming redistricting was to be found politically feasible, there are certain other basic objections that render it practically questionable. Property values, even if initially organized into equal groups, are not bound to change in a homogeneous fashion thus making reorganization a recurring event reducing the stability of the local school district.

A second problem inherent in using redistricting as a means of obtaining equality of funding at the state level is the problem of within district allocations. In multiplant school districts, it would be possible for allocation bias to exist among schools the same way it exists among districts without reorganization. This could especially be a problem in large urban districts which encompass both wealthy and poor areas of the city. A within district, among school allocative mechanism, would have to be derived to eliminate this type of problem.

According to the National Educational Finance Project, present literature points toward an increased emphasis on school needs as one of the criteria for aid distribution.[9] Educational need in this context is generally based on a discrepancy model. Arbitrary norms are established

---

[8]William Inman, "Size Factors and State School System Organization," in In Planning for School District Organization, ed. by Ralph Purdy (Lincoln, Nebraska: The Great Plains School District Reorganization Project, June, 1968), pp. 159-60.

[9]National Educational Finance Project, Future Directions for School Financing (Gainesville, Florida: National Educational Finance Project, 1971), p. 10.

by the aid distributing entity; an assessment of the departure from these norms by the children of the school, district or state is made, and the discrepancy is defined as educational need. Garms and Smith in their study of school aid in New York State, believe the consolidation of districts would be unlikely to aid in the creation of a measure based on the needs of individual schools. They see the district, as it exists, as too large a unit for this type of analysis because the assessment of need is most effectively made at either the individual pupil or school building level. Larger, reorganized districts would be detrimental for this type of estimation of educational needs.[10]

As the 65th Session of the Iowa Legislature opened, the battle over legislatively-forced reorganization was seen as a major issue. The problem facing the legislature is the tradeoff between the economic-educational feasibility of small districts, and the fact that the supporters of small schools constitute a viable political force in Iowa.[11] Evidence of the widespread support for small schools could be seen in the opposition of the Farm Bureau to the reorganization plan study suggested by Governor Robert Ray.[12] The Iowa Senate rejected redistricting by legislative mandate on April 7, 1973.[13] Because it is possible through grants

---

[10]Walter Garms and Mark Smith, Development of a Measure of Educational Need and Its Use in A State Support Formula (Albany, New York: New York State Education Conference, June, 1969), p. 26.

[11]See Richard Doak, "Aid for Small Schools Urged Over Reorganizing," Des Moines Register, November 30, 1972; and Richard Doak, "Small School Fight Seen," Des Moines Register, January 20, 1973, p. 20.

[12]James Flansburg, "School Reorganization Plan Opposed by Farm Bureau," Des Moines Register, January 11, 1973, p. 4.

[13]"Major Bills in Iowa Legislature," Des Moines Register," April 8, 1973, p. 9.

systems to create economic incentives that would promote reorganizations arising from decentralized, local decision-making, no complete assessment of possible redistricting schemes will be undertaken here.

Percentage Equalizing Grants

Percentage equalizing aid distribution is a matching grant program with the state-local percentage shares predetermined but having the amount of state support adjusted according to the fiscal capacity of the district.[14] The primary purpose of distribution of such grants-in-aid is to increase the volume of expenditures on educational services by lowering the "price" of education to the local district.

By reducing the price of additional expenditures to the local district, percentage equalizing grants tend to increase the amount of education purchased by the local district, assuming education has a negatively sloped demand curve. Total local spending will increase as state aid increases up to the point of unitary elasticity of demand upon the local district education demand curve. Beyond this point, the state must provide an increasingly larger share to increase purchases of educational services because of the inelasticity of local demand.

Percentage equalizing grants base the district tax rate on the per student amount the district draws from the common pool of educational resources available in the state. The state becomes the relevant fiscal base. Any two districts choosing to tax themselves at the same rate would generate the same dollar amount of revenue per student in average daily

---

[14]Erick Lindman, "Implementing a School Finance Alternative," in California Supreme Court Decision: Serrano v. Priest, ed. by J. Scribner (Los Angeles: U.C.L.A. Education Extension, 1971), pp. 7-8.

attendance. The state pays a predetermined percentage of locally determined expenditures, with the percentages of state support varying inversely with the fiscal capacity of the local district.

Benson, using assessed valuation per student in average daily attendance as a measure of fiscal capacity, generalizes the percentage equalizing aid distribution formula as:

$$A_i = (1 - x\frac{B_i/n_i}{B/n})C_i$$

where

$i \equiv$ local district,

$A \equiv$ aid to district,

$x \equiv$ percent of local support,

$B \equiv$ average assessed valuation for the state,

$B_i \equiv$ assessed valuation of district i,

$n \equiv$ total state enrollment,

$n_i \equiv$ total district enrollment, and

$C \equiv$ total district expenditure.

Percent of local support is weighted by the ratio of district per student assessed valuation to state per student assessed valuation. When district per student assessed valuation (B_i/n_i) is equated to state per student assessed valuation, the predetermined percentage of state support ($1 - x$), is achieved. Assessed valuation per student greater than the state average reduces the state percentage of support while assessed valuation less than state average increases the state share.[15]

---

[15]Benson, The Economics of Education, p. 148.

With pure percentage equalizing, state aid as a percent of district cost can theoretically range from +100 to $-\infty$. The upper limit is reached when B_i/n_i, assessed valuation per pupil, is zero. From the 100 percent maximum, aid is reduced by a factor of $\frac{x}{B/n}$ for each increment in district assessed valuation. State aid, per se, reaches zero at the level where $B_i/n_i = \frac{B/n}{x}$. At levels of district assessed valuation per pupil higher than $\frac{B/n}{x}$, an additional property tax, to be redistributed by the state, is levied on the district thus causing the percentage of the state support to become negative. This particular redistributional aspect of pure percentage equalizing programs has not been found politically acceptable, except in Utah.[16] However, in the opinion of John Coons, the Serrano criterion would require this type of redistribution.[17]

Percentage equalizing grants leave the problem of determining local needs entirely to the local authorities with the state sharing in the funding of that need. Benson says,[18]

> . . . there is no assurance that demands for educational spending in various local districts, reflecting the usual measure of altruism, selfishness, wisdom, shortsightedness, confusion, and prejudice, will establish a socially efficient geographic distribution of educational resources.

This is a primary criticism of the percentage equalizing grant scheme.

For purposes of control of local educational policy, percentage equalizing grants fall short of foundation programs. The cost sharing aspect of the percentage equalizing grant allows an inefficient district

---

[16] Ibid., p. 179.

[17] Coons, "What the Court Decided and What It Did Not Decide," p. 22.

[18] Benson, The Economics of Education, p. 181.

to share its extra expenses with all taxpayers of the state. Thus, the incentive for good local management is reduced.

Funds which are distributed under percentage equalizing grants are distributed in positive relation to local district spending and negative relation to local district fiscal capacity. For a given level of expenditure, a higher level of subsidy is made available for schools which are relatively poor in terms of the fiscal capacity measure, than to those which are relatively wealthy in terms of the fiscal capacity measure. For a given level of fiscal capacity, higher spending by a local district results in higher tax rates.

In the percentage equalizing formula, the quantity $(x\frac{B_i/n_i}{B/n})$ is subtracted from one to determine the percentage of state support. The quantity, x, is a constant ranging from zero to one, representing the share of the costs the state desires the local district to fund. The quantity, (1 - x), represents the state share or state percentage of funding for districts with average assessed valuation per student. The ultimate interdistrict state-local burden sharing under a system of percentage equalizing grants is thus determined by the fiscal capacity ratios of the districts, i.e., by the interdistrict wealth property distribution in the state, when property wealth per student is used to measure fiscal capacity.

Data from the 1970-71 Secretary's Annual Report, State of Iowa, yields the following sort of distribution. Of the 453 school districts existing at the time, 307 had assessed valuations per student greater than the state average and 146 had less than the state average. The higher-than-average fiscal capacity schools would receive aid at a percentage lower than the predetermined state percentage of support, while the lower-

than-average fiscal capacity schools would receive aid at a higher percentage than the predetermined state support level.

Utilizing 1970-71 school year data, the following results can be obtained. By subtracting federal funds from general fund expenditures,[#] a state-local cost figure of $541,829,082 ($827 per pupil) is derived.

Funding this 1970-71 cost figure by percentage equalizing type grants with a 35 percent[##] state support figure, assuming negative aid (pure percentage equalizing) results in state aid of $180,999,041 (33.405 percent of the total cost), and $360,830,041 in local property taxes (66.59 percent of the total cost), yielding an average millage rate of 48.833. The fact that a larger number of schools have assessed valuations per student in average daily membership greater than the break-even per pupil assessed valuation would make the percentage of state cost less than the predetermined 35 percent.

The 32 percent of schools with below-average assessed valuations per student enroll 63 percent of the students and spend 61 percent of the total budget funded from state-local sources. For the entire group receiving subsidy greater than the predetermined level, the cost per student for 1970-71 was $813.[###] This was $14 less than the state average of $827 for the same year.

[#]General fund expenditures, as defined in Iowa Department of Public Instruction Research Bulletin No. 1000, p. 104, are essentially the total costs of the district.

[##]Thirty-five percent was selected as an arbitrary rate of support. Computation indicated that a rate of state support of 64 percent would be necessary to insure that all districts except the one wealthiest receive some amount of aid, given the 1970-71 property tax distribution in Iowa, and a percentage equalizing grant system.

[###]See Table 3-1, p. 43.

Effects of allowing or not allowing surtaxes as a redistributive device are shown by Table 3-1. Assuming surtaxes are allowed, the state portion of aid to Group I schools (schools receiving positive state aid) would be reduced by 7.05 percent. Group I schools constitute 75.7 percent of the total number of districts and contain 91 percent of the students. They are backed by 83.1 percent of the total assessed valuation and account for 89.6 percent of the 1970-71 general fund expenditures. Cost per pupil in ADM and assessed valuation per pupil in ADM are both below state Average.

Group II schools would be hard hit by utilizing surtaxes as a redistributive device. These schools are primarily small schools with high ($962 average) per pupil expenditures. Imposition of the surtax would boost average per pupil tax collected in these districts to $1,179. This would be the money cost of financing an average per pupil expenditure of $962.

Group I, as described in Table 3-1, contains a subset of 146 districts which have an assessed valuation per student less than the state average. These districts, under percentage equalizing, receive a higher than average subsidy because of their relatively low fiscal capacity. Table 3-2 shows a breakdown of these schools according to size class.[#] The absolute

---

[#]The Iowa Department of Public Instruction uses the following arbitrary size index:

Size Class	District Enrollment
1	0 - 499
2	500 - 749
3	750 - 999
4	1,000 - 1,499
5	1,500 - 1,999
6	2,000 - 2,999
7	3,000 plus

Table 3-1

Percentage Equalizing Using Surtax and Redistribution Compared with Percentage Equalizing with Only Positive Aid[a]

	Total	Group I[b]	Percent of Total	Group II[c]	Percent of Total
Number of Districts	453	343	75.70	110	24.30
Assessed Valuation	$7,389,309,777	$6,143,381,264	83.10	$1,245,928,513	16.90
Enrollment	655,356	596,658	91.00	58,698	9.00
Assessed Valuation Per Public School Pupil in ADM	$11,279	$10,296		$21,226	
General Fund Expenditures	$541,829,082	$485,344,667	89.60	$56,484,667	10.40
Cost Per Pupil	$827	$813		$962	
Assuming Use of Surtax					
State Aid	$180,999,041	$193,772,240	107.05	-$12,773,199	-7.05
Local Property Tax	$360,830,041	$291,572,427	80.81	$69,258,866	19.19
Millage	48.833	47.461		55.588	

[a]From Iowa, Secretary's Annual Report, 1970-71.
[b]Group I schools are those schools below the break-even assessed valuation per student.
[c]Group II schools are those above the break-even figure (i.e., receive zero or negative aid).

Table 3-1--Continued

Assuming No Surtax	Total	Group I[b]	Percent of Total	Group II[c]	Percent of Total
State Aid	$193,772,240	$193,772,240	100.00	- 0 -	- 0 -
Local Property Tax	$348,058,094	$291,572,427	83.77	$56,485,667	16.23
Millage	47.102	47.461		45.336	
Difference in State Aid Surtax vs. No Surtax	$12,773,199	- 0 -		$12,773,199	
Difference in Local Property Tax	-$12,773,199	- 0 -		-$12,773,199	
Difference in Millage	-1.731	- 0 -		-10.252	

Table 3-2

Size Class Distribution of Schools with Lower Than Average Fiscal Capacity[a]

	Size Class							
	All	1	2	3	4	5	6	7
Number in Size Class	146	15	22	26	25	6	27	25
Percent of Size Class	100.0	12.1	19.8	37.1	42.4	26.1	71.1	86.2
Percent of Category		10.3	15.1	17.8	17.1	4.1	18.5	17.1

[a]From Iowa, Secretary's Annual Report, 1970-71.

number of schools receiving grant percentage increases seems relatively insensitive to size class. However, when the number is expressed as a percentage of the total number of schools in the size class, a definite relationship between size and relatively low fiscal capacity is indicated.

The remaining 197 Group I schools and the 110 Group II schools all have assessed valuation per student in ADM greater than the state average. For this reason, the percentage of state support is lower than the nominal rate for these schools. Table 3-3 shows the size class distribution of this group of 307 schools. Again, there is a definite relation between the size of the school and the fact that there is a lower rate of state support. The smaller schools tend to have higher than average fiscal capacity per pupil and under percentage equalizing aid distribution, would be at a relative disadvantage compared to larger schools.

By looking at the subset of these 307 schools which contains only

Table 3-3

Size Class Distribution of Schools with Larger Than Average Fiscal Capacity[a]

	Size Class							
	All	1	2	3	4	5	6	7
Number in Size Class	307	108	89	44	34	17	11	4
Percent of Size Class	100.0	87.8	80.2	62.9	57.6	73.9	28.9	13.4
Percent of Category		35.1	29.0	14.3	11.1	5.5	3.5	1.3

[a]From Iowa, Secretary's Annual Report, 1970-71.

those districts that would be surtaxed under pure percentage equalizing, the previously noted relation between size and percent of state support is reinforced. As is readily apparent from Table 3-4, around 85 percent of

Table 3-4

Size Class Distribution of Schools Paying Surtax[a]

	Size Class							
	All	1	2	3	4	5	6	7
Number in Size Class	110	59	35	10	4	1	1	0
Percent of Size Class	100.0	47.96	41.5	14.3	6.8	4.3	2.6	0
Percent of Category		53.6	31.8	9.1	3.4	0.9	0.9	0

[a]From Iowa, Secretary's Annual Report, 1970-71.

the schools paying surtax would have less than 750 students in total enrollment.

Percentage equalizing in its pure form would bias aid distribution in favor of large Iowa districts in two basic ways. Both result, not from the intent of the formula, but from the distribution of taxable property in Iowa. Because of the fact that in Iowa, as school size rises, property value per student tends to fall, most of those with less-than-average fiscal capacity, receiving a higher percentage of subsidy than average, are large. Due also to the relation between tax base per student and enrollment, small schools, as a whole, receive a lower (possibly even negative) rate of aid than do large schools.

This biases the price per student of a small school upward and can be used as a mechanism to encourage consolidation of smaller districts. As previously noted, reorganization through direct legislation is both politically difficult and practically suspect. Provision of an economic incentive to redistrict, which a percentage equalizing grants system would do by introducing a price bias based on size, would be a more feasible means of reorganization than direct legislation. It would allow a decentralized decision making process to occur. If a small district felt it necessary to maintain its separate existence, this type of process would not force the district out of existence.

Full State Funding

Full state funding is the third type of fiscal system generally accepted as constitutional under Serrano v. Priest for funding elementary and secondary education systems. This type of funding scheme reduces the

power delegated to the local districts by the state. Such proposals would not, of necessity, limit local control over educational policy. Only local control over revenue raising and budget level would have to be limited to implement full state funding. Benson views full state funding as the logical extension of the state's responsibility for education.[19]

Under such funding schemes, the state becomes the agent of primary responsibility in collecting and distributing the educational funds. The mechanisms for generation and distribution of funds are not as explicit within the concept of full state funding as they are within foundation or power-equalizing programs. The levy under full state funding must be state-wide, so any combination of statewide sales, property or income taxes could be used. In New York, where such a proposal is being seriously considered, initial use of a property levy is being proposed, with a gradual replacement by a levy deemed more equitable by the state.[20] Equity of the allocative mechanism must also be considered in devising an allocative mechanism for this type of funding scheme.

Benson sees six major areas of concern in designing a full state funding system.[21] First, since revenue generation is to become the responsibility of the state, the choice of levy and the type of expenditures to be covered by the levy should also be determined by the state. This would most likely include only operating expenses. Expenses such as debt service,

---

[19]Benson, "Selecting a School Finance Alternative," pp. 9-11.

[20]New York State Commission on the Quality, Cost, and Financing of Elementary and Secondary Education, Commission Report (Albany, New York: The State Education Department, 1972), p. 28.

[21]Benson, "Selecting a School Finance Alternative," pp. 9-11.

community service, capital equipment cost and new construction would probably be left to the discretion of the local district.

Second, if one accepts the Serrano logic, a leveling of expenditures is necessary. Leveling is a term used by educational administrators to describe equalization of expenditures. Leveling up implies inducing lower spending districts to increase expenditures at a more rapid rate than higher spending districts. Leveling down is generally interpreted to mean forcing expenditure cutbacks on higher spending districts. Otherwise, full state funding would continue to fund spending differentials founded on an improper base. Leveling down of high spending districts would be very difficult because of the large number of contractual obligations of the local district.[22] In Iowa, the same problem of contractual obligations would make leveling down of high spending districts difficult. Benson fails to take account of possible necessary expenditure variations such as lack of economies of scale in small school districts when making this point.

Leveling up brings up the third aspect of full state funding. The state must determine a defensible basis for allocating money to local districts. This implies a great need to improve measures of educational need. Benson suggests the accounting for regional price differentials as a possible starting place for defining such a base.

Fourth, to ease the process of determining a defensible basis for educational aid distribution, Benson advocates the establishment of regional educational centers for certain types of activity as a fourth

---

[22]New York State Commission, Commission Report, p. 26.

area of concern. For example, special programs for vocational education, student transport programs for the handicapped and other types of aid in kind, would reduce the need for aid in money. Most of these activities would probably exhibit economies of scale.

Fifth, any power local authorities might have to supplement educational programs by local taxation should be limited. The now common proposal is that, if such power is granted at all, any such supplemental levies be of the power equalizing type. Thus, any two districts choosing the same rate of additional taxation would generate the same amount of revenue.

Sixth and finally, Benson sees as implicit within the idea of full state funding a shift in power, from the local to the state level, to engage in collective bargaining with professional and non-professional staff. This would also ease the process of determining a defensible distribution mechanism by eliminating the possibility of inter-regional wage differentials not being accounted for.

In a commission report, the New York State Commission on the Quality, Cost, and Financing of Elementary and Secondary Education concluded that full state funding was, for the State of New York, the most feasible alternative which would conform to the Serrano v. Priest criteria. The recommendations of the Commission reflect those areas Benson saw as major concerns. The Commission recommended cost leveling, aid distribution based on educational need, regional educational centers and statewide collective bargaining for teachers.[23]

---

[23]Ibid., pp. 24-26.

The cost leveling aspect of the recommendation of the New York Commission is essentially a growth freeze on high spending schools. It is similar to the budget growth constraints of Iowa H.F. 654.[#] Under the New York plan, schools would be ranked according to per pupil expenditure and all those below the 65th percentile would be brought up to that level within three years. Those schools above the 65th percentile would be allowed to maintain their higher spending at full state support, but would not be allowed per pupil budget growth until the rest of the state's schools had risen to meet them.

A simulated application of full state funding to Iowa was made to assess the impact of this type of funding on the state. Data from school year 1970-71, with all federal contributions subtracted, was used. As a leveling up device, the budget growth constraint of H.F. 654 was utilized. Without federal funds, average per pupil cost is $827. Under H.F. 654, budgets were constrained to being less than 110 percent of average state cost per pupil in ADM if budget growth was to be allowed. Applying this constraint to $827 yields a $910 monetary constraint. Schools with average per pupil costs greater than $910 would not be allowed budget growth.[##]

A three-year period during which expenditures would be leveled was assumed. Each district below the 110 percent state average cost per pupil

---

[#]See Chapter 2 for a discussion of budget growth under Iowa's H.F. 654.

[##]A comparison between this limit and a percentile figure such as New York uses was made. With the cutoff at the 65th percentile, nine more districts would be allowed growth by utilizing a 110 percent limit. Since the two are practically equivalent, the 110 percent limit was chosen because of its prior use in Iowa.

limit would grow at one-third the absolute difference between its initial cost figure and the cost limit in each of the three years. As in New York, districts with spending above the 110 percent level would not be allowed growth until the rest of the state had risen to meet them.

A plan of this type entails strict equalizing of per pupil expenditure if used in the unmodified form outlined above. If equalization of expenditures does not mean equalization of opportunity, such a plan could be disequalizing with respect to educational opportunity. Modifications would be needed to account for interdistrict educational need, cost and process quality variations to insure equality of opportunity. However, since present interpretation of the Serrano v. Priest case concentrates on equal financing, the need-cost-quality aspects will be deferred to a later chapter.#

Combined state-local funding under percentage equalizing was $541,829,082. Elimination of those categories which would be left under local control leaves a figure of $524,106,779 to be funded by the state. This is shown in Table 3-5. Funding this amount--65 percent from a property levy and 35 percent from general funds--yields a millage comparable to the state average millage for percentage equalizing as previously discussed in this chapter.

The distributional impact of a full state funding scheme derives from two characteristics of the scheme. First, a statewide levy is used. This could mean that some districts are paying a larger amount than their total

---

#The conference proceedings edited by J. Scribner contain a good cross section of the present interpretation of Serrano v. Priest.

Table 3-5

Overall Breakdown of Full State Funding[a]

State and Local Funding	$541,829,082
Less: Debt Service	1,145,585
Capital Outlay	13,711,439
Community Service	2,865,279
State Funding	$524,106,779
All Property Tax	70.9277 Mills
65% Property Tax - 35% General Fund	46.1029 Mills

[a]From Iowa, Secretary's Annual Report, 1970-71.

general fund expenditures. Thus, a redistribution from richer to poorer districts could occur. This is analogous to the percentage equalizing surtax. Second, leveling up could cause a type of distributional impact. Those districts which are not allowed growth due to leveling up do not receive increasing amounts of aid. As the lower spending districts grow, they receive an increasing portion of the total school bill relative to the high spending districts. Thus, a redistribution from high spending schools to low spending schools occurs.

As Table 3-6 shows, in Iowa full state funding redistributes funds from small to large districts on both bases. Small districts, as a group, tend to have higher property values per student, and also tend to have higher per pupil expenditures.

Keeping all expenditures above the $910 budget growth constraint constant, and assuming no significant aggregate state enrollment changes, it would cost approximately $22,530,900 to level all schools up to 110 percent

Table 3-6

Size Class Distribution of Districts Not Receiving Budget Growth and/or Paying Surtax[a]

	Size Class							
	All	1	2	3	4	5	6	7
No Budget Growth	147	79	44	40	5	2	3	4
Percent of Size Class		64.2	39.6	14.3	8.5	8.7	7.9	13.8
Percent of Category	100.0	53.7	29.9	6.7	3.4	1.3	2.0	2.7
Paying Surtax	49	27	12	4	5	0	1	0
Percent of Size Class		21.1	11.7	7.1	6.8	0	2.6	0
Percent of Category	100.0	53.1	26.5	10.2	8.2	0	2.0	0

[a]From Iowa, Secretary's Annual Report, 1970-71.

of the 1970-71 average state cost over a three-year period.[#] Examining the size class distribution of the districts receiving leveling up funds, once again, shows a bias in favor of large districts. As Table 3-7 indicates, percent of size class of those districts allowed growth increases as size class increases.

Those districts with total costs greater than that amount raised by the statewide levy imposed on the district would be subsidized by the "surtaxed" districts of the state. Again, as shown in Table 3-7, the percent of size class receiving favorable treatment shows a positive relation to enrollment. Full state funding, like percentage equalizing, would favor large Iowa districts, as a group, over small Iowa districts. This

[#]Enrollments in Iowa have been constant or declining slightly. For further information on this point, the reader may contact Mr. Eldert Gryunendyke, Management Information, Department of Public Instruction, Des Moines, Iowa.

Table 3-7

Size Class Distribution of Districts Allowed Growth and/or Receiving Aid Under Full State Funding[a]

	Size Class							
	All	1	2	3	4	5	6	7
Allowed Growth	306	44	67	60	54	21	35	25
Percent of Size Class		35.8	60.4	85.7	91.5	91.3	92.1	86.2
Percent of Category	100.0	14.4	21.9	19.6	17.6	11.4	11.4	8.2
Receiving Aid	404	97	99	66	53	24	37	28
Percent of Size Class		79.9	88.3	92.9	93.2	100.0	97.4	100.0
Percent of Category	100.0	24.1	24.5	16.3	13.1	5.9	9.1	6.9

[a]Data for computations from Iowa, Secretary's Annual Report, 1970-71.

is due to the relation between size of district, property values and level of expenditures. Full state funding plans of the type discussed would create economic incentives for district reorganization in Iowa if there are economies of scale to be gained by reorganization. The mechanism for creating economic incentives for district reorganization (consolidation) would be the allowable growth constraint. Those districts not being allowed growth would have incentive to merge with other districts if the merger would result in lower costs and allowable growth.

Conclusion

There are three commonly proposed alternatives to present methods of school finance which are considered constitutional under Serrano v. Priest criteria. They are school district reorganization, percentage equalizing and full state funding.

Because of the political difficulty with legislative redistricting and with the possibility of creating economic incentives to reorganize, legislated redistricting is not considered a feasible plan for the State of Iowa. Percentage equalizing and full state funding distribute funds and allocate tax burdens, to a large extent, on the size of the district in Iowa. This is because of the relations between district size, fiscal capacity and expenditure.

If there is a negative relation between size of district and quality of education, if small districts have high costs because of high overhead rather than high quality, both of the remaining alternatives, percentage equalizing and full state funding, when applied in Iowa, distribute funds and burdens on a suspect classification--district size. District size should no more be a relevant variable than should district wealth in determining access to educational opportunity. Only if per pupil expenditures are true proxies of educational opportunity (as assumed by the California Supreme Court) do percentage equalizing and full state funding meet the spirit of the Serrano v. Priest decision.

CHAPTER IV: EDUCATIONAL EXPENDITURE AND EDUCATIONAL QUALITY

As noted previously, the Serrano v. Priest decision was based on several untested assumptions about the nature of the educational process as a production process. By accepting at face value the complaint that diminished fiscal capacity has a negative effect on the quality of education, the California Supreme Court implicitly correlated educational expenditures with educational quality. The relationship between educational expenditures and quality of output should be subjected to more scrutiny than was given by the Court.

In an attempt to further specify this relation, an investigation into literature dealing with the educational productive process was made. From this, variables were chosen as educational quality proxies to study the relation between these quality proxies and expenditures per pupil for Iowa school districts. The variation in per pupil expenditure was also studied to determine the extent to which the variation was caused by regional cost variations and economies of scale.

Review of Supporting Literature

Herbert Kiesling, in his attempt to measure costs and benefits of local government services in New York, found a "disappointingly weak" relation between expenditure per pupil and test scores at the school district

level.[1] Test scores were used as a measure of output of the educational process after attempting to account for variance in pupil inputs such as intelligence and socio-economic status (hereafter referred to as SES). He also found a strong correlation between SES and per pupil expenditures.

Kiesling's data consisted of a sample of 1,400 New York school districts for the year 1957. The average daily attendance of the districts was 2,000. As a partial explanation for the poor relation between output (test scores) and expenditure, Kiesling said,

> . . . the small school district is the principal villain with respect to the overall weakness in the expenditure-performance relationship.[2]

For small districts as a group, he found no significant positive relation between performance and expenditure. In isolated instances, high school performance in small districts was actually negatively related to expenditure per pupil. His overall conclusion is that significant differences in school efficiency do exist, and that this efficiency is related to size.[3]

Burkhead, Fox and Holland studied the input-output relation in schools of two large cities, Atlanta and Chicago.[4] Output was proxied by

---

[1]Herbert J. Kiesling, "Measuring a Local Government Service: A Study of School Districts in New York State," Review of Economics and Statistics, XLIX (August, 1968), 356-68.

[2]Ibid., 361.

[3]Ibid., 363.

[4]Jesse Burkhead, Thomas Fox and John Holland, Input and Output in the Large-City High Schools (Syracuse, New York: Syracuse University Press, 1967), pp. 56-60.

IQ scores, verbal and reading test scores, school holding power[#] and post-high school measures such as college attendance. Inputs included median family income as an SES proxy; age of physical plant; teacher characteristics such as experience, salaries and formal education; teacher turnover; student-teacher ratio and expenditure per pupil.

In both Chicago and Atlanta, the non-school inputs which were used to proxy SES explained more of the output variation than all combined school inputs. No systematic response to school inputs was found. This was attributed to the relatively small variation among schools for school inputs and the high correlation between SES and inputs.

In both cities, the only in-school variables having positive and significant effects on the output measures were teacher characteristics. Teacher turnover was found to be important in determining both test scores and post-highschool measures such as college attendance. Teacher salaries tended to be positively associated with verbal test scores but the significance was not great. Experience tended to explain a larger portion of output variation than formal education did.

The results of the Burkhead, Fox and Holland study are very similar to a study, headed by Charles Benson, done for the California Senate in 1965. Benson used test scores as an output proxy. Inputs which were used that yielded significant results included teacher characteristics (entirely proxied by teacher salaries) and student SES. For certain districts,

---

[#]School holding power is defined as the quantity, (1 minus the drop out rate). It is used as a proxy of educational output or process quality, and assumes that completion of the socially defined amount of schooling is good and necessary for all individuals.

class size and administrative staffing were important, but these districts were few in number.

Overall, Benson found what he considered to be a negative relation between district handicap and the ability of the district to overcome that handicap. SES was related to output in a positive, statistically significant manner. District resources purchased were positively related to composite district SES. The non-school factors (SES and IQ) were much more important in explaining output than were school factors.[5]

Teacher characteristics were the single most important school factors in explaining output variation. All teacher characteristics were assumed to be explained by teacher salaries, so that higher salaries meant better teachers. This assumes a high degree of knowledge on the part of the hiring agency (school board) in that the above relation implies that the qualities which differentiate teachers are readily discernible.

By far the most famous study concerning educational quality and expenditures done to date is Equality of Educational Opportunity (The Coleman Report), by James Coleman and others for the U.S. Office of Education. It was a massive study involving some 600,000 students and 5,000 schools. The findings of the study have been quite controversial.[6]

Essentially, the Coleman Report found that the socioeconomic status (SES) of the student, the SES composite of the school, and peer attitudes

---

[5]Charles Benson, et al., State and Local Fiscal Relationships in Public Education in California (Sacramento, Cal.: Senate of the State of California, 1965), pp. 41-59.

[6]James S. Coleman, et al., Equality of Educational Opportunity (Washington, D.C.: U.S. Government Printing Office, 1966), pp. 325-33.

were the primary determinates of school output variation.# The effect of schools on achievement was found to be very small compared to the out-of-school factors such as SES. Given that no school factors account for much variation, teacher characteristics account for more than any other school factor. The implication is that schools have little influence on a child that is independent of the child's background. As the report states, ". . . equality of educational opportunity through schools must imply a strong effect of schools that is independent of the child's immediate social environment . . . that strong independent effect is not present in American schools."[7]

Coleman's implication that schooling and achievement are not related when one accounts for SES factors caused an intensive study of the relations involved. Much criticism of the methodology of analysis, particularly the statistical techniques used in the Coleman Report, has been voiced. In particular, a high degree of correlation between independent variables makes the order in which the independent variables are entered into a regression equation important. The variable entered first will pick up the explanatory power the variables have in common, and its explanatory power will be overstated. When the other correlated independent variables are entered, their explanatory power is understated.[8]

George Masek and others re-analyzed the data from the Coleman Report

---

[7]Coleman, Equality of Educational Opportunity, p. 325.

[8]See Samuel Bowles and Henry Levin, "The Determinants of Scholastic Achievement--An Appraisal of Some Recent Evidence," Journal of Human Resources, III (Winter, 1968), 3-24. Page 14 offers an in depth treatment of this methodological problem.

#School output was proxied by average school district achievement.

using partial correlation techniques to account for out-of-school variables. This did little to change the basic implications of the study. In-school factors still tended to explain a moderate to low amount of output variation. The change in technique indicated that the Coleman Report had understated the explanatory power of the school inputs, but that school factors were still not as influential as out-of-school factors.[9]

The in-school factors which Masek, et al found most increased in explanatory power by the changed statistical techniques were those associated with teachers. This is consistent with the other studies cited. If schools affect achievement (output), the primary factor of influence is associated with teachers.[10]

Coleman found curriculum variation insignificant in determining achievement variation, thus implying that type of curriculum is unimportant. This is contrary to an earlier study by James Conant. Using SCAT-V and SCAT-Q tests[#] in an attempt to discover differences in educational quality among high schools in a control group and a comprehensive group, Conant found no major difference in the two groups. The control group schools are ". . . of acknowledged excellence and send a large

---

[9]George Masek, et al, Correlation and Regression Analyses of Differences Between the Achievement Levels of Ninth Grade Schools from the Educational Opportunity Survey (Washington, D.C.: National Center for Educational Statistics, Office of Education, 1968), pp. 54-55. (Mimeographed)

[10]Ibid.

[#]SCAT-V and SCAT-Q tests were verbal and quantitative skills tests developed by the Educational Testing Service in the late 1950's.

number of graduates to four year colleges."[11] Conant did find a difference among schools based on breadth of curriculum. Most of his recommendations for improving high schools are based on making the curriculum broader to increase the alternatives available to the individual student. If broadening a curriculum increases cost, cost variation due to curriculum variation could mean quality variation according to the Conant study.

Patricia Cayo Sexton found average family income, used as a proxy for social class, the primary determinant of achievement scores. The relation held also for school failings. Children from low income families tend to be retained in grade about four times as often as children from high income families.[12]

The number of studies on the relation between educational outcome and educational expenditure is large. Most have three things in common. Expenditures, as such, show a very weak relation to educational outcome, regardless of how one measures outcome. Socioeconomic status, proxied by some variant of family income, tends to have more explanatory power than any (in some studies, all) in-school variable. The in-school variables which do have explanatory power are those associated with teachers such as teacher salaries, teacher verbal ability, load and experience. If schools alter the life chance of the individual, the mechanism by which they alter it is teachers.

---

[11]James B. Conant, The American High School Today (New York: McGraw-Hill, Inc., 1959), p. 33.

[12]Patricia Cayo Sexton, Education and Income: Inequalities of Opportunity in Our Public Schools (New York: The Viking Press, 1961), p. 93.

Regional Teacher Salary Variation in Iowa

Since teacher characteristics such as verbal ability, experience, turnover, and course load are, according to most studies, the most important in-school factors for explaining variation in educational output as output is measured by test scores, a significant regional teacher salary variation within a state could mean that dollar per pupil cost figures are not, as assumed by Serrano v. Priest, adequate measures of educational quality. If such a variation is present, equalization of expenditures as under full state funding, without statewide collective bargaining, could cause less equality of educational opportunity by allowing districts in low teacher salary areas to purchase more real inputs per dollar spent. This assumes teacher quality is distributed homogeneously throughout the state.

Existence of a non-equalizing regional teacher salary variation would not be possible if the market for teachers was perfect. It is probable that the market for teachers has relatively high information costs thus making the market less than perfect. Equalizing differentials are assumed to be not recognized by full state funding equalization grant models.

An initial check for geographic teacher salary variation was made for the State of Iowa by observing the average teacher salary in each of Iowa's fifteen merged areas.[#] Table 4-1 shows the merged area average teacher salary as a percent of the state average teacher salary. The range, from 92.5 percent in Area 14 to 106.9 percent in Area 16, seemed

---

[#]A merged area in Iowa is a group of contiguous school districts constituting a large district. There are fifteen such areas in the state. The purpose of such a division is to provide a base for community colleges.

sufficiently large to warrant further investigation.

Table 4-1

Merged Area Average Teacher Salary and Merged Area Average Teacher Salary as a Percent of State Average Teacher Salary, 1970-71[a]

Area[b]	Average Salary	Percent of State Average
1	$8,302	100.6
2	8,319	100.8
3	8,285	100.4
4	8,550	103.6
5	8,441	102.2
6	8,296	100.5
7	8,346	101.1
9	8,541	103.4
10	8,043	97.4
11	8,283	100.4
12	8,074	97.8
13	7,991	96.8
14	7,631	92.5
15	7,826	95.4
16	8,822	106.9

[a]From Iowa, Secretary's Annual Report, 1970-71.
[b]Area 8 has merged with Area 9 and no longer exists.

A randomized complete block design was used to attempt to isolate the regional variation from other sources of cost variation.[13] Due to the large number of small districts in Iowa and the possibility of salary variation due to district size, district size seemed to be a factor that needed to be controlled in the test. The simple correlation coefficient between average teacher salary and school size is 0.37. Property values

[13]See Bernard Ostle, Statistics in Research (Ames, Iowa: Iowa State University Press, 1963), pp. 363-75 for a discussion of randomized complete block designs.

per student have small, negative (-0.088) simple correlation with average teacher salary, and as such were not controlled for explicitly.# Teacher quality is assumed the same in each region.

Using the fifteen merged areas as regional treatments and the seven size classes as blocks, a random sample for each treatment within each block was drawn.## The results shown in Table 4-2, Analysis of Variance of Teacher Salaries, were obtained. The ratio of treatment mean squares

Table 4-2

Analysis of Variance of Teacher Salaries[a]

	Degrees of Freedom	Sum of Squares	Mean Square	Ratio
Mean	1	7,455,965,000	7,455,965,000	
Size (Blocks)	6	23,527,420	3,921,237	
Geographic (Treatment)	14	19,943,420	1,424,530	4.336
Experimental Error	84	27,598,840	328,559	

[a]Computed from Iowa, Secretary's Annual Report, 1970-71.

to error mean squares is distributed F with 14 and 84 degrees of freedom. This F ratio can be used to test the hypothesis that the treatment effects are not significantly different from zero.[14] An F ratio of 4.336, with 14,84 degrees of freedom is significant at the 0.999 level.[15] The

[14]Ostle, Statistics in Research, p. 366.

[15]Samuel Selby, ed., Standard Mathematical Tables (Cleveland, Ohio: The Chemical Rubber Company, 1968), p. 592.

#See Appendix A for a matrix of simple correlation coefficients.

##See Appendix B for the matrix of treatments and blocks.

hypothesis that the effects of the treatments is not significantly different from zero cannot be accepted.

Due to the relatively small correlation between average teacher salary and district size, a test was made to see if stratification by size class helped or harmed the explanatory power of the treatments. An estimate of the experimental error mean square for a completely random design was compared to the experimental error mean square for the randomized complete block design. A measure of relative efficiency of the two designs has been defined by Ostle as being the ratio of these two quantities.[16] For the study the ratio of estimated experimental error mean square for the completely random design to the experimental error mean square of the randomized complete block design was 1.65. The addition of the blocks added to the efficiency of the design.

Regional teacher salary variation is large enough in Iowa to warrant adjustment of per pupil cost to account for the variation. For the State as a whole, teacher salaries account for 63.65 percent of total general fund expenditures including federal funds. If federal funds are removed to find the percentage of state-local funding going to teacher salaries, this figure increases to 66.12 percent.

As an example, let us assume two hypothetical schools, identical in all aspects except geographic location. School 1 is located in Area 16 where teacher salaries are 106.9 percent of the state average. School 2 is in Area 14 where teacher salaries are 92.5 percent of the state average. If both schools spend $920 per pupil and allocate 66.12 percent of this

---

[16]For a detailed explanation of the estimation of the completely random design experimental error, see Ostle, Statistics in Research, p. 375.

for teacher salaries, they spend approximately $608 per student to acquire teachers. In Area 16, however, teachers of equal quality should cost $87 per student more than in Area 14. If one assumes that higher salaries mean better teachers, the school in Area 14 is actually a higher quality school than the school in Area 14.

School District Long Run Cost

A minimum level of teachers and other resources are required to attain any educational outcome. This minimum level of resources represents a minimum "fixed capital" requirement necessary to provide an educational offering of given quality. In small districts, economies of scale in resource use are obvious.[17]

In Iowa, approximately 50 percent of all school districts have total enrollments of less than 750 students in average daily membership. Table 4-3 shows the average per pupil cost and coefficient of variation for

Table 4-3

Size Class and Per Pupil Expenditure[a]

	Size Class						
	1	2	3	4	5	6	7
Per Pupil Expenditure	$1,000.73	$923	$863	$836	$844	$819	$834
Coefficient of Variation	12.35%	11.23%	10.86%	9.99%	9.07%	11.21%	10.29%

[a]From Iowa, Secretary's Annual Report, 1970-71.

[17]Henry M. Levin, "The Effect of Different Levels of Expenditure on Educational Output," in Economic Factors Affecting the Financing of Education, ed. by Roe Johns, et al. (Gainesville, Florida: National Educational Finance Project, 1970), p. 192.

each size class in the state. If one assumes homogeneous educational quality among districts, the cost per student tends to decline up through Size Class 4, then level out as size class increases. These cost figures are averages over size class. The enrollment range of Size Class 7, for example, is from 3,000 to around 45,000. In spite of the wider range of enrollments in the five larger categories, the standard deviation of average size class cost as a percent of the mean does not vary widely. The coefficient of variation reaches its minimum at Size Class 5 and tends to increase for 6 and 7 as cost per student levels off. A possible reason for the increased coefficient of variation would be diseconomies of scale in the larger schools, since both 6 and 7 cover large enrollment ranges.

John Riew, in studying possible economies of scale in Wisconsin public high school operations using a regression model, estimated the optimal size school to be around 1,700 students.[18] While the difference between school and district might cloud the issue some, it would seem that the optimum Iowa district, when categorized by size class, assuming homogeneous quality of output, would be a Size Class 6 district. The cost per student is relatively low, and the coefficient of variation is also low indicating a relatively homogeneous distribution of per pupil costs within the size class. Size Class 6 districts contain from 2,000 to 2,999 students, and so, are slightly larger than Riew's optimal size category. This measure would be, however, a very weak indication of optimal size if used in absence of other supporting evidence.

Riew's model of the long-run cost function of the high school

---

[18]John Riew, "Economies of Scale in High School Operations," Review of Economics and Statistics, XLVIII (August, 1966), 285.

district is linear in all terms except enrollment. This entails an implicit assumption that all of his quality proxies are unrelated to size. The actual model he fitted was

$$X_1 = a + B_1X_2 + B_2X_2^2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7$$

where

$X_1 \equiv$ per pupil cost,

$X_2 \equiv$ enrollment,

$X_3 \equiv$ average teacher salary,

$X_4 \equiv$ units offered,

$X_5 \equiv$ average courses taught per teacher,

$X_6 \equiv$ change in enrollment from 1957 to 1960, and

$X_7 \equiv$ percent of classrooms built after 1950.

Variables X_3, X_4 and X_5 are intended to proxy school quality. Variable X_6 was included to attempt to catch any long-run vs. short-run cost differences. X_7 was included because per pupil cost figures for the data included building maintenance which could cause cost variation if older buildings are more expensive to keep up.

His findings were that the six independent variables explained approximately 56 percent (R^2 of 0.557, significant at 0.98) of the per pupil cost variation. However, only teacher salaries, changes in enrollment and enrollment were statistically significant. Removal of both enrollment variables, X_2 and X_2^2, from the equation reduced the R^2 to 0.374, so enrollment variation "explained" approximately 18.3 percent of the cost variation.

Signs of the estimated regression coefficients associated with the variables are all consistent with his hypothesis that economies of scale

exist. The actual equation for his sample of 109 districts is[19]

$$X_1 = 10.31 - 0.402X_2 + 0.00012X_2^2 + 0.107X_3 + 0.985X_4 - 15.62X_5 + 0.613X_6 - 0.102X_7 .$$

Overall, Riew concluded that the reorganization of small school districts into larger districts could result in a more efficient allocation of educational resources.

Elchanan Cohn studied economies of scale in Iowa high school districts. He used per pupil cost as a dependent variable and enrollment varients (ADA, ADA^2, and ADA^{-1}), school quality (as proxied by test scores), college hours per high school assignment, assignments per teacher, teachers' salaries, units offered, building value, bonded indebtedness and class size as independent variables. He was, with these variables, able to attain R^2 values in the 0.35 range using various combinations of linear and nonlinear equations. His attempts at explaining cost variation in Iowa high schools suggest the existence of significant economies of scale in the smaller districts.[20]

The estimated cost function which Cohn feels best fits the 1962-63 Iowa data he used takes the form of

$$C = a + bQ_1^{-1} + \Sigma c_i z_i$$

with C being cost, Q_1^{-1} the inverse of enrollment (the only enrollment variable included), c_i shadow prices and z_i the cost and quality proxies. Like Riew, Cohn assumed a linear relation between cost and all variables

---

[19] Ibid., 284.

[20] Elchanan Cohn, "Economies of Scale in Iowa High School Operations," Journal of Human Resources, III (Fall, 1968), 422-34.

except enrollment. R^2 for this estimated cost equation was 0.377.

In an attempt to find additional evidence of economies of scale in Iowa schools, the present study estimated cost functions based on 1970-71 per pupil expenditure, net of federal funds. Table 4-4 shows various estimated cost functions for the Iowa 1970-71 sample. Because the size-cost relation was deemed important in the Riew and Cohn studies, a random sample for the present study was drawn from the 453 Iowa districts after stratifying them into the seven size class categories used by the Iowa Department of Public Instruction. Each stratum was weighted so that the proportion of the stratum in the sample was the same as the proportion of the stratum in the state. A random sample of 50 districts was then drawn.

Per pupil expenditure net of federal aid was chosen as the dependent variable. Independent variables were chosen as follows: The total average daily membership[#] of the district was chosen as an independent variable intended to isolate economies of scale. To attempt to account for school district quality, average teacher salary, courses taught per teacher, and total units offered by the district were included. They were used to attempt to isolate teacher quality, degree of specialization of teachers and alternatives available to the student, respectively.

Stepwise regression was used to attempt to fit the four models found in Table 4-4. The multiplicative model was a better fit for the sample data than either linear or semi-linear models. This indicates non-linearity in the quality proxies as well as the existence of economies of scale. Model 4 takes the form

---

[#]Average daily membership (ADM) is the sum of all pupils enrolled each day during the school year divided by the actual number of days taught.

Table 4-4

Regression Estimates of Cost Functions for a Stratified Random Sample of 50 Iowa School Districts[a]

Variables:

Dependent: $C \equiv$ Cost per pupil

Independent: $X_1 \equiv$ ADM
$X_2 \equiv$ Courses taught per teacher
$X_3 \equiv$ Units offered
$X_4 \equiv$ Average teacher salary

Functions:

1. $C = a + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4$

2. $C = a + B_1X_1 + B_1'X_1^2 + B_2X_2 + B_3X_3 + B_4X_4$

3. $C = a + B_1X_1 + B_1'X_1^{-1} + B_2X_2 + B_3X_3 + B_4X_4$

4. $C = aX_1^{B_1}X_2^{B_2}X_3^{B_3}X_4^{B_4}$

Function	Estimates[b]			
	a	B_1	B_1'	B_2
1	797	-0.0941 (0.054)		-9.0157 (61.885)
2	1,330	-0.6259 (0.1376)	0.0001 (0.0000)	-260.31 (89.730)
3	263	-0.2019 (0.0471)	197,723.4 (37,466.0)	-412.24 (90.740)
4	90.02	-0.7239 (0.0986)		-0.7192 (0.1145)
	B_3	B_4	R^2	F
1	2.0378 (3.595)	0.0135 (0.252)	0.207	2.95
2	5.42 (2.557)	0.0063 (0.0020)	0.451	7.32
3	12.46 (3.434)	0.0528 (0.0213)	0.515	9.34
4	0.7562 (0.1517)	0.4751 (0.1566)	0.634	19.46

[a]Computed from Iowa, Secretary's Annual Report, 1970-71.
[b]Standard error of the B values is in parentheses.

$$(1) \quad C = aX_1^{B_1}X_2^{B_2}X_3^{B_3}X_4^{B_4}$$

The B_i's are partial cost elasticity coefficients defined as

$$(2) \quad e_{c_i} = \frac{\frac{\partial C}{C}}{\frac{\partial X_i}{X_i}} = \frac{\partial C}{\partial X_i} \cdot \frac{X_i}{C} .$$

Solving (1) for the value of e_{c_1}, one attains

$$(3) \quad e_{c_1} = \frac{(aB_1X_1^{B_1-1}X_2^{B_2}X_3^{B_3}X_4^{B_4})X_1}{aX_1^{B_1}X_2^{B_2}X_3^{B_3}X_4^{B_4}} = B_1 .$$

Changing to discrete terms,

$$(4) \quad e_{c_1} \cong B_1 = \frac{\Delta C}{\Delta X_1} \cdot \frac{X_1}{C} ,$$

$$(5) \quad \Delta C \cong B_1 \frac{\Delta X_1 C}{X_1} .$$

The partial elasticity coefficient thus indicates the responsiveness of cost to the change of the variable in question, all other variables assumed constant. The X_i's are the independent cost variables defined in Table 4-4.

In Function 4, Table 4-4, the partial elasticity of cost with respect to district size, B_1, takes the value of -0.7239. The negative relation indicates the existence of economies of scale if all quality proxies are held constant. This form of function will yield no minimum point for the long-run average total cost as far as size is concerned. The positive coefficient associated with X_1^2 in Function 2, Table 4-4 indicates that the actual function might have a minimum at an enrollment of slightly over 3,100 pupils. This substantiates the distribution of the raw cost data

cited earlier.[#] The difference between functions would be insignificant for the State of Iowa because of the predominance of small districts.

The restrictive assumption of linearity in all variables except enrollment is not found in Function 4. This allows for the existence of economies and diseconomies of scale in the quality proxies. This implicitly assumes that a minimum number of courses and teachers is required for any educational offering, and that beyond a certain level, increases in the number of courses or specialization of teachers may not yield increases in quality.

Overall, if one assumes that quality can be held constant as size increases, the stratified sample of Iowa school districts would indicate economies of scale in Iowa school districts. A school district of 200, spending $920 per student would reduce its per pupil costs approximately $3.32 per student by enrolling another student. Over 50 percent of Iowa districts could be in the range where per pupil costs decline significantly for each incremental student since over 50 percent have enrollments of 750 or less.

Size and Quality

Function 4, Table 4-4, is the "best" cost function for the sample data. One can interpret the partial elasticity coefficients of the quality proxies for this function as follows. Units per teacher, variable X_2, was used to determine the extent to which teachers tended to be specialists or

---

[#]For Function 2, Table 4-4, $B_1 = -0.6259$ and $B_1' = 0.0001$. Since $\frac{\partial C}{\partial X_1} = B_1 + 2B_1'$, if $\frac{\partial C}{\partial X_1} = 0$, then $-B_1 = 2B_1'X_1$. Solving for X_1, $0.6259 = 0.0001X_1$, $X_1 = 3129.5$.

generalists with the assumption being made that specialization implies higher quality. The coefficient had the expected sign but appeared to explain much more of the variance in cost than was expected. Analysis of variance of the logarithmic regression equation used to estimate the coefficients for Function 4 yielded the results shown in Table 4-5. There

Table 4-5

Analysis of Variance of Cost for a Sample of 50 Iowa School Districts[a]

Source	Degrees of Freedom	Sum of Squares	Mean Square	F
Regression	4	0.4714	0.1179	19.46
Residual	45	0.2725	0.0061	
	Value	R^2	ΔR^2	F
a	90.02			
B_1/a	-0.7239	0.2771	0.2771	53.19
B_2/aB_1	-0.7192	0.3833	0.1062	39.43
B_3/aB_1B_2	0.7562	0.5588	0.1755	24.85
$B_4/aB_1B_2B_3$	0.4751	0.6337	0.0749	9.202

[a]From Iowa, Secretary's Annual Report, 1970-71.

exists a significant amount of colinearity among the independent variables. Simple correlation coefficients indicate that size and all the quality proxies are correlated. The simple correlation coefficients are r_{12} = -0.80, r_{13} = 0.90 and r_{14} = 0.37.[#]

[#]See Appendix A for a matrix of simple correlation coefficients.

Coefficient r_{12} would indicate that school size and degree of generalization are inversely related or that size and quality as proxied by specialization are positively related. The relationship between units offered and size is positive as is the average teacher salary and size relation. These coefficients indicate the possibility of quality itself being a function of the size of the district. In spite of the strong relationship which exists between size and the quality proxies, the F values associated with each B_i are large enough to indicate that the overall relationship indicated by Equation 4 is valid for the sample data.

The possibility that quality and size are positively related is reinforced when one looks at the simple correlations among the quality proxies in light of the relation between the quality proxies and district size.[#] The degree to which teachers tend to be generalists is negatively related to the units offered by a district. A simple correlation coefficient r_{23} of -0.6750 indicates that as units offered increases, the degree of specialization also increases. Since units offered by a district are strongly positively correlated with the size of the district, larger districts tend to have more specialized teachers.

Generalists also would seem to get lower pay judging from the -0.3692 value for r_{24}. A negative relation between the degree of generalization and average teacher salary, given the positive relation between district size and teacher salary, could be interpreted to mean that larger districts have to pay more for the specialized teachers they utilize.

The number of units offered by a district is positively related to

---

[#]See Appendix A for a matrix of simple correlation coefficients.

teacher salary with a simple coefficient of $r_{34} = 0.3377$. It is not possible to tell if the higher salary associated with a broader curriculum is a result of specialization or of just having higher quality teachers in general. It seems reasonable to assume that specialization and higher quality teachers are closely related also and that higher teacher salaries for specialization implies higher quality teachers.

Conclusion

In general, it is impossible to conclude that size and quality of educational offering as proxied by curriculum breadth, specialization of teachers, and teacher salaries are independent enough to be able to assume that quality can be assumed constant as size varies. However, judging from simple correlations, it seems likely that, over the range of schools investigated, size and school quality are related in a positive manner. From this, one could infer that the existence of economies of scale could be understated by a cost function of the type previously estimated. Since economies of scale tend to be the most important explanatory factor in the estimated cost function, this analysis leads to rejecting the hypothesis that economies of scale are not significant in determining per pupil cost variation.

CHAPTER V: ADJUSTMENTS TO ATTAIN COMPARABLE PER PUPIL COSTS

To determine the extent to which economies of scale and regional cost variation influence the impact of grants in aid in the State of Iowa, a full state funding model was adjusted for regional teacher salary variation and economies of scale. Statistical evidence in Chapter 4 indicates that these two variables could cause variation in per pupil expenditure which is not compensated for by variation in quality of educational offering. Grants systems such as full state funding and percentage equalizaton which are usually offered as alternatives to foundation plans often have some sort of cost equalization aspect. This dollar cost equalization, when viewed in terms of real inputs purchased could have a disequalizing rather than equalizing impact on equality of access to educational resources for the children of a state.

As noted in Chapter 3, full state funding requires a statewide collection and distribution of revenues. Because of the statewide levy a redistribution from high to low assessed valuation districts results from this type of grant in aid. In Iowa, this redistribution is a redistribution from small schools to large schools.

Full state funding requires that the state pay all educational costs incurred by the local district.[#] Since the full cost of elementary and

---

[#]Except for costs of strictly local services such as community plays, etc., full state funding pays the entire per pupil expenditure.

secondary education is borne by the state, the amount of aid above local tax collections or the amount of tax above district cost would not vary with adjustments of the per pupil cost figure to include regional cost variations or deflators for lack of economies of scale. A growth constraint was incorporated into the simulated full state funding model discussed in Chapter 3. It was noted that if either regional cost variation or economies of scale existed, the use of unadjusted cost figures in a growth constraint could cause horizontal inequity. In other words, districts which should be receiving different treatment are receiving the same treatment.

A full state funding model coupled with a growth constraint with expenditures adjusted for variations in the quantity and quality of real resources purchased could be used as a device to equalize educational opportunity. This could be much more equitable in a horizontal fashion than the equalization of unadjusted per pupil expenditures in that districts in equal cost situations would be treated equally.

Cost Adjustments

With horizontal equity in mind the data used to simulate the full state funding model of Chapter 3 were modified in the following fashion. Teacher salaries account for 66.12 percent of the total per pupil cost for the State as a whole.[#] For each district, 66.12 percent of the per pupil cost was adjusted for the average cost of obtaining teachers in that geographic area. This was done by subtracting 66.12 percent from per pupil

---

[#]Figures on average cost of teachers in geographic regions were obtained from Table 4-1.

cost, multiplying it by the ratio of average teacher salary per merged area to state average teacher salary, and adding the adjusted teacher cost back into per pupil cost. The assumptions were made that teacher quality is distributed homogeneously across the State and that higher salary bids will cause teachers to move within a geographic region but not out of the region. All other costs were assumed to vary in a homogeneous fashion among districts.

To deflate per pupil expenditure for lack of economies of scale in the smaller districts, the relation between size class and per pupil expenditure was used.# Average per pupil cost for each size class drops rapidly through Size Class 4 where a leveling trend begins. The assumption is made that the average per pupil cost of the four largest size classes is a proxy for the optimal per pupil cost. Using this figure as a base, deflators of 1.2, 1.11 and 1.03 can be derived for Size Class 1, 2 and 3 schools, respectively.

Deflating regionally adjusted per pupil cost figures for each local district by these cost deflators yields an average adjusted per pupil cost of $800. This same data, unadjusted, yielded an average of $827 when the full state funding model was simulated in Chapter 3.

Application of a 110 percent state average cost per pupil in ADM growth constraint was employed as in Chapter 3. The purpose is to attempt to equalize real educational expenditures rather than money educational expenditures. The adjustments for lack of economies of scale in the small districts and regional teacher salary variation are intended to provide

---

#See Table 4-3 for this relation.

cost figures that are more representative of the real educational services provided. Table 5-1 contains the size class distribution of districts which would be allowed per pupil cost increases under the adjusted cost full state funding model as well as the size class distribution from the unadjusted model of Chapter 3. It is apparent that Size Class 1 and 2

Table 5-1

Size Class Distribution of School Districts Allowed Per Pupil Cost Increase Under Full State Funding Using Adjusted and Unadjusted Data[a]

	Size Class							
	All	1	2	3	4	5	6	7
Cost Adjusted	365	94	89	59	48	21	31	23
Percent of Size Class		76.4	80.1	84.3	81.3	91.3	78.8	79.3
Percent of Category	100	25.7	24.3	15.2	13.1	5.7	8.5	6.3
Cost Unadjusted[b]	306	44	67	60	54	21	35	25
Percent of Size Class		35.8	60.4	85.7	91.5	91.3	92.1	86.2
Percent of Category	100	14.4	21.9	19.6	17.6	11.4	11.4	8.2

[a]Data from Iowa, Secretary's Annual Report, 1970-71.
[b]Unadjusted figures obtained from Table 3-7.

schools stand to benefit from adjustment for economies of scale. A total of 72 districts which were not allowed growth using unadjusted cost figures would be allowed growth using the adjusted cost figures. Cost adjustment reduces the variance of the distribution of percent of size class. The standard deviation of the distribution of percent of size class allowed

growth declines from 27.55 for the unadjusted data to 11.97 for the adjusted model.

It is not possible to totally segretate the adjustment for regional teacher salary variation in the Size Class 1, 2 and 3 schools because it could either increase or decrease the per pupil cost of the district depending on the location of the district. Also, the adjustment for lack of economies of scale was so large in this group of schools that it would probably outweigh any upward cost revision due to low average teacher salary in the surrounding area. However, in the size classes where no adjustment was made for lack of economies of scale, a district could have its cost increased or decreased by this adjustment and segregation would be possible. Table 5-1 indicates that 12 schools of Size Class 4 through 7 which were near the constraint were also in areas of generally low teacher salaries. There is no other way a school in this group could be disallowed growth. Schools in geographic areas of lower than average teacher salaries have their costs adjusted upward to reflect this fact.

Summary

This adjusted cost simulation of a full state funding model has limited objectives. It is intended to show that if educational resources are used to proxy equality of educational opportunity, a model which does not adjust for economies of scale and regional teacher salary variation yields substantially different results than one which does. Table 5-1 shows this quite adequately by simulating the same model using both adjusted and unadjusted costs.

The practical usefulness of adjustments of the type presented in

this chapter are limited by social goals and political feasibility. Maintenance of the status quo in access to educational resources is often deemed not satisfactory. If reform is to take the route of reorganizing school districts into more efficient size units, it will not be necessary to use a deflator to account for lack of economies of scale in small schools. In states such as Iowa where redistricting seems not to be feasible politically, such an adjustment is necessary to insure equal access to educational resources under any grants system which pushes toward equalization of dollar expenditures.

Adjustment for regional teacher salary variation is necessary to get cost figures that are comparable across a wide geographic area. Not doing so could create a situation of geographic horizontal inequity in which schools in an entire region are treated differently than similar schools in a different region.

CHAPTER VI: SUMMARY AND CONCLUSIONS

Scarcity of economic resources is well illustrated by the struggle to finance elementary and secondary education in America. Eduators have a seemingly endless, nobly justified demand for funds to better the educational opportunities of the children of a community. The members of a community who must supply the needed funds have a justified demand for measurable results of the educational process which they are purchasing.

Local property taxes are currently the primary source of funds for the local school district. In the late 1960's, questions began to arise about the constitutionality of this system of educational finance. With taxable property as the main revenue base for local school districts, large variation in the ability of districts to generate revenue can arise. The constitutional question is based on the assertation that the variation in taxable property causes variation in educational expenditures. It is generally assumed that educational expenditures are directly related to educational opportunity and that the denial of equal educational opportunity is unconstitutional.

The first case in which this question was upheld was Serrano v. Priest in the State of California. The California Supreme Court ruled that the school finance system in California was in violation of both the California and United States Constitutions. In Texas, the U.S. District Court of the Western District of Texas held that the Texas system of financing education was in violation of the U.S. Constitution. The case was Rodriguez v. San

Antonio and was based entirely on the Serrano v. Priest prededent. Generally, the rulings of these two courts were interpreted to mean that the quality of education received by a child could not be functionally related to the wealth of the school district in which he resides. The U.S. Supreme Court reversed this decision and ruled that education is not a right protected by the U.S. Constitution.

Concurrent with this push toward greater equality of educational opportunity was increasing strain on the willingness of the local taxpayer to bear increasing tax burdens. As the taxes to finance schools increased, many schools had to shut down because of lack of funds caused by taxpayer revolt. The pressure on local taxpayers was quickly transmitted to state legislatures.

Educational finance was under pressure for change from two directions--the push for greater equality of opportunity and the push for lower taxes. In Iowa, the state legislature met these forces with a property tax freeze, educational spending limits to control taxes, and a foundation program to insure a minimum level of resources available for all districts.

Reversal of Rodriguez v. San Antonio by the U.S. Supreme Court did not quell the pressure for either type of reform. The Serrano v. Priest case is still the basis for much of the pressure to equalize educational opportunity. Expenditure per pupil and equality of educational opportunity were implicitly equated by the California Supreme Court when it assumed that higher expenditures mean better schools. As a result, much of the proposed reform for equality of educational opportunity contains strong equalization of educational expenditure measures.

This thesis studied three aspects of educational finance reform in

the State of Iowa. First, Iowa's system of school finance was analyzed to determine if it was subject to Serrano v. Priest type criticism. Second, the thesis studied the degree to which higher per pupil expenditures are related to measures which, under reasonable assumptions, should indicate higher quality education. Third, the effect on the State of Iowa of school aid plans which conform to the letter of the Serrano v. Priest decision was studied.

Findings

Iowa's school aid law, House File 654, is a foundation program of the type ruled unconstitutional in California. Should a case be brought against this law under the Iowa Constitution, the possibility exists it could be found unconstitutional. In addition, H.F. 654 has four modifications dealing with spending constraints, guaranteed minimum aid, miscellaneous income, and millage reductions, all of which could increase its susceptibility to this type of criticism.

A review of the literature on educational input-output relations indicates a weak relationship between expenditures and most measures of educational output. This is partly explained by the high average cost found in small schools. Estimates of the long-run average cost for school districts in the State of Iowa indicate the existence of significant economies of scale occurring up to enrollments of around 2,000 students. These estimates assume quality of school inputs constant throughout the range. There is some evidence that the quality of real educational resources purchased actually increases in this range. This would tend to further aggravate the problems encountered when using educational

expenditures per pupil as a measure of educational opportunity.

Teacher salaries show a substantial regional variation across the State of Iowa. If one assumes teacher quality is distributed throughout the state in a homogeneous fashion, and that teachers are mobile within but not among regions, equalization of educational expenditures could cause an allocation problem. Relatively too much money would be allocated to regions with low cost teachers and too little to areas with high cost teachers.

Simulation of percentage equalizing and full state funding grant systems indicated that both systems tend to distribute relatively more aid to larger districts or if a growth constraint is used, both systems tend to constrain small districts. Those districts being taxed an amount greater than district cost under full state funding, and those districts receiving lower than average (possibly negative) aid under percentage equalizing plans were primarily small districts. Expenditure constraints, which are often proposed for "leveling up" educational expenditures, tend to constrain small districts more than large districts.

Coupled with the evidence on teacher salary variation and economies of scale, implementation of either of these aid programs could be detrimental to small school districts in Iowa. Both programs comply to the letter of the Serrano v. Priest decision in that they do not make the amount of resources available a function of the wealth of the school district. Because of the large number of small school districts in Iowa, the application of either plan could disequalize rather than equalize educational opportunity. A grant system which prescribes the same treatment for all school districts when in reality there are large differences among

districts will only intensify existing problems.

Simulation of the full state funding model using data adjusted for lack of economies of scale in the smaller schools and for regional teacher salary variation yields quite different results than the unadjusted data. The bias against small schools is largely eliminated. The percent of schools not allowed expenditure increases by the growth constraint shows no discernable relationship to the size of the district.

Policy Implications

When the California Supreme Court made its ruling in the Serrano v. Priest case, it was specifically dealing with a problem in California. Because of the acceptance of the Serrano v. Priest ruling across the nation, the implications of the case were far reaching. The particular economic-demographic structure of California could have made some aspects of the Serrano v. Priest case unique to California. To apply that same ruling to a state such as Iowa which has a different economic-demographic structure would yield questionable results.

The California Supreme Court implicitly based educational opportunity on the money per pupil expenditures of the school district. In Iowa, money expenditures do not represent real resources purchased because of the existence of economies of scale and regional teacher salary variation. This implies that if expenditures are to be used as a proxy for educational opportunity, they should be adjusted to account for cost variations due to economies of scale or resource price variation.

A more general policy implication deals with one of the ever present problems in legislated economics; the problem of defining an adequate base

of comparison. Policy which attempts to treat all entities with the same legal definition in the same fashion without looking at underlying differences will only succeed in treating them differently. Any law which deals with a reallocation of resources among legal entities should have a broader base of comparison than the legal definition of those entities.

APPENDIX A:

MATRIX OF SIMPLE CORRELATION COEFFICIENTS[a]

	Y	X_1	X_2	X_3	X_4	X_5	X_1^2	X_1^{-1}
Y	1							
X_1	-0.4396	1						
X_2	0.3446	-0.8	1					
X_3	-0.3562	0.9016	-0.6750	1				
X_4	-0.0806	0.3656	-0.3692	0.3787	1			
X_5	0.6472	-0.5316	0.5390	-0.4180	-0.0880	1		
X_1^2	-0.3469	0,9684	-0.6697	0.8716	0.3377	-0.4571	1	
X_1^{-1}	0.4751	-0.7615	0.9059	-0.74825	-0.4845	0.5282	-0.6075	1

$X_1 \equiv$ Average daily membership

$X_2 \equiv$ Courses taught per teacher

$X_3 \equiv$ Units offered

$X_4 \equiv$ Average teacher salary

$X_5 \equiv$ Assessed valuation per student

$Y \equiv$ Cost per student

[a]Computed from Iowa, Secretary's Annual Report, 1970-71.

APPENDIX B:

ANALYSIS OF REGIONAL TEACHER SALARY VARIATION:

RANDOMIZED COMPLETE BLOCK DESIGN

Block[b]	Treatment[a]								
	1	2	3	4	5	6	7	9	10
1	7,549	7,232	8,721	7,651	7,767	8,034	7,454	9,673	6,749
2	8,345	9,365	8,644	8,534	8,954	8,272	8,746	8,205	8,103
3	8,728	8,390	8,074	8,694	8,551	8,339	7,638	8,480	6,455
4	8,037	8,091	9,326	8,836	9,817	8,701	8,365	8,505	8,325
5	9,055	8,654	8,779	9,126	9,150	7,488	8,201	8,393	7,467
6	8,436	9,202	9,424	9,200	10,155	8,608	8,660	9,380	8,542
7	8,165	9,015	10,031	9,100	8,445	8,985	8,643	10,316	9,611
T_j	58,351	59,949	63,019	61,141	62,839	58,427	57,416	62,952	55,252
$\bar{Y}_{.j}$	8,366	8,564	9,002	8,734	8,978	8,347	8,244	8,993	7,893

[a]Treatments are merged areas.
[b]Blocks are size classes.

Block[b]	Treatment[a]						B_i	$\bar{Y}_{i\cdot}$
	11	12	13	14	15	16		
1	8,172	7,284	7,121	6,420	6,496	7,636	113,959	7,597
2	8,362	8,101	6,702	7,079	6,615	8,990	123,017	8,201
3	8,617	7,570	7,690	8,295	8,232	8,307	112,120	7,475
4	9,284	8,071	8,505	7,880	7,374	8,233	127,290	8,486
5	8,849	8,503	8,085	8,623	8,148	9,528	1,208,069	8,537
6	8,556	8,910	8,020	7,864	9,288	8,591	132,836	8,856
7	9,529	8,977	8,154	8,624	9,154	10,763	137,512	9,167
T_j	61,369	57,707	54,277	54,785	55,307	62,048	T	$\bar{Y}_{\cdot\cdot}$
$\bar{Y}_{\cdot j}$	8,767	8,202	7,754	7,826	7,915	8,864	884,803	8,427

$\Sigma Y_{ij}^2 = 7,527,034,000$

MYY = 7,455,965,000
BYY = 23,527,420
TYY = 19,943,420
EYY = 27,598,840

M = 7,455,965,000
B = 3,921,237
T = 1,424,530
E = 328,558

$F_{14,84} = 4.3357$

Significant at 0.995

SELECTED BIBLIOGRAPHY

Associated Press. "High Court Upholds Property Tax for Financing of Schools." Des Moines Register, March 22, 1973.

Benson, Charles, et al. State and Local Fiscal Relationships in Public Education in California. Sacramento, Cal.: Senate of the State of California, 1965.

Benson, Charles. "Selecting a School Finance Alternative." California Supreme Court Decision: Serrano v. Priest. Edited by J. Scribner. Los Angeles: U.C.L.A. Education Extension, 1971.

Benson, Charles. The Economics of Education. Boston: Houghton-Mifflin Co., 1968.

Bowles, Samuel and Levin, Henry A. "The Determinants of Scholastic Achievement--An Appraisal of Some Recent Evidence." Journal of Human Resources, III (Winter, 1968), 3-24.

Burkhead, Jesse; Fox, Thomas; and Holland, John. Input and Output in the Large-City High Schools. Syracuse, N.Y.: Syracuse University Press, 1967.

Cohn, Elchanan. "Economics of Scale in Iowa High School Operations." Journal of Human Resources, III (Fall, 1968), 422-34.

Coleman, James S., et al. Equality of Educational Opportunity. Washington, D.C.: U.S. Government Printing Office, 1966.

Conant, James B. The American High School Today. New York: McGraw-Hill, Inc., 1959.

Coons, John E. "What the Court Decided and What It Did Not Decide." California Supreme Court Decision: Serrano v. Priest. Edited by J. Scribner. Los Angeles: U.C.L.A. Education Extension, 1971.

Coons, John E.; Clune, William H., III; and Sugarman, Stephen. Private Wealth and Public Education. Cambridge, Mass.: Harvard University Press, 1970.

Cubberly, Ellwood P. School Funds and Their Apportionment. New York: Teachers College, Columbia University, 1906.

Davis, J. Ronnie. "The Social and Economic Externalities of Education." Economic Factors Affecting the Financing of Education. Edited by Roe Johns, et al. Gainesville, Florida: National Educational Finance Project, 1970.

Doak, Richard. "Aid for Small Schools Urged Over Reorganizing." Des Moines Register, November 30, 1972.

Doak, Richard. "Small School Fight Seen." Des Moines Register, January 20, 1973.

Flansburg, James. "School Reorganization Plan Opposed by Farm Bureau." Des Moines Register, January 11, 1973.

Garms, Walter and Smith, Mark. Development of a Measure of Educational Need and Its Use in a State Support Formula. Albany, New York: New York State Education Conference, June, 1969.

House File 654. Iowa 64th General Assembly, June 30, 1971.

House File 1269. Iowa 64th General Assembly, June, 1972.

Inman, William. "Size Factors and State School System Organization." In Planning for School District Organization. Edited by Ralph Purdy. Lincoln, Nebraska: The Great Plains School District Reorganization Project, June, 1968.

"ISEA Assails School-Aid Rule." Des Moines Register, March 23, 1973.

Iowa Code. School Aid Laws, 1966-72.

Iowa Department of Public Instruction. Secretary's Annual Report, 1970-71. Des Moines, Iowa: Iowa Department of Public Instruction, 1971.

Iowa Department of Public Instruction. Iowa Secretary's Annual Report Summary. Des Moines, Iowa: Iowa Department of Public Instruction, 1971.

Karst, Kenneth. "Description of the Litigation in Serrano v. Priest." Serrano v. Priest: Implications for Equal Educational Opportunity. Edited by J. Scribner. Los Angeles: U.C.L.A. Education Extension, 1971.

Kiesling, Herbert J. "Measuring a Local Government Service: A Study of School Districts in New York State." Review of Economics and Statistics, XLIX (August, 1968), 356-68.

Kirp, David. "A Critique of Wise's Thesis." Phi Delta Kappan, November, 1969, pp. 148-51.

Lawyers' Committee for Civil Rights Under Law. Committee Report. Report No. 9. Washington, D.C.: The Committee, March, 1972.

Levin, Henry M. "The Effect of Different Levels of Expenditure on Educational Output." Economic Factors Affecting the Financing of Education. Edited by Roe Johns, et al. Gainesville, Florida: National Educational Finance Project, 1970.

Lindman, Erick. "Implementing a School Finance Alternative." California Supreme Court Decision: Serrano v. Priest. Edited by J. Scribner. Los Angeles: U.C.L.A. Education Extension, 1971.

McInnis v. Ogilvie, 37 U.S.L.W. 3350 (U.S. Mar. 25, 1969).

"Major Bills in Iowa Legislature." Des Moines Register, April 8, 1973.

Masek, George, et al. Correlation and Regression Analyses of Differences Between the Achievement Levels of Ninth Grade Schools From the Educational Opportunity Survey. Washington, D.C.: National Center for Educational Statistics, Office of Education, 1968.

National Educational Finance Project. Future Directions for School Financing. Gainesville, Florida: National Educational Finance Project, 1971.

New York State Commission on the Quality, Cost, and Financing of Elementary and Secondary Education. Commission Report. Albany, New York: The State Education Department, 1972.

Ostle, Bernard. Statistics in Research. Ames, Iowa: Iowa State University Press, 1963.

Riew, John. "Economies of Scale in High School Operations." Review of Economics and Statistics, XLVIII (August, 1966), 280-87.

Rodriguez v. San Antonio, U.S. District Court of the Western District of Texas, 1971.

"School Finance Reform Isn't Dead." Des Moines Register, April 16, 1973.

Selby, Samuel, ed. Standard Mathematical Tables. Cleveland, Ohio: The Chemical Rubber Company, 1968.

Serrano, et al v. Priest, et al, California Supreme Court, August 30, 1971.

Sexton, Patricia Cayo. Education and Income: Inequalities of Opportunity in Our Public Schools. New York: The Viking Press, 1961.

Strayer, George D. and Haig, Robert M. Financing of Education in the State of New York. New York: The Macmillan Co., 1923.

U.S. Department of Health, Education and Welfare. School Programs for Educationally Deprived Children. Washington, D.C.: U.S. Government Printing Office, 1965.

Wilkins, Roy. "Inequality Wins In Court." Des Moines Register, April 2, 1973.

Wise, Arthur. "The Constitutional Challenge to Inequalities in School Finance." Phi Delta Kappan, November, 1969, pp. 145-48.

ACKNOWLEDGMENTS

Like any sequence of human events, those leading to the completion of this document have been varied. I wish to thank those people who have helped me share the trials and the joy involved in this endeavor. No one has shared in the events to a greater extent than my wife, Valarie. Understanding anything goes far beyond comprehension of the words involved. Valarie understands the things which went into this paper.

Drs. C. W. Meyer and R. W. Thomas of Iowa State University have shared in the chore of reading and commenting on the original drafts of the document. Without their help, guidance and counseling the effort would have probably withered on the vine.

Data supplied by the Iowa Department of Public Instruction provided the basic source for much of the analysis contained in the document. Music was supplied by Beautiful Day, Mason Proffit, James Taylor, The Band and Schubert.

Much of the positive results of the stream of events which lead to the end of this page can be ascribed to the people and institutions mentioned above. Any errors of omission or commission are totally the work of the author.