STATE AID TO LOCAL SCHOOL DISTRICTS: A COMPARATIVE ANALYSIS

by

DENISE M. DIPASQUALE

B.A., Carnegie-Mellon University
(1975)

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE
DEGREE OF

DOCTOR OF PHILOSOPHY

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

(AUGUST 1979)

Signature of Author . . . . . , ...
Department of Urban Studies and Planning, August 1979

Certified by . . . . . .
Professor William C. Wheaton, Thesis Supervisor

Accepted by . . . . . .
Professor Robert Fogelson, Chairman, Department Committee

STATE AID TO LOCAL SCHOOL DISTRICTS: A COMPARATIVE ANALYSIS

by

DENISE M. DIPASQUALE

Submitted to the Department of Urban Studies and Planning

on August 10, 1979 in partial fulfillment of the requirements

for the Degree of Doctor of Philosophy

ABSTRACT

In recent years, many state legislatures have attempted to reform school finance laws. The goals of such reforms vary among states. The goal may be to insure that the level of education expenditures of a school district is independent of the district's property wealth, to equalize per pupil expenditures across all school districts, or to insure that all districts spend a minimum amount per pupil. States have used different types of state grant-in-aid mechanisms, such as matching grants and block grants, to effect these changes. There is a long literature on the theory of intergovernmental grants, which suggests that matching grants have a more stimulative effect on local expenditures than block grants.

The purpose of this dissertation is to evaluate, in a systematic fashion, the response of local school districts to various types of aid mechanisms. This is accomplished by estimating consistent expenditure models for six different states which employ a variety of aid mechanisms. Three of the states--Massachusetts, Michigan, and New Jersey--distribute the major portion of state aid to education through matching formulae, while three states--Colorado, Indiana, and Minnesota--use block grants. The results of this dissertation show that the marginal impact of an additional dollar of matching aid is no larger than the marginal impact of an additional dollar of block aid. However, neither matching nor block grants have much of a stimulative effect on expenditures. In both cases, the major portion of an additional dollar of aid serves as a substitute for locally raised revenue. Using simulation techniques, the expenditure models were employed to estimate the total state costs of achieving several goals of school finance reform through these aid mechanisms.

Name and Title of Thesis Supervisor: William C. Wheaton
Associate Professor of Economics
and Urban Studies

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGMENTS

There are many people who have provided me with advice and encouragement throughout the dissertation process. I would like to extend my deepest thanks to my dissertation advisor, Professor William Wheaton, for his guidance through every stage of this process from the development of the research proposal to the final preparation of this dissertation. His criticisms, suggestions, and continuous encouragement were invaluable. I would also like to thank Professor Andrew Reschovsky for his comments, suggestions, and support during the various stages of the process. Professors Jerome Rothenberg and Bennett Harrison provided useful comments on the draft of this thesis.

Financial support for this research was provided through the Andrew Stouffer Dissertation Fellowship awarded by the Joint Center for Urban Studies of M.I.T. and Harvard University. Additional support was graciously provided by Professors Barry Bluestone and Lynn Ware at the Social Welfare Research Institute at Boston College.

I would also like to thank Virginia Randall, who typed and edited the draft and final version of this thesis. Her patience and friendship throughout this endeavor were greatly appreciated. Valuable research assistance was provided by Amy Kruser and Ellen Fischer.

Finally, I would like to extend my gratitude to the Joint Center Night Crew--Sandy Kanter, Dan Kurtz, Glynnis Trainer, and occasionally, Ned Hill and Katherine Lyons. The Night Crew made an otherwise very lonely process much more tolerable. May none of us ever be forced to eat another meal in Harvard Square.

Chapter 1

INTRODUCTION

Background and Research Questions

For many years, the question of equality in public education in the United States has been under scrutiny. A major issue discussed by educators and debated in the courts has been discrimination in terms of access to educational resources. At the heart of the issue of equal access to educational resources is the present system of financing public elementary and secondary education. Historically, a large portion of total revenue for public education has been raised locally from the property tax. As shown in Table 1.1, the role of local jurisdictions in funding public education has decreased during the past 60 years. During the 1919-20 school year, 83.2 percent of all revenue for public schools came from local sources (primarily the local property tax), 16.5 percent came from state sources, and .3 percent from federal sources. By the 1939-40 school year, the role of state government increased substantially. Revenue from local sources decreased to 68 percent of total revenue while the state and federal contributions increased to 30.3 percent and 1.8 percent, respectively. By the 1975-76 school year, 47.4 percent of total revenue for public education came from local sources, 43.9 percent came from state sources, and 8.8 percent came from federal sources.

Although the role of local jurisdictions in funding public education has decreased over the past 60 years, as of the 1975-76 school year, local jurisdictions still accounted for a larger percent of total

Table 1.1

PERCENT OF REVENUE FOR PUBLIC, ELEMENTARY, AND SECONDARY EDUCATION FROM FEDERAL, STATE, AND LOCAL SOURCES IN THE UNITED STATES 1919-20 to 1975-76

	Percent of Total Revenue From:		
School Year	Federal Sources	State Sources	Local Sources
1919-20	0.3	16.5	83.2
1929-30	0.4	16.9	82.7
1939-40	1.8	30.3	68.0
1941-42	1.4	31.4	67.1
1943-44	1.4	33.0	65.6
1945-46	1.4	34.7	63.9
1947-48	2.8	38.9	58.3
1949-50	2.9	39.8	57.3
1951-52	3.5	38.6	57.8
1953-54	4.5	37.4	58.1
1955-56	4.6	39.5	55.9
1957-58	4.0	39.4	56.6
1959-60	4.4	39.1	56.5
1961-62	4.3	38.7	56.9
1963-64	4.4	39.3	56.3
1965-66	7.9	39.1	53.0
1967-68	8.8	38.5	52.7
1969-70	8.0	39.9	52.1
1971-72	8.9	38.3	52.8
1973-74	8.5	41.4	50.1
1975-76	8.8	43.9	47.4

Source: W. Vance Grant and C. George Lind, Digest of Education Statistics, 1977-78 (Washington, D.C.: National Center for Education Statistics, 1978), p. 67.

revenue than either state or federal sources. This dominance of local jurisdictions in the financing of public shcools is often cited as one of the main reasons for unequal access to educational resources. Since the property tax is the primary source for local revenues, the dominance of local jurisdictions in funding schools indicates that per pupil education expenditures are dependent on the property wealth of the jurisdictions. There are large disparities in the property wealth of local jurisdictions which result in large differences in the levels of revenues raised locally to support schools. Consider a wealthy suburban community with a relatively large property tax base and a small urban community with a small declining tax base. If each community taxes its residents at the same rate, the suburban community will reap much greater revenues. The property poor district may either spend less on education or increase the tax burden on its residents.

Since 1971, the variation in per pupil education expenditures resulting from disparities in the property wealth of local jurisdictions has become a legal issue in both state and federal courts. Serrano v. Priest[1] is the landmark legal case which served as a model for many of the school finance cases which followed. In that case, taxpayers and children from several school districts in Los Angeles County claimed that "there were substantial disparities among school districts in California in tax base per pupil, that these disparities resulted in substantial disparities among school districts in dollar amounts spent per pupil for public education, and that the educational opportunities available to children in property poor districts were substantially

---

[1] Serrano v. Priest, 5 Cal.3d 584, 487 P.2d 1241, 96 Cal. Rpt.601 (1971)

inferior to those available for children of wealthier districts."[2] The California Supreme Court found that the current system of financing public education made per pupil expenditures a function of the local wealth of a school district, and therefore, the state financing scheme was declared unconstitutional. This decision hinged on the view that the financing system violated the equal protection clause of the California Constitution.

Following the Serrano decision, the school finance laws in five other states--Arizona, Minnesota, New Jersey, Texas, and Wyoming--were found to be in violation of either their respective state constitutions or the U.S. Constitution.[3] The constitutional arguments presented in these cases either involved the equal protection clause of the U.S. Constitution or the respective state constitution, as in the Serrano decision, or the education clause of the state constitution. In New Jersey, for example, the State Constitution requires that the State provide "thorough and efficient" public education.[4] In Robinson v. Cahill,[5] the New Jersey school finance law was found to be in violation of this clause of the New Jersey Constitution. It was successfully argued that because of the heavy reliance on the local property tax

---

[2]Update on State-Wide School Finance Cases, School Finance Project, Lawyers' Committee for Civil Rights Under the Law (February, 1978), p. 2.

[3]Oliver Oldman and Ferdinand Schoettle, State and Local Taxes and Finance (Mineola, New York: The Foundation Press, Inc., 1974), p. 945.

[4]New Jersey Constitution, Art. VLLL, Sec. 4.1.

[5]Robinson v. Cahill, 118 N.J. Super. 223, 287 A.2d 187 (1972), aff'd 62 N.J. 473, 303 A.2d 273 (1973).

for revenue to finance public schools, property poor districts in New Jersey were unable to provide adequate public education.[6]

This rapid movement toward court ordered school finance reform was slowed when the lower court decision in Rodriguez v. San Antonio[7] was appealed to the U.S. Supreme Court. The Supreme Court reversed the lower court decision on the grounds that local financing of public schoools and the inequalities in per pupil expenditures that result are not a violation of the equal protection clause of the U.S. Constitution. The Supreme Court decision was based on the view that the Texas school finance scheme did not discriminate against any definable class of "poor" and that education is not a fundamental right guaranteed by the U.S. Constitution.[8] This decision meant that court mandated school finance reform would have to depend on the interpretation of individual state constitutions. Since the Rodriguez decision, school finance laws in five states--Connecticut, New Jersey, New York, Ohio, and Washington--have been declared in violation of their respective state constitutions.[9]

With this growing concern over the inequalities in educational opportunities that result from reliance on the local property tax for

---

[6]James R. Knickman and Andrew Reschovsky, "School Finance Reform in New Jersey: The First Two Years," in 11th Annual Report (Trenton, New Jersey: Economic Policy Council, New Jersey Department of the Treasury, 1978), p. 1

[7]San Antonio Independent School District v. Rodriguez, 411 U.S. 1, 93 S.Ct. 1278, 36 L.ED.2d 16 (1972).

[8]Oldman and Schoettle, State and Local Taxes and Finance, pp. 954-968.

[9]James R. Knickman and Andrew Reschovsky,"The Implementation of School Finance Reform,"mimeo, 1978, p. 1.

a large portion of revenues for public education, many states have begun to reform school funding laws. The goals of such reforms vary among states. The goal may be to insure that the level of education expenditures of a school district is independent of the district's wealth (fiscal neutrality), equalize per pupil expenditures across all jurisdictions in the state, or insure that all districts spend a minimum amount per pupil. Fiscal neutrality and total equalization of per pupil expenditures across school districts may be difficult to achieve since they may require not only increasing expenditures in property poor districts but also decreasing expenditures in property rich districts.

Given the specific goal of finance reform in a particular state, the state legislature has three ways in which it can attempt to achieve the goal. The state can increase the percentage of total school expenditures paid by the state and/or change the method of distributing state aid or completely take over the financing of public elementary and secondary education. Complete takeover by the state of the financing of public education would be an unrealistic option in many states given the long-standing view that local districts should control public schools. The effects of increases in state aid or changes in the method of distributing state aid on the level of education expenditures are unclear. An increase in state aid to a local district may have a significant impact on education expenditures or little or no effect on education expenditures. The district may use the grant to increase education expenditures or as a substitute for locally raised revenue for education.

In the latter case, the district may use local revenues which in the absence of state aid would have been used for education to provide other local services or to reduce local taxes. Thus, increases in state aid may significantly increase per pupil spending or have little or no effect on spending depending on the behavioral response of the local district.

A state legislature may also consider changing the method of distributing state aid in order to achieve its goal. State aid to education is usually distributed in the form of block grants or matching grants. As will be shown in Chapter 2, block grants increase the income available to a local district for education expenditures. Again, the effect of the block grant on local spending is unclear. Will the local district use the grant to increase per pupil expenditures or as a substitute for locally raised revenue? Under a matching grant, a local district is reimbursed by the state for some fraction of every locally raised dollar spent on education. In effect, the matching grant alters the price of education for the district--an additional dollar in education expenditures actually costs the district less than a dollar. As will be shown in Chapter 2, matching grants are thought to have more of a stimulative effect on local spending than block grants because of this price effect. The decrease in the price of education resulting from the matching grant encourages the local district to spend more on education. With the movement towards school finance reform in recent years, more states are allocating aid to education through matching

grants because of this expected stimulative impact on spending. However, the size of the impact on local spending of changes in the price of education resulting from a matching grant is uncertain. Does a large decrease in the price of education result in a large or small increase in per pupil expenditures?

The above discussion indicates that when a state legislature is considering changes in school finance laws in order to impact per pupil education expenditures, it is important to understand the response of local districts to the proposed changes. It is the response of the local districts which determines the magnitude of the impact of changes in finance laws on the level of expenditures. The experience in New Jersey in recent years illustrates this point.

As already discussed, the New Jersey Supreme Court ruled in Robinson v. Cahill that the New Jersey school finance law did not provide children in property poor districts with "thorough and efficient" education as required by the New Jersey Constitution. It was argued that property poor districts could not provide adequate education because the finance scheme relied too heavily on the property wealth of the local district--large disparities in local property wealth resulted in large disparities in per pupil education expenditures. The Court mandated that the Legislature alter the school finance laws so that every district has the resources to provide "thorough and efficient" education for its pupils. In response to the Court mandate, the New Jersey Legislature modified the state aid formula and increased state aid for education by $400 million. The new legislation took effect in the 1976-77 school year.

Two recent studies evaluating the impact of the new legislation during its first two years show that the changes did nothing to narrow the gap between per pupil expenditures of property poor districts and property rich districts.[10] "In fact, the dollar gap between districts spending at the low 5th percentile and districts spending at the high 95th percentile widened over the period."[11] One explanation for this rather startling result is that in two years local districts have not had time to respond to the changes in legislation, and therefore, the long run implications of the new legislations cannot be measured. If this is the case, policy makers can wait and reevaluate the program in a few years to determine the impact of the legislation. Another explanation is that the local districts have responded to the new legislation and the legislation simply brought about no change in the disparities in per pupil expenditures among school districts either because of the distribution of grants-in-aid or because of the nature of the response of local districts. In this case, the legislature can modify the finance laws again and wait another several years to determine the impact of the new changes. This type of time-consuming iterative procedure is a very inefficient method of achieving desired goals of school finance reform.

---

[10] Margaret E. Goertz, Where Did the $400 Million Go? The Impact of the New Jersey Public School Education Act of 1975 (Princeton, New Jersey: Education Policy Research Institute, Education Testing Service, March, 1978).

Knickman and Reschovsky, "The Implementation of School Finance Reform."

[11] Goertz, Where Did the $400 Million Go?, p. 4.

One alternative to the iterative procedure described above for achieving the goals of school finance reform is for policy makers to predict the local response to various changes in finance legislation under consideration. Such predictions would help legislators choose those changes which will most likely have the desired effects on education expenditures. The local response predictions can be made by statistically modeling the education expenditure decisions of local jurisdictions. The conventional way of modeling local government behavior is to assume that local decision makers respond to the demand of local residents, thus education expenditures per pupil may be considered some function of the income and wealth of the district and the price of education for the district. The income component of such a model would include a measure of the residents income as well as the various grants in aid for education received by the district. In this way the specific impact of each type of grant on local spending could be estimated. If the school finance legislation includes a matching grant, the price of education resulting from the matching grant would serve as one component of the price term. Thus, the local response to changes in the price of education can be estimated. Another component of the price term would be some measure of the tax burden on local residents resulting from education expenditures.

The Research Design

The purpose of this dissertation is to evaluate, in a systematic fashion, the response of school districts to various types of aid mechanisms. This will be accomplished by estimating a model of local

school district behavior for a group of carefully selected states which employ a variety of aid mechanisms. In the literature, there have been a number of studies which estimate education expenditure models. However, these studies usually estimate an expenditure model for only one state and, therefore, only examine the specific aid mechanisms of the particular state being modeled.[12] It is difficult to compare the results of these individual studies because the specifications of the expenditure models vary substantially. In this dissertation, consistent expenditure models are estimated for six states--Colorado, Indiana, Massachusetts, Michigan, Minnesota, and New Jersey--with each state representing different types of state aid mechanisms. Three of the states examined in this analysis distribute state aid through some form of block grants while the other three states use different types of matching grants to distribute state aid. The results of each of these models are compared and contrasted to determine the different impacts of these various aid mechanisms on the level of expenditures. This comparative analysis may provide useful insights to policy makers who are trying to determine which aid mechanisms to use to have specific effects on education expenditures.

---

[12] In fact, three of the major studies of education expenditures are based on models of just one state--Massachusetts. See:

Martin S. Feldstein, "Wealth Neutrality and Local Choice in Public Education," American Economic Review, Vol. 65 (March, 1975), pp. 75-89.

W. Norton Grubb and Stephen Michelson, States and Schools (Lexington, Massachusetts: D. C. Heath and Company, 1974).

Helen F. Ladd, "Local Education Expenditures, Fiscal Capacity, and the Composition of the Property Tax Base," National Tax Journal, Vol. 28 (June, 1975), pp. 145-58.

The analysis of local education expenditure decisions is presented in the remaining four chapters of this dissertation. In Chapter 2, the various types of state aid to education are defined and the expected theoretical impacts of these types of aid on the level of expenditures are discussed. A brief background on previous empirical models of the impact of grants on local expenditure decisions in the literature is then presented with an emphasis on the models of education expenditures. Finally, the theoretical basis for the expenditure models estimated in this analysis is presented.

In Chapter 3, a description of the school financing systems in each of the six states included in this analysis is provided. This Chapter presents the reasons for choosing the six states and gives a detailed description of the state aid legislation for each of the states. This legislative background will specifically define the types of aid provided by each of the six states. These definitions will prove particularly useful when comparing and contrasting the results of the estimated expenditure models for the six states.

The specifications of the expenditure models actually estimated for the six states are described in Chapter 4. The estimated expenditure model for each state is then presented. The similarities and differences in the results for the six states are discussed, with an emphasis on comparing and contrasting the impacts of the various types of aid on local expenditures.

Finally, in Chapter 5, the conclusions and policy implications of this analysis are discussed. To illustrate the usefulness of the

expenditure models estimated in Chapter 4 to policy makers, the models are used to simulate to what extent the aid mechanisms of a given state can achieve specific goals of school finance reform. Two forms of wealth neutrality and three forms of per pupil expenditure equalization across school districts are considered in the simulations. Simulations for each of these goals are estimated for one state with a matching formula and one state with a block grant program. In the case of the state with the matching formula, the price of education each district would have to face as a result of the matching formula in order to achieve the specific goal will be determined in the simulation. By comparing these estimated prices with the actual prices for the districts, the amount of aid that the state would have to provide through the matching grant to achieve the specific goal can be calculated. Similarly, in the case of the state with the block grant program, the simulation would indicate how much aid the state would have to allocate to each district in order to achieve each of the goals. By comparing these estimates with the actual aid received by the districts, the increase in aid necessary to achieve the goals can be determined.

Simulations similar to those described above would be of interest to state policy makers considering methods of impacting the level of per pupil education expenditures of districts within the state. The results of these types of simulations indicate whether or not specific goals can be achieved through the existing aid mechanisms and if so at what cost to the state.

Chapter 2

DEFINITIONS AND THEORETICAL BACKGROUND

In order to evaluate the response of local school districts to various types of aid mechanisms, it is important to understand how each of the aid mechanisms works and the expected impact of these various types of aid mechanisms on local expenditures. Part of the extensive literature on fiscal federalism deals with the impacts of intergovernmental grants-in-aid on the level of expenditures of the receiving jurisdiction. In this Chapter, the types of state aid to education will be defined and, drawing from the literature on intergovernmental grants, the expected impacts of these different types of aid will be discussed. A brief background on previous models of the impact of grants on local expenditure decisions in the literature is then presented with an emphasis on models of local education expenditure decisions. Finally, the theoretical basis for the expenditure model estimated in this analysis is presented.

Types of State Aid to Education

In order to determine the impact of various types of state aid on local education expenditures, it is important to understand how these different types of aid are distributed. There are two basic types of state aid to local districts: categorical aid and general aid. Categorical aid refers to state aid which is earmarked for specific programs such as aid for transportation, special education, vocational training, etc. Categorical aid is distributed on the basis of need, usually measured as some function of the number of pupils in

each program. Since categorical programs are not usually fully funded by the state, these programs do depend to some extent on the ability of the local district to raise revenue from local property taxes. It is more difficult for property poor districts to raise the revenues for these programs than property rich towns. To date, however, there has been little effort to distribute categorical aid according to a district's fiscal ability to raise such revenues.[1] Attempts to equalize the fiscal resources available to school districts through allocation of state aid via various equalization schemes have been reserved to the distribution of general aid. General aid is allocated to local school districts for the purpose of assisting districts in funding their education programs. There is no specific program for which the aid is intended. There are basically three ways in which general aid is distributed: flat grants, foundation programs, and district power equalizing programs.

Flat grants distribute a fixed number of dollars for each pupil or unit of instruction in the state. The grant to each district is simply the fixed sum (e.g., $200) multiplied by the number of pupils in the district. Flat grants allocate the same per pupil aid regardless of the wealth of the district, which means that these grants do nothing to alleviate the disparities in resources available for education that result from disparities in the property wealth of school districts.[2]

---

[1] Allan Odden, John Augenblick, and Phillip Vincent, School Finance Reform in the States 1976-1977: An Overview of Legislative Actions, Judicial Decisions and Public Policy Research (Denver, Colorado: Education Commission of the States, Report No. F76-F, December, 1976), pp. 19-21.

[2] Ibid., p. 48.

Both foundation programs and district power equalizing programs attempt to equalize resources available for education across local jurisdictions. A foundation program sets a certain "foundation level" of per pupil expenditures and a minimum tax rate which each district must levy. This minimum tax levy is generally referred to as the required local effort. Under this type of program, state aid covers the difference between the revenue raised from the minimum tax levy and the foundation level of per pupil expenditures. A property poor district will raise less revenue by levying the minimum tax rate than a wealthier district and, therefore, receives a larger amount of state aid in order to reach the foundation level. Thus, foundation programs attempt to narrow the gap between resources available to wealthy districts and those available to poor districts. The success of the foundation program in narrowing this gap depends on what the foundation level is relative to current expenditures. If the foundation level is low relative to current expenditures, then the foundation program will be less effective in narrowing the gap between wealthy and poor districts than if the foundation level was a larger portion of total expenditures. Both flat grant programs and foundation programs insure a minimum level of per pupil expenditures for each district in the state.[3]

District power equalizing (DPE) grants are distributed by a formula which is designed to make total revenue a function of the tax rate levied by the school district (local effort) rather than the property wealth of the district. In other words, districts levying

---

[3] Ibid., p. 48.

the same tax rate would raise the same revenue regardless of property wealth. The general expression of this type of formula is:

$$G_i = (1 - K\frac{EV_i}{\overline{EV}})E_i \qquad (2.1)$$

where

G_i = state DPE grant to district i,

K = constant between 0 and 1,

EV_i = per pupil equalized property value of district i,

$\overline{EV}$ = average per pupil equalized property value of districts in the state, and

E_i = education expenditures (usually from the previous budget year).[4]

The constant K is usually set by the state legislature and may be interpreted as the local share of education expenditures.[5] Grubb and Michelson show that by distributing state aid via the formula given in equation (2.1), district expenditures become a function of the tax rate rather than district property wealth. Assuming expenditures, E_i, are equal to locally raised revenue ($t_i EV_i$) and the DPE grant G_i, then:

---

[4]These expenditures are usually defined to include total local expenditures and DPE state aid. All other state and federal aid are usually omitted. See the definition of reimbursable expenditures for Massachusetts in Chapter 3, p. 57 or prebudget year expenditures for New Jersey in Chapter 3, p. 67.

[5]Charles Benson, The Economics of Public Education, 2nd Ed. (Boston: Houghton Mifflin Company, 1968), p. 148.

$$E_i = t_i EV_i + G_i$$

$$E_i = t_i EV_i + (1 - K\frac{EV_i}{\overline{EV}})E_i$$

$$E_i - E_i + E_i K\frac{EV_i}{\overline{EV}} = t_i EV_i$$

$$E_i = t_i \frac{\overline{EV}}{K} \qquad (2.2)$$

where

t_i = tax rate levied by district i.[6]

The above descriptions of flat grants, foundation programs, and district power equalizing programs provide the basic structure of how these programs operate. In practice, however, states use many different variations of these programs. For example, some states using district power equalizing programs impose floors and ceilings on the amount of aid districts can receive or set a level of property wealth per pupil above which districts are not eligible for aid under the program.[7] As a result of these floors and ceilings, expenditures and equalized property wealth may no longer be completely independent, as implied in equation (2.2). States may use various combinations of the three programs to distribute general aid. For example, one type of program is used to distribute the bulk of general aid and a second type of program may be used to distribute a small portion of the general aid

---

[6] W. Norton Grubb and Stephen Michelson, States and Schools (Lexington, Massachusetts: D. C. Heath and Company, 1974), pp. 74-75.

[7] Examples of specific limitations on the distribution of state aid are given in Chapter 3, where the specific programs used in the six states included in this analysis are described in detail.

funds as supplemental aid. Table 2.1 indicates the percent of total revenue for public elementary and secondary education from state sources during the 1975-76 school year by state. The Table also gives the percentage of total state aid distributed through flat grants, foundation programs, district power equalizing grants, categorical grants, and other state support grants. The Table shows that during the 1975-76 school year, 30 states used some variation of the foundation program to distribute the bulk of general aid, 11 states used a district power equalizing formula, and 8 states used a flat grant program.

Theoretical Impacts of Aid on Expenditures

The economic theory of intergovernmental grants suggests the different ways in which the various types of aid already discussed will impact local expenditure decisions. This theory is largely based on the model developed by James Wilde.[8] This basic model will be presented first, and then the model will be modified to include the specific characteristics of the different types of aid for education already outlined above.

Wilde's model considers the governing body of a local district which must decide how to allocate the district's resources between a social good, say education, and all other social and private goods, X. The model assumes that the district has a set of preferences represented by those of the governing body and that these preferences are consistent. Therefore, these preferences are represented by a conventional mapping

---

[8] James Wilde, "The Expenditure Effects of Grant-In-Aid Programs," National Tax Journal, Vol. 21 (September, 1968), pp. 340-48.

Table 2.1

STATE AID TO LOCAL SCHOOL DISTRICTS BY TYPE OF DISTRIBUTION, 1975-76

	State Aid As A Percent of Total Revenue*	Percent of State Aid Distributed Through:** Flat Grants	Foundation Aid	District Power Equalizing Aid	Categorical Aid	Other State Support
Alabama	62.2	5.4	86.5		8.1	
Alaska	61.9	0.9		74.5	24.6	
Arizona	45.7	2.8	94.1		3.1	
Arkansas	51.3	69.8	19.0[a]		11.1	0.1
California	42.4	27.3	49.3		23.5	
Colorado	40.7	0.1		84.8	15.2	
Connecticut[b]	32.4	68.8			31.3	
Delaware	68.3	61.7		3.4[a]	33.9	0.9
Florida	52.1	0.8	89.4		9.8	
Georgia	47.1		81.8		18.2	
Hawaii	87.2	47.7			52.3	
Idaho	48.2		85.0		1.4	13.5
Illinois	39.3		(c)	(c)	9.8	9.7
Indiana	48.5	8.4	89.1		2.5	
Iowa	41.9	1.0	96.4		2.6	
Kansas	39.0	6.1		72.4	21.6	
Kentucky	55.5	3.2	96.8			
Louisiana	57.3	1.5	87.7		5.5	5.3
Maine	43.1		92.5	7.1[a]	0.5	
Maryland	41.0		47.4		34.5	18.1
Massachusetts[b]	36.1			75.9	24.1	
Michigan	45.0			81.7	18.3	
Minnesota	58.5	1.7	75.7		22.7	
Mississippi	54.5	3.1	80.9		16.0	0.1
Missouri	37.2	3.7	78.3		18.0	
Montana	50.9		85.6	10.5[a]	2.9	1.0
Nebraska[b]	19.0	45.9	34.1		20.0	
Nevada	37.5		100.0			
New Hampshire	9.5	19.5	20.1		60.2	
New Jersey	28.6			42.8	32.2	25.0
New Mexico	59.4	1.4	92.1		6.5	
New York	39.3	1.3	97.9		0.8	
North Carolina	61.6	91.2			8.8	
North Dakota	43.7	7.2	84.5		8.3	
Ohio	39.5			60.8	34.9	4.4
Oklahoma	50.5		27.9[a]	38.1[a]	31.3	0.9
Oregon	26.1	70.9	17.6[a]		10.1	1.4
Pennsylvania	47.2			79.1	20.7	0.2
Rhode Island	33.4			93.5	6.5	
South Carolina	54.9	91.5			8.5	
South Dakota	17.0	15.2	78.4		6.4	
Tennessee	49.3	5.4	89.9		4.7	
Texas	49.0	23.2	75.2[d]		1.6[e]	
Utah	54.6	0.9	74.3		7.1	17.6
Vermont	28.6			75.3	24.7	
Virginia	32.0	20.7	52.0		16.7	10.5
Washington	61.1		72.8		27.2	
West Virginia	54.3	14.9	79.4		5.7	
Wisconsin	36.5	0.5		86.7	12.8	
Wyoming[b]	30.9		100.0			

[a] This feature is part of the supplemental support program.
[b] 1974-75 Distribution.
[c] Illinois has both foundation and district power equalizing programs which account for 80.4 percent of the total state aid.
[d] Includes both state and local shares of the Foundation Program.
[e] Part of the Foundation Program.

*Source: W. Vance Grant and C. George Lind, Digest of Education Statistics 1977-78 (Washington, D.C.: National Center for Education Statistics, 1978), p. 66.

**Source: Esther Tron, Public School Finance Programs, 1975-76 (Washington, D.C.: Bureau of School Systems, Office of Education, 1976), pp. 12-15.

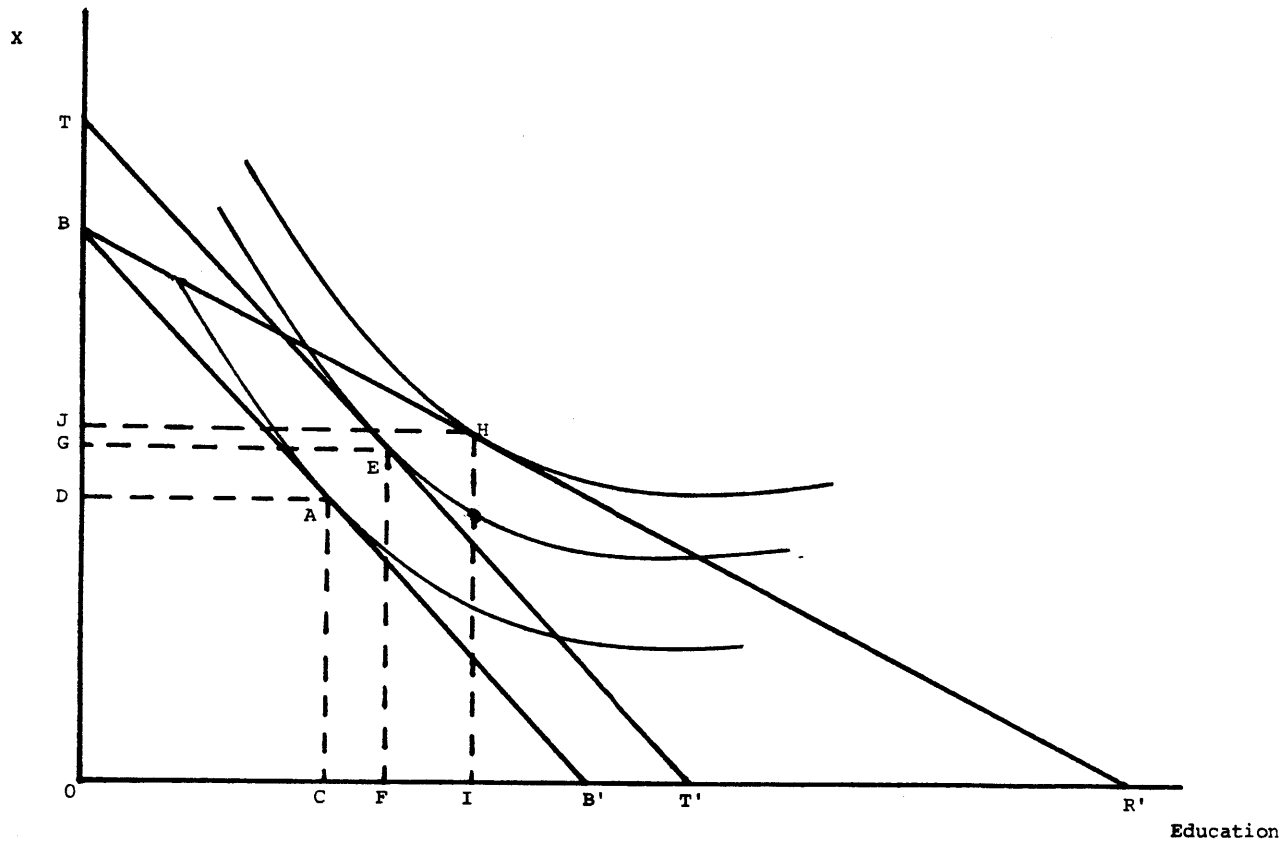
of indifference curves. Wilde also assumes that the governing body of a local district maximizes the district's preferences subject to the prices of the social good, education, and the prices of all other private and social goods and the total resources available to the district. In the absence of state and federal aid, a district's resources consist of the sum of the residents' income after state and federal income taxes.

Given that the prices of education and all other social and private goods, X, and the district's resources are known, the district faces a budget line, BB' (see Figure 2.1). The district will operate at point A, where the district's indifference curve is tangent to the budget line BB' allocating $C to education expenditures and $D to X. Assume that the local district receives a general lump sum or block grant of $BT from the federal or state government which can be allocated to any local program. This general block grant increases the total resources available to the district and, therefore, shifts the budget constraint from BB' to TT'. This type of grant is said to have an income effect on local spending. As a result of the grant, the district now operates at point E allocating $F to education, increasing education expenditures by $F-C, and allocating $G to X, increasing expenditures on X by $G-D.

Suppose that rather than receiving a lump sum grant from the state or federal government, the district receives a grant with matching provisions. In other words, for every dollar the local district spends on a particular budget item, such as education, the state or federal

Figure 2.1

IMPACTS OF GENERAL BLOCK GRANTS
AND UNRESTRICTED MATCHING GRANTS ON EXPENDITURES



government contributes some fraction of the dollar. In effect, the matching grant reduces the price of education for the local district. Assuming there are no restrictions on the matching grant, such a grant would pivot the budget line from BB' to BR' (see Figure 2.1). The district will now operate at point H allocating $I to education and $J to X. The state or federal government will pay $\frac{B'R'}{OB'}$ of the local share of the local district's education expenditures. This type of matching grant has both an income and a price effect. Matching grants are thought to have more of a stimulative effect on local expenditures than lump sum grants because matching grants reduce the price of the budget item. Economic theory suggests that when the price of a good falls, more of the good will be purchased.

The different types of aid to education described earlier can be divided into the block grant and matching grant categories used in Wilde's model. Flat grants, foundation grants, and categorical grants are all examples of block grants. The district power equalizing grant is a matching grant, since the size of the grant is some fraction of the level of expenditures.

Flat grants, foundation grants, and categorical grants are all forms of state aid to local education programs. Because these block grants are allocated specifically for education, the effect of these grants may be different than that of a general block grant described above. Again, consider a school district allocating resources between education and X with an initial budget constraint BB' and an initial point of equilibrium A. Assume that the state government provides a

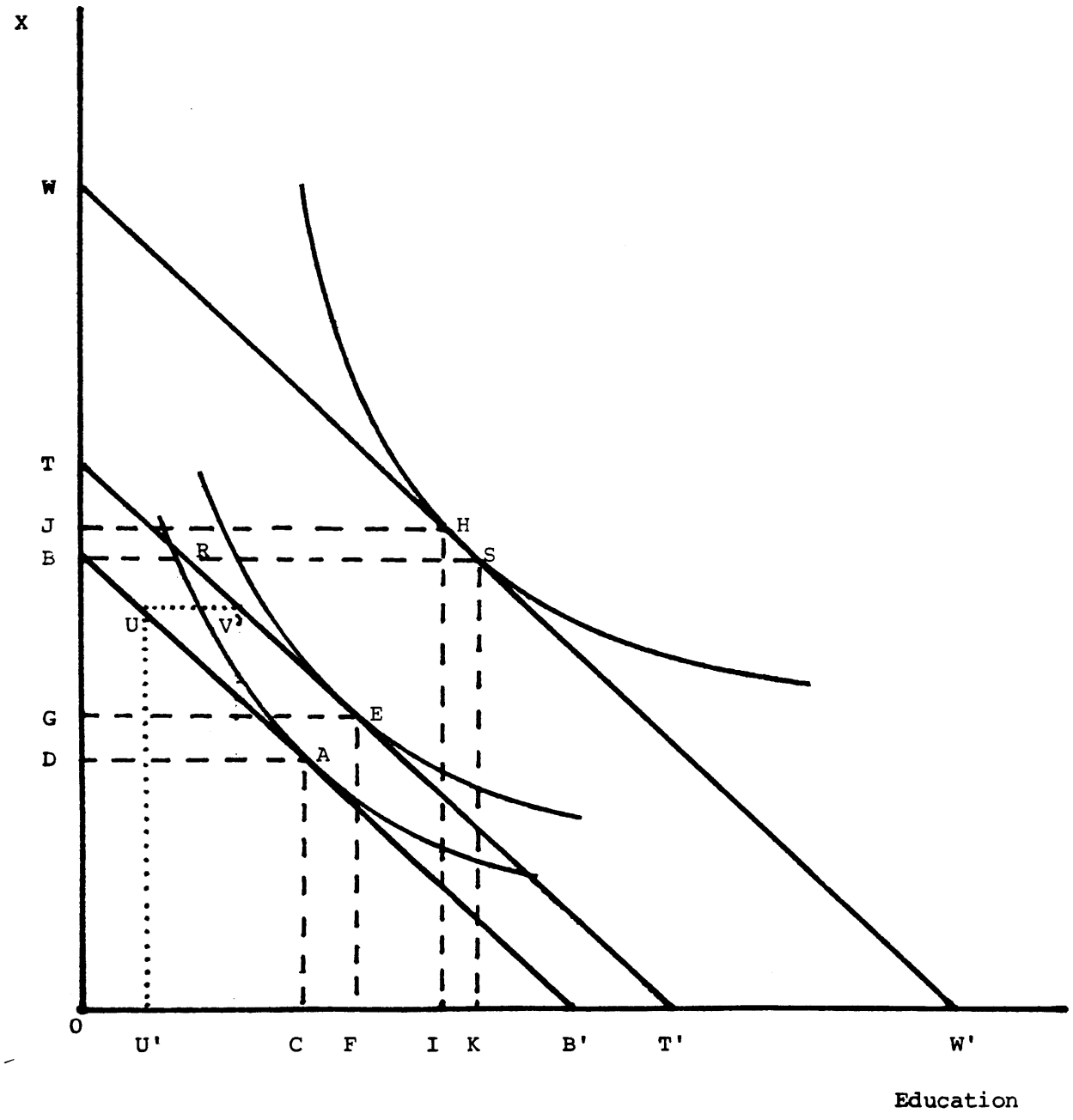
block grant specifically for education, as in the case of the flat, foundation, or categorical grants. Because of the specific nature of the grant, it will alter the budget constraint in a different way than the general block grant discussed earlier. As shown in Figure 2.2, the specific block grant shifts the budget constraint to BRT' because the total sum of this specific grant, $BR, must be spent on education. If the specific block grant is a foundation grant with a required local effort, the budget constraint would become BUVT'. In this case the district would be required to raise OU' locally for education in order to be eligible for a state block grant for education of UV.

For the district modeled in Figure 2.2, in both the cases of a specific block grant and a foundation grant, the district would operate at point E allocating $F to education and $G to X. This is exactly the same allocation achieved when the district received a general block grant of $BT. This specific grant did not increase education expenditures any more than the general grant. In the case of the general grant, $F-C of the additional income was allocated to education while $G-D was allocated to X. In the case of the specific grant, all the additional money was allocated to education, but the district allocated a portion of its local revenue, $G-D, that would have gone to education in the absence of the specific grant to other uses, X. This portion of the specific grant served as a substitute for local revenue raised for education. In other words, the grant is fungible.

As Wilde points out, a specific block grant to education may have a larger impact on education expenditures than a general block

Figure 2.2

IMPACTS OF SPECIFIC BLOCK GRANTS ON EXPENDITURES



grant to the school district, as the size of the grant increases. Consider a general block grant of $BW. As shown in Figure 2.2, the grant, BW, shifts the district's budget constraint to WW', and the district operates at point H, allocating $I to education and $J to X. Now consider a specific block grant to education of $BW. The district's budget constraint becomes BSW'. In this case, the district operates at point S devoting $K to education and $B to good X. The specific block grant of $BW results in an additional $K-I being spent on education than with a general block grant of $BW. The specific grant has a greater impact than the general grant once the size of the grant is larger than the amount that the district would choose to spend on the intended program in the absence of the grant. In this instance, all of the district's own revenue is devoted to X, and the specific grant serves as full funding for the intended program. When the size of the specific grant exceeds the amount the district would choose to spend on the program, the district will operate at the "corner" of the budget constraint--point S in Figure 2.2. Wilde refers to this additional impact of a specific grant as a "deflective effect." He states in his article that "the existence of any deflective effect depends on the marginal propensity to consume that social good (education) and on the size of the grant relative to the community's expenditures in its absence."[9]

As already stated, flat grants, foundation grants, and categorical grants to education are all examples of specific block grants. The

---

[9] Ibid., pp. 341-42.

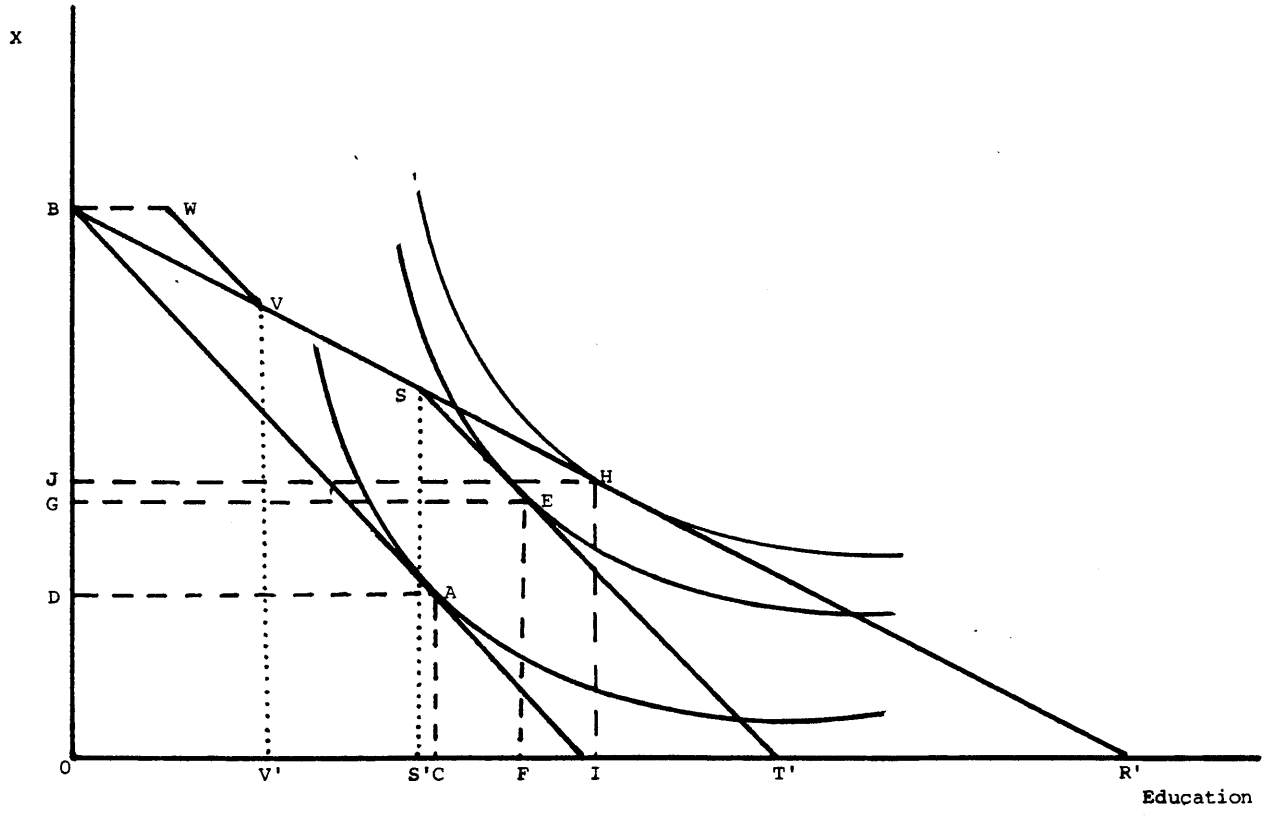
expected impacts of these grants have been described in detail and modeled in Figure 2.2. The essential difference among these three grants is that flat grants and foundation grants are tied to the general budget category of education, while categorical grants are tied to specific education programs. Categorical grants would have the same basic effect as the specific grants modeled in Figure 2.2. However, these grants may be expected to have a deflective effect more often than other types of specific grants because the size of the categorical grant need only exceed local spending on the specific program to which the grant is tied in order for there to be a deflective effect. In some instances, categorical grants are given to start local programs which do not currently exist or to promote programs which have little local support. In these cases, the categorical grants will most probably exceed local spending and, therefore, have a deflective effect. In terms of the model presented in Figure 2.2, categorical grants which exceed local spending on the intended program will push the district to operate on the corner of its new budget constraint (point S in Figure 2.2). Because categorical grants may be expected to exceed local spending on the intended programs more often than flat grants or foundation grants exceed local spending on education in general, categorical grants should have a greater impact on education expenditures than flat or foundation grants.

The district power equalization grants for education are somewhat more complex in practice than the simple open-ended matching grant depicted in Figure 2.1. In the simple case, the matching grant

decreases the price of education and, therefore, pivots the budget constraint decreasing its slope. In practice, however, matching grants usually have floors and/or ceilings. In other words, there are minimum and/or maximum levels of expenditures for which a district is reimbursed by the matching grant. Districts spending above or below these minimum or maximum levels receive block grants. Figure 2.3 illustrates the district's budget constraints, given different restrictions on the matching grant. In the absence of a grant, the budget constraint is BB', and the district operates at point A spending $C on education and $D on X. If the state provides a matching grant with no restrictions, the budget constraint is BR', and the district operates at H, spending $I on education and $J on X. Suppose the matching grant has a maximum, S', such that if the district spends more than $S', the district receives a block grant rather than a matching grant. In this case, the budget constraint becomes BST', and the district operates at E, spending $F on education and $G on X. Note that this restricted matching grant has less of a stimulative effect on education expenditures than the unrestricted grant. Consider a matching grant with a minimum, $V', such that if the district spends less than $V', the district receives a block grant, BW. The budget constraint becomes BWVR'. Given the indifference curves for the district in Figure 2.3, the minimum has no impact on the allocation of resources between education and X. The district will operate at point H, as it would if there were no restrictions on the grant. The state may provide a matching grant with both minimum and maximum spending restrictions, as shown in Figure 2.3. If the

Figure 2.3

IMPACTS OF RESTRICTED MATCHING GRANTS ON EXPENDITURES



minimum is $V' and the maximum is $S', then the budget constraint becomes BWVST'. The district modeled in Figure 2.3 would operate at point E, as it would if there were only the maximum spending restriction $S'.

As the above analysis indicates, restrictions on matching grants may significantly decrease the price effect of the matching grant, and, therefore, the impact of the grant on the level of education expenditures may be less than expected when there are no restrictions. For districts spending above or below the restrictions, the price of a dollar of education is 1, and the grant becomes a specific block grant having only an income effect. For districts spending within the maximum or minimum limits, the price of a dollar of education may be calculated from the general DPE formula given in equation 2.1. The price is defined to be that portion of a dollar spent on education that is paid by the local district or:

$$P_i = \frac{T_i}{T_i + G_i} \tag{2.3}$$

where

P_i = price for district i,

T_i = contribution of district i, and

G_i = DPE grant to district i.

From the DPE formula, the matching rate which is defined as the grant per dollar of local revenue may be calculated. Again, assuming that E_i is equal to locally raised revenue, T_i, plus the DPE grant, G_i, equation 2.1 becomes:

$$G_i = (1 - K\frac{EV_i}{\overline{EV}})(T_i + G_i) \tag{2.4}$$

The matching rate is determined by solving equation (2.4) for G_i.

$$G_i - G_i + G_i K\frac{EV_i}{\overline{EV}} = T_i - T_i K\frac{EV_i}{\overline{EV}}$$

$$G_i K\frac{EV_i}{\overline{EV}} = T_i - T_i K\frac{EV_i}{\overline{EV}}$$

$$G_i = (\frac{\overline{EV}}{K\ EV_i} - 1)T_i \tag{2.5}$$

$\frac{\overline{EV}}{K\ EV_i} - 1$ is the matching rate which indicates the portion of local spending that the district receives in state aid. From equation (2.5), it is obvious that the matching rate, M, is equal to $\frac{G_i}{T_i}$. Given the matching rate, the definition of price given in equation (2.3) may be rewritten as $P_i = \frac{1}{M_i + 1}$. Substituting $\frac{\overline{EV}}{K\ EV_i} - 1$ for M_i, then:

$$P_i = K\frac{EV_i}{\overline{EV}} \tag{2.6}$$

Note that as the per pupil equalized property value of the district (EV_i) increases, the effective price (P_i) of education increases. Property poor school districts face a lower price for education than property rich districts.

---

[10] Andrew Reschovsky, Predicting the Effect of New Jersey's New Education Funding Law on Local Support for Education (New Jersey: Urban Education Observatory, New Jersey Department of Education, January, 1977), pp. 11-12.

Previous Models of the Impacts of Grants On Local Expenditure Decisions[11]

There is a long economic literature on the determinants of local expenditures. The central theme of this work is the measurement of the impacts of grants-in-aid from both the state and federal governments on local expenditure decisions. Typically, these studies involve the estimation of an econometric model with local expenditures being some function of the income of the local jurisdiction, aid from state and federal sources, and various socio-economic characteristics of the jurisdiction. The exact specification, as well as the underlying theoretical basis for these models, vary widely. In many of the early studies, there was really no theoretical basis for the empirical models of local expenditures. As Inman points out, "the model specifications. . . were rarely more than an ad hoc collection of variables which seemed to work."[12] Because of the lack of a theoretical framework, it is often difficult to interpret the results of these studies. However, this early work did show that grants from state and federal governments were positively correlated with local expenditures. In the late 1960's, studies by Gramlich, Henderson, and others helped to construct a theoretical foundation for empirical models of local expenditures.

---

[11] This section is intended to highlight the strengths and weaknesses of previous models of local expenditure decisions. For a more extensive and complete review of this literature, see Robert P. Inman, "The Fiscal Performance of Local Governments: An Interpretive Review," in Current Issues in Urban Economics, edited by Peter Mieszkowski and Mahlon Straszheim (Baltimore: The Johns Hopkins University Press, 1979), pp. 270-321.

[12] Ibid., p. 273.

The theoretical frameworks presented in these individual studies varied, but one common thread found in most of this work is the notion that local jurisdictions maximize preferences subject to their budget constraints.[13]

Given that the purpose of this dissertation is to evaluate the local response to various state aid mechanisms, there are two main concerns when evaluating previous models of local expenditures in the literature: the specification of the aid variables and the unit of analysis of the model (e.g., municipality, school district, count, state, etc.).

One of the earlier models of local expenditures with a theoretical base was presented by Henderson.[14] Henderson considers a local governing body which must decide what portion of the community's resources should be allocated to public and private goods in order that the community's welfare is maximized subject to its budget constraint. Henderson models per capita public expenditures as a function of the community's per capita income, federal and state aid received by the community, and the total population of the community. The expenditure and aid variables in the model include all expenditures by and federal and state aid to cities, school districts, and special districts within each county. Henderson estimates this model for two samples:

---

[13] Ibid., pp. 272-74.

[14] James M. Henderson, "Local Government Expenditures: A Social Welfare Analysis," The Review of Economics and Statistics, Vol. 50 (May, 1968), pp. 156-63.

a cross section of 100 metropolitan counties in the U.S. and a cross section of 2,980 non-metropolitan counties.

There are several problems that result from Henderson's aggregation to the county level. The county government does not make the spending decisions for city or municipal services, education, or the services provided by special districts. These decisions are made by mayors or city councils, school boards, and special district commissions. By aggregating the spending of all these government units, the model averages across these local decision making units. This type of aggregation assumes that there are no differences in the decision making processes of school boards determining how much to spend on education, mayors or city councils deciding how much to spend on police or fire protection, or a special district deciding how much to spend on sewers. This assumption seems rather heroic given that factors which must be considered when making budget decisions for different services vary widely. School boards consider very different factors than a city council deciding how much to spend on police.[15]

---

[15] There are many studies which have similar problems with aggregation. For example, the study by Roy W. Bahl and Robert J. Saunders, "Factors Associated with Variations in State and Local Government Spending," Journal of Finance, Vol. 21 (September, 1966), pp. 523-34, includes a model of current state per capita expenditures. These expenditures include all spending by state and local governments. The model was estimated for a sample of states.

Other studies which consider expenditures on particular functions but use aggregate state data rather than data on the actual decision making unit include: Thomas E. Boercherding and Robert T. Deacon, "The Demand for the Services of Non-Federal Governments," American Economic Review, Vol. 62 (December, 1972), pp. 891-901; J. W. Osman, "The Dual Impact of Federal Aid on State and Local Government Expenditures," National Tax Journal, Vol. 19 (December, 1966), pp. 362-372; Seymour Sacks and Robert Harris, "The Determinants of State and Local Government Expenditures and Intergovernmental Flow of Funds," National Tax Journal, Vol. 17 (March 1964), pp. 75-85.

Because of these differences in decision making processes, it seems more reasonable to model expenditures on a specific function, such as education, with the unit of observation being the local jurisdiction which controls the spending on that function, such as the school district.

Another problem with a model such as Henderson's is the specification of the aid variable. Henderson considers total state and federal aid to all services within the county. As shown in the previous section, aid, particularly state aid, is distributed in many different ways. General block grants may have less of an income effect than specific block grants, while matching grants have both income and price effects. The coefficient on this total aid variable indicates the impact of an across-the-board, say 1 percent, increase in all aid programs. Since policy makers rarely consider such across-the-board increases in all aid programs, this aid specification is not very useful.[16] Policy makers consider adjustments in allocations for particular aid programs, and, therefore, an aid specification which measures the spearate income and price effects of these grant programs would be more useful.[17]

---

[16]Other studies which use aggregate aid variables include: George A. Bishop, "Stimulative Versus Substitutive Effects of State School Aid in New England," National Tax Journal, Vol. 17 (June, 1964), pp. 133-43; Osman, "The Dual Impact of Federal Aid;" Sacks and Harris, "The Determinants of State and Local Government Expenditures;" and Bahl and Saunders, "Factors Associated with Variations in State and Local Government Spending."

[17]Inman, "The Fiscal Performance of Local Governments," p. 274.

Gramlich and Galper[18] also estimate local government expenditure equations. Separate equations are estimated for expenditures on education, public safety, social services, urban support, and general government. Unlike Henderson's model, Gramlich and Galper's model specified three categories of aid: matching grants, general block grants, and categorical block grants. The models estimate the different price and income effects of these grants. The models are based on a pooled cross section time series of data for ten large U.S. cities. The data include annual observations for each city from 1962 to 1970. One problem with using a cross section of cities is that it is impossible to measure the specific impacts of the particular state formulae because the observations come from different states. For example, one city may be located in a state which has a relatively unrestricted matching grant while another city may be located in a state which has a very restricted matching grant. By estimating an equation with both cities in the sample, the coefficient on matching aid represents an average of the impacts of those different restrictions. By estimating an expenditure equation for districts or cities within the same state, the aid coefficients measure the impacts of specific state formulae. Estimation of several state equations where the units of observation are districts or cities within the same state permits a comparison of different aid formulations such that the impact of different restrictions on matching or block grants can be determined.

---

[18]Edward M. Gramlich and Harvey Galper, "State and Local Fiscal Behavior and Federal Grant Policy," Brookings Papers on Economic Activity, Vol. 1 (1973), pp. 15-58.

The above discussion points out the basic characteristics that a model should have in order to address the questions concerning the impact of aid on local expenditure decisions under investigation in this thesis. In summary, the model should have, as a dependent variable, expenditures on a specific budget item, such as education, and the unit of observation should be that local jurisdiction which has control over the spending decisions on that item. The districts included in the model should be from within the same state in order that the impact of specific aid mechanisms of the state can be determined. Finally, aid should be specified in such a way that the price and income effects of the different types of grants can be determined.

The two prominent studies in the recent literature which meet the criterion outlined above are those by Ladd and Feldstein.[19] Both of these studies estimate education expenditure models for a sample of school districts in Massachusetts for the 1970 calendar year.[20] Ladd's sample includes the 78 cities and towns in the Boston SMSA, while Feldstein's sample includes 105 cities and towns in Massachusetts.[21]

---

[19]Helen F. Ladd, "Local Education Expenditures, Fiscal Capacity, and the Composition of the Property Tax Base," National Tax Journal, Vol. 28 (June, 1975), pp. 145-58.

Martin S. Feldstein, "Wealth Neutrality and Local Choice in Public Education," American Economic Review, Vol. 65 (March 1975), pp. 75-89.

[20]A third model of education expenditures for school districts in Massachusetts is presented in Grubb and Michelson, States and Schools. Similar work has been done for Colorado and Minnesota school districts in Phillip E. Vincent and E. Kathleen Adams, Fiscal Responses of School Districts: A Study of Two States--Colorado and Minnesota (Denver: Education Finance Center, Education Commission of the States, October, 1978).

[21]In Massachusetts, school districts are coterminous with cities and towns.

The basic expenditure models estimated in these two studies are very similar.

Ladd carefully outlines the theoretical basis for her model. Ladd assumes that each resident of a school district maximizes his utility subject to his budget constraint and that "the education level desired by each resident can be expected to vary with each resident's income or wealth, his share of the cost of public services as determined by the tax structure, and his preferences for education."[22] Ladd resolves the conflicting demands for education of the district's residents by assuming majority rule. Thus, the community's demand for education is equal to the median quantity demanded by the resident voters.[23] Ladd further assumes that the median voter in the community has the median income. Using this theoretical framework, Ladd estimates a basic expenditure model:

$$E = f(Y, WR, RB, LS, SBG, FG, PUP, PRIV, POV, PROF)$$

where

E = total education expenditures per pupil of district i,

Y = median family income,

---

[22] Ladd, "Local Education Expenditures," p. 146.

[23] There is a long literature on the median voter model. See Duncan Black, "On the Rationale of Group Decision-Making," Journal of Political Economy, Vol. 56 (February, 1948), pp. 23-34; Howard R. Bowan, "The Interpretation of Voting in the Allocation of Economic Resources," Quarterly Journal of Economics, Vol. 58 (November, 1943), pp. 27-48; and James L. Barr and Otto A. Davis, "An Elementary Political and Economic Theory of the Expenditures of Local Governments," Southern Economic Journal, Vol. 33 (October, 1966), pp. 149-65.

WR = market value per pupil of residential property,

RB = fraction of the assessed property tax base that is residential,

LS = price calculated from the state matching formula,

SBG = block grants per pupil received by districts above or below the matching limits,

FG = categorical state and federal grants per pupil,

PUP = public school pupils as a fraction of the population,

POV = fraction of families with income below poverty,

PRIV = private school pupils as a fraction of the population, and

PROF = professional, technical, and kindred workers as a fraction of the population.

Ladd argues that median family income represents the budget constraint of the median voter while residential market value serves as a measure of personal wealth or permanent income of the residents. Both are expected to have a positive impact on education expenditures.

There are three variables included in the model which account for state and federal grants to local districts for education. First, all categorical state grants and federal grants are included in FG. These block grants are expected to increase the income of the local jurisdiction and, therefore, have a positive impact on local education expenditures. Massachusetts also has a matching grant. LS is the price of education for a given district derived from the state's matching formula. This local share is considered part of the tax price of education to local residents because this local share indicates what portion of total education expenditures comes from locally raised revenue. Because of the various restrictions on this matching formula,

some districts face a matching rate of 0, which implies that the price of education for these districts is equal to 1. All other districts face a price for education between 0 and 1. The expected impact of this price term, LS, is negative; as the price of education rises, the district is expected to spend less on education. Those districts for which the price of education is equal to 1 receive a block grant which is included in the model as a separate component, SBG. Again, this block grant increases the income of the local district and is expected to have a positive impact on expenditure. Given this specification of the aid variables, Ladd estimates the separate price effects of the matching grant, the income effects of the block grants, and the income effects of the categorical grants.

The fraction of the assessed property tax base that is residential serves as a proxy for that portion of the property tax burden which is perceived to be paid by local residents. This residential share is considered to be another component of the tax price of education facing the residents of a district since almost all of the locally raised revenue for education comes from the local property tax.[24] Again, this tax price term is expected to have a negative impact on expenditures.

Ladd suggests that pupils per capita, PUP, may serve as a third price term. The argument is that an increase in PUP may indicate more

---

[24]The use of the residential share of the tax base as part of the tax price term assumes that local residents do not perceive that they bear any of the property taxes on commercial and industrial property. In a more complex version of this model, Ladd employs a more general form of this tax price component to determine what fraction of the taxes on commercial and industrial property residents perceive they pay.

children per family which implies less family income per pupil. In this case PUP would be expected to have a negative impact on spending. On the other hand, Ladd suggests that PUP may have a positive impact on per pupil spending if an increase in PUP indicates that more families have school aged children. The implication is that if more families have school aged children, there is more interest in spending resources on education. Voters with school aged children prefer more education. Ladd argues that the estimated coefficient on PUP measures the net effect of these conflicting arguments.

In addition to PUP, PRIV, POV, and PROF are included in the model to account for preference differences among local districts. The expected impacts of these taste variables may be unclear. According to Ladd, private school pupils per capita should have a negative impact on spending, since those families opting for private schools have little interest in public school spending. Feldstein offers an alternative view. Private school pupils per capita may have a positive impact on public school spending to the extent that private school pupils receive some part of their elementary or secondary education in public schools. A child may be sent to private or parochial elementary schools but then attend a public high school. PRIV may also indicate that the residents place a high premium on quality education and, therefore, support public education. Ladd indicates that the fraction of families with income below poverty is included in the model because POV is positively correlated with categorical aid and negatively correlated with RES and the coefficients for these two variables would be biased

if POV was not included. However, it is unclear as to whether poor families prefer to spend more or less on public education. Professional and technical workers per capita, PROF, is included as an indication of preference for education.

Feldstein's basic expenditure model is very similar to Ladd's. Feldstein's model considers per pupil education expenditures to be a function of total property wealth per pupil, median family income, the price of education to the district resulting from the matching grant, the block grant per pupil received by districts above and below the matching limits, state and federal categorical grants per pupil, fraction of the tax base that is residential, private school pupils per capita, public school pupils per capita, and a pupil growth rate.

There are three main differences between Feldstein's model and Ladd's model. Feldstein does not include POV and PROF, which are two of Ladd's taste variables. Feldstein includes a pupil growth rate in order to control for lags in the district's spending response. As Feldstein states, "If there is a reluctance to raise tax rates quickly, a rapid growth of pupils will temporarily reduce per pupil spending."[25] The third difference between the two models is that Feldstein considers total property wealth per pupil while Ladd only considers the market value of residential property per pupil. Ladd's and Feldstein's respective results are presented in Table 2.2. The models were estimated using ordinary least squares with a log-log specification.

---

[25]Feldstein, "Wealth Neutrality," p. 81.

Table 2.2

BASIC EDUCATION EXPENDITURE MODELS[a]

Independent Variables[b]	Ladd*	Feldstein**
Constant	-.057 (.034)	--
WR[c]	.239 (2.53)	.283 (7.45)
Y	.459 (2.90)	.475 (6.99)
SBG	.030 (1.70)	.066 (5.08)
FG	.102 (3.97)	.136 (5.04)
LS	-.485 (-1.63)	-1.00 (-5.41)
RB	-.309 (-2.66)	-.118 (-2.74)
PRIV	-.018 (-.781)	-1.112 (-2.84)
PUP	-.027 (-.257)	.208 (1.49)
POV	.078 (1.65)	--
PROF	.102 (1.52)	--
GROW	--	-.336 (-4.42)
R^2	.65	.64

[a] Dependent variable equals per pupil education expenditures. All variables are in log form. The estimated coefficients are given with t-statistics in parentheses.

[b] Variables are defined on p. 45. GROW is the pupil growth rate.

[c] Ladd uses residential market value per pupil while Feldstein uses total property value per pupil.

*Source: Ladd, "Local Education Expenditures," p. 151.

**Source: Feldstein, "Wealth Neutrality," p. 82.

The Expenditure Model

The expenditure model estimated for each of the six states analyzed in this dissertation is very similar to those estimated by Ladd and Feldstein. As was the case in Ladd's model, the theoretical basis for the model used in this analysis is essentially the median voter model, which assumes that the quantity of education demanded by the community is equal to the quantity demanded by the median voter in the community. The median voter is also assumed to have the median income of the community. The demand for education is a function of income, the cost of education to the voter, and voter preferences or tastes for education.

The model estimated for the six states included in this analysis considers per pupil education expenditures to be a function of various income, wealth, and price variables. The income variables included in the model are median family income and per pupil state and federal aid, when this aid is not distributed through a matching formula. As Ladd suggests, median family income represents the budget constraint of the median voter. State and federal aid increase the income available for education in the local district. All three of these variables are expected to have a positive impact on expenditures.

Ladd includes per pupil residential property wealth in her model. The argument is that residential wealth serves as a measure of personal wealth or permanent income. Voters are thought to consider permanent income, as well as current income, when deciding how much to spend on

education. There is an alternate view of how voters consider wealth when making expenditure decisions. Voters may be expected to be concerned over how the level of expenditures affects the local property tax rate, given the argument that high property tax rates tend to depress property values.[26] Voters have an interest in maintaining the value of their property. Since the local property tax rate is simply expenditures divided by the total property tax base of the local district, voters may consider the size of the property tax base (total wealth) when making expenditures decisions. Voters in a district with a large total tax base per pupil may be willing to spend more on education than voters in a district with a small total tax base per pupil because they can spend more at a lower tax rate. It is unclear as to which of the wealth arguments presented here is the more theoretically correct. In this analysis, the latter argument is used; and therefore, total property wealth per pupil is included in the model.

The expenditure model used in this analysis also has three price components. Each is expected to have the conventional negative impact on expenditures. As shown earlier in this Chapter, aid distributed through a matching formula essentially alters the price of education to the district. The price of education resulting from

---

[26]See Wallace E. Oates, "The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis," Journal of Political Economy, Vol. 77 (November/December, 1969), pp. 957-971.

a matching formula for district i may be calculated using the formula presented in equation (2.6). In those states with matching formulae, this calculated price is included in the model. The residential share of the assessed property tax base is a second price term included in the model. As Ladd suggests, this residential share is a measure of the property tax burden borne by the district's residents. The third price term is public school pupils as a fraction of the district's population. As William Neenan points out, "The higher the density of the school population, the more expensive education is to local residents."[27] As a result, as PUP increases, per pupil expenditures would be expected to decrease. However, Ladd's notion that PUP may reflect preference differences--as PUP increases there may be more pupils per family, and therefore, more voters may be interested in devoting resources to education--will be kept in mind when interpreting the models estimated in Chapter 4.

There are no specific preference or taste variables included in the model used in this analysis. This is a result of the fact that there are no clear theoretical arguments as to how to measure preference differences beyond those measured in the income and price variables. In the literature, a number of rather ad hoc socioeconomic variables have been used to measure these underlying taste differences. However,

---

[27]William B. Neenen, "Fiscal Relations Between State and Local Governments in Southeastern Michigan," in Financing the Metropality, edited by Kent Mathewson and William B. Neenen (New York: Praeger Publishers, forthcoming), p. 39.

there are really no clear theoretical arguments indicating which of these variables truly measure underlying taste differences. In many cases, it is difficult to determine what the expected sign on these variables should be. For example, some studies have included the percent of the total district population that is minority or the percent of the population with professional occupations. Do minorities prefer more or less education than non-minorities? Do professionals prefer more or less education than blue collar workers? Since it is unclear how to measure preference differences beyond those reflected in the income and price variables, preference variables were excluded from this analysis.

The exact specifications of the education expenditure models estimated for the six states included in this analysis are presented in Chapter 4. In the next Chapter the specific aid mechanisms used by the states included in this analysis are presented in order to determine how aid should be specified for each of the models presented in Chapter 4 and to help to interpret the impacts of these various aid formulations on the level of education expenditures estimated by the models presented in Chapter 4.

Chapter 3

STATE AID MECHANISMS

Given that the objective of this dissertation is to compare and contrast the impacts of various types of state aid formulations on the level of local education expenditures, education expenditure models were estimated for each of six states. These models are presented in Chapter 4. The states included in this analysis were chosen because of the types of state aid schemes they represent, as well as the availability of data for school districts within the states. The states chosen include three states--Massachusetts, Michigan, and New Jersey--which distribute the major portion of general aid through some type of matching formula and three states--Colorado, Indiana, and Minnesota--which distribute the major portion of general aid through various foundation programs. The restrictions on these aid programs vary widely from state to state. The number of states included in this analysis was limited to six because collecting data by school district is a time-consuming and costly process. In many states, the data required for this research are simply not available by school districts. The set of states considered for this analysis was limited to those states where the data were readily available either from state agencies or various research groups. The six states were chosen from this set of states.

The purpose of this chapter is to provide a detailed description of the state aid legislation in each of the six states chosen for this analysis. These descriptions will illustrate how each of the aid

formulae works with an emphasis on the specific restrictions on the aid programs. This legislative background will prove to be useful when interpreting the statistical results presented in Chapter 4.

The States With Matching Formulae

Massachusetts

From 1948 through 1966, Massachusetts used a foundation plan to distribute general aid to local school districts. In 1966, the Massachusetts legislature passed new school finance legislation which changed the method of distributing general aid to a district power equalizing program.[1] This district power equalizing program--Chapter 70 of the Massachusetts Statutes--has been used with some modifications from year to year to distribute general aid from 1966 until the present school year. For the 1978-79 school year, the Massachusetts Legislature again made significant changes in the distribution method. For this analysis, data for Massachusetts school districts[2] were collected for the 1976-77 school year when 62 percent of total state aid to local districts was distributed through the Chapter 70 formula. The Chapter 70 formula in effect for the 1976-77 school year will be described in detail here.

---

[1] Ralph Sanders Levine, "Massachusetts' New Equalization Formula for Education" (Cambridge, Massachusetts: Harvard University, unpublished qualifying paper, 1967), p. 5.

[2] In Massachusetts, school districts are coterminous with cities and towns.

Under the Massachusetts legislation,[3] Chapter 70 equalization aid per pupil is defined as:

$$EAID_{it} = SAP_{it}(RE_{it-1}) \tag{3.1}$$

where

$EAID_{it}$ = Chapter 70 aid to district i for the current year,

SAP_{it} = school aid percentage for district i for the current year, and

RE_{it-1} = reimbursable expenditures per pupil for district i for the last completed fiscal year.[4]

The school aid percentage (SAP) for town i is defined as:

$$SAP_{it} = 1 - .65\left(\frac{EV_{it}}{EV_{SAV}}\right)$$

where

EV_{it} = equalized property value per pupil in town i for the current year, and

EV_{SAV} = average equalized value per pupil for all towns in the State.

---

[3]Massachusetts Annotated Statutes, Chapter 70, Sections 1-4, 1978.

[4]Reimbursable expenditures are defined to be "the total amount expended by a city or town during a fiscal year for the support of public schools during said year exclusive of expenditures for transportation, for food for school food service programs, for programs of vocational education as provided in Chapter 74, and for capital outlays, after deducting therefrom any receipts for tuition, receipts from the federal government, the proceeds of any invested funds, and grants, gifts, and receipts from any other source, to the extent that such receipts are applicable to such expenditures, provided, however, that amounts received by a city or town under this Chapter as school aid shall not be so deducted." (Massachusetts Annotated Statutes, Chapter 70, Section 2(c)).

The legislation puts an upper limit on SAP of .75 and a lower limit of .15. These limits indicate that for any town where the ratio $\frac{EV_{it}}{EV_{SAV}} < .38$, the SAP is set at .75 and for any town where the ratio $\frac{EV_{it}}{EV_{SAV}} > 1.31$, the SAP is set at .15. Substituting the definition of SAP into equation (3.1), the definition of Chapter 70 aid becomes:

$$EAID_{it} = \left(1 - .65 \times \frac{EV_{it}}{EV_{SAV}}\right) RE_{it-1} \qquad (3.2)$$

Reimbursable expenditures are approximately equal to per pupil locally-raised revenue, T_{it-1}, plus the per pupil Chapter 70 aid received during the previous budget year. Using this definition of reimbursable expenditures, equation (3.2) becomes:

$$EAID_{it} = \left(1 - .65 \times \frac{EV_{it}}{EV_{SAV}}\right)\left(T_{it-1} + EAID_{it-1}\right)$$

Assuming that $T_{it-1} = T_{it}$ and $EAID_{it-1} = EAID_{it}$:

$$EAID_{it} = \left(1 - .65\frac{EV_{it}}{EV_{SAV}}\right)\left(T_{it} + EAID_{it}\right). \qquad (3.3)$$

Rearranging equation (3.3):

$$EAID_{it} = \left(\frac{EV_{SAV}}{.65EV_{it}} - 1\right) T_{it}.$$

$\frac{EV_{SAV}}{.65EV_{it}} - 1$ is equal to the matching rate. As shown in Chapter 2, the price of education for district i for the current year, P_{it}, resulting from the matching grant is:

$$P_{it} = \frac{1}{M_{it} + 1} \qquad (3.4)$$

where

M_{it} = matching rate for district i for the current year.

In the Massachusetts case, the price of education for district i, P_{it}, is simply:

$$P_{it} = \frac{1}{\left(\frac{EV_{SAV}}{.65EV_{it}} - 1\right) + 1}$$

or

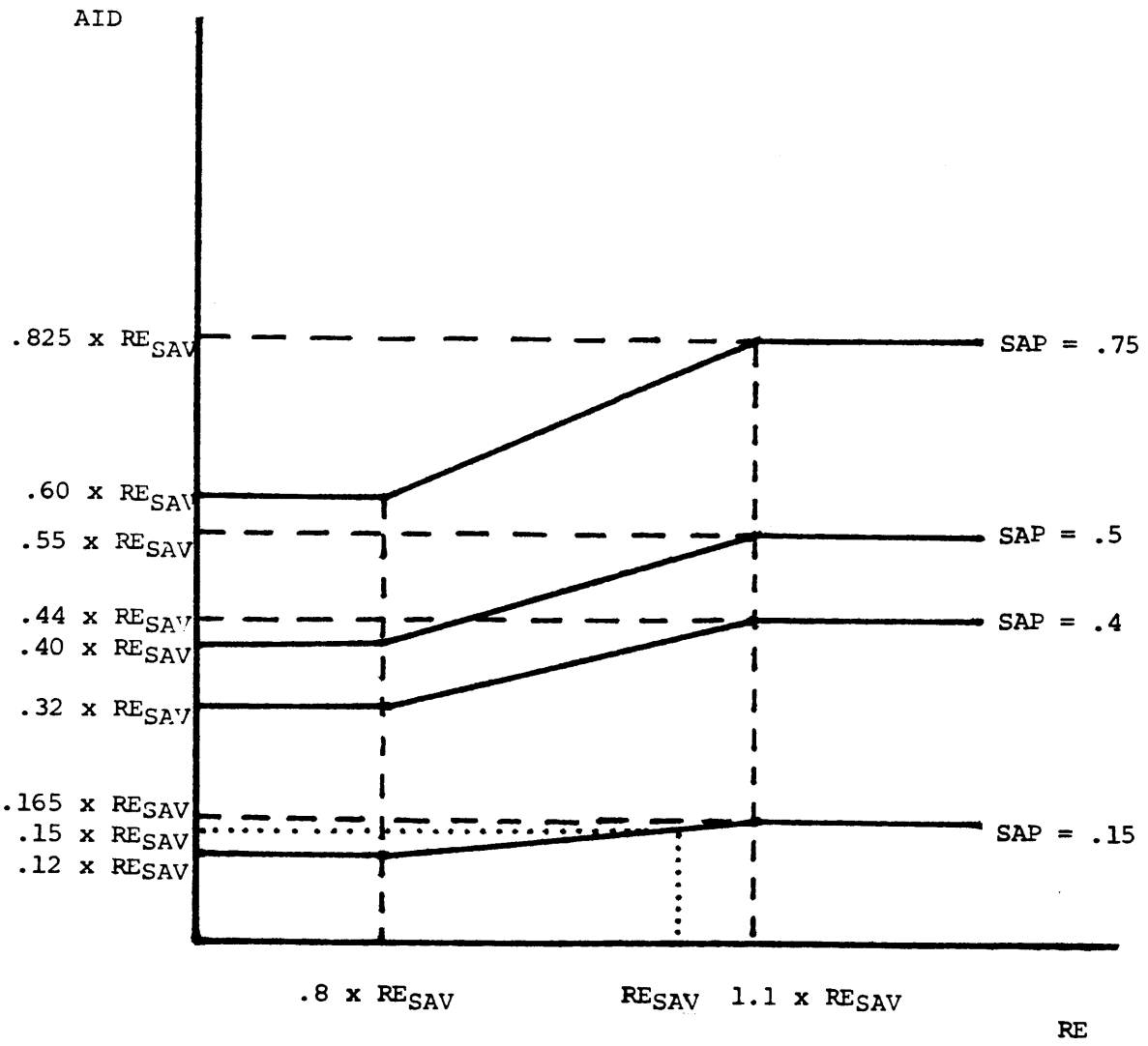
$$P_{it} = .65 \frac{EV_{it}}{EV_{SAV}} \tag{3.5}$$

Under the Massachusetts legislation, there are minimum and maximum levels of per pupil reimbursable expenditures. If per pupil reimbursable expenditures for district i, RE_{it-1} are less than .8 multiplied by the average per pupil reimbursable expenditures for all districts in the State, RE_{SAV}, then RE_{it-1} is set equal to $.8(RE_{SAV})$. On the other hand, if $RE_{it-1} > 1.1(RE_{SAV})$, then $RE_{it-1} = 1.1(RE_{SAV})$. Districts with reimbursable expenditures above or below these limits are not reimbursed for a portion of each locally-raised dollar but rather receive some portion of the fixed sum $.8(RE_{SAV})$ of $1.1(RE_{SAV})$. In other words, for districts above or below these limits, Chapter 70 aid is a specific block grant rather than a matching grant, and the effective price of education resulting from the Chapter 70 aid for these districts is 1. Of the 258 Massachusetts school districts included in this analysis, 79 are above or below the spending limit, while 179 are within the limits.

As shown in equation (3.1), the actual size of the Chapter 70 grant for all districts, whether above, below, or within the matching limits, depends on the SAP of the district. For example, a property rich town with an SAP of .15 and reimbursable expenditures below $.8(RE_{SAV})$ would receive a grant of $.15(.8 \times RE_{SAV})$ or $.12(RE_{SAV})$. If reimbursable expenditures for the same town were above $1.1(RE_{SAV})$, the town would receive a grant of $.15(1.1 \times RE_{SAV})$ or $.165(RE_{SAV})$. Figure 3.1 illustrates the size of the grant that the district would receive if reimbursable expenditures are at some point between the two limits. In the Figure, the size of the grant for the town with SAP equal to .15 when reimbursable expenditures are below the limit is $.12(RE_{SAV})$, and the size of the grant when reimbursable expenditures are above the limit is $.165(RE_{SAV})$. If reimbursable expenditures are within these two limits, the size of the grant received by the town may be determined by the intersection of the given level of reimbursable expenditures and the straight line drawn between the limits. At reimbursable expenditures of RE_{SAV}, the size of the grant is equal to $.15(RE_{SAV})$. Figure 3.1 also illustrates the grants received by districts with average levels of per pupil property wealth as indicated by SAPs of .4 and .5 and the grants received by property poor districts with an SAP of .75, given the possible levels of reimbursable expenditures. Note that there is relatively little increase in the size of the grant given to the wealthy town with a SAP of .15, as reimbursable expenditures increase when compared with the increase in the size of the grant given to the poor town with an SAP of .75, as

Figure 3.1

MASSACHUSETTS CHAPTER 70 MATCHING FORMULA



reimbursable expenditures increase. For districts within the spending limits, as the per pupil property wealth declines and the SAP increases, a larger portion of each dollar of reimbursable expenditures is matched by the State. The average Chapter 70 grant received by the 258 districts in the Massachusetts sample was $305 per pupil for the 1976-77 school year.

Michigan

From 1946 to 1973, Michigan's state aid program for local school districts was essentially a foundation plan. In 1973, Michigan adopted the "Bursley School District Equalization Act," which changed the state aid program from a foundation program to a district power equalizing program.[5] This district power equalizing program has been in effect since the 1973-74 school year. This analysis uses data for the 1974-75 school year for 174 of the 530 school districts in Michigan. During the 1974-75 school year, 79 percent of the total state aid to those 174 districts was distributed via the Bursley School District Equalization Act.

Under the Bursley Act[6], the grant to local districts for the 1974-75 school year was determined by the formula:

$$EAID_i = (KDW - SEV_i)mill_i \qquad (3.6)$$

---

[5]William B. Neenen, "Fiscal Relations Between State and Local Governments in Southeastern Michigan," in Financing the Metropality, edited by Kent Mathewson and William B. Neenen (New York: Praeger Publishers, forthcoming), pp. 20-21.

[6]Michigan, P.A., 160 of 1973.

where

$EAID_i$ = equalization aid per pupil for district i under the Bursley Act,

KDW = "Key District Wealth" (level of per pupil property wealth guaranteed by the State),

SEV_i = state equalized property value per pupil for district i,[7] and

$mill_i$ = mills levied for the operation of school district i.

If mills are defined as total locally raised revenue per pupil of district i, T_i, divided by the equalized property value per pupil of district i, SEV_i, then equation (3.6) becomes:

$$EAID_i = (KDW - SEV_i)\frac{T_i}{SEV_i}$$

$$= \left(KDW \times \frac{T_i}{SEV_i} - SEV_i \times \frac{T_i}{SEV_i}\right)$$

$$= \left(\frac{KDW}{SEV_i} - 1\right)T_i \qquad (3.7)$$

Since the matching rate is defined as that portion of local spending that the district receives in state aid, under the Bursley formula, the matching rate is $(\frac{KDW}{SEV_i} - 1)$. Substituting this matching rate into the price formula given in equation (3.4), the effective price of education for Michigan school districts as a result of the Bursley Act is:

$$P_i = \frac{1}{\left(\frac{KDW}{SEV_i} - 1\right) + 1}$$

---

[7] State equalized property values are 50 percent of market values.

$$= \frac{SEV_i}{KDW} \tag{3.8}$$

The Bursley Act puts two restrictions on this matching grant. First, any district with an SEV_i greater than the "Key District Wealth" receives no aid under the Bursley Act. In 1974-75, the Key District Wealth was set at $39,000. Of the 174 Michigan school districts in the sample used for this analysis, 17 had SEVs in excess of the $39,000 limit and, therefore, received no equalization aid. For these districts, the price of education resulting from the Bursley Act is 1. The second restriction sets a maximum number of mills, $mill_{max}$, which may be entered in equation (3.6) to determine a district's grant. If a district levies more than $mill_{max}$, the district receives a block grant of:

$$EAID_i = (KDW - SEV_i)mill_{max} \tag{3.9}$$

This limit on the number of mills means that districts levying more than the maximum are not reimbursed for some portion of each locally raised dollar, as indicated in equation (3.7). Rather, these districts receive some portion of a fixed level of locally raised revenue. In 1974-75, $mill_{max} = .025$.[8] Eighty-two of the 174 districts in the

---

[8]After 1974-75, the restrictions under the Bursley Act became more complex. In 1975-76, the Key District Wealth took on two values: $42,000 for the first 20 mills levied and $38,250 for up to 7 additional mills. This set the mill limit at 27 mills. In 1977-78, the Bursley Act had two aid components: (1) a flat grant of $164 per pupil and, (2) a power equalizing grant. The equalizing grant set the Key District Wealth at $40,000 and the mill limit at 30 mills. Under this program, any district which raised more than $1,364 per pupil locally was not eligible for aid. (William B. Neenen, "Fiscal Relations Between State and Local Governments in Southeastern Michigan," p. 29.)

Michigan sample levied in excess of 25 mills and, therefore, received block grants. For these 82 districts, the matching rate was set to 0, and the price of education resulting from the Bursley Act is 1.

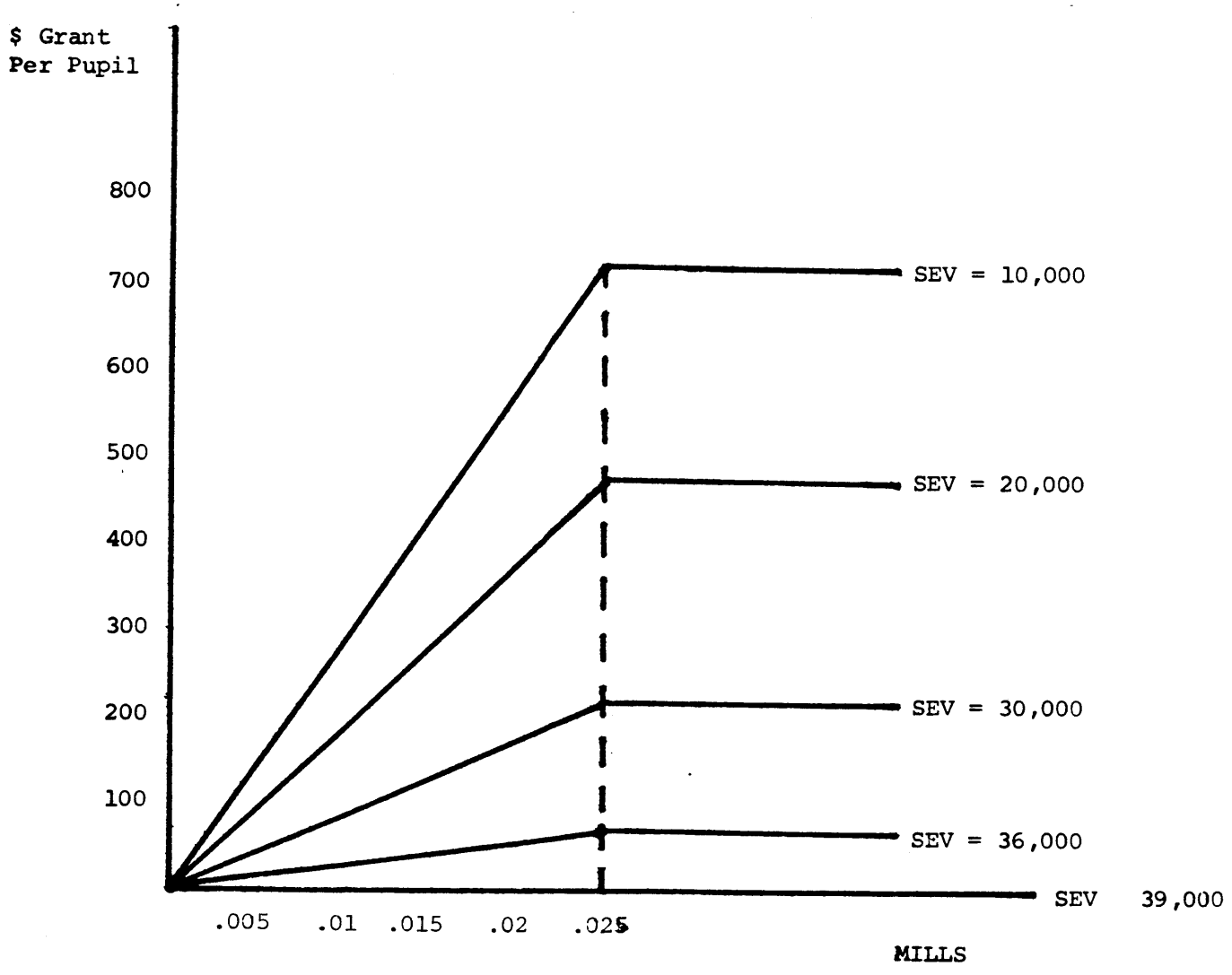
Figure 3.2 illustrates the per pupil grants received under the Bursley formula in 1974-75 by districts with particular per pupil state equalized values (SEV), given all possible mill rates. As shown in the figure, a relatively wealthy district with an SEV of $36,000 which levied 25 or more mills received a grant of $75 per pupil. If the same district levied 20 mills, the district would have received $60 per pupil. A district with an SEV of $30,000 received a $225 per pupil grant if it levied 25 or more mills or $180 per pupil if it levied 20 mills. A property poor district with an SEV of $10,000 per pupil would receive $725 per pupil if the district levied 25 mills or more. If the district levied 20 mills, the grant would decrease to $580 per pupil. The average grant received under the Bursley Act by the 174 Michigan school districts was $364 per pupil for the 1974-75 school year.

New Jersey

Since 1970 New Jersey has used some form of a district power equalizing program to distribute state aid to local school districts. In 1975 the New Jersey Legislature passed P.L. 212, which modified the state aid formula, but the aid program remained a district power equalizing program. P.L. 212 was the Legislature's response to the New Jersey Supreme Court ruling, which found that because of the program's reliance on the local property tax, the school finance program failed

Figure 3.2

MICHIGAN MATCHING FORMULA UNDER THE BURSLEY ACT 1974-75



to provide each pupil in the State with a "thorough and efficient" education and, therefore, was in violation of the State Constitution. In addition to modifying the State formula, P.L. 212 also increased total State support for public schools by $400 million.[9] Since the New Jersey school district data used in this analysis were for the 1977-78 school year, the equalizing formula specified in P.L. 212 will be described here. During the 1977-78 school year, 75 percent of total state aid to local school districts was distributed through the equalizing formula. Under P.L. 212, equalization aid per pupil is defined as:

$$EAID_{it} = \left(1 - \frac{EV_{it}}{1.35 \times EV_{SAV}}\right) NCEB_{it-1} \qquad (3.10)$$

where

$EAID_{it}$ = state equalization aid per pupil to district i in the current year,

EV_{it} = equalized property value per pupil of district i in the current year,

EV_{SAV} = average per pupil equalized property value for all towns in the State, and

$NCEB_{it-1}$ = net current expense budget per pupil for the pre-budget year.[10]

---

[9] James R. Knickman and Andrew Reschovsky, "School Finance Reform in New Jersey: The First Two Years," in 11th Annual Report (New Jersey: Economic Policy Council, New Jersey Department of the Treasury, 1978.)

[10] Net current expense budget is defined as "the balance after deducting: (1) State support for categorical programs pursuant to Section 20 of this Act; (2) the transportation amount in the current expense budget; and (3) all other revenue in the current expense budget except the amount to be raised by local taxation, equalization State support, and State support for approved transportation." (New Jersey, P.L. 212 of 1975, Sec. 3.)

In the legislation, $\left(1 - \frac{EV_{it}}{1.35 \times EV_{SAV}}\right)$ is referred to as the support ratio. As in the case of reimbursable expenditures for Massachusetts, $NCEB_{it-1}$ may be considered approximately equal to $EAID_{it-1}$ plus locally raised revenue per pupil, T_{it-1}. Using the definition, equation (3.10) becomes:

$$EAID_{it} = \left(1 - \frac{EV_{it}}{1.35 \times EV_{SAV}}\right)\left(EAID_{it-1} + T_{it-1}\right)$$

Again, assuming that $EAID_{it-1} = EAID_{it}$ and $T_{it-1} = T_{it}$:

$$EAID_{it} = \left(1 - \frac{E_{it}}{1.35 \times EV_{SAV}}\right)\left(EAID_{it} + T_{it}\right) \tag{3.11}$$

Rearranging equation (3.11):

$$EAID_{it} = \left(\frac{1.35 \times EV_{SAV}}{EV_{it}} - 1\right)T_{it} \tag{3.12}$$

$\left(1.35 \times \frac{EV_{SAV}}{EV_{it}} - 1\right)$ is the matching rate, and the price of education for district i resulting from the grant is:

$$P_{it} = \frac{1}{\left(\frac{1.35 \times EV_{SAV}}{EV_{it}} - 1\right) + 1}$$

$$= \frac{EV_{it}}{1.35 \times EV_{SAV}} \tag{3.13}$$

In the New Jersey legislation, there are two restrictions on the equalization grant. P.L. 212 defines a "state support limit" as the per pupil net current expense budget of the district in the 65th percentile when all districts in the State are ranked from lowest per

pupil net current expense budget to highest. If a district's per pupil net current expense budget exceeds the support limit, S, the district receives a block grant equal to:

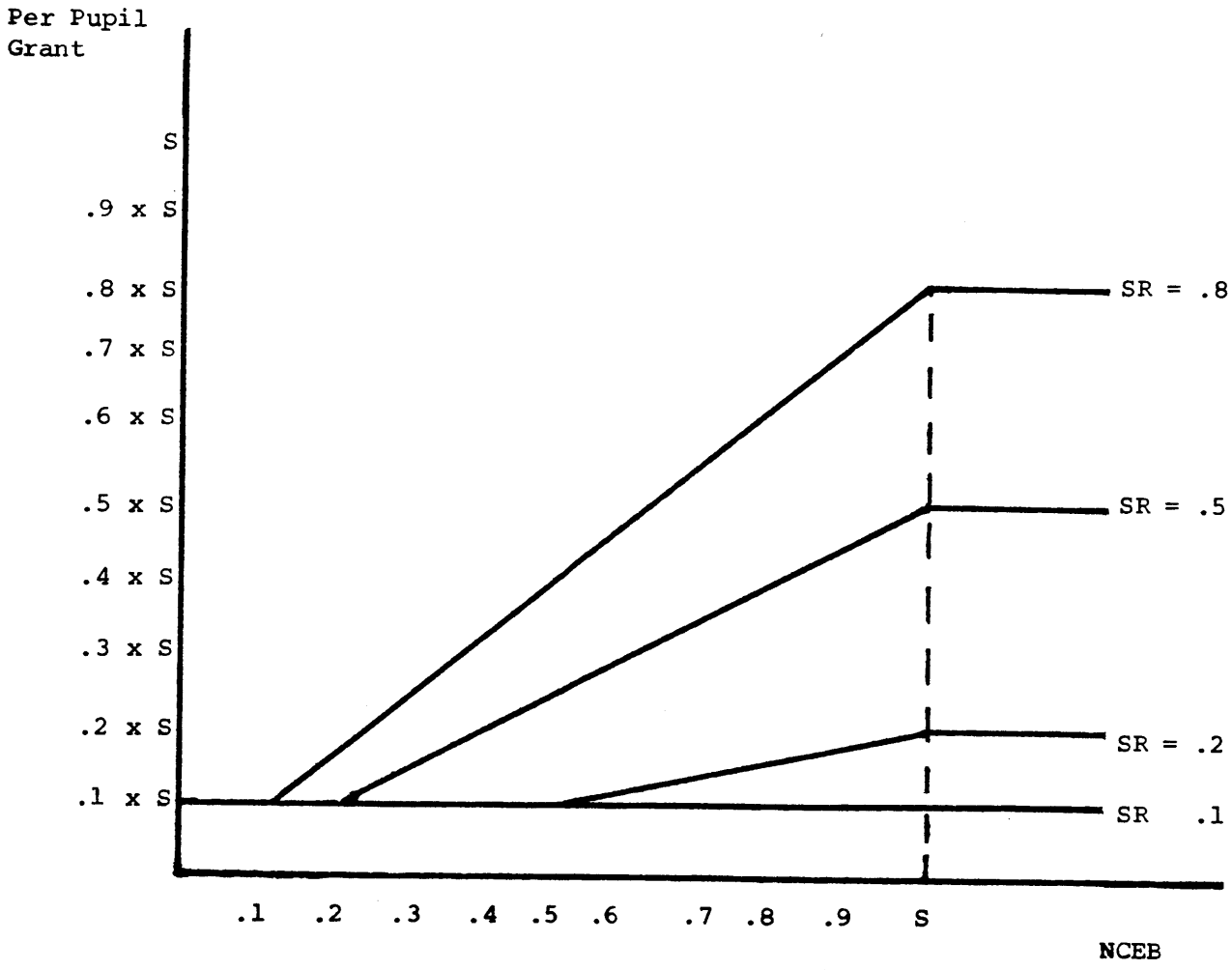
$$EAID_{it} = \left(1 - \frac{EV_{it}}{1.35 \times EV_{SAV}}\right)S \qquad (3.14)$$

The second restriction in the legislation states that no district shall receive a grant less than 10 percent of the support limit. Any district which, through equations (3.10) or (3.14), would receive less than this minimum is given a grant of 10 percent of the support limit. The matching rate for any district receiving equalization aid under either of the two restrictions is set to 0, and the price of education resulting from this grant is 1. Of the 287 districts included in this analysis, 141 districts had a price of 1.

Figure 3.3 illustrates the various per pupil equalization grants received by districts with particular support ratios (SR) given all levels of net current expense budgets (NCEB). As shown in the Figure, any district with an SR less than or equal to .1 receives a per pupil grant of 10 percent of the current support limit, S. A relatively wealthy district with a SR of .2 receives a grant of .2(S) if the district's NCEB is greater than or equal to S. If the district's NCEB is less than or equal to .5(S), then the district receives the minimum grant of .1(S). A property poor district with a SR of .8 receives a grant of .8(S) if the district's NCEB is greater than or equal to the support limit. If the district's NCEB is less than or

Figure 3.3

NEW JERSEY P.L. 212 MATCHING FORMULA



equal to .125(S), the district receives the minimum grant of .1(S). The average equalization grant received by the 287 districts in the sample used for this analysis was $410 per pupil for the 1977-78 school year.

The States With Foundation Programs

Colorado

Until 1973, Colorado distributed general state aid through a modified foundation program. In 1973, the Colorado Legislature passed a new school finance law which changed the distribution program to a district power equalizing program. The new finance program went into effect in 1974.[11] In this analysis, the foundation program in effect prior to 1974 will be evaluated. The data are for 109 Colorado school districts in 1973[12], which was the last year of the foundation program. 84 percent of the total state aid allocated to the 109 Colorado school districts in 1973 was distributed through the foundation program.

In 1973, the Colorado foundation program set a foundation level of $518 per pupil with a required local property tax levy of 17 mills.[13] The aid received under this program is simply:

$$AID_i = \$518 - (.017 \times TB_i) \qquad (3.15)$$

---

[11] Phillip E. Vincent and E. Kathleen Adams, Fiscal Responses of School Districts: A Study of Two States--Colorado and Minnesota (Denver: Education Finance Center, Education Commission of the States, October, 1978), p. 6.

[12] The Colorado fiscal year is the calendar year.

[13] Session laws of Colorado of 1969, Chapter 299, Sections 1-11. The $518 foundation level for 1973 was set in the Session Laws of Colorado of 1972, Chapter 90, Section 1.

where

AID_i = foundation aid per pupil to district i, and

TB_i = assessed tax base per pupil of district i.

Under the Colorado program, if the 17 mill levy would raise more than $250 per pupil, then the per pupil amount to be raised by the local tax levy is set by the legislation. In order for the 17 mill levy to raise more than $250 per pupil, the per pupil assessed tax base of the district must be greater than $14,706.[14] If a district can raise more than $250 per pupil with a 17 mill levy, the district would be required to raise that $250 per pupil unless that amount could be raised with a tax levy of less than 14 mills, in which case the district would be required to raise $280 per pupil. If $280 per pupil could be raised with less than an 11.5 mill levy, the district would be required to raise $300 per pupil. If the district can raise $300 per pupil with less than a 10 mill levy, the district would be required to raise the maximum of $380 per pupil. In order for a district to raise $380 per pupil with a 17 mill levy, the per pupil assessed tax base of the district must be approximately $22,350. The average grant received by the Colorado school district included in this analysis was $277 per pupil in 1973.

Indiana

Indiana first adopted a foundation program to distribute general aid in 1949 and since that time has used various forms of a foundation

---

[14] In Colorado, property is assessed at 30 percent of the market value.

program. In 1976, the Indiana foundation program had a foundation level of $690 per pupil with a required local tax levy of 30 mills. In 1977, the foundation level was raised to $755 per pupil, while the required local tax levy remained the same. For the 290 Indiana school districts included in this analysis, the foundation grant accounted for 87 percent of total state aid received during the 1976-77 school year.

The Indiana foundation formula is rather complex. In addition to the foundation level and the required local effort, the Indiana formula considers the training and experience of a district's teachers and the district's needs for handicapped, vocational, and compensatory programs.[15] The aid distributed to a given district in 1976 when the foundation level was $690 was:

$$\begin{aligned} AID_i = &[(\$690 \times tr_i \times ADM_i) - (0.03 \times CAAV_i)] + \\ &[.75 \times \$690 \times tr_i(hp\ Add\ Ct_i + vp\ Add\ Ct_i)] + \\ &[.60 \times \$690 \times tr_i(cp\ Add\ Ct_i)] \end{aligned} \tag{3.16}$$

where

Aid_i = State foundation aid to district i,

tr_i = teacher ratio for district i for the current year,

ADM_i = average daily membership for district i,

$CAAV_i$ = current adjusted assessed property value for district i,

$Add\ Ct_i$ = additional count of pupils in special programs in district i in the current year,

---

[15] Acts of 1975 Indiana General Assembly, P.L. 343, as amended.

hp = programs for handicapped children,

vp = vocational education programs, and

cp = compensatory education programs.

The teacher ratio used in the foundation program is calculated by dividing the district's teacher factor, which is determined on the basis of the years of experience and training of the teachers in the district, by a state teacher factor, which is determined on the basis of the years of experience and training for all teachers in the State.[16] Average daily membership (ADM) is the pupil count used in the formula. The actual ADM used to determine the level of aid for the district is the greater of ADM for the current year or the ADM for the previous year. The current adjusted assessed property value is simply the equalized property value of the district. The additional pupil count is a count of pupils in special programs weighted by type of program. For example, the weight given for a program for physically handicapped children is 2.04, while the weight for a program for educable mentally retarded children is 1.2, and the weight for a vocational program in home economics is .33. In 1976, each district was guaranteed a minimum grant under this foundation program of the sum of the district's 1975

---

[16]The inclusion of the teacher ratio in the foundation program adds a matching component to the program. Districts are reimbursed for hiring more experienced and better trained teachers. This is analogous to matching grants where districts are reimbursed for some fraction of each locally raised dollar. In each case, the aid formula provides incentives for the local district--in Indiana, districts are encouraged to hire better teachers, while under a traditional matching formula districts are encouraged to raise more revenue for education locally.

grant plus $80 per ADM. The average grant received by the 290 Indiana districts used in this analysis was $448 per ADM during the 1976-77 school year.

Minnesota

The Minnesota legislature first adopted a foundation program to distribute general aid to local school districts in 1957. Under this program, the level of education expenditures was still heavily dependent on local property tax revenues. Throughout the 1960's, citizen groups pushed for school finance reform as a way of relieving the property tax burden. In 1971 the Minnesota Legislature adopted new school finance legislation. Under this new legislation, general aid was still distributed through a foundation program, and the actual foundation formula remained essentially the same. However, the new legislation significantly increased the role of the State in funding education. For the 1970-71 school year, State aid accounted for 43 percent of total education expenditures. Under the new program, the State role increased to 70 percent of total expenditures for the 1972-73 school year. The foundation level increased from $404 per pupil in 1970-71 to $750 per pupil in 1972-73.[17] For the 370 Minnesota school districts analyzed in this study, foundation aid accounted for 72 percent of total state aid received during the 1975-76 school year.

---

[17] John Ostrem and Douglas Smith, "The State Revenue Requirements of School Finance Reform," in School Finance Reform: A Legislator's Handbook, edited by John J. Callahan and William J. Wilken (Washington, D.C.: National Conference of State Legislatures, February, 1976), pp. 77-80.

For the 1975-76 school year, the foundation level was set at $900 per pupil unit,[18] and the required local levy was 30 mills. The foundation aid distributed to district i in 1975-76[19] was:

$$Aid_i = \$900(PU_i) - .030(AAV_i) \qquad (3.17)$$

where

Aid_i = total foundation aid to district i,

PU_i = number of pupil units in district i, and

AAV_i = adjusted (equalized) assessed property value of district i.

In 1975-76, not all districts received foundation grants equal to the grant computed in equation (3.17). Because of the large increase in state foundation aid resulting from the new 1971 legislation, the law specified that foundation aid to school districts should be increased gradually over a six-year period. This "phase-in" aspect of the law was designed so that districts spending the least on education prior to the new law did not in one year receive a windfall grant. The law specified that any district with current expenditures[20] greater than the

---

[18] Pupil units are weighted pupil counts where kindergarten, elementary, and secondary pupils are assigned different weights. In 1971, for example, a kindergarten pupil had a weight of 0.5, an elementary pupil had a weight of 1.0, and a secondary pupil had a weight of 1.4. (Ibid., p. 79.)

[19] Minnesota Statutes 1975, Section 124.212.

[20] For the purposes of this aspect of the law, current expenditures are equal to "state and local current expense for pupils in elementary and secondary schools, exclusive of transportation, veterans training program, community services, and after reduction for receipts from the sale of other items sold to the individual pupil by the school. . .and after reduction for receipts from quasi-school activities when the school board has assumed direction and control. . ." (Minnesota Statutes 1971, Section 124:212 Subd. 2(1)).

State average in 1970-71 receive the foundation grant determined by the foundation formula. In 1975-76, these districts received the grant specified in equation (3.17). Districts with current expenditures below the State average in 1970-71 receive either the grant determined in equation (3.17) or the grant calculated from the "formula allowance," whichever is less. The "formula allowance" is a calculated foundation level which is less than the foundation level set for a particular year (e.g., $900 in 1975-76). A "formula allowance" is calculated for these districts for each year of the "phase in" period.[21] The formula allowance for a given year is based on the foundation level for that year and the formula allowance for the previous year. The formula allowance gets closer to the foundation level each year. In 1975-76, the formula allowance per pupil was:

$$FA_{it} = \frac{\$900 - FA_{it-1}}{2} + FA_{it-1} \qquad (3.18)$$

where

FA_{it} = formula allowance per pupil for district i in 1975-76, and

FA_{it-1} = formula allowance per pupil for district i in 1974-75.

For districts receiving foundation aid under the formula allowance in 1975-76, the local tax levy ($mill_{it}$) required is equal to:

---

[21]This six-year "phase in" process ended in 1977-78. For the 1977-78 school year, all districts received foundation aid based on the foundation level of $1,095 per pupil unit and a required local effort of 28 mills.

The discussion of this "phase in" aspect of the legislation and the formula allowance is largely based on a telephone conversation with Mr. Gary Olson of the Minnesota Department of Education.

$$mill_{it} = \frac{FA_{it}(.03)}{900} \tag{3.19}$$

Obviously, this local levy is less than the 30 mills required in equation (3.17). The foundation aid received by districts under the formula allowance is:

$$Aid_{it} = FA_{it}(PU_{it}) - mill_{it}(AVV_{it}) \tag{3.20}$$

The average grant received under this foundation program by the 370 Minnesota school districts used in this analysis was $650 per pupil unit during the 1975-76 school year.

The above discussion illustrates the differences in state aid mechanisms emphasizing the different restrictions placed on the aid formulae in each of the states. As discussed in Chapter 2, these restrictions may help determine the impact of a specific grant on local expenditure decisions. It will be important to recall the specific aid mechanism and restrictions on these mechanisms for each of the states when interpreting the results of the expenditure models presented in Chapter 4. In Chapter 4, the estimated expenditure models for each of the six states will be presented, and these results will be compared and contrasted emphasizing the similarities and dissimilarities in the impacts of the state aid on local expenditure decisions.

Chapter 4

MODEL SPECIFICATIONS AND RESULTS

The theoretical basis for the expenditure models estimated in this analysis was presented in Chapter 2. The purpose of this Chapter is to discuss the specifications of the expenditure models actually estimated and to present the results of the estimation. Expenditure models were estimated for each of the six states included in this analysis. Each model is based on cross-section data for school districts in a given state for a given school year.[1] In other words, the unit of observation is the school district. In this Chapter, the specification of the models for the states with matching formulae will be presented first followed by the specification of the models for the states with foundation programs. The estimated models for each of the states will then be presented.

Specification of the Expenditure Models

States With Matching Formulae

The expenditure models for each of the states with matching formulae--Massachusetts, Michigan, and New Jersey--are of the general form:

$$CEXP_i = f(Y_i, EPV_i, RES_i, PRICE_i, SBG_i, CAID_i, FED_i, PUP_i) \qquad (4.1)$$

---

[1] See Appendix B for a description of the specific data used for the expenditure models for each state.

where

$CEXP_i$ = current education expenditures per pupil for district i,

Y_i = median family income of district i,

EPV_i = equalized property value per pupil of district i,

RES_i = residential fraction of the assessed property tax base of district i,

$PRICE_i$ = price of education for district i resulting from the matching formula $(1/(m_i + 1)$ where m_i is the matching rate for district i),

SBG_i = state block grants per pupil to district i (received only by districts with matching rates of 0),

$CAID_i$ = state categorical aid per pupil to district i,

FED_i = federal aid per pupil to district i, and

PUP_i = pupils as a fraction of total population of district i.

As shown in Chapter 2, median family income, state block grants, state categorical aid, and federal aid are all expected to have positive income effects on current education expenditures. Of the specific block grants to education, state categorical grants are expected to have the largest effect on expenditures because they are tied to specific education programs. Equalized per pupil property wealth is expected to have a positive wealth effect on the level of per pupil education expenditures. If the property tax rate remains constant, more local revenue for education may be raised as the tax base increases. Price of education resulting from the matching grant and residential share of

the assessed property tax base are expected to have a negative impact on spending. Both of these variables alter the price of education for a school district; as economic theory suggests, an increase in the price of a good or service results in a decrease in the quantity demanded. As discussed in Chapter 2, pupils per capita may reflect price differences among districts and/or taste differences among districts. As pupils per capita rise, expenditures per pupil may be expected to fall. On the other hand, an increase in pupils per capita may indicate that more voters have children and, therefore, are concerned about education.

The specification of the aid variables in the expenditure model is a result of the restrictions placed on the matching formulae in each of the states. As shown in Chapter 3, in each of the three states there are minimum and/or maximum levels of local spending for which matching aid is received. Districts spending above or below these limits receive a block grant rather than a matching grant. For districts above or below these limits, the price of education resulting from the matching formula is 1, and state block grant per pupil is some positive amount. For districts within these limits, the price of education is less than 1, and state block grants is equal to 0. Together, PRICE and SBG account for all general state aid to education.

Without the restrictions on the matching formulae, it would be impossible to estimate the model given in equation (4.1). As shown in equations (3.5), (3.8), and (3.13), the price of education resulting from the matching formulae in each of the three states is the per pupil

equalized property value divided by some constant. If all districts were within the spending limits, price would be a linear combination of the per pupil equalized property value, which indicates that the two variables would be perfectly correlated and the separate effects of the variables could not be estimated. In Michigan, the correlation coefficient between PRICE and EPV is 1 when only districts within the matching limits are included in the sample. In New Jersey, the correlation is .98, while in Massachusetts the correlation is .72. The relatively low correlation between PRICE and EPV in Massachusetts, when only districts within the matching limits are included in the sample, is due to the additional restrictions that the Massachusetts legislation places on the school aid percentage (SAP).[2] The legislation places an upper limit on SAP of .75, which implies that the minimum per pupil equalized property value is .38 of the State average. The per pupil equalized property value is assumed to be .38 of the State average for all districts with EPVs below this level. The lower limit on SAP is .15, which implies a maximum EPV of 1.31 times the State average. EPV is assumed to be 1.31 times EV_{SAV} for all districts with EPVs above this level. These limits account for the relatively low correlation coefficient in Massachusetts.

---

[2] Recall that the SAP for district i is:

$$SAP_i = 1 - .65\left(\frac{EV_i}{EV_{SAV}}\right)$$

where

EV_i = equalized property value per pupil in town i, and

EV_{SAV} = average equalized property value per pupil for all towns in the State.

The simple correlation matrices for each of the three states are presented in Tables 4.1, 4.2, and 4.3. These matrices are based on the total sample--all districts, above, below, and within the matching limits--used to estimate the expenditure models. All variables in the expenditure models are included in the matrices. Note that the correlation between PRICE and EPV drops to .463 in Michigan, .407 in Massachusetts, and .601 in New Jersey. These tables also show a relatively high correlation between PRICE and SBG. This correlation coefficient is .659 in Michigan, .716 in Massachusetts, and .643 in New Jersey. These correlations are not surprising given the relationship between PRICE and SBG defined in the legislation; SBG is some positive amount when PRICE is equal to 1 and 0 when price is less than 1.

States With Foundation Programs

The only difference between the expenditure models estimated for the states with foundation programs--Colorado, Indiana, and Minnesota--and the expenditure models estimated for states with matching formulae is the specification of the aid variables. As shown in Chapter 2, foundation grants increase the community's income but do not alter the price of education. As a result, the per pupil foundation grant is included in the model in place of PRICE and SBG in the model presented in equation 4.1. Thus the general form of the expenditure models for states with foundation programs is:

$$CEXP_i = f(Y_i, EPV_i, RES_i, EAID_i, CAID_i, FED_i, PUP_i) \qquad (4.2)$$

Table 4.1

CORRELATION MATRIX FOR MASSACHUSETTS

	CEXP	Y	EPV	RES	PRICE	CAID	FED	SBG	PUP
CEXP	1.000	.436	.523	.010	.274	.513	.068	-.032	-.382
Y	.436	1.000	.081	.379	.208	.159	-.290	-.030	.156
EPV	.523	.081	1.000	-.026	.407	.127	-.057	-.045	-.388
RES	.010	.379	-.026	1.000	.022	-.026	-.306	.027	.160
PRICE	.274	.208	.407	.022	1.000	.078	.002	.716	-.179
CAID	.513	.159	.127	-.026	.078	1.000	.082	.087	-.154
FED	.068	-.290	-.057	-.306	.002	.082	1.000	.095	-.051
SBG	-.032	-.030	-.045	.027	.716	.087	.095	1.000	-.018
PUP	-.382	.156	-.388	.160	-.179	-.154	-.051	-.018	1.000

Table 4.2

CORRELATION MATRIX FOR MICHIGAN

	CEXP	Y	EPV	RES	PRICE	CAID	FED	SBG	PUP
CEXP	1.000	.394	.543	-.001	.616	.239	.380	.239	-.498
Y	.394	1.000	.226	.433	.454	-.304	-.372	.234	-.029
EPV	.543	.226	1.000	-.235	.463	-.109	.010	-2.95	-.294
RES	-.001	.433	-.235	1.000	.083	-.192	-.314	.277	-.053
PRICE	.616	.454	.463	.083	1.000	-.054	.033	.659	-.332
CAID	.239	-.304	-.109	-.192	-.054	1.000	.499	.024	-.092
FED	.380	-.372	.010	-.314	.033	.499	1.000	.057	-.227
SBG	.239	.234	-.295	.277	.659	.024	.057	1.000	-.086
PUP	-.498	-.029	-.294	-.053	-.332	-.092	-.227	-.086	1.000

Table 4.3

CORRELATION MATRIX FOR NEW JERSEY

	CEXP	Y	EPV	RES	PRICE	CAID	FED	SBG	PUP
CEXP	1.000	.339	.539	-.054	.398	.186	-.032	.339	-.264
Y	.339	1.000	.371	.331	.539	-.225	-.412	.293	.066
EPV	.539	.371	1.000	-.090	.601	.065	-.234	.225	-.412
RES	-.054	.331	-.090	1.000	.110	-.388	-.180	.110	-.082
PRICE	.398	.539	.601	.110	1.000	-.183	-.402	.643	-.344
CAID	.186	-.225	.065	-.388	-.183	1.000	.297	-.068	.032
FED	-.032	-.412	-.234	-.180	-.402	.297	1.000	-.033	.084
SBG	.339	.293	.225	.110	.643	-.068	-.033	1.000	-.189
PUP	-.264	.066	-.412	-.082	-.344	.032	.084	-.189	1.000

where

$EAID_i$ = per pupil equalization aid distributed through the foundation program to district i, and

all other variables are as defined in equation 4.1.

Since EAID is a block grant which increases the income of the district, it is expected to have a positive impact on current education expenditures. The expected impacts of the other variables included in the model are the same as those described for these variables in the model for states with matching formulae.

The correlation matrices for each of the three states with foundation programs are presented in Tables 4.4, 4.5, and 4.6. All variables included in the expenditure models are included in these matrices. Note the high correlation between per pupil equalization (foundation) aid and per pupil equalized property value. The correlation is -.756 in Colorado, -.628 in Indiana, and -.853 in Minnesota. These strong negative correlations are not surprising given the formulae used to determine foundation aid. As shown in equation (3.17), the level of foundation received by a school district in Minnesota is a linear function of the district's equalized property value. The reason per pupil foundation aid and per pupil equalized property value are not perfectly correlated is that not all Minnesota school districts received the aid calculated in equation (3.17). As discussed in Chapter 3, the Minnesota legislation had a "phase in" clause which was still in effect in 1976 (the year for which the data used in this analysis were collected). In 1976, only half the school districts received foundation aid calculated in equation (3.17).

Table 4.4

CORRELATION MATRIX FOR COLORADO

	CEXP	Y	EPV	RES	EAID	CAID	FED	PUP
CEXP	1.000	.281	.585	-.209	-.633	.394	.045	-.184
Y	.281	1.000	.049	.459	-.100	-.290	.006	.084
EPV	.585	.049	1.000	-.286	-.756	.293	-.259	-.188
RES	-.209	.459	-.286	1.000	.215	-.326	.145	.123
EAID	-.633	-.100	-.756	.215	1.000	-.533	.283	.221
CAID	.394	-.290	.293	-.326	-.533	1.000	-.105	-.181
FED	.045	.006	-.259	.145	.283	-.105	1.000	.038
PUP	-.184	.084	-.188	.123	.221	-.181	.038	1.000

Table 4.5

CORRELATION MATRIX FOR INDIANA

	CEXP	Y	EPV	RES	EAID	CAID	FED	PUP
CEXP	1.000	.197	.505	.082	-.167	.055	.202	-.370
Y	.197	1.000	.045	.518	.046	-.097	-.126	.196
EPV	.505	.045	1.000	-.003	-.628	-.187	-.024	-.263
RES	.082	.518	-.003	1.000	.106	-.020	-.145	.038
EAID	-.167	.046	-.628	.106	1.000	.270	.026	-.044
CAID	.055	-.097	-.187	-.020	.270	1.000	.023	.118
FED	.202	-.126	-.024	-.145	.026	.023	1.000	-.047
PUP	-.370	.196	-.263	.038	-.044	.118	-.047	1.000

Table 4.6

CORRELATION MATRIX FOR MINNESOTA

	CEXP	Y	EPV	RES	EAID	CAID	FED	PUP
CEXP	1.000	-.047	.054	.015	-.025	.615	.449	-.0002
Y	-.047	1.000	-.116	.737	-.069	-.153	-.484	-.0215
EPV	.054	-.116	1.000	-.516	-.853	.269	.083	-.105
RES	.015	.737	-.516	1.000	.356	-.135	-.401	-.098
EAID	-.025	-.069	-.853	.356	1.000	-.237	-.009	.200
CAID	.615	-.153	.269	-.135	-.237	1.000	.158	-.059
FED	.449	-.484	.083	-.401	-.009	.158	1.000	-.034
PUP	-.0002	.021	-.105	-.098	.200	-.059	-.034	1.000

In Colorado, foundation aid in 1973 was a linear function of the per pupil assessed property tax base, where property is assessed at approximately 30 percent of market value. However, assessment practices may vary from district to district, and therefore, the relationship between assessed property value and equalized property value may vary. Because of the variation in the relationship between assessed value and equalized value and the various restrictions placed on the Colorado foundation program which are discussed in Chapter 3, foundation aid per pupil and the per pupil equalized property value are not perfectly correlated.

As shown in equation (3.16), the level of foundation aid received by school districts in Indiana is a function of the equalized property value as well as the training and experience of the district's needs for handicapped, vocational, and compensatory programs. These additional components explain why the correlation between foundation aid and equalized property value are somewhat lower for Indiana than for the other two states.

The high correlations between foundation aid and equalized property value described above indicate that some caution should be taken when evaluating the regression results presented in the next section of this Chapter. When two independent variables are highly correlated, the estimated coefficients for these variables remain unbiased. However, such correlations tend to increase the standard error of the estimates, which may result in relatively low t-statistics for these coefficients. In other words, low t-statistics, which would otherwise suggest a

statistically insignificant relationship, may be due to the correlation between the two independent variables rather than the relationship between the independent and dependent variables.

In the literature, expenditure models similar to those described above have been estimated using either a linear of log-log functional form. Ladd and Feldstein estimate their models using the log-log form, while Vincent and Adams present linear and log-log estimates of their expenditure models.[3] Ladd argues that,

> Except that the tax price variables (RES and PRICE) are predicted to appear in multiplicative form, the underlying theory does not imply a particular specification. The choice of the log-log form for estimation is based in part on the reasonable view that intercommunity variations in the tax price, the key variable for this analysis, are likely to have a multiplicative impact on education demand. That is, they are likely to affect demand with constant elasticity rather than with constant marginal impact.[4]

The log-log functional form implies that as a price variable (with its expected negative impact) approaches 0, expenditures approach infinity. In other words, if school districts bear none of the

---

[3]Helen F. Ladd, "Local Education Expenditures, Fiscal Capacity, and the Composition of the Property Tax Base," National Tax Journal, Vol. 28 (June, 1975), pp. 145-58.

Martin S. Feldstein, "Wealth Neutrality and Local Choice in Public Education," American Economic Review, Vol. 65 (March, 1975), pp. 75-89.

Phillip E. Vincent and E. Kathleen Adams, Fiscal Responses of School Districts: A Study of Two States--Colorado and Minnesota, (Denver, Colorado: Education Finance Center, Education Commission of the States, October, 1978).

[4]Ladd, "Local Education Expenditures," p. 149.

costs of education expenditures, these districts would be expected to radically increase the level of expenditures. This notion is certainly consistent with economic theory. Similarly, the log-log functional form seems appropriate for median family income and equalized property wealth. As median family income or per pupil equalized property value (with their expected positive impacts) approach 0, education expenditures approach 0. This relationship seems reasonable given that most local revenue for education is raised through the local property tax and those taxes are paid out of current income. If a district has no income or no property tax base, locally raised revenue would be 0. Since most aid programs require some local effort, expenditures for a district with no local revenue would be 0. However, the log-log specification is not quite appropriate for the state and federal aid variables included in the model. Again, that specification would imply that as state or federal aid approaches 0, a district's expenditures approach 0. A property rich school district may not be eligible for aid under a particular equalization program and, therefore, receives no aid, but the district may still spend well above the state average on education. Expenditures for such a district are determined by the income and property tax base of the district, as well as the price of education for the district. This implies that a linear specification is appropriate for the aid variables. However, this specification is inappropriate for the income, wealth, and price variables. For example, the linear specification implies that if the price of education is 0,

expenditures are determined by the remaining variables in the model. Theoretically, it is much more appealing to assume that a price of 0 implies a radical increase in expenditures. Thus, neither the log-log specification nor the linear specification seems theoretically appropriate.

For this analysis, a hybrid of the log-log and the linear specifications was used to estimate the six expenditure models described earlier. Using this hybrid specification, the functional form of the model for states with matching formulae is:

$$CEXP = K \cdot Y^{\beta 1} \cdot EPV^{\beta 2} \cdot RES^{-\beta 3} \cdot PUP^{-\beta 4} \cdot PRICE^{-\beta 5} \cdot e^{\beta 6 CAID} \cdot e^{\beta 7 SBG} \cdot e^{\beta 8 FED} \qquad (4.3)$$

where

K = a constant, and

all other variables are as defined in equation (4.1).[5]

According to this functional form, if median family income or per pupil equalized value are 0, then current expenditures are 0. If the price components approach 0, then expenditures approach infinity. If per pupil categorical aid, state block grants, federal aid, or foundation aid are 0, current expenditures are a function of the remaining

---

[5] The functional form of the model for states with foundation formulae is:

$$CEXP = K \cdot Y^{\beta 1} \cdot EPV^{\beta 2} \cdot RES^{-\beta 3} \cdot PUP^{-\beta 4} \cdot e^{\beta 5 EAID} \cdot e^{\beta 6 CAID} \cdot e^{\beta 7 FED}$$

where

K = a constant, and
all other variables are as defined in equation (4.2).

variables. The model can be estimated by taking the log of equation (4.3) and then using ordinary least squares:

$$\log CEXP = \log K + \beta_1 \log Y + \beta_2 \log EPV - \beta_3 \log RES - \beta_4 \log PUP - \beta_5 \log PRICE + \beta_6 CAID + \beta_7 SBG + \beta_8 FED$$

The estimated coefficients for income, property wealth, and the price components are simply income, wealth, and price elasticities. The marginal impact on expenditures of an additional dollar of categorical aid, state block grants, or federal aid can be derived from the respective estimated coefficients. These marginal impacts are calculated by taking the partial derivative of current expenditures with respect to a given aid variable. For example, using equation (4.3), the marginal impact of an additional dollar of categorical aid is:

$$\frac{\partial CEXP}{\partial CAID} = \beta_6 \cdot K \cdot Y^{\beta 1} \cdot EPV^{\beta 2} \cdot RES^{-\beta 3} \cdot PUP^{-\beta 4} \cdot PRICE^{-\beta 5} \cdot e^{\beta_6 CAID} \cdot e^{\beta_7 SBG} \cdot e^{\beta_8 FED}$$

$$= \beta_6 \cdot CEXP \qquad (4.4)$$

Equation (4.4) may be evaluated at the mean level of current expenditures. $\beta_6 \cdot \overline{CEXP}$ indicates the increase in the level of current expenditures resulting from an additional dollar of categorical aid at the mean. This derived marginal impact should be close to that estimated in a linear model.

The results of the estimation of this hybrid model for each of the six states will be presented in the next section. The expenditure

models for each of the states were also estimated using the linear and log-log specifications. The results of these estimations are presented in Appendix A.

The Regression Results

The results of the estimated models for each of the six states will be presented in this section. The discussion of these results will emphasize the similarities and differences among states and will offer some speculations as to why these similarities and differences occur. The description of the results will first focus on the estimated income and wealth elasticities followed by the various price elasticities. Finally, the different impacts of the various block grants will be discussed.

The estimated expenditure models for each of the six states are presented in Table 4.7.[6] Any variable with the prefix L was entered into the model in log form; all other variables were entered in linear form. The t-statistics are in parentheses below each of the estimated coefficients. The mean values and standard deviations of each of the variables for each state are presented in Table 4.8.

---

[6] Each of these models is estimated using cross-section data for a given school year. The Colorado model is based on data from the 1972 calendar year. The Indiana and Massachusetts models are both based on data for the 1976-77 school year. The Michigan model is based on data from the 1974-75 school year, while the Minnesota model uses data from the 1975-76 school year. Finally, the New Jersey model is based on data for the 1977-78 school year. See Appendix B for a complete description of the data for each state.

Table 4.7

HYBRID EXPENDITURE MODELS*
(Dependent Variable: LCEXP)

Matching Formulae:				Block Grants:			
Independent Variables	Massachusetts	Michigan	New Jersey	Independent Variables	Colorado	Indiana	Minnesota
C	1.889	-.897	3.380	C	3.155	3.070	5.703
	(3.970)	(-1.179)	(5.618)		(4.130)	(6.626)	(14.346)
LY	.387	.363	.213	LY	.278	.264	.092
	(9.942)	(10.657)	(3.868)		(5.053)	(5.589)	(3.310)
CAID	.0007	.001	.0006	CAID	.0008	.0014	.0006
	(8.504)	(5.901)	(3.935)		(2.992)	(4.659)	(14.972)
LPRICE	-.124	-.379	-.188	EAID	-.0003	.0002	.0001
	(-2.963)	(-4.871)	(-3.318)		(-1.146)	(2.514)	(1.582)
SBG	.0001	.0007	.0004	--	--	--	--
	(1.509)	(6.068)	(5.419)				
FED	.0005	.001	.0003	FED	.0009	.0004	.0009
	(4.652)	(8.201)	(1.251)		(4.576)	(5.032)	(11.407)
LEPV	.213	.465	.203	LEPV	.134	.212	.022
	(8.646)	(7.183)	(5.648)		(3.493)	(8.246)	(.867)
LRES	-.048	.002	-.019	LRES	-.026	-.007	.017
	(-1.159)	(.114)	(-.457)		(-1.780)	(-.416)	(1.486)
LPUP	-.133	-.149	-.064	LPUP	-.039	-.172	.031
	(-4.227)	(-6.583)	(-1.453)		(-.861)	(-5.015)	(1.152)
R^2	.6960	.8178	.4084	R^2	.6126	.5061	.5242
NUMBER OF OBSERVATIONS	258	174	287	NUMBER OF OBSERVATIONS	109	290	370

*Any variable with the prefix L was entered into the model in log form; all other variables were entered in linear form. T-statistics are in parentheses below the estimated coefficients.

Table 4.8

MEANS AND STANDARD DEVIATIONS OF ALL VARIABLES INCLUDED IN THE EXPENDITURE MODELS

	Massachusetts		Michigan		New Jersey	
Variable	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
CEXP	1,612.93	283.54	1,175.66	200.45	2,095.66	430.49
Y	11,549.70	2,367.42	11,267.80	2,458.17	11,993.40	2,882.70
CAID	177.92	73.95	73.44	31.09	155.91	60.20
PRICE	.73	.21	.79	.26	.79	.24
SBG	81.37	143.08	181.13	221.25	117.53	160.14
FED	65.10	65.60	53.29	54.89	29.33	40.65
RES	77.09	11.04	48.91	14.17	70.41	14.74
PUP	23.12	4.76	27.27	7.16	18.26	4.50
EPV	50,332.50	30,710.70	25,004.10	11,274.60	98,210.30	63,077.00

Table 4.8 (Cont.)

Variable	Colorado		Indiana		Minnesota	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
CEXP	1,025.48	184.04	1,227.33	182.75	1,409.08	175.24
Y	7,992.43	2,021.00	9,548.68	1,440.87	8,015.58	2,147.27
CAID	84.47	61.39	72.30	20.27	285.76	111.05
EAID	277.20	90.36	448.24	109.91	650.13	161.81
FED	52.34	64.15	34.53	78.03	103.17	67.83
RES	35.23	22.89	33.70	11.14	31.58	20.32
PUP	27.97	9.49	25.19	5.41	26.39	4.44
EPV	61,102.40	36,090.90	12,510.50	6,575.91	67,336.20	30,939.70

Income and Wealth Elasticities

As shown in Table 4.7, the income elasticities (Y) for all six states have the expected positive sign, and all are statistically significant. The income elasticities for five of the states--Colorado, Indiana, Massachusetts, Michigan, and New Jersey--range from a high of .39 in Massachusetts to a low of .21 in New Jersey. Minnesota is the outlier with a relatively low income elasticity of .092.

In the various versions of their models for Massachusetts, Ladd estimates income elasticities which range from .41 to .46, while the income elasticities estimated by Feldstein range from .37 to .64.[7] In their model of education expenditures for school districts in California, Grubb and Osman estimate an income elasticity of .154.[8] Certainly, the .39 income elasticity estimated for Massachusetts in this analysis falls within the range of those estimated by Ladd and Feldstein. The income elasticities for Colorado, Indiana, Michigan, and New Jersey estimated in this analysis are lower than those estimated for Massachusetts but greater than those estimated by Grubb

---

[7]Ladd, "Local Education Expenditures," p. 151. Feldstein, "Wealth Neutraility," p. 82.

[8]W. Norton Grubb and Jack W. Osman, "The Causes of School Finance Inequalities: Serrano and the Case of California," Public Finance Quarterly, Vol. 5 (July, 1977), p. 380.

and Osman for California. The reason for the relatively low income elasticity in Minnesota is unclear.[9]

The estimated wealth elasticities (EPV) are all positive and in all states but Minnesota are statistically significant. As discussed earlier in this Chapter, in Minnesota the correlation between foundation aid and per pupil property wealth is -.853. This high correlation may increase the standard error of the estimates and, therefore, may explain the statistically insignificant wealth elasticity in Minnesota. As shown in Table 4.7, the wealth elasticities range from a high of .465 in Michigan to a low of .022 in Minnesota. The estimated wealth elasticities for Indiana, Massachusetts, and New Jersey are consistent--all are approximately .21.

This high wealth elasticity in Michigan is similar to that estimated by Grubb and Osman for California--.465 and .490 respectively.[10] The estimates for Indiana, Massachusetts, and New Jersey are consistent with the wealth elasticities estimated by Feldstein. In his basic

---

[9]Vincent and Adams estimated an education expenditure model using the 1976 Minnesota data. Their estimated income elasticity is .168. However, Vincent and Adams used gross income per state tax return as their income variable, while for this analysis, median family income was used as the income variable. This difference in the choice of income measures probably accounts for the different estimated elasticities. See Vincent and Adams, Fiscal Responses of School Districts, p. 34.

[10]Grubb and Osman, "The Causes of School Finance Inequalities," p. 380.

model, Feldstein estimates a wealth elasticity of .28.[11] The wealth elasticities for Colorado and Minnesota are relatively low--.13 and .022 respectively--when compared with those for the other states in this analysis and those estimated by Feldstein and Grubb and Osman.[12]

The Price Elasticities

The price elasticity (PRICE) of the matching grants is estimated for Massachusetts, New Jersey, and Michigan. In each case, the elasticity has the expected negative sign and is statistically significant: -.124 in Massachusetts, -.188 in New Jersey, and -.379 in Michigan. These results indicate that the demand for education is highly inelastic with respect to the price of education set by a matching formula. A 100 percent increase in this price term would only result in a 12 percent decrease in expenditures in Massachusetts, a 19 percent decrease in New Jersey, and a 38 percent decrease in Michigan. Large changes in this price component effect relatively small changes in expenditures.

---

[11] Feldstein, "Wealth Neutrality," p. 82.

Ladd uses residential wealth rather than total property wealth, but the residential wealth elasticities estimated in her models range from .24 to .30, which are in the same range as the total wealth elasticities estimated by Feldstein and those estimated in this analysis for Indiana, Massachusetts, and New Jersey. (See Ladd, "Local Education Expenditures," p. 151.)

[12] Vincent and Adams estimate residential wealth elasticities for Colorado and Minnesota using 1973 data for Colorado and 1976 data for Minnesota. They estimated a residential wealth elasticity of .111 for Colorado, which is very close to the wealth elasticity estimated in this analysis. Their residential wealth elasticity for Minnesota is -.065. This negative elasticity is difficult to interpret. See Vincent and Adams, Fiscal Responses of Local School Distrcts, pp. 33-34.

Consider a school district for which the price of education resulting from the matching formula is equal to .8. This indicates that the district provides 80 cents of each additional dollar of education expenditures and the state provides the remaining 20 cents. If the price was decreased to .4, the district would pay 40 cents of each additional dollar spent while the state would provide the remaining 60 cents. Thus, reducing the price by one half would result in the state providing the district with three times as much aid. However, using the price elasticities presented in Table 4.7, this reduction in price will only result in an 8.3 percent increase in expenditures in Massachusetts, a 12.5 percent increase in New Jersey, and a 25.2 percent increase in Michigan.[13] Reducing the price of education by one half results in a very large increase in state aid (three times that currently allocated), but this increase in aid has a relatively small impact on spending.

---

[13]The percent change in price between .8 and .4 depends on which price is used as the base. A decrease in price from .8 to .4 indicates a 50 percent change. However, an increase in price from .4 to .8 indicates a 100 percent change. Thus, the direction of the change in price influences not only whether the impact is positive or negative but also the size of the impact. Ideally, a change in price from .8 to .4 would have the same absolute impact as a change from .4 to .8. To get around this problem, the calculation of the impact of the reduction in price from .8 to .4 is based on the average change in price:

$$\frac{\Delta PRICE}{(Price_1 + Price_2)/2}$$

or, in this case:

$$\frac{-.4}{(.8 + .4)/2} = -.666$$

Using the estimated price elasticities presented in Table 4.7, the marginal impact of an additional dollar of aid allocated through the matching formula may be calculated.[14] These marginal impacts indicate what portion of each additional dollar of matching aid is used to increase expenditures and what portion is used as a substitute for locally raised revenue. The marginal impact of an additional

---

[14] Assuming that: $E = A + T$ and

$$A = (1 - P)E$$

where

E = current education expenditures per pupil,
A = equalization aid per pupil,
T = locally raised revenue, and
P = price of education resulting from the matching formula.

$$\frac{dA}{dP} = -E + (1 - P)\frac{dE}{dP}$$

$$\frac{dE}{dA} \cdot \frac{dA}{dP} = \frac{dE}{dP}$$

substituting

$$\left(-E + (1 - P)\frac{dE}{dP}\right)\frac{dE}{dA} = \frac{dE}{dP}$$

$$\frac{dE}{dA} = \frac{dE}{dP} \Big/ \left(-E + (1 - P)\frac{dE}{dP}\right)$$

let E_p = price elasticity:

$$\frac{dE}{dA} = \left(\frac{E}{P} E_P\right) \Big/ \left(-E + (1 - P)E_P \frac{E}{P}\right)$$

$$= \left(\frac{E}{P} E_P\right) \Big/ \left(\frac{-E + (1 - P)E_P E}{P}\right)$$

$$= E_P \Big/ \left(-P + (1 - P)E_P\right) \qquad (4.5)$$

The marginal impact of an additional dollar of matching aid for a given state may be calculated by substituting the estimated price elasticity and the mean price in equation (4.5).

This derivation is an approximattion of the marginal impact. This derivation is a simplification, since it assumes that districts only receive equalization aid and, therefore, assumes that no state or federal categorical aid programs exist.

dollar of matching aid at the mean price is $0.16 in Massachusetts, $0.23 in New Jersey, and $0.44 in Michigan. In other words, an additional dollar of matching aid increases expenditures by $0.16 in Massachusetts, $0.23 in New Jersey, and $0.44 in Michigan. The implication of these results is that an additional dollar of maching aid decreases locally raised revenue by $0.84 in Massachusetts, $0.77 in New Jersey, and $0.56 in Michigan. A major portion of each dollar serves as a substitute for locally raised revenue. Districts may use this savings in locally raised revenue to lower local property taxes or to provide other services. The results cast some doubt on the conventional theoretical argument presented in Chapter 2, which suggests that because of the price effect of matching grants, these grants have a large stimulative effect on spending. The policy implications of these results will be discussed in Chapter 5.

The other two price variables are the residential share of the assessed property tax base (RES) and pupils per capita (PUP). Both of these price variables were included in the expenditure models for all six states. RES has the expected negative sign in four of the six states. In Michigan and Minnesota, RES is positive. However, RES is not statistically significant at the .05 level in any of the six states. In Ladd's models and Feldstein's models, RES is negative and statistically significant.[15] However, Ladd estimates her model for the 78 Massachusetts cities and towns in the Boston SMSA in 1970.

---

[15]Feldstein uses several different techniques to estimate his expenditure models. In some cases, RES is statistically insignificant.

Feldstein's sample includes 105 cities and towns in Massachusetts which accounted for 72 percent of the population in 1970.[16] The Massachusetts sample used for this analysis includes the 258 cities and towns for which data were available for the 1976-77 school year. In the preliminary stages of this analysis, the Massachusetts model was estimated for the 78 cities and towns in the Boston SMSA. In that model, which is not presented here, RES was negative and statistically significant. This may indicate that RES is a better proxy for the tax burden on voters in densely populated urban areas with significant amounts of commercial and industrial property than the tax burden on voters living in rural districts. In rural districts in Indiana, for example, voters may not perceive any difference in the burden of property taxes on their home versus taxes on farmland. In such cases, RES would not be an appropriate measure of the tax burden on voters. In urban areas, it is more likely that voters perceive themselves bearing the burden of taxes on residential property to a larger extent than they perceive themselves bearing the burden of taxes on commercial or industrial property. In a more general specification of the tax burden term, Ladd uses a search procedure to determine what fraction of the tax burden on commercial and industrial property residents perceive they pay. Ladd's results show that residents of cities and towns in the Boston SMSA perceive themselves bearing only 21 percent

---

[16] Ladd, "Local Education Expenditures," p. 148. Feldstein, "Wealth Neutraility," p. 81.

of the taxes on commercial property and 55 percent of the taxes on industrial property.[17]

Pupils per capita (PUP) has a negative impact on expenditures in five of the six states. Of those five states, PUP is statistically significant in Indiana, Massachusetts, and Michigan and statistically insignificant in New Jersey and Colorado. In Minnesota, PUP is positive but statistically insignificant. The implication is that in Indiana, Massachusetts, and Michigan, the price effect of PUP dominates any taste differences reflected in PUP. However, the magnitude of the coefficients in these three states indicates that the effects of changes in PUP on the level of education expenditures are small. A 100 percent increase in PUP would result in a decrease in expenditures of 13 percent in Massachusetts, 15 percent in Michigan, and 17 percent in Indiana. The insignificant results in Colorado, Minnesota, and New Jersey may be due to the conflicting role of PUP in the model--PUP as a price variable with an expected negative impact versus PUP as a taste variable with an expected positive impact.

Marginal Impacts of the Block Grants

As shown in Table 4.7, the estimated coefficients for categorical aid (CAID) are positive and statistically significant in all six states. Federal aid (FED) has a positive impact in all six states and is statistically significant in all states except New Jersey. The coefficients for state block grants (SBG) also have the expected positive signs in the three states with matching formulae. These coefficients are statistically significant in New Jersey

---

[17] Ibid., p. 152.

and Michigan but insignificant in Massachusetts. This insignificant t-statistic in Massachusetts may be due to the high correlation between PRICE and SBG. As stated earlier, this correlation is .72 in Massachusetts, .66 in Michigan, and .64 in New Jersey. This correlation may increase the standard error of the estimates, but the estimated coefficient is still unbiased.

The coefficients for foundation aid (EAID), in the three states with foundation programs are positive in Indiana and Minnesota. In Colorado, the estimated coefficient has a perverse negative sign. Only in Indiana is the coefficient on EAID statistically significant. As suggested earlier, the high correlations between EAID and EPV may explain the insignificant t-statistics in Minnesota and Colorado. This correlation is -.76 in Colorado, -.85 in Minnesota, and -.63 in Indiana. Again, this high correlation increases the standard errors of the estimates, but the coefficients remain unbiased.

The aid coefficients given in Table 4.7 are difficult to interpret. As shown earlier in this Chapter, the marginal impact of an additional dollar of aid on education expenditures can be calculated from these coefficients by multiplying the estimated coefficients by the mean level of current expenditures in a given state. These calculated marginal impacts of CAID and FED for all six states, as well as the marginal impacts of SBG in the three states with matching formulae and EAID in the three states with foundation programs, are presented in Table 4.9.

Table 4.9

MARGINAL IMPACTS OF BLOCK GRANTS

State	CAID	FED	SBG	EAID
Massachusetts	1.13	.81	.16	n.a.
Michigan	1.18	1.18	.82	n.a.
New Jersey	1.26	.63	.84	n.a.
Colorado	.82	.92	n.a.	-.31
Indiana	1.72	.49	n.a.	.25
Minnesota	.85	1.27	n.a.	.14

n.a. = not applicable

As shown in the Table, the marginal impacts of categorical aid (CAID) at the means range from a low of .82 in Colorado to a high of 1.72 in Indiana. In Colorado this implies that an additional dollar of categorical aid results in $0.82 in additional education expenditures. The remaining $0.18 represents a decrease in the local district's contribution to education expenditures. In other words, $0.18 of the additional grant serves as a substitute for a portion of local education expenditures. The districts may use the $0.18 to provide other local services or to reduce local property taxes. Similarly, an additional dollar of state categorical aid to local districts in Minnesota results in a $0.85 increase in expenditures, which indicates that $0.15 of the additional dollar serves as a substitute for locally raised expenditures. In Indiana, Massachusetts, Michigan, and New Jersey, an additional dollar of categorical aid results in more than a one dollar increase in expenditures. This implies that in these four states, categorical aid encourages the local districts to spend more locally raised money on the special programs supported by state categorical aid. The impact of an additional dollar of categorical aid on spending rages from 1.72 in Indiana to 1.13 in Massachusetts. The results of these four states support the view presented by Ladd that "these (categorical) grants are for specialized purposes on which local communities would have spent less than the allotted amount in the absence of aid."[18] For example, the categorical aid may be given to

---

[18] Ibid., p. 150.

start a particular program which the district did not previously provide. The program may have been successful or proved worthwhile, and the local district may decide to allocate a portion of its own revenue to the project. Thus, as a result of categorical aid, the district was encouraged to spend some of its own revenue; and, therefore, expenditures increased by more than the size of the grant.

The marginal impact of a dollar of categorical aid in Indiana is considerably higher than for the other five states in this analysis--1.72 versus 1.26 in New Jersey, which is the second highest marginal impact of categorical aid given in Table 4.9. One possible explanation for this large impact is that the types of programs included in categorical aid for Indiana differ substantially from those included in the five other states. As discussed in Chapter 3, aid for programs for handicapped children, vocational education, and compensatory education, is provided through the foundation program formula in Indiana and is, therefore, part of equalization aid rather than categorical aid. In the other five states, state aid for these types of programs is considered part of categorical aid. The higher impact of categorical aid in Indiana may indicate that aid for the specific programs covered in categorical aid in Indiana (summer school, evening school, transportation, etc.) encourages local districts to spend more than aid for special, vocational, and compensatory education. These results may suggest that a focus for future research may be to investigate the impact of categorical aid on spending by type of program for which the aid is given. In

other words, the focus would be to determine the different impacts of aid for special education, vocational education, transportation, etc., on the level of education expenditure.

Again referring to Table 4.9, the marginal impacts of federal aid (FED) at the means range from a low of .49 in Indiana to a high of 1.27 in Minnesota. In Indiana, Colorado, Massachusetts, and New Jersey, an additional dollar of federal aid results in less than a dollar increase in spending. This implies that a portion of federal aid serves as a substitute for locally raised revenue. In Michigan and Minnesota, an additional dollar of federal aid results in an increase in expenditures of $1.18 and $1.27 respectively.

As was suggested in the case of categorical aid, the differences in the response to federal aid among the six states may be due, at least in part, to the different types of federal aid received by the districts within each of the states. A major portion of federal aid for elementary and secondary education is distributed through Title 1 of the Elementary and Secondary Education Act. The Title 1 aid actually received by local school districts is a function of the number of pupils which come from low income families and the average per pupil education expenditures in the state. There is a stipulation that Title 1 aid must be used for additional expenditures, not as a substitute for local revenue. In a recent study, Feldstein examined the impact of Title 1 aid on school district education expenditures.[19] In his

---

[19]Martin S. Feldstein, "The Effect of a Differential Add-On Grant: Title 1 and Local Education Spending," The Journal of Human Resources, Vol. 13 (Fall, 1978), pp. 443-58.

expenditure model, Feldstein considered Title 1 aid and all other federal aid separately. He estimated the expenditure model using a sample of over 4,500 school districts in the U.S. Feldstein's results show that the marginal impact of an additional dollar of Title 1 aid increases expenditures by $0.72, while an additional dollar of other federal aid increases expenditures by $0.41. Feldstein attributes the larger impact of the Title 1 grants to the effectiveness of the stipulation that the grants be used as additional money rather than as a substitute for locally raised revenue.[20]

Feldstein's results provide one possible explanation for some of the variation in the marginal impacts of federal aid for the six states included in this analysis. Across the six states, the portion of total federal aid that is Title 1 aid is expected to vary. This variation may result in different impacts of federal aid on expenditures. Also it may be that the various types of aid combined in Feldstein's other federal aid variable may have different impacts on expenditures. Again, as already suggested in the case of state categorical aid, it may be useful to evaluate the impact of each type of federal aid on education expenditures.

As shown in Table 4.7, for the three states with foundation programs, the impact of foundation aid (EAID) on expenditures ranges from -.31 to .25. The negative effect of foundation aid in Colorado is difficult to explain. The implication of this finding is that a

---

[20] Ibid., p. 452.

dollar of foundation aid results in a decrease in expenditures of $0.31.[21] This indicates that a dollar of foundation aid results in local districts decreasing locally raised revenue for education by more than a dollar. The reason for this response by local districts is unclear. In Indiana and Minnesota, an additional dollar of foundation aid increases spending by only $0.25 and $0.14, respectively. These results indicate that an additional dollar of foundation aid results in a decrease in locally raised revenue of $0.75 in Indiana and $0.86 in Minnesota. Foundation aid in Indiana and Minnesota serves mainly as a substitute for local revenue and, therefore, has only a small impact on spending.

In the three states with matching formulae, the marginal impacts of state block grants (SBG) range from .16 to .84. In Massachusetts, the marginal impact of .16 implies that an additional dollar of SBG results in only a $0.16 increase in current expenditures. This implies that $0.84 of each additional dollar serves as a substitute for locally raised revenue for education. In Michigan and New Jersey, an additional dollar of SBG increases spending by $0.82 and $0.84, respectively, indicating that $0.18 and $0.16 of each additional dollar serves as a substitute for locally raised revenue.

The marginal impact of SBG in Massachusetts is much smaller than in Michigan and New Jersey. In fact, the marginal impact of SBG in Massachusetts is consistent with the marginal impacts of foundation

---

[21] Vincent and Adams estimate Colorado expenditure models using the 1973 data. In both the linear and log specifications, they estimate negative equalization aid coefficients, and in both cases the results are statistically significant. See Vincent and Adams, Fiscal Responses of School Districts, pp. 29-33.

aid in Indiana and Minnesota. The large discrepancy between the result in Massachusetts and those in Michigan and New Jersey may be due to the different restrictions in the matching formulae in the three states. As discussed in Chapter 3, in Massachusetts a school district receives a block grant rather than matching aid if the district's reimbursable expenditures are above or below certain limits. In New Jersey, the upper limit is similar to the Massachusetts restriction--if a district's net current expense budget is above the support limit, the district receives a block grant.[22] The New Jersey legislation places no minimum on net current expense budget but rather states that no district will receive less than ten percent the support limit in equalization aid. Whether or not a district receives this minimum block grant is determined by both the level of the district's net current expense budget and the district's property wealth. As a result, a property rich district with an average to above average net current expense budget may receive the minimum grant. In other words, under the New Jersey restrictions, more high spending districts may be receiving block grants than in Massachusetts, where the lower limit only effects low spending districts. In Michigan any district which levies more than 25 mills receives a block grant. The number of mills levied is determined by dividing locally raised revenue by property wealth. Districts receiving block grants may either be high spending districts or property poor districts.

---

[22]The definitions for reimbursable expenditures and net current expense budget are given in Chapter 3 footnotes 4 and 10, pages 57 and 67, respectively. Both are essentially equal to total locally raised revenue plus state equalization aid for the previous year.

Examining the data for each of the three states, some differences in the types of districts affected by these restrictions are observed. Of the districts which received block grants in Massachusetts, 50.63 percent were districts with current per pupil education expenditures below the mean level for the sample. In Michigan 31.71 percent of the districts receiving block grants had current per pupil expenditures below the mean level for the sample, while 34.75 percent of the districts receiving block grants in New Jersey had current per pupil expenditures below the mean for the sample. As expected, the Massachusetts restrictions affect more low spending districts than do the restrictions in Michigan or New Jersey. The combination of low spending and high spending districts receiving block grants in Massachusetts may serve as one explanation of why the marginal impact of block grants in Massachusetts is similar to the impact of foundation aid in Indiana and Minnesota and dissimilar to the impacts of block grants in Michigan and New Jersey. In Indiana and Minnesota, all districts--high spending and low spending--receive block grants. In Michigan and New Jersey, the districts are more homogenous with more high spending districts receiving block grants.

Low spending districts may be expected to use block grants as substitutes for locally raised revenue to a larger extent than high spending districts. A district which spends less on education relative to other districts may do so because the current level of spending already places a large tax burden on local residents and additional spending cannot be seriously considered. The district may provide

other services which compete with education for the limited revenues available, or the local residents may just prefer less education. A block grant to such a district may be expected to serve as a substitute for local revenue in order that the district may relieve the property tax burden on local residents, divert locally raised funds to other services where additional revenue is needed, or provide those services which the local residents prefer. High spending districts may not have these types of pressures and, therefore, may be more likely to use block grants for education to provide additional education services rather than as substitutes for locally raised revenue. Thus, block grants to the districts in Michigan and New Jersey may be expected to have a larger impact on expenditures because a large percentage of the districts receiving the grants are high spending districts. In Massachusetts, a much more heterogenous group of districts receive block grants (as is the case in Indiana and Minnesota), and therefore, the grants may be used to a larger extent as substitutes for local revenue and have less of an impact on expenditures.

Summary of the Impacts of Grants on Expenditures

As shown in the discussion in the previous section, categorical aid had a larger impact on spending than any of the other aid variables in four of the six states included in this analysis--Indiana, Massachusetts, Michigan, and New Jersey. The marginal impacts of an additional dollar of categorical aid range from 1.13 to 1.76 in these four states. In Colorado and Minnesota, federal aid, which for the most part is also allocated to specific programs, had the largest impact on spending.

The marginal impact of an additional dollar of federal aid is .92 in Colorado and 1.27 in Indiana. These results are consistent with the theoretical argument presented in Chapter 2. Grants tied to specific programs may be expected to have a greater impact on spending than general grants because if the size of the grant for the specific program exceeds the amount allocated by the district to the program, the district must increase expenditures.

The impacts of general aid to education on the level of spending probably have more policy implications than the impacts of categorical and federal aid on spending. Policy makers have tried to achieve the various goals of school finance reform discussed in the introduction of this paper through the general aid mechanisms. The results presented in the previous section show that these mechanisms have relatively little impact on the level of education expenditures in the six states included in this analysis. In the three states with matching formulae, the estimated price elasticities resulting from the matching formulae show that large changes in the price of education effect relatively small changes in the level of expenditures. An additional dollar of matching aid increases expenditures by only $0.16 in Massachusetts, $0.23 in New Jersey, and $0.44 in Michigan. For districts in Massachusetts above or below the restrictions in the matching formula, state block grants serve mainly as a substitute for local revenue--each additional dollar only generates a $0.16 increase in expenditures. State block grants have a greater impact on spending in Michigan and New Jersey, but

this impact may be due to the fact that in these states, a large percentage of the districts receiving the block grants are high spending districts. Such districts are, for the most part, not the targets of the various school finance reforms. The results of this analysis show that a large portion of general aid distributed through foundation programs also serves as a substitute for locally raised revenue. An additional dollar of foundation aid results in only a $0.25 increase in spending in Indiana and a $0.14 increase in Minnesota.

The impacts of the matching grants and foundation grants estimated in this Chapter raise an important question for policy makers. To what extent can these general aid mechanisms be used to achieve the goals of school finance reform? In order to begin to answer that question, the expenditure models presented in this Chapter will be used in Chapter 5 to simulate how much aid would have to be pumped through the foundation program in, say Indiana, to achieve various goals of school finance reform. Similarly, the estimated expenditure model for New Jersey may be used to simulate the changes in price or state block grants that would be required to achieve particular goals. Through these simulations, it may be determined whether or not certain goals may be achieved through the current aid mechanisms and how much aid would be required.

In Chapter 5, the hypothetical goals to be achieved through the general aid mechanisms will be described. The results of the simulations will then be presented, followed by a discussion of the policy implications of these simulations.

Chapter 5

POLICY IMPLICATIONS AND CONCLUSIONS

As discussed in the introduction to this dissertation, the current concern over the inequalities in educational opportunities that result from reliance on the local property tax for a large portion of revenues for public education has prompted many states to reform school funding laws. The specific goals of this reform vary from state to state but these goals seem to be directed at either insuring that the level of per pupil expenditures of a school district is independent of the district's property wealth (fiscal neutrality) or narrowing the gap in per pupil expenditures between high spending and low spending school districts and thereby achieving some degree of equalization of per pupil expenditures across districts. For the most part, policy makers have attempted to achieve the various goals of school finance reform by altering the method of distributing general aid and/or increasing the amount of general aid provided. General aid to education is usually provided through a matching or foundation formula. The results presented in Chapter 4 suggest that large portions of each dollar of general aid allocated through foundation programs or matching grants serve as a substitute for locally raised revenues; and therefore, these grants have relatively small impacts on the level of education expenditures. Given these results, to what extent can policy makers achieve specific goals of school finance reform through these aid mechanisms and how much additional aid would be necessary?

The purpose of this Chapter is to illustrate how the models presented in Chapter 4 may be used to determine the feasibility of achieving specific goals through the current state aid mechanisms and, if the goals are in fact feasible, to estimate the amount of state aid that would be required. In this Chapter, the costs of achieving complete and partial equalization of per pupil education expenditures across districts and the costs of achieving complete and partial wealth neutrality through a matching formula and through a foundation program will be compared and contrasted. These simulations will be presented for one state with a matching grant and one state with a foundation program--New Jersey and Indiana, respectively. In the following section, the specific school finance goals to be tested in the simulations will be described. The results of the simulations will then be presented. Finally, the conclusions and policy implications to be drawn from the expenditure models estimated in Chapter 4 and the simulations presented in this Chapter will be suggested.

The Simulations

The New Jersey simulations presented in this section will estimate the amount of aid that the State of New Jersey would have to provide through its matching formula in order to achieve total and partial equalization of expenditures across jurisdictions. The simulations will also estimate the amount of aid that would be required to achieve total and partial wealth neutrality. The Indiana simulations will indicate how much foundation aid would be required to achieve the same goals.

For this analysis, total equalization of per pupil expenditures across districts would be achieved by giving each district the amount of aid required to bring that district to a certain fixed level of per pupil expenditures. The amount of aid each district would have to receive can be estimated by using the expenditure models presented in Chapter 4. Using the expenditure model estimated for Indiana, for example, the amount of foundation aid, $EAID_i$, district i must receive in order to spend some fixed level per pupil, $\overline{CEXP}$, can be calculated by:

$$EAID_i = (\log \overline{CEXP} - 3.07 - .264 \log Y_i - .212 \log EPV_i + .007 \log RES_i + .172 \log PUP_i - .0014 CAID_i - .0004 FED_i) / .0002 \quad [1] \qquad (5.1)$$

where

$\overline{CEXP}$ = fixed level of per pupil expenditures, and

all other variables are as defined in equation (4.2).

Similarly, the expenditure model for New Jersey presented in Chapter 4 may be used to determine the amount of aid necessary for each district to spend the fixed level per pupil. However, since some districts in New Jersey receive matching grants while other districts receive block grants, two separate estimates must be made. For those districts receiving matching grants, the price of education that the district must face as a result of the matching grant in order to spend the fixed level per pupil may be calculated. Using the expenditure

---

[1] Recall that all state and federal aid variables were entered into the model in linear form. All other variables were entered into the model in log form.

model estimated for New Jersey, the price, $PRICE_i$, district i must face to spend the fixed level $\overline{CEXP}$ may be calculated by:

$$Z_i = (\log \overline{CEXP} - 3.380 - .213 \log Y_i - .203 \log EPV_i + .019 \log RES_i + .064 \log PUP_i - .0006 CAID - .0003 FED - .0004 SBG) / -.188 \quad (5.2)$$

where

$Z_i = \log PRICE_i$,

$\overline{CEXP}$ = the fixed level of per pupil expenditures,

and all other variables are as defined in equation (4.1).

From this calculated price, $PRICE_i$, the amount of aid the district must receive in order to spend $\overline{CEXP}$ may be determined.[2] For those districts in New Jersey which receive state block grants (SBG), the block grant necessary to bring district i to the fixed expenditures level is:

$$SBG = (\log \overline{CEXP} - 3.380 - .213 \log Y_i - .203 \log EPV_i + .019 \log RES_i + .064 \log PUP_i - .0006 CAID - .0003 FED + .188 \log PRICE) / .0004 \quad (5.3)$$

where

$\overline{CEXP}$ = fixed level of expenditures, and

all other variables are as defined in equation (4.1).

---

[2] In New Jersey, the amount of aid a district receives would simply be $(1 - PRICE_i)(NCEB_i)$ where $NCEB_i$ = net current expense budget for district i for the previous year.[1] Since the data assembled for this analysis do not include data for the previous year, aid was estimated on the basis of current year data. This will result in an overestimate of the aid necessary to achieve equalization of expenditures.

In the simulations presented in this Chapter, the target (fixed) level of per pupil expenditures is that level which constitutes the 65th percentile when per pupil expenditures for all districts in the sample for each state are ranked from lowest to highest. This level was chosen because most state aid programs have spending limits where districts with expenditures above the limits are not eligible for aid under the program. These limits essentially serve as a target level of per pupil expenditures for the aid program. Generally, these limits are set at some level above the mean expenditures for school districts within the state. For example, districts in Massachusetts with reimbursable expenditures above 1.1 times average reimbursable expenditures in the State are not eligible for matching aid. In New Jersey, districts with a net current expense budget above that for the district in the 65th percentile when the net current expense budgets of all districts are ranked from lowest to highest are not eligible for matching aid. In both states, districts above the spending limits receive block grants. Per pupil expenditures for the district in the 65th percentile in the New Jersey sample are $2,135.76 and $1,267.56 in the Indiana sample.

For some high spending school districts, the amount of aid necessary to bring per pupil expenditures down to the 65th percentile may be negative. In other words, in order to achieve total equalization of expenditures, some type of taxing mechanism may be required to bring high spending districts down to the target level of per pupil expenditures. In many states, it may be difficult to pass school finance legislation

which requires that high spending districts be taxed in order to decrease their levels of expenditures to some level fixed by the state. Such legislation may be considered too great an infringement of local control over public education. For this reason, two additional goals which only involve partial equalization of per pupil expenditures are also considered in this analysis. These two goals would not require that any district be taxed. In the first case, any district that would receive negative aid under the total equalization program would simply be given no aid. Thus, some districts may spend more than the target amount, but the gap in per pupil expenditures between high spending and low spending districts would certainly be narrowed. The program would require more aid than total equalization of expenditures because under this program, no revenue (negative aid) is collected from high spending districts but the program does not require a taxing mechanism.

The second partial equalization goal which will be considered involves giving all districts with per pupil expenditures below the 65th percentile the aid required to bring their per pupil expenditures to the 65th percentile. Such a program sets a minimum level of per pupil expenditures in the state and insures that expenditures in all districts meet that minimum. Any district spending above the target level will be given the amount of aid received prior to the new legislation. This program should require more state aid than the partial equalization program described above because this program involves no reduction in aid to any district. This program may be looked on more

favorably by a state legislature than the other two programs described above because it does not penalize high spending districts by decreasing the level of aid which they receive, and it still increases aid to low spending districts and, therefore, may narrow the gap between per pupil expenditures in high spending and low spending districts.

The final set of school finance reform goals to be considered involves total and partial wealth neutrality. Total wealth neutrality is defined as the situation when a school district's level of current expenditures is completely independent of the district's property wealth. As discussed in the introduction of this thesis, the wealth neutrality concept has been used in many court decisions involving school finance.

In order to achieve total wealth neutrality, state aid to education may be distributed in such a way that the combined impacts of aid and wealth on expenditures are equal to the effect of some constant level of wealth. For example, the price of education resulting from the matching formula may be adjusted for districts in New Jersey which receive matching grants in such a way that the combined effects of the price and property wealth of each district are set equal to some constant. The coefficients for PRICE and EPV estimated in the New Jersey expenditure model presented in Chapter 4 measure the effect of these variables on expenditures. Using those estimated coefficients, total wealth neutrality for those districts in New Jersey receiving matching grants is achieved when the combined price and wealth effects are set equal to some constant wealth effect. Using the price and wealth coefficients

estimated in the New Jersey expenditure model, wealth neutrality is achieved when:

$$-.188 \log(PRICE_i) + .203 \log(EPV_i) = .203 \log(\overline{EPV}) \qquad (5.4)$$

where

$PRICE_i$ = price of education for district i resulting from the matching formula,

EPV_i = per pupil equalized property value for district i, and

$\overline{EPV}$ = some fixed level of per pupil property wealth.

The price, $PRICE_i$, each district must face in order that the impact of wealth on expenditures is constant for all districts can be determined by rearranging equation (5.4):

$$Z_i = \frac{.203 \log (\overline{EPV}/EPV_i)}{-.188}$$

where

$$Z_i = \log PRICE_i.$$

Again, the amount of aid that each district would receive may be determined by subtracting the calculated price from 1 and multiplying the result by the net current expense budget.

For those districts in New Jersey which receive block grants (SBG_i), total wealth neutrality may be achieved when:

$$.0004\ SBG_i + .203 \log EPV_i = .203 \log (\overline{EPV}) \qquad (5.4)$$

where

SBG_i = state block grant to district i,

EPV_i = per pupil equalized property value for district i, and

$\overline{EPV}$ = some fixed level of per pupil equalized property value.

The block grant each district must receive in order that the impact of property wealth on expenditures is constant for all districts can be determined by rearranging equation (5.5):

$$SBG_i = \frac{.203 \log (\overline{EPV}/EPV_i)}{.0004}$$

Similarly, for Indiana, the impacts of foundation aid and property wealth may be set equal to some constant wealth effect. Using the foundation aid and wealth coefficients estimated in the Indiana expenditure model, total wealth neutrality may be achieved when:

$$.0002\ EAID_i + .212 \log EPV_i = .212 \log \overline{EPV} \qquad (5.6)$$

where

$EAID_i$ = foundation aid to district i,

EPV_i = per pupil equalized property value for district i, and

$\overline{EPV}$ = some fixed level of per pupil equalized property value.

Again, the foundation grant each district must receive to achieve wealth neutrality may be determined by rearranging equation (5.6):

$$EAID_i = \frac{.212 \log (\overline{EPV}/EPV_i)}{.0002}$$

In the simulations for Indiana and New Jersey, the fixed level of per pupil property wealth, $\overline{EPV}$, was set equal to 1.35 times the mean per pupil wealth for all districts in the sample --$16,889.18 in Indiana and $132,583.88 in New Jersey.[3]

---

[3] In Indiana property is assessed at one-third full market value; while in New Jersey, property is assessed at full market value.

As was the case for the total expenditure equalization goal discussed earlier, the amount of aid necessary to achieve the total wealth neutrality described above may be negative for some school districts. Again, because it may be difficult to pass school finance legislation which involves taxing school districts, a partial wealth neutrality goal is also considered. Under partial wealth neutrality, any district which would receive negative aid under total wealth neutrality would simply receive no aid. For these districts, the impact of wealth may vary from the constant level set by the state. However, this program would be expected to bring the state school finance system closer to wealth neutrality.

The Simulation Results

The total amounts of state aid which must be allocated through the equalization program in New Jersey and the foundation program in Indiana to achieve the expenditure equalization and wealth neutrality goals described in the previous section were calculated in the simulations. The results are presented in Table 5.1. The amount of state aid actually allocated during the school year considered in the expenditures models for Indiana and New Jersey--1976-1977 and 1977-1978 respectively--is also given in the Table.[4] The percent change in

---

[4]$628,368,240 is an estimate of the actual equalization aid received by districts in the New Jersey sample in 1977-1978. The districts actually received $520,552,816. The estimate combines actual state block grants received with an estimate of the dollar amount of matching grants received. The dollar amount of matching grants received

(continued on next page)

Table 5.1

CHANGES IN TOTAL AID UNDER EXPENDITURE EQUALIZATION AND WEALTH NEUTRALITY

Finance Goals	Indiana		New Jersey	
	Amount of Aid (dollars)	Percent Change	Amount of Aid (dollars)	Percent Change
State Aid Currently Received	505,049,344		628,368,240*	
State Aid Necessary to Achieve:				
Total Equalization of Expenditures	572,270,080	13.31	883,492,928	40.60
Partial Equalization of Expenditures (no taxing mechanism)	598,704,640	18.54	893,699,376	42.23
Partial Equalization of Expenditures (no decrease in aid for districts above the 65th percentile)	704,278,784	39.45	922,704,288	46.84
Total Wealth Neutrality	368,889,344	-26.96	717,688,624	14.21
Partial Wealth Neutrality (no taxing mechanism)	398,679,040	-20.06	729,254,128	16.06

*This is an estimate of current aid (see footnote 4).

current aid necesssary to achieve each of the goals is also presented in Table 5.1.

The results presented in Table 5.1 show that in order to achieve total equalization of per pupil expenditures (all districts spending at the level of the district in the 65th percentile) a 13.31 percent increase in aid would be required in Indiana while a 40.60 percent increase in aid would be required in New Jersey. The large increase in aid required in New Jersey relative to the increase required in Indiana may be due, at least in part, to the fact that there is more variation in per pupil expenditures among the districts in the New Jersey sample than among the districts in the Indiana sample. As shown in Table 4.8, the mean per pupil expenditures for districts in New Jersey is $2,095.66 with a standard deviation of $430.49 (coefficient of variation = .21). The mean per pupil expenditures in Indiana is $1,227.33 with a standard deviation of $182.75 (coefficient of

---

4 (continued)
is calculated by subtracting the actual price of education resulting from the matching grant in 1977-1978 from 1 and multiplying this fraction by 1977-1978 current per pupil expenditures minus per pupil categorical aid. This is an over estimate of the matching aid actually received because actual aid is based on the net current expense budget of the previous year. The data for this analysis do not include data for the previous school year; and therefore, the state aid calculations in the simulations are based on an estimate of current year (not previous) net current expense budget. It would be difficult to compare the aid calculated in the simulations with actual aid received because the calculated aid and actual aid are based on different years. In order to permit comparison, estimated current aid for New Jersey is used in this analysis.

variation = .15). Under total equalization of expenditures, 12.54 percent of the school districts in New Jersey would receive negative aid and 8.28 percent of the districts in Indiana would receive negative aid.

In Tables 5.2 and 5.3, the mean, standard deviation, minimum, and maximum levels of per pupil expenditures and per pupil state aid for districts in Indiana and New Jersey, respectively, under each of the school finance goals are presented. The Tables also present the mean, standard deviation, maximum, and mimimum actual per pupil expenditures and state aid for each of the states. In Indiana, the mean actual per pupil expenditures is $1,227.33 with a standard deviation of $183.08. The mean state aid received is $448.24 with a standard deviation of $110.27. The minimum per pupil aid actually received is $180.27 while the maximum per pupil aid is $954.18. Under total equalization of expenditures, all districts spend $1,267.56 per pupil. The mean per pupil aid under total equalization increases to $631.69 with a standard deviation of $473.89. The minimum per pupil aid under this program is -$1,331.33 while the maximum is $1,652.46. In New Jersey, the mean actual expenditures is $2,095.66 with a standard deviation of $431.26. The mean per pupil state aid actually received is $499.99 with a standard deviation of $364.83. The minimum per pupil aid actually received is $142.50 while the maximum is $2,095.92. Under total equalization of expenditures, all districts spend $2,135.76 per pupil. The mean per pupil aid under this program is $689.25 with a

Table 5.2

DISTRIBUTION OF EXPENDITURES AND STATE AID UNDER EXPENDITURE EQUALIZATION AND WEALTH NEUTRALITY: INDIANA
(dollars)

Finance Goals	Per Pupil Expenditures				Per Pupil State Aid			
	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Current Expenditures and State Aid	1,227.33	183.08	847.00	2,114.37	448.24	110.14	180.27	954.18
Expenditures and State Aid Resulting From:								
Total Equalization of Expenditures	1,267.56	0	1,267.56	1,267.56	631.69	473.89	-1,331.33	1,652.46
Partial Equalization of Expenditures (no taxing mechanism)	1,278.30	52.03	1,267.56	1,721.68	665.52	393.72	0	1,652.46
Partial Equalization of Expenditures (no decrease in aid for districts above the 65th percentile)	1,297.61	85.39	1,267.56	1,881.69	725.72	326.35	180.27	1,652.46
Total Wealth Neutrality	1,193.25	77.27	1,036.15	1,929.77	361.12	372.78	-1,111.62	1,444.90
Partial Wealth Neutrality (no taxing mechanism)	1,204.88	94.15	1,036.15	1,929.77	399.70	291.87	0	1,444.90

Table 5.3

DISTRIBUTION OF EXPENDITURES AND STATE AID UNDER EXPENDITURE EQUALIZATION AND WEALTH NEUTRALITY: NEW JERSEY
(dollars)

	Per Pupil Expenditures				Per Pupil State Aid			
Finance Goals	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Current Expenditures and State Aid*	2,095.66	431.26	1,343.03	4,269.27	499.99	364.83	142.50	2,095.92
Expenditures and State Aid Resulting From:								
Total Equalization of Expenditures	2,135.76	0	2,135.76	2,135.76	689.25	635.66	-1,082.43	2,511.16
Partial Equalization of Expenditures (no taxing mechanism)	2,167.99	133.13	2,135.76	3,365.05	721.26	584.65	0	2,511.16
Partial Equalization of Expenditures (no decrease in aid for districts above the 65th percentile)	2,211.56	185.93	2,135.76	3,608.94	766.05	542.18	152.59	2,511.16
Total Wealth Neutrality	2,028.03	114.35	1,764.44	2,704.79	527.23	542.75	-569.18	2,282.25
Partial Wealth Neutrality (no taxing mechanism)	2,059.05	182.18	1,764.44	3,365.05	558.98	499.51	0	2,282.25

*This is an estimate of current aid (see footnote 4).

standard deviation of $635.66. The minimum per pupil aid received by a district under this total equalization program is -$1,082.43 while the maximum per pupil aid received is $2,511.16. These results show that while total equalization of expenditures eliminates variation in per pupil expenditures, variation in state aid to districts increases substantially.

Under the first partial equalization goal, it is assumed that the state school finance legislation does not include a taxing mechanism; and therefore, those districts that would receive negative aid and as a result would be taxed under total equalization of per pupil expenditures are simply given no aid. As shown in Table 5.1, this partial equalization program would require an 18.54 percent increase in aid in Indiana and a 42.23 percent increase in New Jersey. As expected, this program requires more aid than total equalization because no districts receive negative aid under this program and, therefore, no revenue is generated.

As shown in Table 5.2, the mean per pupil expenditures in Indiana under this partial equalization program is $1,278.30 with a standard deviation of $52.03. This variation in expenditures is considerably smaller than the variation in current expenditures--the coefficient of variation in expenditures is .04 under the partial equalization program and .15 for current expenditures. The mean per pupil state aid distributed under this program is $665.52 with a standard deviation of $393.72. There is less variation in aid under this program than under total equalization because no districts receive negative aid. As shown in Table 5.3, the mean per pupil expenditure in New Jersey

under this partial equalization program is $2,167.99 with a standard deviation of $133.13. Again, this variation in expenditures is considerably smaller than the variation in current expenditures--the coefficient of variation in expenditures is .06 under this program and .21 for current expenditures. The mean per pupil state aid distributed to New Jersey districts under this program is $721.26 with a standard deviation of $584.65.

The second partial equalization program considered in this analysis allocates the aid necessary to bring those districts with current expenditures below the 65th percentile up to that level. Districts spending above the 65th percentile are given the same amount of aid received prior to the new legislation.[5] As shown in Table 5.1, this partial equalization program would require a 46.84 percent increase in aid in New Jersey and a 39.45 percent increase in aid in Indiana. In New Jersey, the increase in aid necessary to achieve this goal is similar to that required for total equalization or partial equalization with no tax mechanism. In Indiana, this program would cost the state substantially more than total equalization or partial

---

[5]Whether or not a district's expenditures were above or below the 65th percentile was determined by the level of expenditures predicted by the expenditure model estimated for the state rather than actual expenditures. If actual expenditures had been used, some districts may still receive negative aid. For example, a district's actual expenditures may be below the 65 percentile but the model may predict that expenditures for that district are above that level. If actual expenditures are used in this instance, the simulation will calculate the amount of aid necessary to bring the district's expenditures to the 65th percentile. Since the model would have predicted the district's expenditures to be above that level, the model may generate negative aid for that district. For this reason, predicted expenditures were used in this analysis.

equalization with no taxing mechanisms. One reason for this increase is that the per pupil aid actually received by many of the large school districts in Indiana for the 1976-1977 school year exceeds the amounts these districts would receive under total equalization of expenditures or partial equalization with no taxing mechanism. In fact, of the 22 school districts in Indiana with more than 10,000 pupils, 16 received more foundation aid per pupil in 1976-1977 than would have been the case under total equalization or partial equalization with no taxing mechanism. Because these dsitricts have so many pupils, the total increase in aid to these districts becomes quite large. This may, at least in part, explain the percent increase in aid necessary to achieve this partial equalization goal in Indiana.

As shown in Table 5.2, under this partial equalization goal, the mean per pupil expenditures in Indiana is $1,297.61 with a standard deviation of $85.39. The coefficient of variation is .07 which indicates that the variation in expenditures under this program is considerably less than the variation in current expenditures. The mean level of per pupil state aid under this program is $725.72 with a standard deviation of $326.35. There is less variation in state aid under this partial equalization program than under total equalization or partial equalization with no negative aid. As shown in Table 5.3, the mean per pupil expenditures under this program is $2,211.56 in New Jersey with a standard deviation of $185.93. The coefficient of variation is .08 which indicates that the variation in expenditures resulting from

this program is considerably less than the variation in current expenditures. The mean level of per pupil state aid is $766.05 with a standard deviation of $542.18. Again, there is less variation in state aid under this partial equalization program than under total equalization or partial equalization with no negative aid.

The amount of aid required to achieve total wealth neutrality is considerably lower than that necessary to achieve total equalization of expenditures or either form of partial equalization in both states. This result may be expected since under wealth neutrality aid is being used to counteract just the effect of wealth on spending rather than to effect specific changes in expenditures. In New Jersey, total wealth neutrality would require a 14.21 percent increase in equalization aid currently allocated. In Indiana, total wealth neutrality would actually result in a 26.96 percent decrease in the amount of foundation aid currently allocated. The large differences between the amount of aid necessary in New Jersey and that necessary in Indiana may be explained, at least in part, by the difference in the amount of variation in property wealth among districts in the two states. As shown in Table 4.8, the mean per pupil property wealth in New Jersey is $98,210.3 with a standard deviation of $63,007.0 (coefficient of variation = .64). In Indiana, the mean per pupil property wealth is $12,510.50 with a standard deviation of $6,575.91 (coefficient of variation = .53). In New Jersey, equalization aid must counteract the impacts of a wide variation in wealth across districts. Since Indiana has less

variation, total wealth neutrality might be expected to cost less there than in New Jersey.

As shown in Table 5.2, the mean per pupil expenditures in Indiana under total wealth neutrality is $1,193.25 with a standard deviation of $77.27. The coefficient of variation in expenditures is .06 under this program which is less than the variation in current expenditures. There is a great deal of variation in the per pupil aid required to achieve total wealth neutrality in Indiana. The mean per pupil state aid under this program is $361.12 with a standard deviation of $372.78. The minimum aid distributed under this program is -$1,111.62 while the maximum is $1,444.90. As shown in Table 5.3, the mean per pupil expenditures in New Jersey under total wealth neutrality is $2,028.03 with a standard deviation of $114.35. There is less variation in expenditures under this program than in current expenditures (coefficient of variation = .06). Again, there is a great deal of variation in the aid distributed under this program. The mean per pupil aid is $527.23 with a standard deviation of $542.75. The minimum aid received is -$569.18 while the maximum is $2,282.25.

Under total wealth neutrality, 15.68 percent of the districts in New Jersey would receive negative aid and, therefore, have to be taxed. In Indiana, 11.38 percent of the districts would have to be taxed to achieve total wealth neutrality. If the school finance legislation does not include a taxing mechanism, the aid for these districts may be set equal to 0. Under this partial wealth neutrality program, there will be some variation in the impact of wealth on expenditures.

This program will require more aid than total wealth neutrality because there is no revenue generated since no districts are taxed. Partial wealth neutrality would require a 16.06 percent increase in equalization aid in New Jersey and a 20.06 decrease in aid in Indiana.

As shown in Table 5.2, the mean per pupil expenditures in Indiana, under partial wealth neutrality is $1,204.88 with a standard deviation of $94.15 (coefficient of variation = .08). The mean per pupil aid under this program is $399.70 with a standard deviation of $291.87. As shown in Table 5.3, mean per pupil expenditures under this partial wealth neutrality program in New Jersey is $2,059.05 with a standard deviation of $182.18 (coefficient of variation = .09). The mean per pupil aid under this program is $558.98 with a standard deviation of $499.51.

Summary and Conclusions

There are three major conclusions which may be drawn from the results of the expenditure models presented in Chapter 4 and the results of the simulations presented in this Chapter. First, the estimated expenditure models show that neither matching grants nor foundation aid have much of a stimulative effect on local education expenditures. The results consistently show that a major portion of the aid allocated through these mechanisms serves as a substitute for locally raised revenue and, therefore, has little impact on total spending. An additional dollar of foundation aid resulted in a -$0.31 to $0.25 change in current expenditures in the three states with foundation

programs examined in this analysis. For the three states with matching formulae, the results presented in Chapter 4 show that large changes in the price of education resulting from the matching formula effect relatively small changes in expenditures. An additional dollar of aid allocated through the price mechanism in a matching formula results in a $0.16 to $0.44 change in current expenditures for the three states with matching formulae examined in this analysis. In Massachusetts, an additional dollar of block grants (SBG) received by districts above or below the matching limits results in only a $0.16 increase in expenditures. In Michigan and New Jersey, an additional dollar of SBG has a much larger impact--$0.82 and $0.84 respectively. However, in these two states, a large portion of the districts which receive block grants are high spending districts. The relatively small impacts of foundation aid and matching grants estimated in the expenditure models raised considerable doubts about the feasibility of achieving various goals of school finance reform through these aid mechanisms.

The second major conclusion of this analysis may be drawn from the simulations presented in this Chapter. These simulations show that, in spite of the relatively small impacts of matching grants and foundation aid, two popular goals of school finance reform--total equalization of expenditures across school districts and total wealth neutrality--may be achieved through these mechanisms in New Jersey and Indiana. Total equalization of expenditures would require a 40.60 percent increase in state aid in New Jersey and a 13.31 percent increase in Indiana. These increases are substantial, particularly in New Jersey,

but they are increases which the state may be able to provide. In New Jersey, total equalization of expenditures would require an additional $255 million which may well be feasible, especially considering the fact that the New Jersey Public School Education Act of 1975 increased aid to education by $400 million.[6] Total wealth neutrality is also a feasible goal using the existing aid mechanisms in Indiana and New Jersey. Total wealth neutrality would require a 14.21 percent increase in aid in New Jersey and an actual decrease in aid in Indiana of 26.96 percent.

Although the simulations show that the total amount of state aid required to achieve total equalization and wealth neutrality may well be feasible, the distribution of aid required to achieve these goals may be politically infeasible. For example, under total equalization of expenditures, the minimum aid received by districts in New Jersey is -$1,082.43 per pupil while the maximum is $2,511.16. It may be difficult to convince a state legislature that the state should provide one district with $2,511.16 per pupil in order to get that district to spend only $2,135.76 per pupil while another district in the state is taxed $1,082.43 per pupil. Similarly, in Indiana, a minimum of -$1,111.62 per pupil in state aid and a maximum of $1,444.90 per pupil

---

[6] $255 million would be required to achieve total equalization across the 287 kindergarten through twelfth grade districts included in this analysis. The sample did not include 56 kindergarten through twelfth grade districts and regional and vocational districts which do receive aid under the New Jersey Public School Education Act of 1975.

would be required to achieve total wealth neutrality. Again, it may be difficult for a state legislature to consider such wide variation in the amount of aid received by districts. A state legislature may be willing to modify the goals of the school finance reform in order to decrease the variation in the amount of aid received by districts.

The simulations presented in this Chapter consider two such modifications of the total equalization goal and one modification of the total wealth neutrality goal. The first partial equalization goal considered does not permit any district to be taxed (no negative aid). The second partial equalization goal increases aid in order to bring districts with spending below the 65th percentile up to that level but permits no decrease in aid to districts spending above the 65th percentile. Both of these partial equalization goals permit some variation in per pupil expenditures. The simulations show that in both states, this variation in expenditures under these partial programs is considerably less than the variation in current per pupil expenditures. The simulations also show that there is less variation in per pupil state aid under these partial equalization programs than under total equalization. For example, in New Jersey, the coefficient of variation for per pupil state aid under total equalization of expenditures is .92. The coefficient of variation under partial equalization with no negative aid and partial equalization with no decrease in aid is .81 and .70, respectively. While both partial equalization goals decrease the variation in per pupil state aid, the total amount of state aid required to achieve these partial goals is greater than the amount necessary

to achieve total equalization. For example, as shown in Table 5.1, total equalization of expenditures would require a 13.31 percent increase in total aid in Indiana. Partial equalization with no negative aid and partial equalization with no decrease in aid would require an 18.54 percent and 39.45 percent increase, respectively. Under partial wealth neutrality, no district may receive negative aid. As shown in Tables 5.2 and 5.3, the variation in per pupil state aid under this partial program is less in both Indiana and New Jersey than is the case under total wealth neutrality. However, as shown in Table 5.1, this partial wealth neutrality goal requires more total state aid in both Indiana and New Jersey than total wealth neutrality.

The third major conclusion of this analysis may be drawn from the comparisons of the simulations of total equalization and partial equalization and total wealth neutrality and partial wealth neutrality presented above. As shown above, both total equalization and total wealth neutrality create wide variations in the amount of state aid per pupil received by school districts. If state legislatures find this variation unacceptable, modified equalization or wealth neutrality goals may be considered. The modified goals considered in this analysis decreased the variation in state aid per pupil across school districts, but in each case, these modified goals required more total aid than the original goals. These results indicate that there is a tradeoff between what is an acceptable distribution of aid (how much variation is too much variation?) and how much additional aid is required. The results presented in this analysis show that decreasing the variation in state aid across districts increases the total cost to the state.

APPENDIX A

Linear and Log Expenditure Models

The results of the estimated expenditures models for each of the six states using linear and log-log specifications are presented in Tables A.1 and A.2, respectively. All variables are those defined in equation (4.1), p. 79 and equation (4.2), p. 83. In the log-log expenditure models presented in Table A-2, all variables have the prefix L. The t-statistics are in parentheses below each of the estimated coefficients.

Table A.1

LINEAR EXPENDITURE MODELS*
(Dependent Variable: CEXP)

Matching Formulae:				Block Grants:			
Independent Variables	Massachusetts	Michigan	New Jersey	Independent Variables	Colorado	Indiana	Minnesota
C	979.677	582.624	1,523.72	C	764.871	793.135	665.717
	(8.777)	(8.314)	(7.191)		(5.823)	(8.656)	(7.265)
Y	.055	.038	.043	Y	.037	.037	.017
	(10.001)	(9.216)	(4.402)		(5.323)	(5.497)	(3.225)
CAID	1.332	1.430	1.253	CAID	.716	1.717	.951
	(8.969)	(5.229)	(3.338)		(2.848)	(4.111)	(16.694)
PRICE	11.090	-236.324	-225.288	EAID	-.518	.096	.137
	(.113)	(-2.317)	(-1.401)		(-2.164)	(.941)	(1.776)
SBG	-.115	.436	.648	--	--	--	--
	(-.871)	(4.165)	(3.638)				
FED	.733	1.309	.931	FED	.716	.530	1.310
	(4.281)	(7.824)	(1.570)		(3.809)	(5.117)	(13.054)
EPV	.003	.012	.003	EPV	.002	.014	.0003
	(6.882)	(6.943)	(6.056)		(2.974)	(7.917)	(.798)
RES	-1.337	-.192	-1.527	RES	-1.672	-.449	1.192
	(-1.264)	(-.298)	(-.958)		(-2.747)	(-.530)	(1.981)
PUP	-14.731	-6.929	-12.548	PUP	-.900	-10.380	2.022
	(-6.004)	(-5.989)	(-2.331)		(-.721)	(-6.202)	(1.413)
R^2	.6689	.7866	.4139	R^2	.6081	.4629	.5900
NUMBER OF OBSERVATIONS	258	174	287	NUMBER OF OBSERVATIONS	109	290	370

*T-statistics are in parentheses below the estimated coefficients.

Table A.2

LOG EXPENDITURE MODELS*
(Dependent Variable: LCEXP)

Matching Formulae:				Block Grants:			
Independent Variables	Massachusetts	Michigan	New Jersey	Independent Variables	Colorado	Indiana	Minnesota
C	1.614	2.030	3.962	C	3.232	1.789	4.569
	(3.388)	(3.597)	(6.302)		(3.540)	(2.741)	(9.515)
LY	.407	.387	.188	LY	.271	.360	.137
	(9.793)	(9.168)	(3.252)		(4.838)	(7.006)	(4.368)
LCAID	.059	.095	.110	LCAID	.075	.147	.212
	(5.250)	(5.838)	(4.146)		(3.502)	(5.510)	(13.703)
LPRICE	-.136	-.010	-.150	LEAID	-.046	.030	-.002
	(-3.030)	(-.191)	(-2.916)		(-.858)	(.697)	(-.075)
LSBG	.010	.011	.027	--	--	--	--
	(2.173)	(1.856)	(4.981)				
LFED	.040	.062	.006	LFED	.035	.044	.110
	(3.869)	(6.652)	(.796)		(3.763)	(4.593)	(9.442)
LEPV	.206	.142	.131	LEPV	.124	.184	-.032
	(8.841)	(3.621)	(3.900)		(3.571)	(6.401)	(-1.527)
LRES	-.082	-.031	-.016	LRES	-.040	-.008	.015
	(-1.826)	(-1.440)	(-.383)		(-2.538)	(-.435)	(1.195)
LPUP	-.132	-.165	-.066	LPUP	-.037	-.197	.026
	(-3.666)	(-6.281)	(-1.449)		(-.794)	(-5.623)	(.899)
R^2	.6292	.7530	.3825	R^2	.5925	.4961	.4568
NUMBER OF OBSERVATIONS	258	174	287	NUMBER OF OBSERVATIONS	109	290	370

*T-statistics are in parentheses below the estimated coefficients.

APPENDIX B

Data Sources

In an attempt to create consistent data sets for each of the six states included in this analysis, data were obtained from a wide variety of sources. The following is a description of these data sources by state.

Colorado

The expenditure models estimated for Colorado are based on data collected for the 1973 calendar year. Data on current expenditures, state and federal aid, pupils, and the composition of the property tax base were obtained from the Colorado Department of Education. Total equalized property values of school districts were estimated from data obtained from the Colorado Division on Property Taxation which included total assessed property value by school district, assessment to sales ratios, and assessor's market value by county.[1]

The median family income and population data were obtained from the fourth count of the 1970 Census of Population.[2] These data are

---

[1]This data on current expenditures, state and federal aid, pupils, residential share of the districts' assessed property tax base, and esimates of total equalized property values were assembled and provided by Phillip E. Vincent and E. Kathleen Adams at the Education Finance Center, Education Commission of the States. These data are further described in Phillip E. Vincent and E. Kathleen Adams, Fiscal Responses of School Districts, A Study of Two States--Colorado and Minnesota (Denver: Education Finance Center, Education Commission of the States, October, 1978), p. 39.

[2]The fourth count of the 1970 Census of Population provides population characteristics by school districts. Copies of the computer printout of this fourth count for each of the six states included in this analysis were obtained from the National Center for Education Statistics.

only available for districts with enrollments greater than 300. As a result, these data were only available for 109 of the 174 school districts in Colorado. The data base used in this analysis included those 109 school districts.

Indiana

The expenditure models estimated for Indiana are based on data collected for the 1976-77 school year. Indiana has 305 school corporations (districts) each providing kindergarten through twelfth grade education programs. The expenditure, state and federal aid, pupil, and equalized property valuation data were obtained from reports published in 1976, 1977 Report of Statistical Information for Indiana School Corporations by the Indiana Department of Public Instruction. Current expenditures for this analysis were defined as total cost minus capital outlay. State aid to corporations was divided into two categories: the basic grant allocated by the foundation program and categorical aid which is total state support minus the basic grant and includes aid for transportation, summer school, evening school, etc. The pupil data used for this analysis is average daily membership which is the count of all pupils enrolled in grades kindergarten through twelve with kindergarten pupils weighted by .5. Equalized property values of school corporations are estimated by the State Board of Tax Commissioners. All property is valued at one-third true cash value.

Neither the State Board of Tax Commissioners nor the Department of Public Instruction collect data on the composition of the assessed property tax base by school corporation. No other source of such data

was found. However, the State Board of Tax Commissioners has a breakdown of the assessed tax base in 1977 by county. These data were used to obtain the residential share of the assessed tax base for each of the 92 counties in the State. The residential share for each county was then assigned to each school corporation within its boundaries. All school corporations are within the boundaries of one county.

Median family income and total population of the school corporation were obtained from the fourth count of the 1970 Census of Population. There were nine cases where corporations boundaries changed between 1970 and 1976. Because the fourth count census data are avialable only for corporations with enrollments greater than 300, no income or population data were available for seven of the school corporations. As a result, only corporations for which all data were available and corporation boundaries remained the same between 1970 and 1976 were used in the analysis. 290 of the 305 corporations in the State were included in the analysis.

Massachusetts

The models estimated for Massachusetts are based on data collected for the 1976-77 school year. The expenditure, state and federal aid, and pupil data were obtained from published and unpublished reports by the Massachusetts Department of Education. The measure of current expenditures used in this analysis was "integrated operating costs" which includes the total operating costs of schools and educational

programs within the district.[3] In addition, this measure includes the district's contributions to regional schools and tuition paid for placement of pupils in programs within other districts. In Massachusetts, a town may belong to a regional district or make arrangements with neighboring towns for education services. For example, a town may operate its own elementary school, but rather than operating its own high school, the town may belong to a regional high school. The town would contribute its share of the operating costs of the regional school, which is determined by the number of pupils who reside in the town, but go to the regional school. The pupil data used for this analysis is net average membership which includes pupils who reside in the town and attend school operated within the town, regional schools, or programs in other towns.[4]

Data on state and federal aid to Massachusetts' school districts were obtained from unpublished reports provided by the Massachusetts Department of Education. State aid was divided into two categories: equalization aid (Chapter 70 aid) and categorical aid (total state aid - school construction aid - Chapter 70 aid). These federal and state aid data only include the aid allocated for education programs within the town. State and federal aid is also allocated to regional school

---

[3] In Massachusetts, school districts are coterminous with cities and towns.

[4] Integrated operating cost per pupil (net average membership) is provided in Per Pupil Expenditures 1976-1977 published by the Massachusetts Department of Education.

districts. Because current expenditures included contributions to regional districts, it was necessary to apportion state and federal aid to regional districts back to member towns. Otherwise, state and federal aid would be underestimated.

Aid to regional school districts may be divided into two categories: regional school aid and regional categorical aid. Regional school aid is state aid to regional school districts distributed by a formula similar to the Chapter 70 formula.[5] Regional school aid is considered equalization aid. In order to apportion this regional equalization aid back to member towns, the ratio of member town's contribution to the regional district to the total contributions of all member towns was calculated.[6] This ratio was multiplied by the regional equalization aid to determine the portion of that aid that should be added to the member town's equalization aid. Similarly, this ratio was multiplied by the state categorical aid to regional districts (total state aid to the regional district - regional school aid - regional school construction aid) to determine the portion that should be added to the member town's state categorical aid.

Equalized property values and the residential share of the assessed property tax base were obtained from 1976 Equalized Valuations of Massachusetts Cities and Towns: Selected Tax Base Information,

---

[5]For a description of the regional school aid formula, see Annotated Laws of Massachusetts, Chapter 71, Section 16D.

[6]Each regional district files a report with the Massachusetts Department of Education stating the contribution of each member town to operating expenses. These reports were examined in order to calculate these ratios.

published by the Massachusetts Department of Corporations and Taxation. This publication provides a breakdown of the assessed tax base of each city and town by ten property classes. Four residential classes are reported: single dwelling unit, two dwelling units, three dwelling units, and four or more dwelling units. Residential/commercial is a fifth property class which refers to property where the first floor has a commercial use while the upper floors are residential. Total residential assessed valuation was calculated by summing the assessed valuations of the four residential classes and one half the assessed valuation of the residential/commercial class. Total residential assessed valuation was divided by the total assessed valuation of the town to obtain the residential share of the assessed property tax base.

Since school districts in Massachusetts are coterminous with cities and towns, 1975 population estimates could be obtained from Current Population Reports, published by the U.S. Bureau of the Census.[7] Median family income data were obtained from the fourth count of the 1970 Census of Population. Since fourth count census data were only available for districts with enrollments greater than 300, median family income data were not available for 93 cities and towns. As a result, 258 cities and towns were included in the Massachusetts sample used in this analysis.

---

[7]U.S. Bureau of the Census, "1973 (Revised) and 1975 Population Estimates and 1972 (Revised) and 1974 Per Capita Income Estimates for Counties, Incorporated Places, and Selected Minor Civil Divisions in Massachusetts," Current Population Reports (Washington, D.C.: Government Printing Office, 1977).

Michigan

The models estimated for Michigan are based on data collected for the 1974-75 school year. There are 530 K-12 school districts in Michigan. However, this analysis is based on a sample of 174 school districts located in southeastern Michigan.[8] Data on current expenditures, state and federal aid, pupils, and equalized property values are provided in Ranking of Michigan Public High School Districts by Selected Financial Data 1974-75 published by the Michigan Department of Education. State equalization aid was calculated using the formulae specified in the Michigan legislation (see equations 3.6 and 3.9). State categorical aid was calculated as total state aid minus state equalization aid. The pupil count used in this analysis is total enrollment on the fourth Friday after Labor Day. Equalized property values for each school district are determined by the State Tax Commission and are specified to be 50 percent of market value.

In the other five states included in this analysis, the residential share of the assessed tax base was used as a measure of the tax burden borne by the resident voters of the school district. However, in Michigan, voters pay taxes on the state equalized value of their property rather than the assessed value. Property is assessed locally and these figures are submitted to a county tax commission which calculates an equalized property value based on the assessments made in all districts

---

[8]The data for the 174 Michigan school districts used in this analysis were assembled and provided by Professor William Neenen at the University of Michigan.

in the county. Finally, the State Tax Commission equalizes valuations across counties. Taxes are based on this final state equalized value. As a result, the residential share included in the Michigan models is the residential share of the state equalized value of school districts.

Median family income and total population data were obtained from the fourth count of the 1970 Census of Population.

Minnesota

The expenditure models estimated for Minnestoa were based on data collected for the 1976 school year. Data on current expenditures, state and federal aid, and pupils were obtained from the Minnesota Department of Education. Data on the composition of the assessed tax base were obtained from the Minnesota Department of Revenue. Total equalized property values were estimated from assessment data and assessment to sale ratios provided by the Department of Revenue.[9]

The median family income and total population data were obtained from the fourth count of the 1970 Census of Population. These data were available for 370 Minnesota school districts. The Minnesota sample used in this analysis included these 370 districts.

9The data on current expenditures, state and federal aid, pupils, residential share of assessed property tax base, and estimates of total equalized property values were assembled and provided by Phillip E. Vincent and E. Kathleen Adams at the Education Finance Center, Education Commission of the States. For a more detailed description of this data, see Vincent and Adams, Fiscal Responses of School Districts, pp. 39-40.

New Jersey

The models estimated for New Jersey are based on data collected for the 1977-78 school year.[10] New Jersey has 343 school districts which provide K-12 education. Data on current expenditures, state and federal aid, pupils, and equalized property values were obtained from the New Jersey Department of Education's school finance computer tapes. Current expenditures include all expenditures except those for capital outlay. The pupil count used in this analysis is total enrollment as of September, 1977. The composition of the assessed property tax base was obtained from municipal data published by the New Jersey Department of Community Affairs.[11] In New Jersey, school districts are coterminous with municipalities. The municipal data provide two categories of residential property: residential and apartments. These two categories were combined to determine the residential share used in this analysis.

Since New Jersey school districts are coterminous with municipalities, 1975 population estimates are available in Current Population Reports, published by the U.S. Bureau of the Census.[12] Data on median family

---

[10] All data for New Jersey school districts used in this analysis were assembled and provided by Professor Andrew Reschovsky of Tufts University or Margaret E. Goertz of the Education Policy Research Institute, Education Testing Service.

[11] Thirty-Seventh Annual Report of the Division of Local Government Services, 1974, Statements of Financial Condition of Counties and Municipalities, prepared by the State of New Jersey, Department of Community Affairs, Division of Local Government Services.

[12] U.S. Bureau of the Census, "1973 (Revised) and 1975 Population Estimates and 1972 (Revised) and 1974 Per Capita Income Estimates for Counties, Incorporated Places, and Selected Minor Civil Divisions" in Current Population Reports (Washington, D.C.: Government Printing Office, 1977).

income were obtained from the fourth count of the 1970 Census of Population. These census data were not available for 56 New Jersey districts which had enrollments of less than 300 in 1969. As a result, the New Jersey sample for this analysis included 287 school districts.

BIBLIOGRAPHY

1. Bahl, Roy W., and Robert J. Saunders. "Factors Associated with Variations in State and Local Government Spending," Journal of Finance, Vol. 21 (September, 1966), pp. 523-34.

2. Barr, James L., and Otto A. Davis. "An Elementary Political and Economic Theory of the Expenditures of Local Governments," Southern Economic Journal, Vol. 33 (October, 1966), pp. 149-65.

3. Benson, Charles. The Economics of Public Education, 2nd Ed. Boston: Houghton Mifflin Company, 1968.

4. Bishop, George A. "Stimulative Versus Substitutive Effects of State School Aid in New England," National Tax Journal Vol. 17 (June, 1964), pp. 133-43.

5. Black, Duncan. "On the Rationale of Group Decision Making," Journal of Political Economy, Vol. 56 (February, 1948), pp. 23-34.

6. Boercherding, Thomas E., and Robert T. Deacon, "The Demand for the Services of Non-Federal Governments," American Economic Review, Vol. 62 (December, 1972), pp. 891-901.

7. Bowan, Howard R. "The Interpretation of Voting in the Allocation of Economic Resources," Quarterly Journal of Economics, Vol. 58 (November, 1943), pp. 27-48.

8. Feldstein, Martin S. "The Effect of a Differential Add-On Grant: Title 1 and Local Education Spending." The Journal of Human Resources, Vol. 13 (Fall, 1978), pp. 443-58.

9. Feldstein, Martin S. "Wealth Neutrality and Local Choice in Public Education," American Economic Review, Vol. 65 (March, 1975), pp. 75-89.

10. Goertz, Margaret E. Where Did the $400 Million Go? The Impact of the New Jersey Public School Education Act of 1975. Princeton, New Jersey: Educational Policy Research Institute, Education Testing Service, March, 1978.

11. Gramlich, Edward M., and Harvey Galper. "State and Local Fiscal Behavior and Federal Grant Policy," Brookings Papers on Economic Activity, Vol. 1 (1973), pp. 15-58.

12. Grant, W. Vance, and C. George Lind. Digest of Education Statistics, 1977-78. Washington, D.C.: National Center for Education Statistics, 1978.

13. Grubb, W. Norton, and Stephen Michelson. States and Schools. Lexington, Massachusetts: D. C. Heath and Company, 1974.

14. Grubb, W. Norton, and Jack W. Osman. "The Causes of School Finance Inequalities: Serrano and the Case of California." Public Finance Quarterly, Vol. 5 (July, 1977), pp. 373-91.

15. Henderson, James M. "Local Government Expenditures: A Social Welfare Analysis," The Review of Economics and Statistics, Vol. 50 (May, 1968), pp. 156-63.

16. Indiana Department of Public Instruction, 1976-1977 Report of Statistical Information for Indiana School Corporations.

17. Inman, Robert P. "The Fiscal Performance of Local Governments: An Interpretive Review," in Current Issues in Urban Economics edited by Peter Mieszkowski and Mahlon Straszheim. Baltimore: The Johns Hopkins University Press, 1979, pp. 270-321.

18. Johnson, Marvin Bruce. "Two Essays on the Modelling of State and Local Government Fiscal Behavior," Syracuse University, Unpublished Ph.D. Dissertation, 1976.

19. Kirp, David L., and Mark G. Yudof. Educational Policy and the Law Cases and Materials. Berkeley, California: McCutchan Publishing Corporation, 1974.

20. Knickman, James R., and Andrew Reschovsky. "The Implementation of School Finance Reform." Mimeo, 1978.

21. Knickman, James R., and Andrew Reschovsky. "School Finance Reform in New Jersey: The First Two Years," in 11th Annual Report. Trenton, New Jersey: Economic Policy Council, New Jersey Department of the Treasury, 1978.

22. Ladd, Helen F. "Local Education Expenditures, Fiscal Capacity, and the Composition of the Property Tax Base," National Tax Journal, Vol. 28 (June, 1975), pp. 145-58.

23. Ladd, Helen F. "Local Public Expenditures and the Composition of the Property Tax Base." Harvard University, Unpublished Ph.D. Dissertation, 1974.

24. Levine, Ralph Sanders. "Massachusetts' New Equalization Formula for Education." Harvard University, Unpublished Qualifying Paper, 1967.

25. Massachusetts Department of Corporations and Taxation. 1976 Equalized Valuations of Massachusetts Cities and Towns: Selected Tax Base Information, April, 1977.

26. Massachusetts Department of Education. Per Pupil Expenditures 1976-1977.

27. Michigan Department of Education. Ranking of Michigan Public High School Districts by Selected Financial Data 1974-75. Bulletin 1012.

28. Neenen, William B. "Fiscal Relations Between State and Local Governments in Southeastern Michigan," in Financing the Metropality, edited by Kent Mathewson and William B. Neenen. New York: Praeger Publishers (forthcoming).

29. New Jersey Department of Community Affairs, Division of Local Government Services. Thirty-Seventh Annual Report of the Division of Local Government Services 1974 Statements of the Financial Conditions of Counties and Municipalities.

30. Oates, Wallace E. "The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis," Journal of Political Economy, Vol. 77 (November/December, 1969), pp. 957-71.

31. Oates, Wallace E. Fiscal Federalism. New York: Harcourt Brace Jovanovich, Inc., 1972.

32. Odden, Allen, John Augenblock, and Phillip Vincent. School Finance Reform in the States 1976-1977: An Overview of Legislative Actions, Judicial Decisions and Public Policy Research. Denver, Colorado: Education Commission of the States, Report No. F76-F, December, 1976.

33. Oldman, Oliver, and Ferdinand Schoettle. State and Local Taxes and Finance. Mineola, New York: The Foundation Press, 1974.

34. Osman, J. W. "The Dual Impact of Federal Aid on State and Local Government Expenditures," National Tax Journal, Vol. 19 (December, 1966), pp. 362-72.

35. Ostrem, John, and Douglas Smith. "The State Revenue Requirements of School Finance Reform," in School Finance Reform: A Legislator's Handbook, edited by John J. Callahan and William J. Wilken. Washington, D.C.: National Conference of State Legislatures, February, 1976.

36. Reschovsky, Andrew. Predicting the Effect of New Jersey's New Education Funding Law on Local Support for Education. Prepared for the Urban Education Observatory, New Jersey Department of Education, January, 1977.

37. Sacks, Seymour, and Robert Harris. "The Determinants of State and Local Government Expenditures and Intergovernmental Flow of Funds," National Tax Journal, Vol. 17 (March, 1964), pp. 75-85.

38. Tron, Esther. Public School Finance Programs, 1975-76. Washington, D.C.: Bureau of School Systems, Office of Education, 1976.

39. U.S. Bureau of the Census. "1973 (Revised) and 1975 Population Estimates and 1972 (Revised) and 1974 Per Capita Estimates for Counties, Incorporated Places and Selected Minor Civil Divisions in Massachusetts," Current Population Reports, Series P-25. Washington, D.C.: Government Printing Office, 1977.

40. U.S. Bureau of the Census. "1973 (Revised) and 1975 Population Estimates and 1972 (Revised) and 1974 Per Capita Income Estimates for Counties, Incorporated Places, and Selected Minor Civil Divisions in New Jersey," Current Population Reports, Series P-25. Washington, D.C.: Government Printing Office, 1977.

41. Update on State-Wide School Finance Cases. Washington, D.C.: School Finance Project, Lawyers' Committee for Civil Rights Under the Law, February 1978.

42. Vincent, Phillip E., and E. Kathleen Adams. Fiscal Responses of School Districts, A Study of Two States--Colorado and Minnesota. Denver: Education Finance Center, Education Commission of the States, October, 1978.

43. Wilde, James. "The Expenditure Effects of Grant-In-Aid Programs," National Tax Journal, Vol. 21 (September, 1968), pp. 340-48.