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"A Programming Approach to Public School Financing in New York"

James Colburn
and
Richard N. Boisvert

Department of Agricultural Economics
Cornell University Agricultural Experiment Station
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York 14853

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A Programming Approach to Public School Financing in New York

by

James Colburn and Richard N. Boisvert*

Introduction

Based on data from the National Education Association (1979), some would argue that the 1978-79 school year is particularly significant in the history of school finance. Total revenues received by primary and secondary schools nationally were estimated at $86.8 billion but for the first time, revenues from state sources exceeded those raised directly by local school districts. State aid was estimated to be 47% of total revenues. The local share was approximately 44% with the balance coming from Federal sources. This situation reflects a continual trend that began at least 50 years ago. In 1929-30, for example, state revenues accounted for only 17% of the total and the local school districts' share was 83%. Throughout much of the 20th Century, state governments have assumed an increasingly larger role in educational finance.

During most of this period, New York State's system of public school finance has followed national trends. In 1929-30, 27% of public school revenues came from the State. This percentage reached a maximum of 45% in 1969-70. Since then, the State's share has fallen to approximately 40% (University of the State of New York, various years).

Despite its continued growth nationally, state aid has always been the subject of controversy. The controversy now centers around the growing financial crises in local governments and the ability of states, through equalization aid, to compensate for disparities in wealth among school districts, and thus, to help guarantee equal educational opportunity to its citizens. During the early 1970's, plaintiffs in numerous court cases charged that existing systems of school finance (based on local property taxes and existing state aid formulas) still denied equal educational opportunity to students in "poorer" districts (Stubblebine and Teeples, 1974, Clune, 1972 and Michelson, 1972).

New York undertook an extensive examination of the quality, cost, and financing of education in 1969. The Fleischmann Commission's (1972) basic conclusion was that the State should be responsible for the full funding of education in order to insure that spending was at adequate levels and that any disparities in spending would reflect only the special educational needs of districts when costs were excessive or there were students with learning difficulties.

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*James Colburn is an economist with the World Food Board, U.S. Department of Agriculture, Washington, D.C. and Richard N. Boisvert is a Professor, Department of Agricultural Economics, Cornell University.

> In addition to their expenditure recommendations, the Commission proposed changes in school taxation as a partial solution to the inequities said to be inherent in the local property tax. A statewide property tax levied at a uniform rate of $20.40 per $1,000 of full value would initially replace existing local property tax revenues. Then reliance on the statewide property tax would be eliminated over a five-year period, with replacement revenues being derived from the progressive State income tax (Boisvert and Mapp, 1974, p. 584).

Because of the drastic nature of the Commission's recommendations, the Governor and the New York State Legislature chose not to implement many of the suggested modifications. Instead, the decade of the 1970's was marked by incremental changes in the existing state aid formulas.

In 1976, New York's system of school finance came under Constitutional challenge (Board of Education, 1978). The initial decision, in favor of the plaintiffs, was recently overturned under appeal, but there is still likely to be increased attention focused on the State's system of school finance for years to come.

The purpose of this study is to examine the inequities in the current public school financing arrangements in New York State and determine the impact of modifications in the state aid formulas needed to alleviate them. Because of the political constraints involved in major structural changes in the way schools are financed, it is advisable to begin by examining the existing aid system, placing a major emphasis on taxpayer equity. Only if it cannot be modified to meet the current objections and withstand future Constitutional challenge should attention be given to a completely different system such as the ones proposed by the Fleischmann Commission and the Special Task Force on Equity and Education in 1980.

The emphasis is placed on examining the aid situation for the 1980-81 school year, the most recent year for which data were available. Because many of the inequities still exist and the aid formulas have not changed dramatically, the methodology and the results remain generally applicable. The background into the history of school finance in section two may help place the problem into proper perspective. The third section outlines state aid formulas used by New York State during the 1970's. The fourth section examines various strategies for evaluating state aid formulas and contains a specification of the programming model used in this research. The empirical results follow in the fifth section and the report concludes with a section on policy implications.

Background

By the turn of the Century, economic growth accompanying the Industrial Revolution had begun to cause wide disparities in the wealth of individual school districts and other units of local government. Arguments for creating a system of state "equalization" aid began to emerge,

primarily from the standpoint of assisting local governments finance an acceptable level of education.[1]

Despite these disparities, the desire to maintain local control over the public school system remained the overriding consideration in financing decisions. It was argued that schools should be administered at the local level because increased state funding would lead eventually to homogeneous school systems under state control and would stifle many educational innovations.

Rapid industrialization during World War I exacerbated the disparities in school district wealth. The advances in transportation and other technological innovations led to a more mobile society; rural areas were no longer completely isolated from urban areas. These changes increased the demand for education throughout the country. Although total revenues collected by public schools more than doubled between the 1919-20 and 1929-30 school years, the states' shares remained less than 20% of the total (NEA, 1979).

During the Depression, school districts had little choice but to rely more heavily on state resources. Property values were eroding along with incomes and many people were unable to pay their property taxes. Therefore, in spite of continued reluctance to increase their dependence on higher levels of government, school districts were obtaining just over 30% of their revenues from state sources by the 1939-40 school year.

World War II also had a significant impact on public education, its finance and state involvement. Perhaps the most pronounced impact was due to the post-war baby boom which started in the mid-1940's and continued well into the 1950's. Additional pressures were placed on school systems because education enabled individuals to share in the benefits of the technological advance and was viewed by many as security for one's children against future economic disasters (Garms et al., 1978).

These factors culminated in tremendous increases in primary and secondary school enrollments. Between 1940 and 1955, the number of children enrolled in public schools increased by 23%, from 25.4 million to 31.2 million (Academic Media, 1969). The same factors explained the increased expenditures on primary and secondary education throughout the 1960's. The revenues per pupil received by school districts from all sources increased from $300 to $759 in constant 1967 dollars representing

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[1]Cubberly (1905) was one of the first to note the direct relationship between quality of school programs and local fiscal capacity. He argued that districts with property wealth had more resources to allocate to schools and recommended that districts with less fiscal capacity should be given more aid than richer districts.

a 359% increase in real revenues (Colburn, 1981).[2] Pupil-teacher ratios decreased significantly, from 28 to 21 (National Center for Education Statistics, 1976). Although few would argue that pupil-teacher ratios are perfectly correlated with quality of education,[3] the tremendous increase in revenues (expenditures) during this period and the decrease in pupil-teacher ratios can be explained in large part by the public's desire to increase educational quality.

As stated above, arguments for equalization aid to the poorer school districts were put forward as early as 1905. It was believed that the poorer districts, already burdened with property taxes, should be aided by the state. In addition, the more recent recognition that education results in substantial "spillover" benefits implies that without state aid, local governments, when viewed from society's point of view, would underinvest in education.[4]

Despite these long term trends in state aid, school expenditures even now depend tremendously on the "wealth" of the districts themselves. While one objective of state aid is to facilitate some minimum level of expenditure, many state aid formulas still are tied to local tax efforts. Until 1970, little attention was given to equalizing expenditures across the various districts even within a state.

At this time, there is still a concern on the part of local educators that too much state aid will erode local control. However, few educators would deny the fact that state aid has become an indispensible part of educational finance. They see it as a way to quiet the critics of the property tax, but according to other critics, rising state aid has neither led to equal spending nor to equal educational opportunity.

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[2]Much of the data available on school district finance is in terms of revenue. However, there is such a high correlation between revenues and expenditures that little distinction between the two is made in general discussion. For example, in 1979, the correlation coefficient for total current expenditures and total revenues in the 50 states was 0.9975.

[3]For example, Hanushek (1971) implies that classroom composition may be more important than class size. The more time a teacher must spend on discipline, the less effective the teacher will be in educating students, regardless of the pupil - teacher ratios.

[4]Spillovers occur when "collective choices" made by local governing units concerning the allocation of resources... "have effects that 'spill over' to residents in other communities who do not participate in the collective decisions." [In education,]... "there tends to be spillout, because some of the recipients of education relocate to other areas after they finish their schooling" (Hyman, 1968, p. 291-2).

The first major victory for critics of traditional school financing systems came in 1971 when the California Supreme Court declared the state's method of financing elementary and secondary schools in violation of the Equal Protection Clause of the 14th Amendment of the U.S. Constitution (Serrano v. Priest, 1971). The Court's conclusion was that school financing based primarily upon property taxes discriminates against the poor, making education a function of a school district's wealth. Other landmark cases followed, but 1973 marked a serious setback for school finance reformers. The plaintiffs in San Antonio Independent School District et al. v. Rodriguez et al. (1973) also challenged the Equal Protection Clause of the 14th Amendment, but the courts eventually concluded that the Texas school finance system was not in violation of the U.S. Constitution. According to this decision, education is not a right guaranteed by the U.S. Constitution.

As an alternative strategy, critics turned their attention away from the U.S. Constitution and focused the attack on individual state constitutions. To date, 16 traditional school finance systems have failed to withstand state constitutional challenge.[5] In 13 other states, challenges had been initiated as of 1978.[6]

In the wake of these court decisions, states must find new ways to finance education in the future. Reform may come through total state control of resources or major changes in existing state aid formulas to remove the disparities.

Issues in New York State School Finance

Compared with other states, New York has for many years been among the leaders in spending for primary and secondary education. In the 1978-79 school year, for example, an average of approximately $2,760 was spent per pupil (e.g., measured as average weighted daily attendance); only Alaska and the District of Columbia had higher spending levels. New

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[5]Since 1971, 16 states have substantially revised their school finance systems: Arizona, California, Colorado, Connecticut, Florida, Illinois, Kansas, Maine, Michigan, Minnesota, Montana, New Jersey, New Mexico, North Dakota, Utah, Wisconsin (NEA, 1974, 1975, 1978, 1979). Illinois, Kansas, Michigan, Wisconsin and Colorado changed to a state guaranteed taxbase type aid formula. Also called district power equalization, aid is determined only according to the tax rate; wealth is neutralized across districts by the state. Maine, Montana and Connecticut modified state aid by using district power equalization in addition to already existing aid formulas. California raised the guaranteed level of support. (See Brown, Ginsburg et al., 1978.)

[6]These states are: Texas, Arkansas, Oklahoma, South Dakota, New York, Connecticut, Georgia, Kansas, Maine, Missouri, Washington, West Virginia, Wisconsin (Brown, Ginsburg, et al., 1978).

York's spending per pupil was 45% above the national average of $1,909.[7] Revenues to finance these expenditures were estimated at $8 billion, nearly 60% of which was raised through local taxation of real property (NEA, 1980).

Although average expenditures per pupil for public primary and secondary education are high, the tremendous variability in per pupil spending among New York's 700+ school districts finally precipitated legal action by some districts challenging New York's method of financing elementary and secondary education. The plaintiffs found two causes for action. The first alleged a violation of the Equal Protection clause of the State Constitution (Art. 1, Sect. 11):

> ... the original plaintiffs assert in their first cause of action that the State's method of financing public education [including the substantial state aid allocations] 'denies to plaintiff students and their parents those educational resources available to students in other, wealthier districts in the State.' Further, that such system prevents the plaintiff districts from carrying out their full responsibilities and obligations to the schools, parents and children and compels them to offer an education inferior to that offered by other districts possessing greater real property wealth (Levittown v. Nyquist, 1978, p. 4).

In the second cause, the plaintiffs alleged a violation of the Education Article of the State Constitution (Art. XI, Sec. 1):

> ... by making the extent to which a child may be educated a function of the real property wealth of the school district in which that child happens to reside, or the school district in which that child's parents are able to afford to live, the State has violated the democratic and egalitarian intention that underlies the Education Article, substituting in its stead an impermissable reliance on the accident of real property wealth as the ultimate determinant of the quality of education available to the children in any particular part of the State (Levittown v. Nyquist, 1978, p. 6).

A judgment of the Supreme Court, Nassau County, in favor of the plaintiffs was issued on June 23, 1978. An appeal was entered on January 2, 1979 and was still pending when this research began. During the summer of 1982, the appeal was decided in the State's favor. Despite this outcome one must still be concerned with questions of educational

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[7]Expenditures include current expenditures (administration, instructional services, plant operation and maintenance, fixed charges and other school services and programs), capital outlay (expenditures for site and site improvements, new buildings and renovations of existing structures, furniture, equipment and publicly-owned vehicles) and interest expenditures. Sources of revenues to finance these expenditures include local property taxes and state and Federal aid.

quality and opportunity among school districts throughout the State. Even if one assumes that future court challenges are successful, it is doubtful that the courts would articulate a specific system for school finance. At best, the State Legislature would be given only general guidelines as to what is acceptable from a constitutional point of view:

> It is the proper function and duty of the judicial branch of government to render a judgment declaring whether a statutory plan is in compliance with constitutional requirements. It is equally the proper function and duty of the legislative branch to devise a state educational finance system that is constitutional. That is the command of the Education Article of the New York Constitution (Article XI, Sec. 1)... this Court has deemed it necessary to refrain from expressing an opinion as to the appropriateness of any particular means or technique for attaining a suitable school finance system in this state believing that 'the ultimate solutions must come from the lawmakers and from the democratic pressures of those who elect them' (San Antonio Independent School District v. Rodriguez, supra, at p. 59) (Levittown v. Nyquist, 1978, pp. 103-4).

Regardless of how changes are initiated, there is unlikely to be widespread agreement on what constitutes equal educational opportunity. Developing a suitable criterion for assessing educational opportunity is complicated by a number of factors. The major difficulty is that society lacks any adequate measure of educational output. Proxies for educational output such as the number of students educated, expenditures per student or the average scores on standardized tests have been used extensively, but the problems associated with their use in this regard are well-known.

The validity of performances on standardized tests as a proxy for measuring educational output has been questioned (Cohn and Millman, 1975). Test scores measure cognitive skills but do not include a measure of attitudes, values or character, which are considered important in assessing a pupil's education. Furthermore, it has been argued that these tests may discriminate against certain ethnic or minority groups. Despite these limitations, test scores are considered by many to be the best available measure of output and hence, are used widely.

School inputs and non-school inputs are also used extensively to explain educational output. School inputs include teacher experience, teacher education, class size, and other human and physical inputs. Problems arise in distinguishing the nature of these purchased resources because effectiveness and productivity of the various inputs are not easily determined (Hanushek, 1971). Non-school inputs are reflected in the socio-economic background of the students,[8] including race, sex,

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[8]Studies using non-school as well as school inputs to explain achievement include those by: Kiesling (1967), Tuckman (1971), Garms and Smith (1970) and Cohn and Millman (1975).

family size, and family income. These environmental factors do not distinguish ability among students.

In order to equalize educational opportunity, school and non-school inputs must be considered. The mixture of school inputs among districts may vary significantly and the effectiveness and productivity of resources, viewed differently by administrators, may cause some districts to intensify the use of an input relative to others. For example, to compensate for the lack of non-school inputs, a student from a poor family, living in overcrowded conditions, may require more of a teacher's time to reach the same level of achievement as a student from a higher income group.[9] School districts with many disadvantaged or handicapped pupils may need more school inputs to reach the same level of educational output as other districts.[10]

Efforts to equalize educational opportunity by equalizing expenditures are confounded by these problems. Differential expenditures are justified for districts containing pupils with varying needs. Uncertainty of the productivity of inputs may cause administrators to use different resource mixes and costs of purchased resources vary from district to district. Therefore, expenditures and educational opportunity are not synonymous, but expenditures are the lowest common denominator over which governments have control and their equalization is usually viewed as a move toward equalizing educational opportunity. The Fleischmann Commission concluded that "...while equality of expenditure in accordance with some reasonable education standard may not inevitably result in higher quality education, we feel that such equality is the essential first step toward achieving that goal" (p. 24). The Commission viewed equal educational opportunity as access to enough resources to insure a certain level of achievement.

Directly related to equalizing expenditures is equalized tax effort. Even after accounting for state aid, some local districts may need an excessively large property tax rate in order to spend as much as richer districts. In other districts, the costs of providing other public services such as fire and police protection may also be extremely high and place an additional burden on property tax revenues.[11] Thus,

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[9]Monk (1980) discusses "student efficiency" which describes the marginal products of different students. High levels of student efficiency are associated with high marginal products. Other inputs combined with students having a high level of efficiency produce a greater output than when combined with students with lower levels of efficiency.

[10]Using regression analysis, Garms and Smith (1970) found that 75% of the variation in student achievement could be explained by six socioeconomic variables: ethnic background, broken homes, welfare, overcrowded housing, student mobility, and parents' education.

[11]This is the municipal overburden argument brought forth in Levittown v. Nyquist, pp. 43-51.

simultaneous equalization of tax effort and expenditures may not be feasible given revenues currently budgeted to state aid.

State Aid to Education in New York

The purpose of this section is to describe New York's system of state aid to education and the major changes that have been made in state aid apportionment throughout the 1970's. While some of these changes have evolved from the Fleischmann Commission's recommendations or may be in response to the inequity charges in Levittown v. Nyquist, the financial pressures in all local governments and other state and local political considerations are also partly responsible.

Although state aid increased dramatically in New York State during the early 1900's, state aid has contributed between 35% and 45% of total educational expenditures between 1950 and 1978. Despite increased concern over equality of educational opportunity and changes in the aid formulas in response to these concerns, there has been no clear trend toward an increase in aid as a proportion of total expenditures (table 1). This is contrary to what one would expect if the formula changes were indeed designed to provide more resources to poorer districts, without penalizing the richer ones.

More importantly, detailed information by school district suggests that disparities have existed throughout the period. For example, school districts in Yates County expended an average of $1,126 per pupil in Weighted Average Daily Attendance (WADA) in 1970-71 whereas expenditures in Westchester County averaged $1,829 per pupil in WADA in the same year (The University of the State of New York, 1970-71). School districts in these same two counties in the 1977-78 school year spent an average of $1,986 and $3,375 per pupil in WADA, respectively. In percentage terms, Westchester County was spending an average 62% more per pupil in 1970-71 than was Yates County. In 1977-78, the differences increased to 69%. While one might argue that some of these disparities are justified in terms of differences in costs of educational services between a rural and an urban county, such a large disparity is not justified.[12] These disparities have also been documented by witnesses in Levittown v. Nyquist, 1978. One witness, for example, indicated that the range in expenditures per pupil across all school districts in New York in 1974 was from $936 to $4,215. The property wealth per pupil across all districts ranged from $8,884 to $412,370.

To identify changes in the state aid formula that could eliminate these disparities, one must first develop a working knowledge of the composition of state aid, the existing aid formulas and how these differ

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[12]According to Wendling (1979), there are considerable differences in the costs of certain educational resources throughout the State. The index for the cost of educational resources (1977-78) in Westchester County's school districts ranged from 1.03 to 1.13. In Yates County, this range was from 0.92 to 0.94. Thus, it appears that these spending differences between districts in these two counties are due to more than just the differential costs of educational inputs.

Table 1. Expenditures and State Aid From All Sources for Elementary and Secondary Public Schools, New York State

School Year	Total Expenditures	State Aid	Aid as Percent of Expenditures
	million $		%
1977-78	$8,229[a]	$3,165[a]	39
1976-77	7,926	3,094	39
1975-76	7,621	3,071	40
1974-75	7,395	2,931	40
1973-74	6,672	2,551	38
1972-73	5,969	2,440	41
1971-72	5,571	2,374	43
1970-71	5,254	2,325	44
1965-66	2,799	1,272	45
1960-61	1,750	748	43
1955-56	1,031	374	36
1950-51	616	250	41
1945-46	378	121	32

Sources: The University of the State of New York, n.d.; 1976.

[a] Estimated.

from those in effect at the beginning of the 1970's. Table 2 contains a list of different types of aid and their relative importance. Throughout the 1970's, operating aid has constituted over 70% of all school aid. While the other kinds of aid can be extremely important to individual districts, operating expense aid is the largest component and is most directly associated with educational inputs. Therefore, the discussion is directed toward operating aid.

1970-71 Operating Aid Formula

Operating expense aid from the state to local school districts in 1970-71 was distributed with the help of an aid ratio, which depended on the property wealth of a school district relative to the state average property wealth. The total amount of aid depended on the expenditure level of the school district and some measure of student numbers.

The aid ratio for any school district in 1970-71 was calculated by the following:

Table 2. Components of General State to Major School Districts in New York

Components	1970-71		1976-77		1978-79E	
	Amount (millions)	% of Total	Amount (millions)	% of Total	Amount (millions)	% of Total
Operating Aid[a]	$1,810	77	$2,310	75	$2,505	74
Building Aid	194	8	209	7	212	6
Transportation Aid	129	6	258	8	296	9
Other Aid	211	9	301	10	353	11
Total Aid	$2,344	100	$3,078	100	$3,366	100

Sources: The University of the State of New York (1970, 1978).

E = estimated.

[a] For 1970-71, this includes operating expense aid, growth and size correction aid and current budget aid. Operating expense aid is 70 percent of total aid in this year. It is assumed that the figures for 1976-77 and 1978-79 are only operating expense aid, but the description of what is included in operating aid in the sources from which the data were derived is unclear on this point.

$$(1) \quad AR_{it} = \left(1 - \frac{FV_{i(t-2)}/RWADA_{i(t-2)}}{AFVRWADA}\ 0.51\right)$$

where

t = current year in which aid is paid;

FV_i = full market value of taxable property in school district i;

$RWADA_i$ = resident weighted average daily attendance, calculated by subtracting the weighted average daily attendance (WADA) of non-resident pupils attending public school in the district from the district's WADA and adding the WADA of pupils resident in the district but attending full time a school operated by a Board of Cooperative Education Services (BOCES) or a County Vocational Education and Extension Board (CVEEB). WADA is determined by weighting average daily attendance (ADA): half-day, kindergarten, 0.5; full day kindergarten and grades one through six, 1.00; grades seven through twelve, 1.25. Average daily attendance is the aggregate number of attendance days of pupils in a school district divided by the number of days in session.

AFVRWADA = statewide average full value of taxable property in (t-2) per resident weighted average daily attendance (The University of the State of New York, 1976).

The aid ratio determines the state's share of a district's approved operating expenses (AOE) or a ceiling level, whichever is lower. Approved operating expenses on which aid was apportioned in 1970-71 were the day-to-day expenditures ($AOE_{i(t-1)}$) in district i in year t-1, the base year. In 1970-71, the state ceiling level was $860. Thus, for some districts, the state would share in expenses of up to $860 per WADA. A district's operating aid could be calculated by the formula:

$$(2) \quad (AID)_{it} = AR_{it}\,(WADA_{it})(AOE_{i,t-1}); \text{ for } AOE_{i,t-1} \leq 860$$

$$= AR_{it}[WADA_{it}][860]; \text{ for } AOE_{i,t-1} \geq 860.$$

The formula was constructed so that the state's share was 49% of AOE or the ceiling level for a district of average wealth. As a district's wealth increased, the State's share decreased. However, all districts were guaranteed at least $310 per WADA.[13] This was the "flat grant" provision of the 1970-71 aid formula. Districts receiving $310 per WADA were called "flat grant" districts. "Equalization" districts are those which received less aid as property wealth increased. No district could receive more than 90% of its expenditures in state aid.[14]

Three important observations can be made about this aid formula. First, the aid ratio depends on the relative property wealth in a district. If some other measure of wealth, such as income were used, the distribution of aid could be altered substantially. Second, because a measure of student numbers other than a head count on enrollment is used in the aid calculation, it is also possible to alter the distribution of aid by a legislative change in this measure of student numbers. Finally, without changing the basic formula, aid allocations could be altered significantly by changing the 0.51 figure in equation (1) so that contribution by the state in the form of aid going to a district of average property wealth would be different from 49%. A careful examination of the

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[13] $WADA_{it}$ was used in calculating total aid (equation (2)) because this reflects the weighted number of students attending school in the year to which the aid applies. $RWADA_{i(t-2)}$ was used to calculate the aid ratio so that wealth per pupil is based on the number of students residing in the district, not on the number attending school in that district.

[14] This was accomplished by placing a ceiling of 0.9 on the aid ratio even for very poor districts. Since $AFVRWADA_{1970-71}$ = $32,300, the aid ratio would reach 0.9 for a full value of property per RWADA of $6,333 in 1968-69.

proposals for changing the aid formulas during the decade of the 1970's indicates that much of the attention has been focused on the first two items.

The 1970-71 aid formulas were in effect during the time the Fleischmann Commission was studying school finance in New York. Their recommendations reflect a recognition of the importance of the measure of wealth and number of students in the distribution of aid.

Although one purpose of state aid has always been to assist the poorer school districts and districts making substantial local effort to finance education, the Fleischmann Commission (1971) concluded that the aid system in 1968-69, which was essentially the same as the one for 1970-71 described above, did little to equalize educational opportunity across school districts. Table 3 contains data from New York State school districts on expenditure per student and average full value property, ranked by quartiles. The relationship shows that spending in the 1969-70 school year was directly related to property wealth, and as indicated above, the Commission made a number of recommendations to correct the situation.

Table 3. Operating Expenditures and Property Valuation 1969-70 by School District Quartiles, New York State

Quartile	Expenditure per Student[a]	Average Full Value Property per Student
1	$1,330	$39,836
2	1,041	27,703
3	932	22,389
4	856	17,545

Source: The Fleischmann Commission (1971)

[a] Although it is not clear from the Fleischmann Commission's discussion, students in this context probably refer to students in weighted average daily attendance.

1974-75 Operating Aid Formula

In 1974, legislation was enacted to incorporate some of the Fleischmann Commission's recommendations particularly those relating to special needs of students with learning difficulties. Under such a scheme, the state in theory guarantees equal spending per pupil for equal local effort. The new aid formula was a foundation program in which the state set a minimum expenditure level supported by a combination of state and local funds. Consequently, aid ratios used to determine state shares were eliminated. Expenditure ceilings were raised to $1,200 per pupil and the WADA measure was modified with new weightings. Total aid was now

based on Total Aidable Pupil Units (TAPU).[15] Also, a new type of save harmless provision was initiated.

Because of the foundation nature of the formula, state operating aid was based on the difference between $1,200 per pupil, and the amount of money per pupil a district could raise levying a 15 mill tax rate:

$$(3) \quad AD_{it} = 1200 - (.015\ (FV)_{i(t-2)}/RWADA_{t-2})$$

where

AD_{it} = state aid per TAPU in district i in time t; and

other variables defined as above.

Even under this system, the aid to the wealthier districts was not allowed to drop to zero. If a district's wealth was between $52,800 and $101,000 per RWADA, the following taper formula was applicable:

$$(4) \quad AD_{it} = 360 + .001(101{,}000 - FV_{i(t-2)}/RWADA_{i(t-2)}).$$

Finally, districts with full value greater than $101,000 per RWADA received a flat grant equal to a new level of $360 per TAPU.

Because the 90% limit on the state share was retained, districts with wealth of less than or equal to $8,000 per RWADA did not receive aid in proportion to this formula. The state's share per pupil is multiplied by a measure of pupils to calculate total operating aid. The most significant change in this legislation was the change from using WADA as a measure of pupils to using TAPU as a measure.

Due to the new legislation, aid increased by $372 million. New York City received $127 million of the increase, in part due to the new weighting system (University of the State of New York, 1976). A new type of save-harmless provision was added to the aid scheme: all districts would receive at least as much aid per pupil as it had received in

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[15] TAPU included new weightings to account for the different needs of specific districts. The weightings were to comply with the Fleischmann Commission findings. The following weightings were added to WADA to calculate TAPU:

children with handicapping conditions	1.00
children with educational needs (low achievers on the Pupil Evaluation Program tests)	0.25
pupils in approved summer sessions	0.12
pupils in approved evening sessions	0.50
secondary pupils not receiving additional weighting as a handicapped or special educational needs pupil	0.25

See the University of the State of New York (n.d.; 1976).

previous years. The total aid save-harmless provision, in which no district receives less total aid than in previous years, was also retained.

This new aid formula went into effect in the 1974-75 school year. But despite the several modifications in the aid formula described above, the boards of education of at least 27 school districts and the parents and guardians of a number of individual students remained sufficiently dissatisfied that they initiated the legal action mentioned above (Levittown v. Nyquist, 1978). One group of plaintiffs argued that because 699 of 708 school districts across the state received aid under the save-harmless provisions, the 1974 state aid formulas substantially constrained the equalization efforts of the State. Dr. Joel Berke offered testimony relating to the range in property wealth and disparities in expenditures. According to Berke, the real property wealth in the "richest" district was 46 times as large as it is in the "poorest" district.

Because this range is affected by a very small number of extremely rich and extremely poor school districts, a more helpful comparison is the ratio of wealth between the districts at the 10th and 90th percentiles in a ranking of school district wealth from low to high.[16] Wealth per pupil at the 90th percentile was $86,000 compared with $20,840 for a district at the 10th percentile.

The range in expenditures per pupil across all districts was from $396 to $4,125. This is a ratio of expenditures of approximately 4.5 to 1 whereas an examination of the 10th and 90th percentiles indicates a range of approximately 1.9 to 1. Spending in the 90th percentile district was $2,051 compared with $1,089 in the 10th percentile district.

A somewhat more complete picture of these inequities is provided in table 4, but without the data used in constructing the table, it is impossible to develop a more complete measure of inequity based on Gini coefficients or entropy measures of inequality (Theil, 1967). In any case, using the midpoints of the ranges in taxable wealth categories, the simple correlation coefficient between wealth per pupil and both operating and total expenditures per TAPU was over 0.98. However, the

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[16]From a legal perspective, the extremes in both spending and wealth are significant because equal protection provisions of the Constitution must be enforced regardless of the number of schools or individual students involved. Information concerning the 10th and 90th percentiles is more critical from the standpoint of understanding the magnitude of the problem. One can obtain some idea of the magnitude of the problem at the extremes from evidence provided by the Governors Advisory Panel of Consultants (The New York State Special Task Force, 1980). In 1974-75, there were 44 districts with property wealth per pupil less than $15,000. Average expenditures in these districts were $1,789. On the other hand, 21 districts had a property wealth per pupil between $120,000 and $330,000.

correlations between tax rates and operating and total expenditures were 0.58 and 0.54, respectively. Tax rates and property wealth had a correlation coefficient of 0.65. Thus, the direct relationship between per pupil expenditures and wealth in 1974-75 was significantly stronger than the relationship between expenditures and local tax effort.

Table 4. Wealth, School Expenditures and Tax Rates in New York School Districts, 1974-75

Taxable Wealth per Pupil[a]	# Districts	Expenditure/TAPU		School Tax Rate per $1,000 Full Value of Property
		Operating	Total	
Under $20,000	58	$1,098	$1,504	$15.74
$20,000-27,999	150	1,230	1,631	18.78
28,000-35,999	132	1,333	1,713	20.20
36,000-43,999	97	1,484	1,871	21.96
44,000-51,999	69	1,511	1,919	21.48
52,000-59,999	46	1,688	2,147	22.48
60,000-67,999	30	1,708	2,202	22.57
68,000-over	122	2,041	2,566	19.71
New York City ($71,981 Full Value/pupil 1974-75)		$1,951	$2,601	$21.88

Source: The University of the State of New York (1976).

[a] The data in the table are averages for districts in the corresponding taxable wealth class.

The second group of plaintiffs, consisting mainly of the state's four largest cities, offered a "municipal overburden" argument. They

> . . . introduced evidence to show that the ability of city school districts to support education is impaired by a demand for non-school public services that is greater in cities than in suburbs or rural areas. They argued that the greater size and density of cities create a greater demand for police, fire, sanitation and related services. They further alleged that cities are disadvantaged relative to other areas because

> greater proportions of their populations are poor and dependent persons who require expensive social services. Because proportionately more local revenues are devoted to these non-school services in urban areas, proportionately fewer local tax dollars are available for public schools. The state aid formula uses only property wealth to measure a district's ability to raise local revenues; the plaintiffs-intervenors therefore argued that it does not take into account the diminished ability of cities to support schools that results from this non-school service burden and for this reason, it overstates the ability of cities to support education (The New York State Special Task Force, 1980, p. 51).

Two other issues were raised by the second group of plaintiffs. They argued that the state aid formula is seriously defective because of its failure to account for the difference in educational costs among school districts. Data compiled in a study made under the auspices of the Education Committee of the New York Senate indicated that the cost per pupil for the state-mandated minimum educational program among metropolitan area school districts was 29% higher than the average expenditure level required in rural districts. Another indication of these differences is suggested in the cost of classroom teachers, the largest single component of school costs. In 1974-75, the average classroom teacher salary in the New York City metropolitan area was approximately $16,500, 30% higher than the average salary in the upstate area (data contained in Levittown v. Nyquist, 1978).

A final issue raised by the large urban school districts dealt with the way in which the number of pupils was measured for calculating total state aid. They objected strongly to using average daily attendance figures because most school operations must be designed to accommodate total enrollments regardless of the fact that absentee rates may be high and attendance sporadic. Additional costs may be required in schools of high absenteeism because of the need to provide repetition and remediation to assist pupils whose learning process is impaired by frequent absences.

From evidence provided, the Court concluded that equal educational opportunities do not exist for all students in New York State. Therefore, because the State is obligated to provide and maintain a system of free and common schools for all children, the current system of financing education violated provisions of the State Constitution. State aid legislation is intended to remove inequities in fiscal capacity, but due to the use of the aid formula, flat grants, and save-harmless provisions, inequalities are perpetuated and the court held that equal protection under the law is denied the first group of plaintiffs. The court also concluded that state aid formulas did not consider special cases of municipal and educational overburden.

In rendering this decision, however, the court recognized that designing state aid was a legislative and not a judicial responsibility. Therefore, it was reluctant to recommend any specific change. Furthermore, the court realized that a drastic change in the method of financing education could have major impacts on students, taxpayers, and units of

local government and that "[t]he legislature must be afforded an opportunity to develop a suitable plan for the revision of the state's system of financing public education." (Levittown v. Nyquist, 1978, p. 118).

This court decision was recently overturned under appeal so that legally the Legislature and the Department of Education are not required to make any changes. However, the state aid formula is constantly under careful scrutiny and revision. In 1978-79, the state returned to an old ratio formula similar to that used in 1970-71.

1978-79 Aid Formula

Even though the legislation passed in 1978 involved an aid ratio formula, it was substantially different from the one in operation in 1970-71. A major change was that two separate foundation levels were now defined for "equalization" districts. In keeping with some of the provisions of the 1974-75 formula, the flat grant and taper formula remained in effect for the richer districts (The University of the State of New York, 1978). The new aid formula for "equalization" districts was defined in several steps, based on both spending levels and property wealth. For districts that were spending relatively little per pupil and whose property wealth was less than $85,800 per RTAPU (Resident TAPU), the aid per TAPU in district i in year t was:

$$(5) \quad AID'_{it}/TAPU_{it} = 1450\left(1 - \frac{FV_{i(t-2)}/RTAPU_{i(t-2)}}{AFVRTAPU_{(t-2)}}\ 0.51\right);$$

for $FV_{i(t-2)}/RTAPU_{(t-2)} \leq 85{,}800$

and $AOE_{i(t-1)}/TAPU_{i(t-1)} \leq 1{,}450$

where

$AFVRTAPU_{(t-2)}$ = state wide average full value property wealth per resident total aidable pupil units; and where other variables are defined previously.

It was not necessary for $AOE_{i(t-1)}$ to be $1,450 per TAPU to receive this amount of aid. However, as in previous years, aid per TAPU could be no greater than 90% of the foundation level.

In order for the second tier equalization aid to be operative, districts must have had AOE_i in the base year (t-1) of more than $1,450 per TAPU. These districts essentially received tier 1 aid (equation (5)) for the first $1,450 of approved operating expenses in the base year. If $AOE_{i(t-1)}$ was between $1,450 and $1,500 and $FV_{i(t-2)}/RTAPU_{i(t-2)}$ was below $73,750, a district received tier 2 aid. That is,

$$(6)\quad AID''_{it}/TAPU_{it} = AID'_{it}/TAPU_{it} + E_{i(t-1)}\left(1-\frac{FV_{i(t-2)}/RTAPU_{i(t-2)}}{AFVRTAPU_{(t-2)}}\ 0.8\right)$$

for $FV_{i(t-2)}/RTAPU_{i(t-2)} < 73,750$[17]

$AOE_{i(t-1)} > 1450$

$E_{i(t-1)} = \min\ [50,\ (AOE_{i(t-1)} - 1450)]$.

The rationale underlying this second tier aid was to provide some additional assistance to some of the poorer districts that were spending more than $1,450 per TAPU. This aid was provided at a rate of $0.20 per dollar of additional spending for the district of average wealth. It also dropped to zero as wealth increases before tier 1 aid did.

According to equation (5) equalization aid would ultimately fall to zero as a school district's wealth per RTAPU increased to a level of $115,686. Rather than having aid fall this rapidly for all wealth districts, aid to districts whose wealth per pupil was above $85,800 had the option of a second aid formula called the flat grant taper for these districts. Aid was calculated in the following manner:

$$(7)\quad AID'''_{it}/TAPU_{it} = 360 + .001(101,000 - FV_{i(t-2)}/RTAPU_{i(t-2)});$$

$FV_{i(t-2)}/RTAPU_{i(t-2)} > 85,000$

$FV_{i(t-2)}/RTAPU_{i(t-2)} < 101,000.$

At a wealth of $101,000, aid calculated according to this equation dropped to $360. For districts whose wealth was above this level, the flat grant provision was triggered.

Findings of a Task Force Studying Equity in Education

Although the 1978-79 aid formula was not designed specifically in response to the Levittown decision, a special task force was asked recently to determine if the changes in the state aid formulas during the 1970's corrected the deficiencies noted in the court case. They directed attention on the 1974-75 and 1977-78 school years.

There are a number of ways in which one could examine the disparities in expenditures per pupil or in tax rates across school districts in New York. The situation is complicated considerably by the fact that published data are not available in a completely appropriate form. The Special Report of the Comptroller on Municipal Affairs contains much information on school finances, property tax collections for school purposes and figures on enrollment and average daily attendance (State of

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[17] The level at which the term in parentheses in equation (6) goes to zero.

New York Office of the Comptroller, 1978, 1979). Unfortunately, no published data exist reporting TAPU by district, county or other geographic breakdown.

The Task Force attempted to make these comparisons by delineating approved operating expenses per TAPU ranked from high to low according to percentiles of students. As table 5 indicates, the maximum AOE/TAPU in any of New York's 700+ districts was $4,004 in 1974-75. At least one district was spending as little as $785 per TAPU in this year. At these extremes, the absolute disparity between districts in 1977-78 increased slightly. The per pupil spending ratio between the highest and lowest district rose from 5.1 to 1 in 1974-75 to 5.8 to 1 in 1977-78, at which time the highest spending district spent $5,753 per TAPU and the lowest $989 per TAPU. Although there is no reason to expect expenditures would not increase over this three-year period, spending per pupil at these two extremes increased at significantly different rates.

Table 5. Change in Approved Operating Expenditures per Pupil (TAPU) by Percentiles, New York State (1974-75 to 1977-78)

Percentile of Students	Approved Operating Expenditures Per Pupil (TAPU)[a]			
	1974-75	1977-78	Change 1974-75/1977-78	
			Number	Percent
1st	$ 785	$ 989	$ 204	26.0
10th	1,117	1,389	272	24.4
20th	1,192	1,472	280	23.5
30th	1,251	1,542	291	23.6
40th	1,341	1,639	298	22.2
50th	1,425	1,788	363	25.5
60th	1,510	1,899	389	25.8
70th	1,602	2,015	413	25.8
80th	1,795	2,255	460	25.6
90th	1,950	2,470	520	26.7
100th	4,004	5,753	1,749	43.7

Source: Reproduced from the New York State Special Task Force on Equity and Excellence in Education, 1980, p. 25a.

[a] The expenditure figures shown here have not been adjusted to compensate for inflation, therefore the percentage increases appear larger because of the inflated value of the dollar.

This is not true among the largest proportion of districts. At the 90th percentile in 1974-75, per pupil spending was $1,950 while at a level of $1,117 per pupil at the 10th percentile, a ratio of 1.7 to 1. In 1977-78, the ratio increased slightly to 1.8 to 1 with the 90th

percentile spending $2,470 per pupil and the 10th percentile at a level of $1,389. Expenditures between the 10th and 90th percentiles increased 22.2% in the 40th percentile to a high of 26.7% in the 90th percentile. This is in contrast to the 43.7% increase for the district with the highest approved operating expenditures.[18]

The Special Task Force concluded that the situation which had given rise to the filing of the Levittown case had not changed substantially during this three-year period. It goes on to examine for the 1977-78 school year changes in the relationship between wealth and spending during this three-year period. To do this, it ranked school districts from low to high according to the amount of their pupil spending with districts divided into 10 groups with approximately the same number of Total Aidable Pupil Units. In 1977-78, for example, wealth per RTAPU in the highest spending decile was 3.3 times greater than the wealth in the lowest spending decile. Table 6 contains the reverse relationship, essentially comparing the relationship between full value per RWADA, AOE per TAPU and full value property tax rates. Accordingly, spending in the highest wealth decile was 61% higher than that in the lowest decile, but property tax rates in the highest decile were only approximately 2.5% higher than in the first decile.

In an attempt to summarize the relationship between AOE per pupil and full value per pupil, the Task Force estimated the statewide elasticity of approved operating expenses per pupil with respect to full value per pupil. In 1974-75, this elasticity was equal to 0.41 and by 1977-78, the elasticity had fallen slightly to 0.35.

Although the Task Force did attempt to examine the changes over time in the disparities in school spending, wealth and tax effort, they do not examine explicitly the fiscal situation among school districts for 1979-80, the first year in which the state had returned to an aid ratio formula based on two tiers of aid. Data obtained from the New York State Department of Education enables this analysis to be conducted in the context of this study, in which case they provide a base of comparison for the programming analysis of financing alternatives described in the next section.

Analytical Methods for Studying School Finance

The public sector's involvement in educational finance and aid to education throughout this century has been justified on both legal and economic grounds. The legal justification can vary from state to state but the involvement basically stems from the fact that education is one of the governmental functions delegated to state and local governments. In New York State, for example, the State Constitution contains an Educa-

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[18]While comparisons of this nature do reflect the ranges in approved operating expenses in the particular year, comparisons between years are difficult to interpret because individual school districts can move from one percentile to another in any ranking from low to high in terms of approved operating expenditures per TAPU.

Table 6. The Relationship Between Full Value Per Pupil (RWADA), Approved Operating Expenditures Per Pupil (TAPU) and Full Value Property Tax Rate (in Mills) Pupil Weighted Deciles, New York State (1977-78)

Deciles of Full Value Per Pupil (RWADA) (Average Value)	Approved Operating Expenditures Per Pupil (TAPU)	Property Tax Rate (Full Value, in Mills)
First Decile ($ 30,472)	$1,455	16.09
Second Decile (37,982)	1,571	18.86
Third Decile (42,299)	1,664	20.92
Fourth Decile (46,466)	1,641	18.98
Fifth Decile (50,865)	1,725	20.46
Sixth Decile (56,514)	1,825	20.78
Seventh Decile (62,923)	1,931	21.64
Eighth Decile (71,696)	2,021	21.03
Ninth Decile (86,756)	2,203	21.57
Tenth Decile (132,670)	2,648	20.18
New York City: (81,506)	2,101	22.52
Rest of State: (61,732)	1,867	20.05
Statewide Average: (67,715)	1,938	20.79

Source: Reproduced from the New York State Special Task Force on Equity and Excellence in Education, 1980 p. 26a.

tion Article which reads: "The legislature shall provide for the maintenance and support of a system of free common schools wherein all the children of this State may be educated" (Art. XI, Sec. 1).

The economic arguments stem from the fact that education has both private and public good attributes. From one perspective, for example, it is certainly possible to exclude students either in total or in part from the educational process. A student could be denied access to a

classroom or denied access to educational resources through overcrowding or the failure to purchase certain educational materials. Exclusion could also be accomplished through the market by charging prohibitively high tuitions or other user charges. These are all characteristics of private goods, as is the major benefit associated with education. An individual student has exclusive access to his or her inventory of human capital acquired through the educational process.

However, as Hirsch and Marcus (1966) suggest,

> [t]he benefits of education can be looked upon as the increased resources available to society, i.e., both those which contribute to society's economic well-being and those which are embodied in the educated person and permit him to participate in society more fully (p. 48).

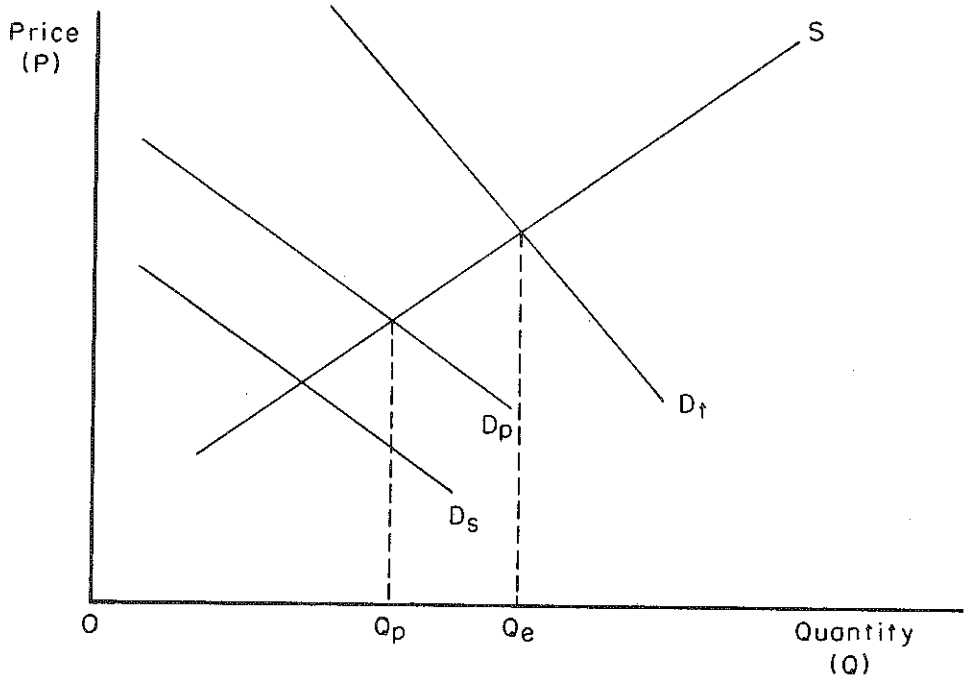
These benefits can be both direct and indirect as well as accrue over the short run or the long run. Perhaps the most immediate and tangible benefits to education are in terms of an increase in a student's productivity and disposable income in future years. Less tangible are the "consumption" benefits from education a student might receive in later years.

From society's point of view, the potential decrease in the demand for public services resulting from a decrease in social and personal problems which are often associated with inadequate schooling may be an important benefit with a public good dimension. The same is true of education induced increments in the social product of second parties who come into contact with educated students. Finally, there are long-term intangible community benefits associated with a relatively well-educated electorate.

The situation is even more complex in a society which is extremely mobile. Because many of the private and public benefits associated with education are realized in the area immediately surrounding the educated person's residence, some benefits resulting from public education supplied in one school district may ultimately be realized by residents of another. Benefits can flow into a school district (spillins) or they can flow out of it (spillouts). See Hirsch et al. 1964 and Hines and Tweeten, 1972 for attempts to measure the magnitude of these effects.

There is overwhelming evidence to suggest that education has both private and public good dimensions. What is not clear is how these public good dimensions necessitate public involvement in the provision of educational services. This can be understood most easily if one views education as a good with which there are associated positive externalities. The external economies, in terms of societal benefits, can be represented in figure 1. The curve labeled D_p represents the individual student's demand for education, reflecting only the private benefits which accrue to the student directly. Because of the public goods aspects of education (D_s) is society's demand for education, output would be 0_p units and price would be P_p if production were left solely in the hands of the private sector.

FIGURE I. DEMAND FOR EXTERNAL ECONOMIES



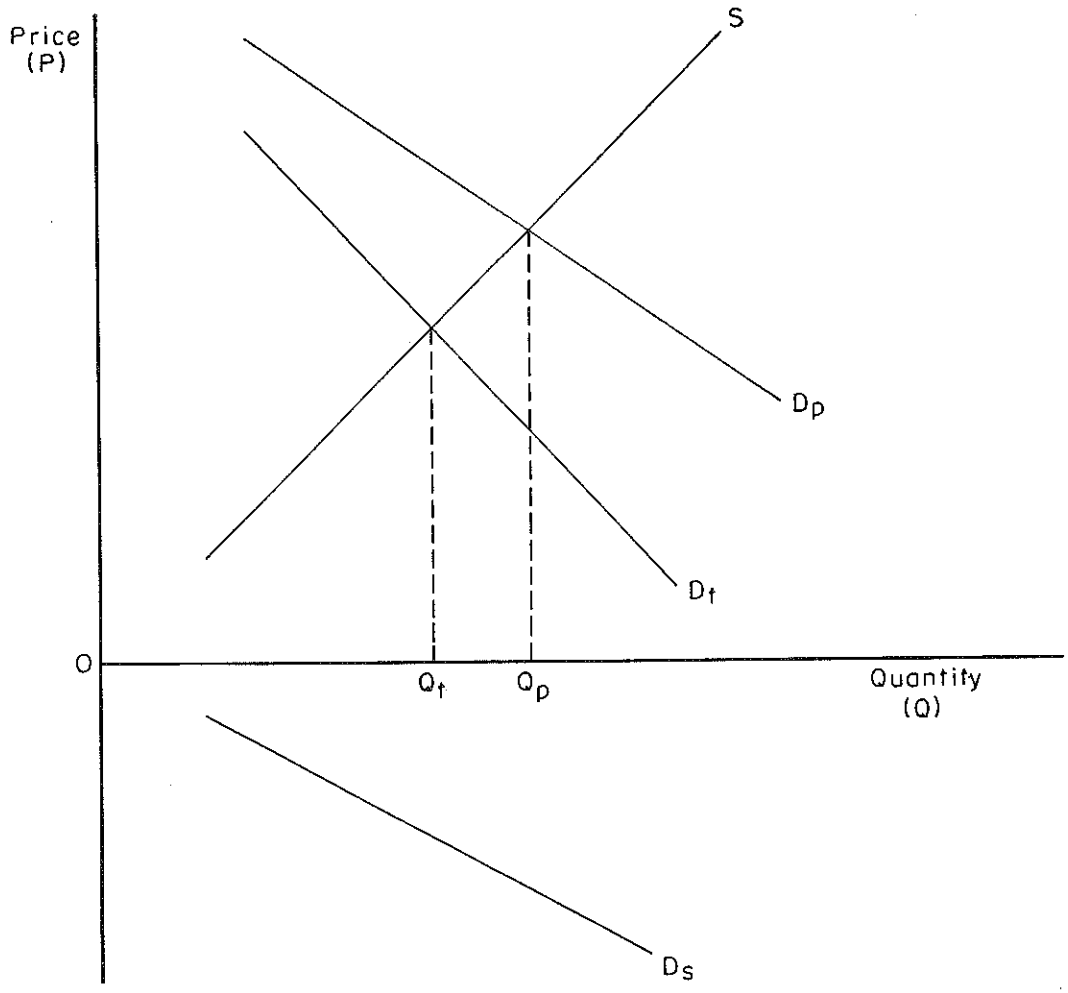
From society's point of view, the demand for educational services, D_t, is reflected in the vertical summation of D_p and D_s. Given the supply curve in figure 1, the optimal output of education from society's point of view is actually Q_e instead of Q_p as would be indicated by strictly private decisions. Thus, a private market for education would lead to underinvestment.

The situation is complicated by the spillover nature of many of the benefits and costs of education. From society's point of view, one might argue that the spillin benefits and costs exactly offset the spillout benefits and costs. Accordingly, this situation causes no difficulty when education is viewed from a state or national perspective. From the local perspective, the situation can be quite different. For those districts who receive a net spillin, the situation can be viewed as a windfall over which they have little or no control. For a school district whose students usually migrate to other parts of the state or nation, the spillout benefits associated with these students leaving the area can be viewed as an external diseconomy.

Consider the case of a school district with significant spillout benefits, a district which loses its educated students through migration to other areas. Figure 2 illustrates this type of school district. Let D_p represent the private market demand for educational services. The optimal output without considering spillouts or spillins is Q_p.

If one assumes for simplicity that all society's benefits to education are exported along with the students as they leave the area, there is essentially a net cost to the local society associated with providing

FIGURE 2. DEMAND FOR SPILLOUT BENEFITS



education. Society demands no education at a positive price and would in effect demand education only if it were paid to do so. Society's demand curves would be positioned in the fourth quadrant. The vertical summation of these two demand curves results in a total demand, D_t, which lies below the private individual's demand for education. Although Q_t is an optimal quantity of education from the local community's point of view, it represents an underinvestment in education both from the standpoint of individual students and society as a whole.

Carried to its logical conclusion, this argument would lead one to an educational system funded at the national level. For political reasons, education has been relegated to the states and it is unlikely that a national system of financing education will develop in the near future. The above argument is applicable at the state level as well because spillover benefits accrue routinely among districts within a state. By providing some assistance, through state aid or other means, one can counteract the underinvestment in education that is likely to

occur in those districts where spillouts occur. This state involvement does nothing to mitigate the consequences of the external effects among various states or regions of the country.

To identify the exact nature of the financial assistance needed to counteract these effects, one must have specific information about the supply and demand curves for education facing school districts throughout the state. Obviously, this information is unavailable and alternative systems of school finance must be evaluated on the basis of different criteria. The criteria often include but are not limited to considerations of economic efficiency (in terms of cost minimization or revenue maximization), equal educational opportunity and taxpayer's equity.

Colburn (1981) describes a number of analytical procedures for analyzing changes in school financing and state aid arrangements. The simplest approach is an ex ante comparison of changes in expenditures, revenues, tax rates, etc. resulting from proposed modifications in aid formulas prior to implementation. This strategy, or an ex post evaluation, has been used by state agencies and researchers alike (e.g., New York State Budget Division, Education Unit, 1978; Johnson and Collins, 1979). While analyses of this kind provide valuable disaggregate information on the impact of specified policy changes, there is no guarantee that the alternatives under study are in anyway optimal according to one or more performance criteria.

Educational financing alternatives can also be examined by econometric or mathematical programming methods. For example, White and Miller (1976) have analyzed a district power equalization (DPE) aid scheme for the state of Georgia with a four equation model in which four endogenous variables, tax effort, achievement, total expenditures and local expenditures, were related to a number of socio-economic shifters in the school districts. This model was developed so that equilibrium expenditure levels could be determined simultaneously with state aid provided under a specific aid ratio. The authors argue that by formulating this structural model of educational demand their simulation analysis would generate equilibrium levels of educational expenditures in each school district given that the endogenously determined expenditure levels, combined with state aid are those which could be financed with a common tax effort statewide.

This particular econometric formulation was facilitated considerably by the fact that school districts in Georgia are organized along county boundaries. Had this not been the case, it would have been impossible to collect the socio-economic information required in estimating the econometric model. Thus, in addition to the conceptual problems involved in estimating the demand for a public good, the fact that school districts are not organized along county boundaries would make it difficult to develop such a model for New York.

Bruno (1968) was perhaps one of the first individuals to use mathematical programming to examine school financing alternatives. His study dealt with the California Junior College Support Program, but the state aid to this junior college system was apportioned in a way quite similar

to the New York State Aid formula of 1974-75. Within this optimizing framework, Bruno was able to develop different state aid formulas that would minimize uniform tax rates, maximize total expenditures, minimize state costs or minimize overall costs. The programming model was particularly appropriate in the case of a foundation type state support program because the aid formulas could be specified as a series of linear constraints, and the several objectives could be optimized individually subject to minimum expenditure levels, maximum state shares and/or minimum tax rates.

The Linear Programming Model

Because of its relative simplicity and flexibility, New York school financing alternatives are studied within a linear programming framework. The programming model allows one to examine the tradeoffs among the provision of equal educational opportunity, equity from a taxpayer's perspective and budgetary limitations.

The model is flexible enough so that different aid formulas used throughout the past decade and in other states, such as DPE in Wisconsin, can easily be incorporated and alternative objective functions including maximizing expenditures or minimizing state aid can be examined. The characteristics of the school districts and the representation of alternative aid formulas are accommodated within four types of constraints: state aid constraints, expenditure constraints, tax rate constraints and accounting constraints. The decision variables include: state aid per TAPU; local expenditures per TAPU; tax rates for each school district; and state shares of tier 1 and tier 2 ceiling levels for the district of average wealth.

Constraints: The first set of constraints are those representing the two-tier state aid formula. The general aid formula for the 1980-81 school year is similar to the one in equations (5) and (6). For districts receiving both tiers of aid (i=1,...,m):

$$(8)\quad AID_{it}/TAPU_{it} = C_1 \left(1 - \frac{FV_{i(t-2)}/RTAPU_{i(t-2)}}{AFVRTAPU_{(t-2)}} X_1\right) + C_2 \left(1 - \frac{FV_{i(t-2)}/RTAPU_{i(t-2)}}{AFVRTAPU_{(t-2)}} X_2\right);$$

where

$AID_{it}/TAPU_{it}$ = district operating aid per TAPU;

C_1 = first tier expenditure ceiling level per TAPU;

C_2 = second tier expenditure ceiling level per TAPU;

X_1 = portion of C_1 raised by local district of wealth equal to $AFVRTAPU_{(t-2)}$;

X_2 = portion of C_2 raised by local district of wealth equal to $AFVRTAPU_{(t-2)}$;

$AFVRTAPU_{(t-2)}$ = some measure of district wealth (historically, $AFVRTAPU_{(t-2)}$ has been the state average full value of property per some pupil measure for wealth; lagged two years);

$FV_{i(t-2)}/RTAPU_{i(t-2)}$ = a measure of the ith districts' wealth per pupil measure; and

t = current school year in which aid is apportioned.

By collecting the terms containing decision variables, the constraint in the programming model becomes:

$$(9)\quad AID_{it}/TAPU_{it} + C_1 \left(\frac{FV_{i(t-2)}/RTAPU_{i(t-2)}}{AFVRTAPU_{(t-2)}} X_1\right) + C_2 \left(\frac{FV_{i(t-2)}/RTAPU_{i(t-2)}}{AFVRTAPU_{(t-2)}} X_2\right) = C_1+C_2$$

for i = (1, ... m), the districts receiving both tiers of aid.[20] In some two-tier aid systems, relatively richer districts may only receive tier 1 aid. District aid to these districts is given by:

$$(10)\quad AID_{it}/TAPU_{it} = C_1 \left(1 - \frac{FV_{i(t-2)}/RTAPU_{i(t-2)}}{AFVRTAPU_{(t-2)}} X_1\right)$$

for i = (m+1, ... n), the n-(m+1) districts receiving only tier 1 aid.

The constraint becomes:

$$(11)\quad AID_{it}/TAPU_{it} + C_1 \left(\frac{FV_{i(t-2)}/RTAPU_{i(t-2)}}{AFVRTAPU_{(t-2)}} X_1\right) = C_1,$$

If a flat grant provision is included in the aid formula for the "richest" school districts additional constraints are needed:

$$(12)\quad AID_{it}/TAPU_{it} = FG$$

for i = ((n+1), ..., r) with r-(n+1) districts receiving flat grant aid; and

FG = the specific flat grant level of aid per TAPU and

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[20]The second tier of aid is for districts with relatively high spending levels and low wealth.

(13) $AID_{it}/TAPU_{it} \geq FG$

for i = (1, ..., n) all districts not receiving flat grant aid.

Constraint (13) insures that aid to all districts not receiving flat grant aid is greater than or equal to the flat grant level.

Careful examination of equations (9) and (11) indicates that they are non-linear in two of the important parameters of the state aid formula, C_k and X_j. Thus, it is impossible within a linear programming context to determine optimal levels of both state shares and ceiling levels simultaneously. The strategy employed below is to fix the C_k's at various levels and solve for optimal state shares, given specified objectives and other constraints.

Expenditure constraints are incorporated into the model to set maximum and/or minimum expenditure levels for each district: if both maximum and minimum constraints are used, school districts are forced to spend within some range

(14) $E_{it} \geq MNE_{it}$;

and

(15) $E_{it} \leq MXE_{it}$;

for i = (1, ..., r) all districts;

E_{it} = actual expenditure level per TAPU in year t;

MNE_{it} = minimum expenditure level per TAPU; and

MXE_{it} = maximum expenditure level per TAPU.

Actual expenditures or some assumed expenditure levels which attempt to equalize educational opportunity across districts can be incorporated into the programming model using these equations.

Contraints on local tax rates are required because of legal limits on the taxing power of school districts or for equity considerations across taxpayer groups.[21] If the objective is to minimize state aid, tax rates must be constrained from above to keep state aid from falling to zero. Tax rate constraints are given by:

(16) $R_{it} \leq MXR_{it}$ i = (1, ..., r);

and

(17) $R_{it} \geq MNR_{it}$ i = (1, ..., r);

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[21]These types of constraints, which require a variable not to exceed a specified limit or restrict the value to be above some level are treated as bounded variables; a modified version of the simple algorithm using bounded variables included in the IBM MPSX linear programming package is used to solve the programming model. See Gass (1976) for the mathematics of bounded variable problems.

where R_{it} = tax rate (per unit wealth);

MXR_{it} = maximum tax rate; and

MNR_{it} = minimum tax rate.

Other constraints must also be included to insure the appropriate relationships among state aid, local expenditures, total expenditures and tax rates are maintained. Total expenditures per TAPU must equal the sum of local expenditures per TAPU plus state expenditures per TAPU,

$$(18) \quad AID_{it}/TAPU_{it} + L_{it} = E_{it}$$

for L_{it} = local expenditures per TAPU.

Local expenditures are related to tax rates by:

$$(19) \quad -L_{it} + R_{it} \left(FV_{i(t-2)}/RTAPU_{i(t-2)}\right) = 0.$$ [22]

Total state aid is calculated by multiplying state aid per TAPU for each district by TAPU and summing over all districts.

$$(20) \quad \sum_{i=1}^{r} AID_{it}/TAPU_{it} \left(TAPU_{it}\right) - TS = 0,$$

for TS = total state aid.

Total local expenditures are calculated in the same manner:

$$(21) \quad \sum_{i=1}^{r} L_{it}(TAPU_{it}) - TL_{t} = 0.$$

In 1980-81, New York State apportioned aid using a two-tier aid system.[23] The first expenditure ceiling, C_1, in the model is set at

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[22]For purposes of state aid ratios, it was appropriate to use the full value of property in year t-2 but because of lack of data, these same tax rolls were also used to establish tax rates in the model. The implications of this assumption are discussed in the next section.

[23]In past years formula aid has comprised approximately three-fourths of the total general operating aid apportioned by New York State. (The University of the State of New York, 1978-79 and the University of the State of New York, 1976.) In 1980-81, for example, New York State gave special aid to school districts. Districts received extra money for severely handicapped students. Districts taxing at rates above $20 per $1000 full value and a per pupil wealth below the state average were eligible for High Tax Aid. Low Income Supplemental School Aid (LISSA) was apportioned to districts with below average income per pupil. The save-harmless and flat grant provisions remained in the 1980-81 formula. To the extent that this model does not account for these kinds of aid, tax rates in eligible districts could be decreased slightly without lowering expenditure levels.

$1600 per TAPU for all districts eligible for tier 1 aid, C_2 is $100; and the flat grant provision remained at $360 per TAPU.

New York used the full value of property per RTAPU as a measure of wealth. $AFVRTAPU_{(t-2)}$ was equal to $69,472 in the 1980-81 aid formulas State shares of expenditure ceiling levels for districts of average wealth remained at 49 percent for tier 1 aid and 20 percent for tier 2 aid. This is equivalent to setting $X_1 = 0.51$ and $X_2 = 0.80$ in the model.

The only remaining values needed are upper limits on tax rates, expenditure levels and full values of property per RTAPU. These values are discussed in the Data Requirements section, where calculations needed to derive specific values are delineated.

Objective Function: Within this programming context, alternative objective functions could be explored. Maximizing total expenditures, minimizing tax rates, and maximizing expenditures per TAPU are a few of the objective functions that could be examined with this model. In this study, emphasis is placed on a system of minimizing state aid allocations. Operationally, total state aid is calculated by (20) and minimized by:

(22) Minimize $Z = TS_t$.

Minimizing total aid subject to specified maximum tax efforts and minimum expenditure levels allows one to examine the tradeoff among alternative allocations of state aid, school district tax efforts and taxpayer equity, total state costs, and school expenditures. In the simplest versions of the model decision variables are the state aid levels for each school district and the local tax rates. In more complex versions, the levels of X_1 and X_2, state shares for tier 1 and tier 2 aid, are also decision variables.

With an objective function focused on the cost to state, implications of varying levels of X_1 and X_2 with respect to the state aid picture must be understood. In the existing aid situation, X_1 is set equal to 0.51, X_2 is equal to 0.8 and $AFVRTAPU_{(t-2)}$ is set at the state average full value of property per TAPU. This implies that as property wealth increases, tier 2 aid falls to zero before tier 1 aid. If tier 2 aid is not allowed to go negative, as in the 1980-81 formula, some richer districts will receive only tier 1 aid. At present, school districts with full value of property per RTAPU between $0 and $86,840 receive tier 1 and tier 2 aid. Districts with wealth between $86,840 and $105,000 per RTAPU are too rich to receive tier 2 aid but not wealthy enough to receive flat grant aid; they are eligible for only tier 1 aid. Flat grant districts are those with full value of property per RTAPU in excess of $105,000. In the programming model these three types of districts are described by the three different state aid constraints in equations (9) and (11) and (12).

Allowing X_1 and X_2 to vary introduces potential problems into the model. As X_2 increases, tier 2 aid can become negative.[24] Because of the possibility of negative tier 2 aid, districts receiving tier 1 and tier 2 aid may now receive less aid than relatively richer districts presently receiving only tier 1 aid. This potential inconsistency is ruled out by simply placing an upper bound on X_2:

$$(23) \quad X_2 \leq UB$$

where UB is some upper bound which constrains tier 2 aid to be positive.[25]

However, if no bound is placed on X_2, a preliminary analysis of District Power Equalization (DPE) as implemented in Wisconsin in 1973 can be achieved. Under such a scheme, the state effectively guarantees a fiscal capacity for each local district equal to a specified level of property valuation per pupil. Once the desired level of spending is determined the district must impose the tax rate needed to raise this revenue if the guaranteed value of property per pupil were actually available. This tax rate is applied to the actual valuation of property in the district and the state pays the difference (Johnson and Collins, 1979). If districts receiving only tier 1 aid or flat grant aid are eliminated from the model, a modification of constraint (9) can be used to reflect a DPE scheme of this kind. Constraint (9) is changed to

$$(23) \quad AID_{it}/TAPU_{it} + C_1 \frac{FV_{i(t-2)}/RTAPU_{i(t-2)}}{GV_1} + C_2 \frac{FV_{i(t-2)}/RTAPU_{i(t-2)}}{GV_2}$$

$$= C_1 + C_2 \text{ for } i = (1, \ldots, m),$$

where $GV_1 = \frac{AFVRTAPU_{(t-2)}}{X_1}$ and $GV_2 = \frac{AFVRTAPU_{(t-2)}}{X_1}$.

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[24]Although X_1 can vary, tier 1 aid cannot be negative. In the model $AID_{it}/TAPU_{it}$ as an activity in a linear program is constrained to be greater than or equal to zero. Because $AID_{it}/TAPU_{it}$ in constraint (11) contains only tier 1 aid, tier 1 aid is forced to be positive or zero (without flat grant provisions). However, in constraint (9), $AID_{it}/RTAPU_{it}$ is the sum of tier 1 and tier 2 aid. Therefore, tier 2 aid can be negative as long as tier 1 aid remains greater than or equal to tier 2 aid.

[25]The upper bound in this model is calculated by setting the tier 2 aid ratio equal to zero for the richest district receiving tier 2 aid, and solving for X_2. Using the aid ratio for the richest group receiving tier 2 aid, $X_2 = 0.87$. Setting UB at 0.87 insures positive tier 2 aid for all districts.

In the DPE formulation, GV_1 and GV_2 are two guaranteed full valuation levels, set by the state.[26] Because in the existing model not all of New York's school districts are eligible for both tiers of aid, only preliminary results for DPE are reported in the next section. In this preliminary analysis, the two guaranteed full valuation levels are set to minimize state aid and, as in Wisconsin, tier 2 aid can go negative, subtracting from tier 1 aid. However, total aid must remain positive.

Data Requirements

This programming model has one disadvantage. For each school district there are at least five constraints and a model containing all 700+ districts in New York State would be difficult, if not impossible, to manage, not to mention the excessive cost in obtaining a solution. To circumvent this problem, the 700+ school districts in New York are grouped into 79 aggregates according to wealth as measured by full value of property per RTAPU, approved operating expenses per TAPU, and TAPU. The total number of TAPU in a group is the sum of the TAPU in the group's component school districts, but each group is then treated as though it were a single district with characteristics reflecting the weighted average of the districts within the group.

The data were obtained from unpublished work sheets from the New York State Department of Education (The Budget Division, 1980). The work sheets contain estimates of operating aid for each school district based on the 1980-81 formula.

In order to examine the large urban school districts closely, the five New York City boroughs, Buffalo, Rochester, Syracuse, Yonkers and Albany are treated separately in the model. Other school districts are classified by three AOE groups; six wealth groups, including wealth cut off points which determine the type of aid to the district; and six groups of TAPU, used as an indication of school size. Each school district is assigned to a group G_{uvw}, where u is the uth approved operating expenditure/TAPU group; v is the vth wealth/RTAPU group; and w is the wth

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[26]Guaranteed valuation levels are wealth levels set by the state which offer poorer districts taxing power equivalent to the set levels. For example, a district applies a particular tax rate to its local wealth base and if the local base is lower than the guaranteed level, the state apportions enough aid so that the sum of local and state revenues are equal to the revenues that could be raised locally at the same tax rate but applied to the guaranteed wealth level.

TAPU group.[27] The ranges for the groups are given in table 7. The large urban school district groups are described in table 8.

The wealthiest school districts were mostly, although not exclusively, in Suffolk, Nassau and Westchester counties. These districts also had the highest expenditure levels per TAPU. Poorer school districts, although not concentrated geographically, were more likely to be in upstate areas. These districts spent at the lowest levels per TAPU. As the wealth of the district groups increases, moving from v=1 to v=6, expenditures per TAPU also increase, implying a direct relationship between wealth as measured by full value of property per RTAPU in 1978-79 and 1979-80 expenditures per TAPU.

No clear pattern exists linking the number of aidable pupil units to levels of expenditures per TAPU. When districts are grouped by $AOE_{(t-1)}/TAPU_{(t-1)}$, TAPU rises as expenditure groups increase from v=1 to v=3. Grouping districts by $TAPU_{(t)}$ shows no consistent relationship between expenditure levels and total TAPU.

Urban area school districts including New York City, Buffalo, Rochester, Syracuse and Albany contain 34% of the TAPU in New York State. New York City alone contains 30% of the state's total. Approved operating expenditures in 1979-80 in all of these districts were above $2,200 per TAPU. This is above the average for the state's other districts.

State aid constraints, equations (9-11), require a measure of wealth for each group. Weighted averages of full value of property per RTAPU are calculated by the following formula:

$$(24) \quad FV_{p(t-2)}/RTAPU_{p(t-2)} = \frac{\sum_{uvw \in p} FV_{uvw(t-2)}}{\sum_{uvw \in p} RTAPU_{uvw(t-2)}}$$

and p = 1,2, ..., 79 are the 79 groups formed by the aggregations specified above. These values are then substituted into the state aid constraints.

Expenditure constraints, equation (14), require right-hand side values for each of the 79 groups. Several alternative expenditure levels per TAPU are examined: 1) 1979-80 approved operating expenditures, AOE;

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[27] Any group with: v=3 contains districts with wealth/RTAPU slightly below the $69,473 state average; and v=4 contains districts with slightly above average wealth. Districts for which v=5 receive only tier 1 type aid. Groups for which v=6 include flat grant districts; and when v=1, 2,3,4, districts receive both tier 1 and tier 2 aid. A summary of the grouped data used as coefficients in the model is provided in Appendix A.

Table 7. Three-Way Classification of New York School Districts for 1980-81 School Year (t=1980-81)

$AOE_{(t-1)}/TAPU_{(t-1)}$ (class variable 1)					$FV_{(t-2)}/RTAPU_{(t-2)}$ (class variable 2)				
Range of Class Variable 1	Index u	No. of Districts	Average/district $\overline{FV_{(t-2)}/RTAPU_{(t-2)}}$	Average/district $\overline{TAPU_{(t)}}$	Range of Class Variable 2	Index v	No. of Districts	Average/district $\overline{AOE_{(t-1)}/TAPU_{(t-1)}}$	Average/district $\overline{TAPU_{(t)}}$
less than $1,600	1	130	$46,426	1,587	less than $33,360	1	56	$1,653	1,701
$1,600-$1,699	2	87	43,239	2,138	$33,361-$51,416	2	265	1,736	2,801
$1,700 and above	3	470	86,014	3,346	$51,417-$69,472	3	144	2,042	3,773
					$69,473-$86,840	4	73	2,304	3,196
					$86,841-$105,570	5	52	2,507	3,291
					$105,570 and above	6	97	3,058	1,850

$TAPU_{(t)}$ (class variable 3)				
Range of Class Variable 3	Index w	No. of Districts	Average/district $\overline{FV_{(t-2)}/RTAPU_{(t-2)}}$	Average/district $\overline{AOE_{(t-1)}/TAPU_{(t-1)}}$
less than 500	1	66	$149,323	$2,400
500-999	2	105	66,025	1,793
1,000-2,499	3	255	61,786	1,955
2,500-4,999	4	154	69,384	2,252
5,000-9,999	5	82	68,512	2,355
10,000 and above	6	25	56,287	2,281

Source: The Budget Division, "1980-81 State Aid Projections", unpublished worksheets, Albany, March 1980.

Note: This classification is for school districts outside New York City, Buffalo, Rochester, Syracuse, Yonkers and Albany. Other districts including Poughkeepsi, Sackets Harbor, Sewanhaka, Bellmore-Merick and Brunswick Central were left out of the analysis because complete data were not available. Districts were combined into group G_{uvw} for programming purposes. Each group is then treated as though it were a single district. The total number of TAPU in the group is the sum of the TAPU in the group's school districts with characteristics reflecting the average of the districts within the group. The variables in the table are defined as AOE = approved operating expenses; FV = full value of taxable property for schools; RTAPU = resident total aidable pupil units; and TAPU = total aidable pupil units respectively. The data in this table are simple averages across school districts. For the programming analysis the expenditure and wealth variables were weighted by TAPU for districts within a group; see Appendix A. For a list of component districts in each group see Appendix B.

Table 8. Classification of Large Urban School Districts for 1980-81 School Year

Districts	$TAPU_{(t)}$	AOE/TAPU	$FV/RTAPU_{(t-2)}$
New York City[a]	937,356	$2,290	$86,428
Buffalo	49,113	2,201	52,427
Rochester	36,247	2,621	52,427
Syracuse	22,795	2,261	62,558
Albany	9,439	2,234	93,167
Yonkers	23,193	2,790	96,570

Source: The Budget Division, "1980-81 State Aid Projections," unpublished worksheets, Albany, March 1980.

[a] Includes the five boroughs, Bronx, Brooklyn, Queens, Richmond and Manhatten.

2) AOE increased by 11.25%;[28] 3) AOE adjusted for inflation and cost of educational resource differentials among groups; 4) equalized expenditures at an inflated statewide average AOE level; 5) equalized expenditures adjusted for cost differentials and 6) a leveling-up expenditure level to the 65th percentile.

All of the expenditure levels were calculated from 1979-80 approved operating expenses. AOE/TAPU for each group were calculated by the following formula:

$$(25)\quad AOE_{p(t-1)}/TAPU_{p(t-1)} = \frac{\sum_{uvw \varepsilon p} AOE_{uvw(t-1)}}{\sum_{uvw \varepsilon p} TAPU_{uvw(t-1)}} ,$$

where p = 1,2, ...,79 are the 79 groups formed by the aggregations specified above. Multiplying each $AOE_i/TAPU_i$ by 1.1125 adjusted the 1979-80 spending levels for inflation. Equalized expenditures were set at the average $AOE_{i(t-1)}/TAPU_{i(t-1)}$ adjusted for inflation for all groups. Leveling-up expenditures were determined by ranking $AOE_i/TAPU_i$ from high to low for the 79 groups and finding the expenditure level applied to the 65th percentile pupil (TAPU) from the bottom. District's expenditures were leveled-up to this value but school districts already spending at a higher rate were not leveled down.

Two expenditure levels, inflated AOE and equalized expenditures, were also adjusted for differential costs of educational resources among

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[28] This is the inflation rate, as measured by the Consumer Price Index, during the 1979 calendar year (Joint Economic Committee by the Council of Economic Advisors, 1980).

districts. Utilizing differential cost indices for New York State school districts derived by Wendling, weighted aggregated indices, weighted by TAPU were calculated for the 79 groups in the model by the following formula:[29]

$$(26)\quad CI_p = \frac{\sum_{vw \in p} CERI_{uvw} \; TAPU_{uvw}}{\sum_{uvw \in p} TAPU_{uvw}}$$

where CI_p = cost index for group p;

CERI = cost index of educational resources derived by Wendling; and

p = 1, 2,...,79 are the 79 groups formed by the aggregations specified above.

The aggregated indices were then multiplied by the various expenditure levels to calculate AOE adjusted for cost differentials. This is an attempt to adjust for the real cost of providing educational services. This index ranges from a high of 1.10 in Albany to a low of 0.85 in a group G_{311}. This latter group had approved operating expenses per TAPU in 1979-80 of $1,909. Full value of property per RTAPU was less than $30,000 and the one district in the group had a TAPU in 1980-81 of 413. The indexes in all surburban areas and New York City were above 1.0.

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[29]Using regression analysis, Wendling (1979) constructed cost indices indicating differential costs in hiring teachers and nonclassroom professionals after controlling for personal and other characteristics. For example, an "average" teacher in New York State was one with: a Master's degree, ten years of experience in the school district, and tenure. There was an average of 47 teachers per thousand students. The predicted salary for the average teacher in New York State teaching in a specific district is compared (indexed) to the predicted salary for the average teacher teaching in the 'average' district in the state to form a cost index. This information is combined with a similar index for nonclassroom professionals and weighted by budget shares to form a cost-of-education index. The index was constructed first by using regression analysis to predict teachers' salaries based on personal characteristics of teachers including their education, years of experience, the nature of their appointment, and their sex. The regression analysis also controlled for professional environment, including the pupil/teacher ratio, and the existence of a collective bargaining unit. The fiscal capacity of the school districts were reflected as both the full value of property per pupil and the gross income per income tax return per district. The size of the school district was accounted for as were regional characteristics such as population density and the location of the district relative to metro areas relative to state. Finally, student's characteristics as reflected in attendance ratios, combined reading and math scores, and the percentage of handicapped students or students with special educational needs were included as explanatory variables.

Finally, to minimize aid also requires one to place tax rate limits on each group such that a maximum tax effort or a constitutional limit is set. Otherwise, state aid will fall to zero. Two tax rates were assumed in the study, $45 and $35 per $1000 full value of property.[30]

Empirical Results

The purpose of this section is to summarize the results of some initial experimentation with the programming model of school finance in New York described above. A more complete description of the results is in Colburn (1981).

A rather small number of alternatives is examined and the emphasis placed on modifications of existing state aid formulas that could possibly contribute to equalizing educational opportunity. Actual approved operating expenditure levels of school districts in 1979-80 serve as the base to which the effects of increased costs, equalized monetary expenditures, equalized real expenditures of funds from state and local sources are compared. The implications for taxpayers are also examined in detail.

Before reporting the empirical results a "base run" is examined carefully. The base run is compared with the existing school finance situation in New York State in order to verify the model (e.g., determine how closely the model reflects actual expenditures, aid and tax rates in the base year, 1979-80). Provided that the correspondence is acceptable, other solutions of the model may then be compared to the base case.

Base Case and Model Verification

The first solution to the programming model is designed to minimize state aid obtained under conditions closely representing the existing situation as depicted in 1980-81 aid projections obtained from the New York State Department of Education. Expenditure levels are assumed to be the same as 1979-80 approved operating expenses (AOE); the two state aid allocation parameters are set at $X_1 = 0.51$ and $X_2 = 0.8$; and the flat grant provision remained at $360 per TAPU. Ceilings on local property tax rates are set at $35 per $1000 full value; but no district is required to tax at this limit.[31] In this particular case, the programming

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[30]The $35 per $1,000 full value tax rate was slightly above the minimum tax rate required to obtain a feasible solution assuming X_1=0.51, X_2=0.89 and expenditures at 1979-80 levels. Assuming inflated expenditures required tax rate limits just unddr $45 per $1,000.

[31]In calculating tax rates to reflect current property tax burdens, one must have access to the full value of property taxable for schools in the current year. These data are not available and tax rates are therefore calculated on the basis of tax rolls lagged two years. This procedure suggests that the tax rates reported are slightly higher than would be required to raise equal revenue from current tax rolls. That

model acts as little more than an accounting device because all the parameters of the aid formula are specified.

Using the information in table 9, the base programming solution can be compared with the 1980-81 aid projections. In the base programming solution, school operating expenditures across the state would total more than $6.9 billion. This is less than 2% higher than the 1980-81 projections. The slight discrepancy is explained by the fact that projected expenditures were calculated by summing 1979-80 actual approved operating expenses over all districts, while the programming model computes total expenditures by multiplying local and state expenditures per TAPU by 1980-81 estimates of TAPU. Between the two school years, TAPU increased by nearly 2%.

Given these expenditure levels and the 1980-81 aid formula, approved operating expenses per TAPU in the base programming solution averaged $2,241 statewide. Of this total, $883 or 39% would be distributed through the state aid formula. The remaining 61% would be raised through local property taxes, at an average tax rate of $18.53 per $1,000 full value. (See footnotes 23 and 31 for an explanation of why relative changes in tax rates are more important than the absolute tax rates).

A more detailed analysis of this "base" situation is provided in table 10 in which information is provided for New York's six major cities and six groups of districts across the state. Approved operating expenditures for these district groups averaged $1,923 in 1979-80, with the state sharing in 47% of this expenditure level. Even though the state shares only in some proportion of the first $1,700 in expenditures, this percentage is remarkably close to the aid ratio of 0.49 set for tier 1 aid for a district of average wealth. Approved operating expenses per pupil ranged widely, from a high in Yonkers of $2,790 to a low of $1,699 in the group 1 districts (e.g., districts with the lowest wealth in terms of property value per student). State aid per TAPU is significantly higher in this group of districts ($1,329). State aid accounts for 78% of AOE in group 1 compared with 17% in Yonkers. Group 6 districts are the only ones that receive a smaller proportion of expenditures in state aid than Yonkers. These districts are extremely wealthy in property value per student and are subject to the flat grant provision in the current aid formula and are limited to aid per pupil of $360.

Local property tax rates needed to generate local shares of expenditures vary widely as well. Tax rates in only one of the six large cities are under $20 per $1,000 full value. For the districts in the rest of

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(footnote 31 (cont.))

is, these rates do not reflect the general statewide increases in the value of real property taxable for schools, estimated at 13% between 1975 and 1977 and at 12% between 1976 and 1978 (Office of the State Comptroller, 1979). Consequently, emphasis is given to relative tax changes throughout the analysis; they are inaccurate only to the extent that property values have increased disproportionately across school districts. This also partially explains why tax rates in the model are allowed to increase above the constitutional limit of $20 per $1,000 full value.

Table 9. Approved Operating Expenditures, State Aid and Local Spending for Schools in New York

Item	1980-81 Projections[a]	Base Programming Solution[b]	Percentage Difference Base is from Actual
Expenditures[c]			
Total	$6,801,330,180	$6,914,557,221	1.6
Per $TAPU_t$	2,204	2,241	
State Aid[d]	(40.0)[e]	(39.4)	
Total	2,723,445,495	2,724,836,248	0.5
Per $TAPU_t$	882	883	
Local Contribution	(60.0)	(60.6)	
Total	4,077,884,685[f]	4,189,720,973	2.7
Per $TAPU_t$	1,321	1,357	
Local Property Tax Rate[g] ($/thousand of Full Value)	18.04	18.53	

[a] Based on data from The Budget Division, 1980.

[b] Based on linear programming model described in section 3 and table 7.

[c] Total expenditures were assumed to be the same as 1979-80 approved operating expenses. Projected expenditures were calculated by simply summing the 1979-80 approved operating expenses for all districts. Total expenditures for the base run, however, were calculated by multiplying TAPU for 1980-81 by local spending per TAPU and state spending per TAPU and summing over all groups. Because the 1980-81 TAPU total (3,086,148) is 1.8% more than the 1979-80 total (3,032,605), total expenditures in the base run should over estimate slightly total 1979-80 approved operating expenses.

[d] Total state aid includes tier 1, tier 2 and flat grant aid for the base programming solution.

[e] Numbers in parentheses represent percent of total expenditures.

[f] Total local spending was computed by subtracting total state aid from total expenditures.

[g] Tax rates based on property tax rolls in 1977-78.

Table 10. Wealth, State Aid and Property Tax Rates for New York School Districts, by Wealth Group

Wealth Groups[a]	FV/ $RTAPU_{(t-2)}$ 1978-79	AOE/ $TAPU_{(t-1)}$ 1979-80	State Aid/$TAPU_{(t)}$ 1980-81 Projected[b]	State Aid/$TAPU_{(t)}$ Base LP Run[c]	Property Taxes ($ Per 1,000 Full Value) 1980-81 Projected	Base LP Run	1979-80 Actual[e]
New York City (30.9)	$86,338	$2,290	$ 803	$ 804	21.70	21.67	21.35
Buffalo (1.6)	52,427	2,201	1,023	1,024	22.45	22.42	20.20
Rochester (1.2)	69,975	2,621	797	797	26.07	26.07	24.80
Syracuse (0.7)	62,559	2,261	892	893	21.88	21.87	20.30
Yonkers (0.8)	96,570	2,790	464	466	24.30	24.32	21.90
Albany (0.3)	93,167	2,235	507	506	18.55	18.56	17.50
Rest of State (64.4)	67,048	1,923	910	910	14.62	14.62	14.23
Group 1 (3.1)	28,810	1,699	1,328	1,329	12.95	12.94	14.05
Group 2 (24.5)	43,255	1,721	1,142	1,142	13.36	13.37	13.68
Group 3 (17.9)	56,565	1,785	942	942	15.15	15.15	12.43
Group 4 (8.0)	77,095	2,017	707	706	16.95	16.96	17.07
Group 5 (5.0)	95,485	2,261	475	477	18.68	18.66	15.36
Group 6 (5.9)	158,492	2,534	360	360	14.15	14.15	12.63

[a] See tables 6 and 7 for group definitions. Group 1 represents the school districts with the smallest full value property per TAPU. Numbers in parentheses indicate TAPU in each group as a percentage of total.

[b] The Budget Division, 1980 and based on 1979-80 AOE.

[c] See table 7 for "base run" assumptions.

[d] Based on 1978-79 tax rolls.

[e] Tax rates in the model are calculated as R_{it} in equation (19); tax rates applied to $FV_{i(t-2)}/RTAPU_{i(t-2)}$ are equal to a district's local expenditures per TAPU. Actual tax rates were calculated differently. Total AOE for 1979-80 minus 1979-80 final selected operating aid were divided by $FV_{i(t-2)}/RTAPU_{i(t-2)}$ to compute actual tax rates. The difference occurs in the use of 1979-80 final selected operating aid which includes small amounts of aid such as special aid, growth aid and other provisions such as save harmless. These considerations explain why actual tax rates are generally lower than rates for the base run. One might expect similar reductions to occur in 1980-81 if other aid figure were available.

the state, property tax rates average $14.62 per $1,000 full value and there is a positive, but relatively weak, relationship between operating expenditures per pupil and tax rates. The poorest group of districts have an average tax rate of $12.94 per $1,000 full value. This rate increases as one moves to groups of districts with more wealth per pupil until one reaches group 6. The wealth per student in group 6 is over 5 times as large as in group 1, yet the tax rate is only 10% higher in group 6.

From a policy perspective, it is important to know the extent to which the flat grant provisions contribute to this relatively weak relationship. Group 6 districts are the only ones affected by this provision. Were flat grants to be eliminated from the aid formula, the local contribution to operating expenses from these districts would have to increase from $2,174 to $2,534 or by about 17%. Tax rates would remain below those in groups 4 and 5. Because less than 6% of the state's aidable pupil units are in flat grant districts, the impact on total state aid would also be relatively small. Total aid would fall from $2,725 million to $2,606 million, a decrease of less than 5%.

Alternative Expenditure Levels under Existing Aid Structure

From the standpoint of calculating state aid, approved operating expenses are always lagged one year. In addition, the programming calculations for the base case and the implied tax rates assume that actual expenditures in 1980-81 would remain at the approved levels in the previous year. This was appropriate in terms of verifying the model and setting the stage for the comparison of alternatives. However, actual 1980-81 expenditure levels in most districts would undoubtedly be higher, at least by some general rate of inflation. To reflect this situation the base expenditure levels in all districts were inflated by a constant 11.25%, the rate of inflation indicated by the Consumer Price Index during calendar year 1979. A summary of the programming results under these new expenditure levels is given in tables 11 and 12. In comparing this situation to the base case one can estimate the impact on local districts of a state aid formula remaining constant for two successive years.

The linear programming solution corresponding to this situation is LP Run 2. Total school expenditures in the state would rise from $6.9 billion to approximately $7.7 billion. Average expenditures per pupil would increase to almost $2,500 and range across the 79 school district aggregates used for programming purposes from $1,600 to $4,036 per TAPU (see Colburn, 1981 for details). Because it is assumed that state aid is not changed, the state's share of total spending falls to 35% while the local share would increase to nearly 65%. Average tax rates would increase by nearly 18%.[32]

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[32]Because of the additional local effort required, tax rates were allowed to go above $35 per $1,000 full value.

Table 11. Alternative Assumptions in the Linear Programming Model Runs

Run Number	Assumptions (a) Expenditure/TAPU (b) Tiers 1 and 2 aid ratio (c) Tax rate ceiling (d) Flat grant level	Solution: Expenditures Total (millions)	Expenditures Per TAPU	State Share Per TAPU	State Share % Total	Local Share Per TAPU	Local Share % Total	Tax Rates $/$1,000 FV
1 (Base Run)	(a) 1979-80 AOE (b) $X_1 = 0.51$, $X_2 = 0.80$ (c) $35/$1,000 FV (d) $360/TAPU	$6,915	$2,241	$883	39.4	$1,358	60.6	18.53
2 (Inflated)	(a) (1979-80 AOE) (1.1125) (b) $X_1 = 0.51$, $X_2 = 0.80$ (c) $45/$1,000 FV (d) $360/TAPU	7,692 (11.2)[a]	2,492 (11.2)	883 (0)	35.4 (-10.2)	1,609 (18.5)	64.6 (6.6)	21.96 (18.5)
3 (Inflated, Cost Adjusted)	(a) 1979-80 AOE) (1.1125)(CERI)[b] (b) $X_1 = 0.51$, $X_2 = 0.80$ (c) $45/$1,000 FV (d) $360/TAPU	7,766 (12.3)	2,516 (12.3)	883 (0)	35.1 (-10.9)	1,633 (20.3)	64.9 (7.1)	22.29 (20.3)
4 (Inflated, Equalized)	(a) $2,336 (b) $X_1 = 0.51$, $X_2 = 0.80$ (c) $45/$1,000 FV (d) $360/TAPU	7,209 (4.3)	2,336 (4.3)	883 (0)	37.8 (-4.1)	1,453 (7.0)	62.2 (2.6)	19.84 (7.1)
5 (Inflated, Equalized, Cost Adjusted)	(a) ($2,336)(CERI) (b) $X_1 = 0.51$, $X_2 = 0.80$ (c) $45/$1,000 FV (d) $360/TAPU	7,263 (5.0)	2,353 (5.0)	883 (0)	37.5 (-4.8)	1,470 (8.2)	62.5 (3.1)	20.07 (8.3)
6 (Leveled-up)	(a) Leveled-up to 65th percentile[c] (b) $X_1 = 0.51$, $X_2 = 0.80$ (c) $45/$1,000 FV (d) $360/TAPU	8,209 (18.7)	2,660 (18.7)	883 (0)	33.2 (-15.7)	1,777 (30.9)	66.8 (10.2)	24.26 (30.9)
7 (Inflated without flat grant)	(a) (1979-80 AOE)(1.1125) (b) $X_1 = 0.51$, $X_2 = 0.80$ (c) $45/$1,000 FV (d) 0	7,692 (11.2)	2,492 (11.2)	844 (-4.4)	33.9 (-13.9)	1,648 (21.4)	66.1 (9.1)	22.50 (21.4)
8 (1979-80 AOE Optimal X_1, $X_2 \leq 0.87$)	(a) (1979-80 AOE) (b) $X_1 = 0.54$, $X_2 = 0.87$ (c) $35/$1,000 FV[c] (d) $360/TAPU	$6,915 (0)	$2,241 (0)	$ 844 (-4.4)	37.7 (-4.3)	$1,397 (2.9)	62.3 (2.8)	19.07 (2.9)
9 (Inflated, Optimal X_1, X_2)	(a) (1979-80 AOE)(1.1125) (b) $X_1 = 0.37$, $X_2 = 0.0$ (c) $35/$1,000 FV (d) $360/TAPU	7,692 (11.2)	2,492 (11.2)	1,096 (24.1)	44.0 (11.7)	1,396 (2.8)	56.0 (-7.6)	19.06 (2.9)
10 (Inflated, Optimal X_1, $X_2 \leq 0.87$)	(a) (1979-80 AOE)(1.1125) (b) $X_1 = 0.54$, $X_2 = 0.87$ (c) $45/$1,000 FV (d) $360/TAPU	7,692 (11.2)	2,492 (11.2)	844 (-4.4)	33.9 (-14.0)	1,648 (21.3)	66.1 (9.1)	22.50 (21.4)
11 (Inflated, Equalized Optimal X_1, X_2)	(a) $2,336 (b) $X_1 = 0.49$, $X_2 = 0.0$ (c) $35/$1,000 FV (d) $360/TAPU	7,209 (4.3)	2,336 (4.3)	955 (8.2)	40.9 (3.8)	1,381 (1.2)	59.1 (-2.5)	18.85 (1.7)
12 (Inflated, Equalized, Cost Adjusted)	(a) ($2,336)(CERI) (b) $X_1 = 0.49$, $X_2 = 0.0$ (c) $35/$1,000 FV (d) $360/TAPU	7,263 (5.0)	2,353 (5.0)	950 (7.6)	40.4 (2.5)	1,403 (3.3)	59.6 (-1.7)	19.15 (3.0)
13 (Inflated, Cost Adjusted, Optimal X_1, X_2)	(a) (1979-80 AOE)(1.1125)(CERI) (b) $X_1 = 0.22$, $X_2 = 0.0$ (c) $35/$1,000 FV (d) $360/TAPU	7,766 (12.3)	2,516 (12.3)	1,279 (44.8)	50.8 (28.9)	1,237 (49.2)	49.2 (-18.8)	16.89 (-8.8)

Note: In all programming runs, combined state aid to all districts is being minimized.

[a] Numbers in parentheses indicate percentage changes from the base run.

[b] CERI are cost of educational resource indices.

[c] The leveled-up expenditure level was $2,546 per TAPU.

Table 12. Effects of General Inflation and Cost of Educational Resources on Average Expenditures and Tax Rates for New York School District Groups

Wealth Group[a]	Average Expenditures $/TAPU			Average Tax Rates ($/1,000 Full Value)		
	Base LP Run	% Change for Inflation Adjustment (LP Run 2)	% Change for Inflation and Cost Adjustments (LP Run 3)[b]	Base LP Run	% Change for Inflation Adjustment (LP Run 2)	% Change for Inflation and Cost Adjustments (LP Run 3)[b]
New York City	2,290	11.2	16.8	21.67	20.5	30.6
Buffalo	2,201	11.2	14.6	22.42	21.1	27.4
Rochester	2,621	11.2	13.5	26.07	16.1	19.3
Syracuse	2,261	11.2	13.5	21.87	18.6	22.3
Yonkers	2,790	11.2	18.0	24.32	13.5	21.5
Albany	2,235	11.2	22.3	18.56	14.5	28.1
Rest of State	1,923	11.2	5.0	14.62	26.7	9.2
Group 1	1,699	11.2	0.1	12.94	51.5	0.6
Group 2	1,721	11.2	4.4	13.37	24.0	12.6
Group 3	1,785	11.2	4.8	14.22	23.9	10.3
Group 4	2,017	11.3	5.7	16.96	17.3	8.6
Group 5	2,261	11.2	7.7	18.66	14.2	9.7
Group 6	2,534	11.2	8.9	14.15	13.1	11.4

[a] See tables 6, 7 and 10 for definition of groups.

[b] See table 11 for the assumptions underlying these linear programming solutions. Percentage changes are from base case.

While expenditures are increased by a constant percentage, the tax rates implied by this inflation adjustment rise by varying amounts and in most districts by more than the expenditure increase. The average tax rate for the six groups of upstate districts is about 27% above what it is in the base run. However, group 1 districts would have to raise tax rates by over 50% to compensate for the general inflation rate while flat grant districts, group 6, would need to increase tax rates by only 13.1%. Tax rate increases in the other 4 groups vary between these ranges and decline as property wealth per pupil rises.

The proportion of total expenditures from state sources is reduced if expenditures are increased and state aid remains constant. In Yonkers, for example, the state contributes 15% of total expenditures, up two percentage points from the base case. In the poorest wealth group, the state share is reduced to 70%.

Based on the detailed results reported in Colburn (1981), this situation can be viewed from a slightly different perspective. Tax rates across the 79 school district aggregates range from $8.40 to $39.40 per $1,000 full value. The low end of the range occurs within the flat grant districts while the top end of the range is associated with a district aggregate receiving both tier 1 and tier 2 aid. As one might expect, the range in tax rates is every bit as large as in the base case, where the range in tax rates across the district aggregates is from $4.80 to $30.95 per $1,000 full value.

This analysis suggests that an annual updating of the state aid formula is more critical for the poorer districts than for the richer ones. A simple ratio of the relative changes in tax rates to relative changes in expenditures for the various groups enables one to compare directly the effects of a one percent increase in expenditures on tax rates. For all six groups this ratio suggests that tax rates must rise by 2.4% for a one percent increase in expenditures. For the poorest districts, this percentage is nearly double that of the six group average (4.6%), while in the districts receiving only tier 1 aid (group 5) and flat grant districts (group 6) the percentage increase in tax rates relative to an increase in expenditures per pupil is less than 1.3%.

In evaluating these results some would argue this higher elasticity in poorer districts is less significant than it appears on the surface because of differential costs of providing services or differential inflation rates the financial needs of poorer upstate districts may not rise as fast as in urban areas. No data exist on relative rates of inflation in various school districts so it is impossible to examine the validity of this argument directly. But, by using an index for the cost of educational services, the implications can be examined indirectly (Wendling, 1979). That is, in LP Run 3, the base expenditure levels adjusted for general inflation were adjusted a second time to account for differential costs of educational services. The results of this adjustment are also reported in tables 11 and 12.

The immediate impact of this adjustment is a significant change in average expenditures per TAPU among the groups of districts. The percentage change in expenditures from the base case is greater than (less

than) the general rate of inflation when the cost index is larger (smaller) than unity. For the state as a whole, additional expenditures in high cost districts relative to the state's norm more than offset any savings due to expenditure decreases justified in low cost areas but, at the state level, spending, state aid, and tax rates in the aggregate differ only slightly from the case in which only general inflation is reflected (table 11). However, when taken as a group, the only districts whose cost index exceed unity are the six major cities.[33] For district aggregates in which the average cost index is less than unity expenditures used in LP Run 3 fall below those in LP Run 2. For example, the district aggregate spending the smallest amount under this cost adjusted scheme spends at a rate of $1,406 per TAPU. At the other end of the range one district aggregate would have AOE of $4,271 per TAPU if this cost adjustment were put into effect (see Appendix E of Colburn, 1981, for these details).

The implications of these new spending levels are particularly significant for some wealth groups. Were the state to attempt to minimize the possibility of further disparities in educational opportunity by encouraging districts to adjust any anticipated expenditure increases by this cost of services index, districts in the lowest wealth group (group 1) would have to reduce expenditures by an amount nearly equal to the 1979 general rate of inflation. Other groups of districts in upstate New York would be unable to raise expenditures sufficiently to compensate entirely for general inflationary trends.

While placing a burden on local school districts, such cost adjustments would mean significant benefits to local taxpayers. Rather than the more than 50% increase in property taxes required to finance increased expenditures due to general inflation, tax rates would rise by less than 1% (compared to the base case) due to the cost adjustment. Tax rate decreases would also occur in other upstate districts but the effects would be less dramatic. When compared to the base case, tax rates would increase an average of 9%.[34]

In New York City and other large cities around the state, the situation would be reversed. Cost adjustments, implying expenditures in excess of those needed to keep up with the general rate of inflation would be required. When compared to the tax rates implied by base level expen-

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[33]This does not imply that all districts within each of the groups have cost indices below unity. For programming purposes there were 79 district aggregates, 70 of which were distributed in groups 1-6. The number of district aggregates with cost indices above unity were as follows: group 1, 0; group 2, 3; group 3, 3; group 4, 0; group 5, 3; and group 6, 4 (see Colburn, 1981, for details).

[34]Even though the expenditure increases required as a result of cost adjustments have been changed significantly when compared to the general inflationary situation, the poorer districts still must increase tax rates by a significantly larger percentage to increase expenditures by one percent than do the richer districts.

ditures, property tax rates in New York City would increase by more than 30%. Rochester, New York, would need the lowest tax rate increase of all major cities, only 19.3% above the base situation.

Forcing school districts to adjust expenditure increases to reflect differences in educational services would be but an incremental step in equalizing educational opportunity as measured by real spending power. At the other extreme, one could equalize spending across all districts at some average level and adjust those expenditures in turn by the index of cost of educational resources. These two situations are represented in tables 11 and 13.

Requiring school districts to spend at an average level can be viewed in light of the direct relationship existing between property wealth and expenditures per TAPU. Because richer districts generally spend more per pupil, they would have to reduce expenditures to reach the average level, while poorer districts would have to raise expenditures. This relationship holds true for the six aggregate wealth groups, when expenditures are set at the state average AOE for 1979-80, adjusted for inflation. Group 1, for example, must increase expenditures by nearly 24% over its previous level adjusted for inflation to reach this equalized level of $2,336 per TAPU, while group 4 requires only 4% increase. Richer districts in group 5 and group 6 would have to reduce expenditures (7% and 17%, respectively), to spend at this equalized average level, as would New York City and the other 5 urban areas. The largest relative reduction would occur in Yonkers (25%). The net effects statewide of forcing school districts to spend at the inflated, but equalized level, of $2,336 per TAPU are a reduction in total spending of 5%, or approximately $480 million, as compared with LP Run 2 (table 11) and a 10% decrease in property tax rates.

Financing these changes in expenditure levels requires a significant increase in average tax rates for the poorer wealth groups. Groups 1 and 2 must increase their taxing efforts by 79% and 67%, respectively, in order to reach the equalized spending level. However, groups 5 and 6 can reduce tax burdens by about 9% and 18%, respectively. These reductions are approximately the same as the spending level reductions. Of the large urban districts, the largest reductions in tax rates are in Yonkers (29%) and Rochester (27%).

Some of the large increases in expenditures and tax rates in the lower wealth groups required for these groups to reach the average level are partially offset when expenditures are adjusted for cost of educational resource differentials among school districts. This situation is depicted in LP Run 5 (see table 11 and 13). In all six groups the expenditures as a result of the cost adjustment are lower than the $2,336 equalized level. In the first three groups they remain above 1979-80 approved operating expenditure levels adjusted for inflation. For group 4, however, the reduction in expenditures due to the cost adjustment outweighs the increase due to the equalization process. Because the cities were spending at levels higher than the state average and their cost indices are all greater than unity, the reduction in expenditures due to the equalization is somewhat dampened by the cost adjustment. In Albany the cost index is sufficiently high to more than compensate for the

Table 13. Effects of Equalizing Expenditures and Adjusting for Cost of Educational Resources on Average Expenditures and Tax Rates for New York School Districts

Wealth Group[a]	Average Expenditures ($ /TAPU)			Average Tax Rates ($/1,000 Full Value)		
	Inflation Adjusted (LP Run 2)[b]	% Change for Inflated and Equalized Expenditures (LP Run 4)[b]	% Change for Inflated, Equalized, and Cost Adjusted Expenditures (LP Run 5)[b]	Inflation Adjusted (LP Run 2)	% Change for Inflated and Equalized Expenditures (LP Run 4)[b]	% Change for Inflated, Equalized and Cost Adjusted Expenditures (LP Run 5)[b]
New York City	2,547	- 8.3	- 3.7	26.11	-13.2	- 5.6
Buffalo	2,448	- 4.6	- 1.7	27.15	- 7.8	- 2.9
Rochester	2,916	-19.9	- 2.7	30.28	-27.4	-25.2
Syracuse	2,516	- 7.2	- 5.3	25.94	-11.1	- 8.2
Yonkers	3,104	-24.7	-20.2	27.61	-29.1	-23.8
Albany	2,486	- 6.0	3.4	21.26	- 7.6	4.2
Rest of State	2,137	9.3	2.4	18.53	32.9	15.5
Group 1	1,890	23.6	11.3	19.61	78.8	37.4
Group 2	1,914	22.0	14.1	16.58	66.9	45.2
Group 3	1,985	17.7	10.4	17.62	35.0	20.9
Group 4	2,245	4.1	- 2.0	19.90	6.3	- 2.7
Group 5	2,515	- 7.1	-10.8	21.31	- 8.7	- 4.9
Group 6	2,815	-17.0	-19.6	16.01	-17.9	- 3.3

[a] See tables 6, 7 and 10 for definition of wealth groups.

[b] See table 11 for the assumptions underlying these runs. Percentage changes are from LP Run 2.

reduction and expenditures actually increased. Because in these analyses, state aid has been fixed in dollar terms the tax rate changes implied by these cost adjustments are similar to the expenditure changes. They are summarized in table 13.

Although the idea of equalizing expenditure levels at some state average, either with or without a cost adjustment, is appealing, from a political perspective any reduction in school expenditures is difficult to implement. Such adjustments might ultimately be mandated by the courts, but an alternative might be to define equal educational opportunity in terms of some minimum level of expenditures. Such a procedure was recommended by the Fleischmann Commission in the early 1970's in which operating expenditures would be leveled-up to the 65th percentile of districts when ranked from low to high in terms of spending per pupil. In the situation where 1979-80 AOE are adjusted for general inflation this 65th percentile would be at $2,546 per TAPU. Under this scheme, districts spending above this level would not be required to reduce their level of effort.

According to table 11 such a scheme would have a considerable impact on school spending statewide. Total operating expenses would rise to 8.2 billion, a 19% increase over and above the 1979-80 levels, or 13% above the expenditure levels adjusted for inflation. With no change in the state aid formula, the state's share of school expenditures would fall from 39% in the base case to 33%. Average tax rates would increase to 24.26 per $1,000 full value.

Most of this increase in tax rates occurs in poorer districts previously spending at levels well below $2,546 per TAPU. Compared with inflated expenditure levels group 1 has to more than double local school taxes while group 2 requires a 96% increase to meet the leveling-up expenditure floor (table 14). The richer groups, containing some school districts already spending above $2,546 per TAPU, are not affected as strikingly as groups 1 and 2. Groups 5 and 6 have to increase tax rates by only 10% and 14%, respectively, in order to comply with the new expenditure levels.

Urban school districts are affected only slightly by leveling-up expenditures due to the fact that these districts are spending at high levels already. Rochester and Yonkers, for example, do not require any increases in tax rates or expenditures. The largest increase in expenditures for the urban areas is 4% in Buffalo which translates into an increased tax rate of 7%.

Solving for Optimal Levels of X_1 and X_2

Up to this point, a number of spending alternatives have been examined, but it was assumed that no change occurred in the state aid formula. This is certainly unrealistic, particularly in the cases where large changes in expenditures are required.

The simplest way to allow for increased aid would be to raise expenditure ceiling levels, C_1 and C_2, thereby increasing the level of

Table 14. Effects of Leveled-up Expenditures on Average Expenditures and Tax Rates for New York School Districts

Wealth Group[a]	Average Expenditures ($/TAPU)		Average Tax Rates ($/1,000 Full Value)	
	Inflation Adjusted (LP Run 2)[b]	% Change for Leveled-up Expenditures (LP Run 6)[b]	Inflation Adjusted (LP Run 2)[b]	% Change for Leveled-up Expenditures (LP Run 6)[b]
New York City	2,547	0.3	26.11	0.9
Buffalo	2,448	4.0	27.15	6.9
Rochester	2,916	0.0	30.28	0.0
Syracuse	2,516	1.2	25.94	1.2
Yonkers	3,104	0.0	27.61	0.0
Albany	2,486	2.4	21.26	3.0
Rest of State	2,137	23.6	18.53	41.8
Group 1	1,890	34.7	19.61	116.0
Group 2	1,914	33.0	16.58	96.3
Group 3	1,985	28.7	17.62	56.0
Group 4	2,245	16.2	19.90	24.1
Group 5	2,515	8.4	21.31	10.4
Group 6	2,819	11.2	16.01	14.4

[a] See tables 6, 7 and 10 for definition of groups.

[b] See table 11 for the assumptions underlying these runs. Percentage changes are from LP Run 2.

expenditures per TAPU in which the state would share. However, within the context of this programming model, no optimal levels of C_1 and C_2 could be determined because of the non-linearity created by introducing C_1 and C_2 as decision variables (equation 9).

Another way to change the state aid formula is to solve for optimal levels of X_1 and X_2, the state shares of a district of average wealth for tier 1 and tier 2 aid, respectively. By setting an upper tax limit of $35 per $1,000 full value, the state is forced to adjust aid apportionment to meet new expenditure levels of local school districts. In this section, the effects of solving for state-aid minimizing levels of X_1 and X_2 on tax rates, total state aid, and state aid per TAPU are examined in light of alternative expenditure schemes.

In order to analyze the effects of treating X_1 and X_2 as decision variables on state and local expenditures, one must have an understanding of which LP run comparisons make the most sense. Ideally, comparisons of solutions with exactly the same assumptions (except that in one solution X_1 and X_2 are optimal and in the other X_1 and X_2 are fixed at 0.51 and 0.80, respectively) would give the best indication of changes in the school financing system caused by solving for optimal levels of X_1 and X_2. These ideal comparisons are impossible to make because solutions for all expenditure assumptions except the base run are infeasible if X_1 and X_2 are fixed at current levels and tax rate ceilings are set at $35 per $1,000 full value. Comparisons of solutions assuming optimal levels of X_1 and X_2 with tax rates limited to $35 per $1,000 full value are, therefore, made with solutions assuming X_1 and X_2 fixed at current levels and tax rate ceilings at $45 per $1,000 full value. During the initial phases of the analysis, it was indicated that optimal levels of X_2 for all expenditure levels are above 0.87 when tax rate ceilings are set at $45 per $1,000. This implies negative tier 2 aid and is consistent with a District Power Equalization strategy. These solutions are discussed in the next section. The discussion in the remainder of this section assumes that $X_2 \leq 0.87$; tier 2 aid is restricted to be positive.

The general effect of keeping tier 2 aid positive and tax rates below $45 per $1,000 full value is shown in table 11, LP Runs 8 and 10. In both cases X_2 increases to its upper limit, 0.87. This implies that the state's share of the tier 2 aid ceiling C_2, for a district of average wealth is only 13%, down from the level in the present aid formula of 20%. The state's share of tier 1 aid for the district of average wealth is also reduced in LP Runs 8 and 10 from 49% to 46%. Despite the changes in these parameters, the implications for state aid to education are insignificant if one allows tax rates to reach $45 per $1000 of full value. By comparing LP Runs 8 and 10 with LP Runs 1 and 2, respectively, it is clear that total state aid under the 1980-81 aid formula is less than 5% higher than in the case where X_1 and X_2 are set at optimal levels.

The results change dramatically if one imposes a limit on property tax rates of $35 per $1,000 on school districts and solves for state aid minimizing levels of X_1 and X_2. Comparisons of LP Run 9 with LP Run 2 and LP Run 11 with LP Run 4 in table 11 illustrate this situation. For

the case where assumed expenditure levels are adjusted only for inflation, the optimal values of X_1 and X_2 fall to 0.37 and 0.0, respectively, indicating that the state pays 64% of the tier 1 ceiling level and the entire tier 2 ceiling level of $100 to the district of average wealth. With total expenditures adjusted for inflation at $7,692 million, the state pays 44% or $1,096 per TAPU, on average. This is 24% above the $883 per TAPU paid by the state when $X_1 = 0.51$ and $X_2 = 0.80$. Similar, but less dramatic, patterns are noticed even when these inflated expenditures are equalized at $2,336 per TAPU. Optimal levels of X_1 and X_2 fall to 0.49 and 0.0, respectively. The state pays 51% of the tier 1 ceiling to the district of average wealth while all districts eligible for tier 2 aid receive a "flat grant" of $100 per TAPU, the tier 2 ceiling level. The share of total expenditures paid by the state is increased to 41% from 38% under the current aid formula.

A more detailed account of the effects of treating X_1 and X_2 as decision variables is given in table 15. By keeping expenditure levels constant and comparing LP Run 2 with LP Run 9 the effects of solving for optimal levels of X_1 and X_2 on state aid and tax rates are isolated.

Richer districts, excluding flat grant districts, receive a greater relative increase in state aid compared to poorer ones. For example, state aid is increased by 49% and 66% in groups 4 and 5, respectively, while in groups 1 and 2 there are increases of approximately 10% and 17%, respectively. This pattern also exists in the large urban areas with the largest increases in aid occurring in Yonkers (68.1%) and Albany (59.6%). Had they not been treated separately, these two districts would be grouped in wealth group 5.

An interesting comparison of the state's shares can be made by examining groups with the largest and smallest relative changes in state aid under the modified aid system. The increase in state aid to Yonkers in LP Run 9 causes the state's share of total expenditures to increase to 25%. This is 10 percentage points above the state's share under identical expenditures but using the 1980-81 aid formula, and 8 percentage points above the base run. The state's share in group 1, however, increased to 77%, 7 percentage points over the share apportioned under the 1980-81 aid formula, but one percentage point below the base run. Under the modified aid formula, increased expenditures are compensated almost identically in the poorer group from a state's share perspective, while in the richer Yonkers, the new formula overcompensates for increased expenditure levels.

Relative tax rate reductions are greatest in poorer groups. Group 1 tax rates are reduced by 22%, while group 5 tax rates decrease by only 17%. A simple ratio of relative increases in state aid to relative reductions in tax rates roughly indicates the effect of a one percent increase in state aid on tax rates. In group 1, a one percent increase in state aid reduces tax rates by 2.3%. However, in group 5, the same percentage increase in state aid reduces tax rates by only 0.3%. This implies that state aid is much more effective in reducing tax rates at the lower end of the wealth scale.

By comparing LP Run 11, which assumes equalized expenditures, to LP Run 2, it is clear that an equalized expenditure scheme requires a

tremendous increase in tax effort from wealth groups 1, 2 and 3 even under optimal levels of X_1 and X_2 (table 15). Other wealth groups including the large urban areas have to reduce tax rates to spend at the equalized level. The rest of the state which includes the six wealth groups has to increase tax rates, on average, by 25%.

An aid allocation scheme in which X_1 and X_2 are optimal for LP Run 11 when compared with LP Run 4 provides some property tax relief to all wealth groups. This is, of course, at the expense of state aid (table 16). Relative increases in state aid are higher in wealth groups 3, 4 and 5 than in groups 1 and 2. However, as in the previous situation, tax rate decreases are greatest in groups 1 and 2.

From a taxpayer's perspective in the large urban areas, the poorer districts, such as Buffalo, Rochester and Syracuse, benefit the most from apportioning aid through optimal levels of X_1 and X_2. These districts experience the largest percentage decrease in tax rates.

Adjusting equalized expenditures to account for cost differentials among districts in an optimal X_1 and X_2 aid scenario reduces tax rates in all non-urban area wealth groups (table 16). Specifically, groups 1 through 4 experience reductions of 28%, 19%, 17% and 16%, respectively, while in groups 5 and 6, the reductions are only 7% and 3%, respectively. Because state aid remains relatively the same in LP Run 12 as in LP Run 11, these tax rate reductions are the result of reduced expenditures and not from reapportioning aid.

All of the urban areas are adversely affected when expenditures are adjusted for cost differentials. In each case, tax rates are increased over levels in LP Runs 11 and 4. Because these districts face higher cost indices than the rest of the state, on average, they have to increase tax efforts to compensate for the increased costs.

Solving for optimal levels of X_1 and X_2 under tax rate limits of \$35 per \$1,000 full value increases state aid over fixed levels of X_1 and X_2. Apportionment of increased aid over all wealth groups is in a manner in which the richer districts receive greater relative aid increases. However, poorer districts are able to reduce tax rates at a greater relative rate. This implies that additional dollars spent on state aid are more effectively spent, from a taxpayer's perspective, poorer districts.

Because tier 2 aid is constrained to be positive, any modifications in levels of X_1 and X_2 are made within the existing state aid framework. However, if tier 2 aid is allowed to become negative, a change in the basic structure takes place. Although aid is apportioned through the tier 1 aid formula and then is taken away because of negative tier 2 aid, total aid remains positive. This situation describes the district power equalization (DPE) implemented in Wisconsin.

Analysis of District Power Equalization (DPE)

In a pure district power equalization framework, school districts, in effect, face the same tax base per pupil. Property wealth is

Table 15. Effects of Inflation Adjusted and Equalized Expenditures With Optimal Values of X_1 and X_2 on Average Expenditures, State Aid and Average Tax Rates

	Average Expenditures ($/TAPU)			State Aid ($/TAPU)			Average Tax Rates ($/1,000 Full Value)		
Wealth Group[a]	Inflation Adjusted (LP Run 2)[b]	% Change for Inflated Expenditures, Optimal X_1X_2 (LP Run 9)[b]	% Change for Inflated and Equalized Expenditures, Optimal X_1X_2 (LP Run 11)[b]	Inflation Adjusted (LP Run 2)[b]	% Change for Inflated Expenditures, Optimal X_1X_2 (LP Run 9)[b]	% Change for Inflated and Equalized Expenditures, Optimal X_1X_2 (LP Run 11)[b]	Inflation Adjusted (LP Run 2)[b]	% Change for Inflated Expenditures, Optimal X_1X_2 (LP Run 9)[b]	% Change for Inflated and Equalized Expenditures, Optimal X_1X_2 (LP Run 11)[b]
New York City	2,547	0	- 3.7	803	20.5	5.9	26.11	-11.6	-17.2
Buffalo	2,448	0	- 1.7	1,023	22.7	8.8	27.15	-16.2	-14.1
Rochester	2,916	0	- 2.7	797	38.6	14.9	30.28	-14.6	-33.0
Syracuse	2,516	0	- 5.3	892	31.0	12.0	25.94	-17.0	-17.6
Yonkers	3,104	0	-20.2	464	68.1	11.6	27.61	-11.9	-31.1
Albany	2,486	0	- 3.4	507	59.6	9.7	21.26	-15.3	-10.2
Rest of State	2,137	0	2.4	910	22.9	8.0	18.53	-22.0	25.3
Group 1	1,890	0	11.3	1,328	9.6	3.8	19.61	-22.4	70.1
Group 2	1,914	0	14.1	1,142	16.6	6.5	16.58	-24.8	56.6
Group 3	1,985	0	10.4	942	27.5	10.5	17.62	-25.0	25.2
Group 4	2,245	0	- 2.0	707	48.7	18.4	19.90	-22.2	- 2.9
Group 5	2,515	0	-10.8	475	66.1	11.8	21.31	-17.4	-11.2
Group 6	2,819	0	-19.6	360	0	0	16.01	0	-17.9

[a]See table 6, 7 and 10 for definition of wealth groups.

[b]See table 11 for the assumptions underlying these runs. Percantage changes are from LP Run 2.

Table 16. Effects of Equalized Expenditures and Equalized Expenditures Adjusted for Cost Differentials with Optimal Values of X_1 and X_2 on Average Expenditures, State Aid and Tax Rates

Wealth Group[a]	Average Expenditures ($/TAPU)			State Aid ($/TAPU)			Average Tax Rates ($/1,000 Full Value)		
	Equalized Expenditures (LP Run 4[b])	% Change for Equalized Expenditures, Optimal X_1X_2 (LP Run 11)[b]	% Change for Equalized, Cost Adjusted Expenditures Optimal X_1X_2 (LP Run 12)[b]	Equalized Expenditures (LP Run 4)[b]	% Change for Equalized Expenditures, Optimal X_1X_2 (LP Run 11)[b]	% Change for Equalized Cost Adjusted Expenditures, Optimal X_1X_2 (LP Run 12)[b]	Equalized Expenditures (LP Run 4)[b]	% Change for Equalized Expenditures, Optimal X_1X_2 (LP Run 11)[b]	% Change for Equalized Cost Adjusted Expenditures, Optimal X_1X_2 (LP Run 12)[b]
New York City	2,336	0	5.0	803	5.9	5.4	22.66	-4.5	4.7
Buffalo	2,336	0	3.0	1,023	8.9	8.3	25.02	-6.8	18.9
Rochester	2,336	0	2.0	797	14.9	14.1	21.99	-7.7	- 4.2
Syracuse	2,336	0	2.0	892	12.0	11.3	23.06	-7.3	- 3.6
Yonkers	2,336	0	6.0	464	11.6	9.7	19.57	-2.8	5.2
Albany	2,336	0	10.0	507	9.7	7.9	19.65	-2.8	10.5
Rest of State	2,336	0	- 6.3	910	8.0	7.5	24.62	-5.7	-18.4
Group 1	2,336	0	-10.0	1,328	3.7	3.5	35.07	-4.9	-27.7
Group 2	2,336	0	- 6.5	1,142	6.5	6.0	27.67	-6.1	-18.8
Group 3	2,336	0	- 6.2	942	10.5	10.0	23.78	-7.2	-17.1
Group 4	2,336	0	- 5.8	707	18.4	17.3	21.15	-8.7	-16.0
Group 5	2,336	0	- 4.0	475	11.8	9.7	19.46	-2.8	- 7.2
Group 6	2,336	0	- 3.1	360	0	0	13.14	0	- 3.3

[a]See table 6, 7 and 10 for definition of wealth group.

[b]See table 11 for the assumptions underlying these runs. Percentage changes are from LP Run 4.

neutralized; equal tax rates among districts will raise equal revenues. This is achieved by "taxing" away additional revenues raised by districts with access to more resources and apportioning these funds to poorer school districts. However, negative aid for any school district is politically as well as legally (in Wisconsin, for example) infeasible.

Total aid cannot be negative. However, in a two-tier aid system, aid can be apportioned through tier 1 aid and "taxed" away through tier 2 aid in such a way that total aid remains positive. Wisconsin currently implements this type of aid scheme.

In order to apply DPE to all districts in New York State, each district must receive both tiers of aid. A respecification of equations (11) and (13), the state aid constraints for tier 1 only and flat grant districts, is required to include tier 1 and tier 2 aid for these districts. Without respecifying the model, however, a preliminary examination of DPE can be achieved by analyzing only those districts already receiving tier 1 and tier 2 aid.

Tier 1 and tier 2 aid applies only to wealth groups 1 through 4, Buffalo, Rochester, Syracuse and the Bronx and Brooklyn combined as New York City. Analysis of DPE, therefore, applies to only these districts in the model. Two expenditure assumptions are used: 1979-80 AOE adjusted for inflation and 1979-80 average AOE adjusted for inflation. The assumptions in the LP Runs used for analysis of DPE are given in table 17. In LP Runs 14 and 15, tier 2 aid becomes negative.

The largest state shares of expenditures in a DPE aid scheme under both expenditure assumptions occur in solutions which constrain tax rates to be less than $35 per $1,000. The state pays, on average, $1,267 per TAPU or 62.1% of inflated expenditure levels (LP Run 9-A). This is about 22% above state expenditure under the current aid formula. If districts spend at the state average (LP Run 4-A) state aid becomes 48.9% of the total. The state pays 8% more than what is apportioned in the current formula. Larger state shares in these runs are reflected in optimal levels of X_1 and X_2. In both runs, $X_2 = 0.0$ which apportions $100 per TAPU to all districts eligible for tier 2 aid. In the current formula $X_2 = 0.8$, which distributes only $20 per TAPU to the district of average wealth. The state's share of tier 1 aid for the district of average wealth in LP runs 9-A and 4-A at 63% and 51%, respectively, is also greater compared to the current state share at 49%.

In a minimization of state aid scheme, the state takes full advantage of being allowed to apportion negative tier 2 aid. For example, $X_2 = 1.74$ in LP Run 14 and $X_2 = 3.05$ in LP Run 15 which determined guaranteed valuation levels at $49,927 per RTAPU and $22,778, respectively.[35] These levels are very low compared to the guaranteed valuation levels in tier 1 aid implied by $X_1 = 0.70$: $99,247 per RTAPU in both LP Runs 14

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[35]Recall that guaranteed valuation levels calculated by dividing the state average full value per RTAPU by X_1 and X_2.

Table 17. Alternative Assumptions in the District Power Equalization Runs

Run Number[a]	Assumptions: (a) Expenditure/TAPU; (b) Tiers 1 and 2 aid ratio; (c) Tax rate ceiling; (d) Flat grant provision	Solution: Expenditures: Total (millions)	Expenditures: Per TAPU	State Share: Per TAPU	State Share: % Total	Local Share: Per TAPU	Local Share: % Total	Tax Rates ($/1,000 FV)
2-A (Inflated)	(a) (1979-80 AOE) (1.1125) (b) $X_1 = 0.51$, $X_2 = 0.80$ (c) $45/$1,000 FV (d) none	$4,664	$2,040	$1,043	51.1	$ 997	48.9	19.74
9-A (Inflated-DPE)	(a) (1979-80 AOE) (1.1125) (b) $X_1 = 0.37$, $X_2 = 0.0$ (c) $35/$1,000 FV (d) none	4,664	2,040	1,267	62.1	773	37.9	15.31
14 (Inflated-DPE, - tier 2 aid)	(a) (1979-80 AOE) (1.1125) (b) $X_1 = 0.70$, $X_2 = 1.74$ (c) $45/$1,000 FV (d) none	4,664 (0.0)	2,040 (0.0)	845 (-19.0)	41.4 (-19.0)	1,195 (19.9)	58.6 (19.8)	23.66 (19.9)
4-A (Inflated, Equalized, DPE)	(a) $2,336 (b) $X_1 = 0.49$, $X_2 = 0.0$ (c) $35/$1,000 FV (d) none	5,340 (14.5)	2,336 (14.5)	1,130 (8.3)	48.4 (- 5.3)	1,206 (21.0)	51.6 (5.5)	23.88 (21.0)
15 (Inflated, Equalized, - tier 2 aid)	(a) $2,336 (b) $X_1 = 0.70$, $X_2 = 3.05$ (c) $45/$1,000 FV (d) none	5,340 (14.5)	2,336 (14.5)	617 (-40.8)	26.4 (-48.3)	1,719 (72.4)	73.6 (50.5)	34.04 (72.4)

[a] These computer runs apply only to expenditures, state aid and taxes in the first four groups of districts, Buffalo, Rochester, Syracuse, the Bronx and Brooklyn in New York City.

[b] Numbers in parentheses indicate percent changes from Run 2-A.

and 15. The result is that the state shares in a small part of total expenditures relative to other solutions. In LP run 15, for example, the state expenditures are $617 per TAPU, a decrease of 41% from the current aid formula. In LP Run 14, the decrease is 19.0%, to a level of $845 per TAPU.

The effect of negative tier 2 aid is reflected in tax rates. An increase in average tax rates by about 20%, to a level of $23.66 per $1,000 full value, is required to make up for reduced state aid in LP Run 14. In LP Run 15, a tax rate of $34.04 per $1,000 full value is required in order to adjust for the aid losses, and the equalized expenditure levels.

The effects of changes in state aid on tax rates by wealth groups is illustrated in table 18. If a $35 per $1,000 full value tax rate is used, as in LP Run 9-A, all wealth groups receive increases in state aid. The largest increases occur in the wealthier districts; group 4 realizes a 49% increase while group 1 receives only a 10% increase. Tax rate reductions are slightly higher in wealth group 1 than in wealth group 4, consistent with the results found previously.

When tier 2 aid is unconstrained and becomes negative under $45 per $1,000 tax rate assumptions, all wealth groups receive reductions in aid compared with current levels. Consequently, all tax rates are increased. The largest reduction in aid occurs in group 4, a decrease of 62%. The lowest, in group 1, is a 12% reduction. In urban areas, reductions in aid range from about 18% in New York City to about 49% in Rochester.

State shares of total expenditures are reduced considerably in run 14 with negative tier 2 aid as compared to the current aid formula in Run 2-A. In wealth group 4, a reduction of aid by 61% reduces the state share of total expenditures from 31% to 12%. In group 1, a 12% reduction in aid reduces the state share from 70% to 62% of total expenditures.

Tax rates increase the most in wealth groups 2 and 3 by 42% and 41%, respectively. A clearer view of effects of negative tier 2 aid on tax rates is provided by calculating ratios of percent changes in tax rates to percent changes in state aid. A one percent decrease in state aid causes the greatest change in tax in group 1, an increase by 2.37%. In group 4, however, a one percent decrease in aid increases tax rates by 0.46%.

Similar patterns in state aid and tax rates occur under a DPE aid scheme when expenditures are equalized as in LP Runs 4-A and 15 (table 19). State aid for all districts is increased in Run 4-A, the solution assuming a $35 per $1,000 tax rate ceiling. Tax rates, however, increase the most in the poorer groups, while in group 4 an actual reduction in tax rates is realized. This is due to the equalization of expenditures which force poorer districts to increase spending substantially, and richer districts to reduce spending.

In LP Run 15, with a $45 per $1,000 tax rate ceiling, state aid is reduced in all wealth groups. The largest reductions occur in group 4,

Table 18. Effects of Inflated Expenditures on State Aid and Tax Rates Under Alternative District Power Equalization Schemes

Wealth Group[a]	State Aid ($/TAPU)					Average Tax Rates ($/1,000 Full Value)				
	Inflated Expenditures LP Run 2-A[b]	Inflated-DPE		Inflated-DPE - Tier 2 Aid		Inflated Expenditures LP Run 2-A	Inflated-DPE		Inflated-DPE - Tier 2 Aid	
		LP Run 9-A	% Change From LP Run 2-A	LP Run 14	% Change From LP Run 2-A		LP Run 9-A	% Change From LP Run 2-A	LP Run 14	% Change From LP Run 2-A
New York City[c]	1,196	1,368	14.4	976	-18.4	34.96	30.54	-12.6	40.57	16.0
Buffalo	1,023	1,255	22.7	730	-28.6	27.15	22.76	-16.2	32.76	20.7
Rochester	797	1,105	38.6	403	-49.4	30.28	25.87	-14.6	35.91	18.6
Syracuse	892	1,169	31.1	541	-39.3	25.94	21.54	-17.0	31.56	21.7
Rest of State	1,047	1,271	21.4	774	-26.1	18.16	13.85	-23.7	24.61	35.5
Group 1	1,328	1,455	9.6	1,167	-12.1	19.61	15.22	-22.4	25.23	28.7
Group 2	1,142	1,332	16.6	899	-21.3	16.58	12.46	-24.8	23.49	41.7
Group 3	942	1,201	27.5	652	-30.8	17.62	13.22	-25.0	24.79	40.7
Group 4	707	1,051	48.7	272	-61.5	19.90	15.49	-22.2	25.52	28.2

[a] See table 7 and 8 for definition of wealth groups.

[b] See table 17 for the assumptions underlying these runs.

[c] New York City does not include Queens, Manhatten or Richmond boroughs in DPE analysis. These boroughs receive flat grant or tier 1 aid.

Table 19. Effects of Equalized Expenditures on State Aid and Tax Rates Under Alternative District Power Equalization Schemes

Wealth Group[a]	State Aid ($/TAPU)					Average Tax Rates ($ per 1,000 Full Value)				
	Inflated Expenditures LP Run 2-A[b]	Inflated, Equalized, DPE		Inflated, Equalized-DPE - Tier 2 Aid		Inflated Expenditures LP Run 2-A	Inflated Equalized-DPE		Inflated Equalized-DPE - Tier 2 Aid	
		LP Run 4-A	% Change From LP Run 2-A	LP Run 15	% Change From LP Run 2-A		LP Run 4-A	% Change From LP Run 2-A	LP Run 15	% Change From LP Run 2-A
New York City[c]	1,196	1,262	5.5	868	-27.4	34.96	28.06	-19.7	38.15	9.1
Buffalo	1,023	1,113	8.8	587	-42.6	27.15	23.33	-14.1	33.36	22.9
Rochester	797	916	14.9	211	-73.5	30.28	20.29	-33.0	30.37	0.3
Syracuse	892	999	12.0	370	-58.5	25.94	21.37	-17.6	31.43	21.2
Rest of State	1,047	1,133	8.2	623	-40.5	18.16	25.29	39.3	35.94	97.9
Group 1	1,328	1,378	3.8	1,089	-18.0	19.61	33.35	70.1	43.40	121.3
Group 2	1,142	1,216	6.5	781	-31.6	16.58	25.97	56.6	35.94	116.8
Group 3	942	1,041	10.5	480	-49.0	17.62	22.06	25.2	34.26	94.4
Group 4	707	837	18.4	60	-91.5	19.90	19.32	- 2.9	29.53	48.4

[a] See tables 7 and 8 for definition of wealth groups.

[b] See table 17 for the assumptions underlying these runs.

[c] New York City does not include Queens, Manhatten or Richmond boroughs in DPE analysis. These boroughs receive flat grant or tier 1 aid.

decreasing by 92%, while group 1 reduces aid by 18% under the current levels. Tax rate increases are greatest in the poorest group with a 121% increase, and show relative decreases moving up the wealth scale to group 4 which shows a 48% reduction. This pattern of tax rate increases is caused mainly by the change in expenditure levels from 1979-80 AOE levels adjusted for inflation, to the average 1979-80 AOE levels adjusted for inflation.

Under district power equalization, poorer wealth groups still require huge increases in tax effort in order to reach the equalized level. Assuming tax rates no greater than $35 per $1,000 full value, which allows for more state aid in the final solution, a 70% increase is required for the poorest wealth group to spend $2,336 per pupil. If tax rate bounds are increased to $45 per $1,000, state aid is removed from the solution and tremendous increases in tax rates are required at the lower end of the district wealth scale.

Changing state aid formulas marginally, or a bit more drastically by not forcing tier 2 aid to be positive, affects school finance participants in conjunction with other assumptions made concerning tax rates and expenditure levels. For example, none of the changes in the aid formula examined could provide much tax relief to poor districts spending at an average inflated level of $2,336. Tax rate assumptions are found to be crucial in determining the amount of state aid allowed into the solution, a $35 per $1,000 full value tax limit increases state aid while a $45 per $1,000 limit increases local expenditures. Although a large number of comparisons between solutions under alternative assumptions can be made, the analysis above has provided some interesting insights into the structure and working parts of the New York State school financing system. In the next section, a summary of these insights is provided.

Summary and Policy Implications

Throughout the 1970's, financing public education had increasingly come under fire. Across the United States, local administrators and parents of school children have protested inequities in educational opportunity by articulating their arguments in court. In New York State, this protest is in the form of Levittown v. Nyquist, in which the plaintiffs argued that the current method of financing elementary and secondary education violates two separate but related Articles of the State Constitution. Because some school districts have access to more educational resources than others, poorer districts are compelled to offer an inferior education to students. This, the plaintiffs allege, violates the Equal Protection Clause of the State Constitution. In the second cause for action, the plaintiffs allege a violation of the Education Article of the State Constitution, because the quality of the child's education depends on the real property wealth in the district in which a child happens to reside. The judgement in favor of the plaintiffs was issued June 23, 1978. Although recently reversed under appeal, court cases such as Levittown v. Nyquist have brought issues of educational quality and opportunity among school districts to the foreground.

The purpose of this study is to examine the current inequities in the school financing system in New York State and to develop a linear programming model to examine systematically changes in expenditure levels, tax rates and state aid policy parameters designed to promote equal educational opportunity. Because a major overhaul of the system would most likely be politically unacceptable, the modifications examined in this study are within the existing framework. Implications of alternative school district expenditure levels combined with modifications in the aid formula for local taxpayers and for the state budget are emphasized. In this section, summaries of the major changes in the New York State aid formulas throughout the 70's, the linear programming model used in the analysis, expenditure assumptions, and the results and policy implications are provided.

Summary

In section 2, major changes in New York State aid formula are traced through the 1970's. Inequities in terms of expenditures per pupil and taxpayer effort existing in New York were not removed even after several modifications in the aid formula were implemented. For example, an aid ratio type formula was used to distribute aid in 1970-71. The state set the percentage of the ceiling level ($860 per Weighted Average Daily Attendance in 1970-71) that will be paid to a district of average wealth (49% in 1971). School district wealth is compared to the state average and aid is generated in an inverse proportion to the district's wealth. Poorer districts received more than 49% of the ceiling, districts of average wealth receive 49% of the expenditure ceiling and districts with above average wealth received less than 49% of the ceiling level.

A foundation type aid formula including a new pupil measure was implemented in 1974-75. The state paid the difference between an expenditure level ceiling and a $15 per $1,000 full value of property tax rate applied to the school district's wealth in a foundation type aid formula. Districts received aid inversely proportional to property wealth. A new pupil measure, including additional weightings for handicapped and disadvantaged students, was designed to be a more precise measure of specific district needs.

A return to the use of aid ratios to apportion aid occurred in 1978-79. An additional expenditure ceiling was added for relatively poorer districts. This second tier of aid was designed to apportion additional aid to poorer school districts. The two-tier system is currently implemented in New York State.

Because of the linearity existing among variables in the present aid formula, New York State's financing scheme can be modeled in a linear programming framework. The LP approach allows one to examine the tradeoff between the size of the state budget and taxpayer efforts while optimizing a policy goal. Comparisons of tax efforts among alternative expenditure assumptions are facilitated by this framework. In this study, state aid is minimized subject to some basic constraints.

In general, there are three types of constraints required to model the relationships among variables in the school finance system. First, state aid constraints are used to apportion aid to school districts. Each district receives tier 1 and tier 2, only tier 1, or flat grant aid depending on the wealth of the district. One constraint for each district is needed to apportion the appropriate type of aid. Second, expenditure constraints place lower bounds on expenditure levels for each district. These bounds are designed to reflect: a) 1979-80 levels, b) these levels adjusted for general inflation to project 1980-81 expenditures; c) levels adjusted for cost differentials among school districts, d) expenditure levels set at the State average and e) levels which level-up expenditures to the 65th percentile of district groups when ranked from low to high expenditures. Finally, tax rates are constrained by upper bounds which represent an upper limit above which is considered politically or legally unacceptable. Two tax rate ceilings are assumed in the model. Other accounting constraints are used to sum total state aid and total local expenditures.

The aid formula is modified by treating the state shares of the two expenditure ceilings for the district of average wealth as decision variables. Three assumptions are made concerning average state shares: average state shares are fixed at the same levels as in the current formula; average state shares are variable but tier 2 aid is restricted positive; and average state shares are variable but tier 2 aid is not restricted. The third assumption represents a preliminary analysis of District Power Equalization, in which aid is distributed through tier 1 but can be "taxed" away by negative tier 2 aid.

Because there are more than 700 school districts in New York, districts with similar characteristics are aggregated to make the model more manageable. Districts are grouped by six pupil ranges, six wealth per pupil ranges and three approved operating expense per pupil ranges. The large urban areas, New York City, Buffalo, Rochester, Syracuse, Yonkers and Albany are treated separately. Results are reported by wealth group aggregates, group 1 being the poorest and group 6 the richest, and by urban areas.

Different solutions to the programming model are obtained as expenditure assumptions, tax rate assumptions, and assumptions concerning average state shares are changed. Other variables solved by the model include state aid per pupil, local expenditures per pupil, tax rates, total state aid and total local spending. Appropriate comparisons are made in order to translate alternative expenditure assumptions into state and local financing decisions.

A solution for the "base" case is determined to serve as a starting point for comparisons. In the "base" run, districts spend at 1979-80 approved operating expenditure levels, totaling $6.9 billion, and aid is distributed through the current aid formula. The state pays 47% of the expenditure level, which is very close to the tier 1 state share of 49% for the district of average wealth. State aid accounts for 78% of expenditures in the poorest wealth group compared to 17% in Yonkers, a rich district. This would suggest that the aid formula is providing a much larger share of expenditures to poorer districts. However, it must

be remembered that the state shares only in the first $1,700 of expenditures. Because richer districts tend to spend more per pupil the state's larger share in poorer districts results from lower expenditure levels in addition to the aid formula.

Tax rates tend to increase as operating expenditures increase, but the correlation coefficient between expenditures and tax rates across the six city schools and the six wealth groups is only 0.3. This can be explained by examining the two wealthiest groups which tax at a relatively low rate, partially due to the flat grant provision providing aid to districts irrespective of property wealth.

Only 6% of the state's aidable pupil units are affected by the flat grant provision. If removed, local districts would need a 16% increase in local contributions, but tax rates would still remain below those of the school districts in the next two wealthiest groups. Total aid is reduced by less than 5 percent, a relatively small impact on state aid. Reductions in the flat grant provision are currently under study by the Legislature.

Approved operating expenses in 1979-80 are increased by 11% to analyze the impact of general inflation on school districts. Ratios of the relative changes in tax rates to relative changes in expenditures for wealth groups indicate the effects of a one percent increase in expenditures. The poorest wealth group where the ratio is 4.6 is nearly double the average of 2.4. The two richest groups require a smaller increase in tax rates to finance a one percent increase in expenditure. Both ratios in these groups are less than 1.3. This analysis suggests that poorer districts are affected the most when expenses rise by some percentage. Updating the state aid formula (the ceilings on which aid is applicable) annually is more critical for the poorer districts than for the richer ones.

Urban areas argue that because there is more competition for property tax revenues for other public services, and educational resource costs are generally higher, an educational overburden exists in these non-rural districts. Accordingly, they maintain the existing state aid formulas, which use wealth per RTAPU as a base for distributing aid, overstates city school districts' fiscal capacity to finance schools. Adjusting expenditures for cost differentials among districts with the aid of a cost index allows one to examine one aspect of this overburden argument. Total expenditures for the state increase by 1 percent, indicating that there are more high cost districts than low cost ones. If the state were to encourage districts to remove some of the disparities in educational opportunity by adjusting expenditures by the cost of resource index, some wealth groups are significantly affected. The lowest wealth group would reduce expenditures by an amount equal to 11%. Districts in all other wealth groups would, on average, have to reduce expenditures. However, the major urban areas would require an increase in expenditures to compensate for higher relative costs. The largest increase, 22% occurs in Albany compared to a 13% increase required in Rochester.

While the Fleischmann Commission concluded that equalizing expenditures among school districts would be one step toward providing equal

educational opportunity, they realized the political difficulty of requiring the richer districts to reduce spending levels. In this light, they proposed an expenditure scheme that would level-up all districts spending below the 65th percentile district, ranking districts by spending per pupil from low to high. Districts spending above the 65th percentile district's level would not be required to reduce expenditures.

Both of these alternatives are examined in this study. By setting spending levels at the state average, adjusted for inflation, total expenditures would increase by 5% compared with the base case. Because richer districts under this alternative are required to reduce spending, expenditures statewide would total $7.2 billion, 6% below the projected 1980-81 level (e.g. base expenditures adjusted only for inflation). Leveling-up expenditures increases total spending by almost 19% over the base case and more than 6% above the base case adjusted for inflation. Both of these strategies for moving toward more equal educational opportunity are feasible, that is, total spending does not become ridiculously large. However, without extreme modification in the existing aid formulas, the poorer districts are affected significantly by proposed expenditure levels.

Under the current formula, the two poorest wealth groups, would require 79% and 67% increases in tax efforts, respectively, in order to spend at the equalized levels; this compares with a 20% reduction in the wealthiest group. Leveling-up expenditures requires 116% and 96% increases in tax rates for the two poorest groups, while the richest group needs only a 14.4% increase. Unless additional aid is apportioned to the poorer wealth groups, it is unlikely that any leveling-up or equalizing expenditure schemes will be implemented.

The spending alternatives summarized so far have not allowed for increases in state aid nor have they allowed optional modification in the formula to minimize aid subject to spending and tax rate limits. If the aid formula is modified by solving for optimal levels of state shares in expenditure ceilings for the district of average wealth, and tax rate ceilings of $35 per $1,000 full value of property are imposed on all districts, additional state aid is apportioned through a modified version of the current formula. The effects of changes in state aid are examined by comparing the current formula with the modified version under the same expenditure levels.

Assuming that school districts spend the projected 1980-81 levels, and a $35 tax limit, state aid rises from about 35% to 44% of total spending, when compared to the same funding level under the old aid formula and no constraint on tax rates. Optimal levels of average state shares require the state to distribute the entire tier 2 expenditure ceiling level to eligible districts. Because only poorer districts are eligible for tier 2 aid, one might expect the "modified formula" to apportion relatively more aid to these districts. However, these districts were already receiving a large fraction of their revenues from the state and the largest increases in aid actually occur in the richer districts. Wealth groups 4 and 5 receive 49% and 66% increases in aid, respectively, compared to a 10% increase for wealth group 1.

By solving for optimal state shares of the ceiling levels, one is also able to examine the effectiveness of state aid in reducing tax rates. In general, state aid is more effective in reducing tax rates in poorer districts than in richer ones. In the poorest wealth group, for example, a one percent increase in state aid reduces tax rates by 2.3%. In wealth group 5, the same percentage increase in state aid reduces tax rates by only 0.3%. Thus, it is not surprising that poorer districts, attempting to spend at equalized levels, require large tax rate increases under the modified aid formula. For example, wealth groups 1 and 2 must increase tax rates by 70% and 57%, respectively, even after receiving additional aid. The modified formula does not offer much tax relief to these districts.

The other modification in the state aid formula examined in this study was the application of District Power Equalization (DPE) to those districts currently receiving tier 1 and tier 2 aid. In its purest form, DPE would allow for the same level of expenditure by all districts at a given tax rate regardless of the district's wealth. This implies that all districts are spending at the same level and that revenues raised through this common tax rate in wealthy districts are actually redistributed to poorer districts. In this particular analysis, however, DPE is applied only to the first $1,700 of expenditures. Thus, it is not a pure DPE scheme. In addition, the redistribution of revenues from rich to poor districts is accomplished by letting tier 2 aid become negative in a fashion similar to that implemented in Wisconsin. Total aid to any district must remain non-negative.

Those districts receiving tier 1 and tier 2 aid account for 75% of the TAPU in the state. Total spending by these districts at the 1979-80 levels adjusted for inflation are equal to $47 billion. For this same spending level, DPE, with no allowance for the effective transfer of revenues from one district to another, state aid increases to 62% of the total because of the $35 tax rate. This is essentially the analogous situation to solving for optimal levels of state shares discussed above. By allowing for negative tier 2 aid this situation is changed dramatically in that the state share now drops to 41% as compared to 51% under the existing aid formula. The largest reduction in aid is a 61% decrease in wealth group 4, the wealthiest group in the DPE analysis. The smallest reduction is 12%, occurring in wealth group 1. If the state were to reduce aid within a DPE scheme, the poorer districts would receive the smallest relative decrease.

Reducing state aid has a greater effect on poorer districts in terms of tax rates. A one percent reduction in aid to group 1 increases tax rates by 2.3%. However, a one percent decrease in aid to group 4 requires only a 0.5% increase in rates. Reducing aid within a DPE scheme forces poorer districts to increase tax rates significantly compared to richer districts in order to spend at previous levels.

Not surprisingly, even under the DPE scheme, districts attempting to spend at the state average adjusted for inflation require huge increases in tax efforts. Group 1 for example, requires a 121% increase and group 4 needs a 94% rise in tax rates in order to finance the new expenditure levels, combined with reductions in aid.

Because of the inherent inequities in educational resources across the state, the use of this particular DPE scheme to apportion aid does not appear, in a preliminary analysis, to be much different than the current or modified aid formulas. The relationships existing among richer and poorer districts under the current and modified formulas, are still visible under the DPE scheme. The situation would be quite different if DPE were implemented in its "purest" form in conjunction with modified (or equalized) expenditure levels. These changes, however, would mark a significant departure from the status quo.

Policy Implications

In light of the fact that many state school financing schemes have been challenged in the courts in terms of equal educational opportunity, any move toward a more equitible system in New York State will depend largely on how educational opportunity is defined. In this study three possible interpretations are examined: equal spending at the state average; equal spending at the state average adjusted for cost differentials; and a minimum expenditure level set at expenditures leveled-up to the 65th percentile. Each of these alternatives implies a change from the status quo and could possibly meet the guidelines implied in any court challenge. From a policy perspective each can be evaluated in terms of its economic and political feasibility by examining how radical a departure each implies from the existing situation, for example, if one assumes that spending at average levels adjusted for cost differentials, the implications for students across the state can be examined by simple ratios of the new versus the existing expenditure level. That is, simple ratios of the 1979-80 expenditure levels adjusted for inflation and leveled-up expenditures indicated by how much district groups' spending deviates from this cost adjusted alternative.

Treating this inflated-expenditure situation as the existing one, it is evident that some district groups are currently spending at nearly the appropriate levels as determined by this equity criterion. On average, in the 6 wealth groups, inflated expenditures are 98% of the more equitable spending levels. The lowest three groups 1, 2 and 3 currently spend 10%, 12% and 9% below the proposed levels. Although these comparisons ignore the intragroup variation among districts, the fact that no group is spending less than 88% of the "equitable level" is somewhat encouraging. That is, the adjustments required to meet court mandates may be less severe than initially anticipated.

The implications for taxpayers around the state are also important. For example, an increase in expenditures required for the 6 wealth groups to reach the average-cost adjusted levels translates into a 15% increase in average tax rates under the current aid formula. Under a modified version of the aid formula where formula parameters are set at optimal levels, spending at the new levels increases average tax rates by only 8% for the six wealth groups. Regardless of how expenditures are increased, current aid formulas imply that tax rates in the poorer districts must be much larger for every one percent increase in spending than in richer districts.

The fact that these tax rate elasticities with respect to spending levels cannot be altered by changing only the rate at which the state shares in expenditure level ceilings is a classic situation in which one policy tool cannot achieve expenditure and taxpayer equity objectives. To meet both objectives, the state would have to allow both the expenditure ceiling levels in which it is willing to share and the state share differ by district wealth. The extent to which aid formulas can be tailored to a district's special circumstances depends on political and legal constraints, as well as economic ones.

From an economist's point of view adjusting equalized expenditures for the differential costs of educational resources is appealing. However, the courts may argue that such adjustments are unnecessary to meet the state's responsibility, in which case the tax implications for people in poorer districts would be compounded because of the relatively high correlation between wealth per pupil and cost of educational services.

At the other end of the continuum, the courts or the Legislature could obviously interpret equality of educational opportunity in terms of meeting some arbitrarily high minimum expenditure level. The leveling-up alternative examined in this study is an example of this strategy in which minimum but not maximum expenditures are imposed. By examining expenditure levels under this system of leveling-up expenditures to the 65th percentile with cost adjusted average expenditure, the implications for students under this definition of equity are apparent (Appendix F of Colburn, 1981).

In all groups, except Albany, increases in expenditures occur. The leveling-up process overcompensates for the equalization and cost adjustments in virtually all cases. In the 6 wealth groups, expenditures are 20% higher on average over the equalized and cost adjusted levels. Large tax rate increases are also required to finance the leveled-up expenditure scheme. Extremely large increases in tax rates required by low wealth districts make the leveled-up expenditure scheme difficult to implement unless substantial amounts of additional aid is apportioned to these districts.

These two situations essentially represent two extremes of a continuum. In the case of adjusting average expenditures for cost differentials, total spending could be kept at existing levels but some districts would be required to reduce expenditures per pupil. Because they probably would not do so willingly, the idea of leveling-up expenditures to some minimum level would certainly have political appeal. Although not examined specifically in this study, leveling-up expenditures to some point less than the 65th percentile could probably be used as a first step in meeting the court challenges, while at the same time mitigating some of the adverse tax implications for local taxpayers.

In conclusion, the results of the experimentation with the model suggest that the minor modifications in the state aid formula analyzed in this study are not particularly effective in reducing tax rates to the poorer districts. This is due to the fact that these minor modifications effectively allocated more state aid to districts of moderate wealth.

The structure of the aid formula is too restrictive to recognize the particular needs of the poorest districts and the State Legislature is likely to find it particularly difficult to balance student equity considerations with those of taxpayers in their attempt to equalize educational opportunity unless a significant modification in the aid formula is designed simultaneously.

Because of these competing objectives, it is extremely difficult to evaluate expenditure and state aid alternatives in a piece-meal fashion by looking at a small set of discrete alternatives. The programming model provides a useful framework in which to examine a wide range of alternatives, while at the same time delineating the potential tradeoff between competing objectives. In this study new expenditure levels were examined within the context of minimizing state aid subject to maximum tax rates. However, other strategies might be to look at minimizing tax rates subject to expenditure and state aid constraints or to maximum total expenditures subject to tax rate and aid constraints and limits on the allowable variation in expenditures across districts. These additional experiments, along with programming strategies for varying both aid ratios and ceilings by district wealth, are important topics for additional research. They should be coordinated with the state's interest in reexamining real property as the only measure of wealth and eliminating flat grant and save-harmless provisions in the aid formulas.

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APPENDIX A

COEFFICIENTS FOR THE SCHOOL DISTRICT GROUPS IN THE LP MODEL

Group G_{ijk}	Total Aidable Pupil Units	Full Value/ Resident Total Aidable Pupil Units	Alternative Expenditure Levels/TAPU				Index of Cost of Educational Resources
			1980-81 Approved Operating	Inflated	Inflated and Cost Adjusted	Equalized and Cost Adjusted	
G112	3,748	$ 27,611	$1,476	$1,642	$1,438	$2,047	0.8764
G113	22,184	28,724	1,486	1,654	1,496	2,114	0.9048
G114	10,355	27,012	1,565	1,741	1,613	2,164	0.9265
G115	5,225	30,367	1,514	1,684	1,583	2,196	0.9400
G121	2,291	41,988	1,472	1,638	1,418	2,023	0.8661
G122	18,365	43,486	1,468	1,633	1,458	2,085	0.8925
G123	61,380	42,004	1,501	1,670	1,536	2,148	0.9196
G124	30,466	42,920	1,546	1,719	1,613	2,192	0.9381
G125	14,940	41,293	1,552	1,727	1,658	2,243	0.9600
G131	924	64,330	1,460	1,624	1,406	2,022	0.8655
G132	4,043	59,868	1,475	1,641	1,447	2,060	0.8817
G133	8,895	55,318	1,438	1,600	1,500	2,192	0.9381
G134	5,981	60,934	1,438	1,600	1,455	2,124	0.9094
G135	7,445	53,211	1,475	1,641	1,690	2,406	1.0300
G141	678	72,620	1,504	1,674	1,465	2,044	0.8751
G142	3,094	77,175	1,504	1,673	1,500	2,094	0.8962
G153	1,532	98,220	1,590	1,769	1,610	2,126	0.9100
G161	496	130,374	1,548	1,722	1,466	1,989	0.8513
G162	760	126,440	1,496	1,665	1,665	2,336	1.0000
G165	5,216	161,913	1,545	1,719	1,719	2,266	0.9700
G211	625	26,717	1,658	1,845	1,653	2,093	0.8960
G212	2,884	32,939	1,647	1,832	1,590	2,028	0.8680
G213	13,243	30,175	1,638	1,822	1,648	2,114	0.9047
G214	9,478	29,730	1,648	1,834	1,686	2,148	0.9194
G221	1,096	42,175	1,654	1,840	1,601	2,032	0.8700
G222	7,672	47,164	1,639	1,823	1,628	2,086	0.8929
G223	40,400	41,389	1,643	1,828	1,688	2,157	0.9232
G224	38,105	41,438	1,652	1,838	1,751	2,227	0.9531
G225	23,015	45,927	1,682	1,871	1,845	2,303	0.9860
G226	14,199	50,168	1,661	1,848	1,848	2,336	1.0000
G231	381	52,469	1,625	1,807	1,572	2,032	0.8700
G232	2,699	60,606	1,665	1,852	1,689	2,131	0.9122
G233	7,313	54,961	1,644	1,829	1,737	2,220	0.9501
G234	13,872	58,971	1,672	1,860	1,744	2,191	0.9378
G235	13,317	56,258	1,613	1,794	1,723	2,243	0.9603
G243	3,602	76,374	1,642	1,827	1,659	2,121	0.9081
G244	5,925	79,107	1,661	1,848	1,720	2,174	0.9307
G311	413	29,821	1,909	2,124	1,805	1,986	0.8500
G312	4,198	27,243	1,849	2,057	1,826	2,074	0.8876
G313	18,183	28,038	1,820	2,024	1,836	2,119	0.9071
G314	5,806	27,353	2,180	2,425	2,231	2,149	0.9200
G321	2,062	41,529	1,847	2,054	1,773	2,016	0.8628

APPENDIX A (Cont.)

Group G_{ijk}	Total Aidable Pupil Units	Full Value/ Resident Total Aidable Pupil Units	Alternative Expenditure Levels/TAPU 1980-81 Approved Operating	Inflated	Inflated and Cost Adjusted	Equalized and Cost Adjusted	Index of Cost of Educational Resources
G322	6,801	$ 39,882	$1,848	$2,056	$1,849	$2,101	0.8992
G323	84,090	41,828	1,817	2,021	1,853	2,142	0.9170
G324	143,506	44,561	1,959	2,180	2,120	2,272	0.9726
G325	117,589	43,872	2,161	2,404	2,460	2,390	1.0231
G326	148,867	43,701	2,154	2,397	2,438	2,376	1.0172
G331	1,890	59,694	2,105	2,342	2,046	2,041	0.8737
G332	5,091	63,025	1,938	2,157	1,937	2,099	0.8983
G333	53,149	58,891	2,074	2,307	2,221	2,249	0.9626
G334	101,908	59,967	2,213	2,462	2,435	2,311	0.9891
G335	191,050	61,063	2,310	2,570	2,571	2,337	1.0005
G336	135,882	61,321	2,397	2,667	2,745	2,405	1.0294
G341	1,470	77,346	2,061	2,293	2,052	2,091	0.8950
G342	9,544	75,237	2,080	2,314	2,120	2,140	0.9160
G343	33,008	77,564	2,367	2,634	2,542	2,262	0.9653
G344	60,344	78,443	2,478	2,757	2,765	2,343	1.0030
G345	103,881	77,382	2,503	2,784	2,856	2,396	1.0256
G346	25,960	79,706	2,376	2,644	2,640	2,333	0.9985
G351	1,967	98,141	2,096	2,331	2,067	2,071	0.8865
G352	2,218	94,983	2,065	2,797	2,065	2,100	0.8988
G353	31,627	94,082	2,428	2,701	2,584	2,235	0.9567
G354	58,343	95,772	2,787	3,101	3,147	2,370	1.0147
G355	43,877	99,956	2,787	3,100	3,267	2,462	1.0537
G356	14,306	87,191	2,074	2,307	2,307	2,336	1.0000
G361	6,221	266,778	3,168	3,524	3,170	2,102	0.8997
G362	9,862	159,981	2,484	2,763	2,579	2,180	0.9333
G363	43,727	149,477	3,099	3,448	3,458	2,343	1.0029
G364	73,228	141,604	3,302	3,673	3,797	2,415	1.0337
G365	43,450	131,370	3,628	4,036	4,271	2,472	1.0582
BUFFALO	50,086	52,427	2,201	2,448	2,522	2,406	1.0300
SYRACUSE	23,094	62,559	2,261	2,516	2,566	2,383	1.0200
ROCHESTER	36,979	69,975	2,621	2,916	2,974	2,383	1.0200
YONKERS	23,586	96,570	2,791	3,104	3,291	2,476	1.0600
ALBANY	9,626	93,167	2,235	2,486	2,735	2,570	1.1000
MANHATTEN	146,948	170,508	2,318	2,579	2,707	2,453	1.0500
QUEENS, RICHMOND	283,033	96,654	2,289	2,546	2,673	2,453	1.0500
BRONX	087,822	46,412	2,282	2,538	2,601	2,453	1.0500
BROOKLYN	335,251	31,777	2,271	2,527	2,653	2,453	1.0500

APPENDIX B

COMPONENT DISTRICTS CONTAINED WITHIN GROUP AGGREGATES

Group Identifier	Component Districts	
	Name	County
G112	Jasper	Steuben
	Lisbon	St. Lawrence
	Cambell	Steuben
	Brushton-Moira	Franklin
	Portville	Cattaraugus
	Addison	Steuben
	Norwood-Norfolk	St. Lawrence
	Cassadaga Valley	Chautauqua
	Groton	Tompkins
	Ilion	Herkimer
	Hermon-DeKalb	St. Lawrence
	Friendship	Allegany
	W. Canada Valley	Herkimer
	Moriah	Essex
	Hannibal	Oswego
	Candor	Tioga
	Whitney Point	Broome
	Mohawk	Herkimer
G114	Peru	Clinton
	Phoenix	Oswego
	Carthage	Jefferson
G115	Central Square	Oswego
G121	Hornesville	Herkimer
	Angelica	Allegany
	Canaseraga	Allegany
	Whitesville	Allegany
	Mount Upton	Chenango
	Sylvan Verona	Oneida
G122	Georgetown	Chenango
	Oppenheim-Ephratah	Fulton
	St. Regis Falls	Franklin
	Edmeston	Otsego
	Scio	Allegany
	De Ruyter	Madison
	Andover	Allegany
G122 (Cont.)	Worcester	Otsego
	Prattsburg	Steuben
	Romulus	Seneca
	Elba	Genesee
	Perth	Fulton
	Duanesburg	Schenectady
	Cincinnatus	Cortland
	Hartford	Washington
	Belfast	Allegany
	S. New Berlin	Chenango
	Ripley	Chautauqua
	Fort Ann	Washington
	Avoca	Steuben
	Argyle	Washington
	Remsen	Oneida
	Laurens	Otsego
	Bolivar	Allegany
	Alfred-Almond	Allegany
G123	Mayfield	Fulton
	S. Lewis	Lewis
	Afton	Chenango
	Spencer-Van Etten	Tioga
	Fillmore	Allegany
	Marathon	Cortland
	Moravia	Cayuga
	Schuyerville	Saratoga
	Alexander	Genesee
	Franklinville	Cattaraugus
	Canisteo	Steuben
	Richfield Springs	Otsego
	General Brown	Jefferson
	Oriskany	Oneida
	Pulaski	Oswego
	Fabius-Pompey	Onondaga
	Pavilion	Genesee
	Newark Valley	Tioga
	Hoosic Valley	Rensselaer
	Galway	Saratoga
G123 (Cont.)	Wayland	Steuben
	Sauquoit Valley	Oneida
	Hoosick Falls	Rensselaer
	Newfield	Tompkins
	Greenwich	Washington
	Stillwater	Saratoga
	Cobleskill	Schoharie
	Dryden	Tompkins
	Wilson	Niagara
	S. Seneca	Seneca
	Cuba	Allegany
	Cattaraugus	Cattaraugus
	Akron	Erie
	Byron-Bergen	Genesee
	Warsaw	Wyoming
	Manchester-Sho	Ontario
	Allegany	Cattaraugus
	Wellsville	Allegany
	Schodack	Rensselaer
	Little Falls	Herkimer
G124	Camden	Oneida
	Windsor	Broome
	Albion	Orleans
	Waterloo	Seneca
	Depew	Erie
	Sherrill	Oneida
	Valley	Orange
	Kinderhook	Columbia
	Johnstown	Fulton
G125	Pine Bush	Orange
	Rome	Oneida
G131	Rushford	Allegany
	Hammond	St. Lawrence
G132	Sharon Springs	Schoharie
	Schenevus	Otsego

Note: The district names are taken from, The Budget Division, "1980-81 State Aid Projections," unpublished worksheets, Albany, March 1980. To save space, the abbreviations used by the Budget Division were used.

APPENDIX B (Cont.)

Group Identifier	Component Districts		Group Identifier	Component Districts		Group Identifier	Component Districts	
	Name	County		Name	County		Name	County
G132 (Cont.)	Milford	Otsego	G213 (Cont.)	Indian River	Jefferson	G223 (Cont.)	Fort Plain	Montgomery
	Charlotte Valley	Delaware		Granville	Washington		N. Collins	Erie
	Northville	Fulton		Marion	Wayne		Waverly	Tioga
	Alexandria	Jefferson		Cato-Meridian	Cayuga		Holland	Erie
				Tioga	Tioga		Greene	Chenango
G133	Richmondville	Schoharie		Canastota	Madison		Tully	Onondaga
	Walton	Delaware					Otego-Unadilla	Otsego
	Broadalbin	Fulton	G214	Mexico	Oswego		Schoharie	Schoharie
	Berlin	Rensselaer		Hudson Falls	Washington		Attica	Wyoming
	Berne-Knox-Wes	Albany		Holland Patent	Oneida		Perry	Wyoming
	Le Roy	Genesee					Oakfield-Alabama	Genesee
			G221	Troupsburg	Steuben		Highland Falls	Lyons
G134	Victor	Ontario		Cohocton	Steuben	G224	Washingtonville	Orange
	Oneonta	Otsego		Brookfield	Madison		Wallkill	Ulster
							S. Glen Falls	Saratoga
G135	Saratoga Springs	Saratoga	G222	Parishville	St. Lawrence		Ballston Spa	Saratoga
				W. Valley	Cattaraugus		Medina	Orleans
G141	Stratford	Fulton		Morris	Otsego		Gloversville	Fulton
	Springfield	Otsego		Little Valley	Cattaraugus		Yorkshire-Pion	Cattaraugus
				Belmont	Allegany		Homer	Cortland
G142	Poland	Herkimer		Wynantskill	Rensselaer		Starpoint	Niagara
	Chatham	Columbia		Morristown	St. Lawrence		Oneida	Madison
				Salem	Washington		Marcellus	Onondaga
G153	Cairo-Durham	Greene		Madison	Madison			
				Arkport	Steuben	G225	Baldwinsville	Onondaga
G161	Wheelerville	Fulton		Mount Morris	Livingston		Auburn	Cayuga
	Andes	Delaware					Shenendehowa	Saratoga
			G223	Sandy Creek	Oswego			
G162	Eastport	Suffolk		Harpursville	Broome	G226	W. Seneca	Erie
				Oxford	Chenango			
G165	Oswego	Oswego		Letchworth	Wyoming	G231	Greenwood	Steuben
				Dolgeville	Herkimer			
G211	Chadwicks	Oneida		Panama	Chautauqua	G232	Richmondville	Schoharie
	Oriskany Falls	Oneida		N. Rose Wolcot	Wayne		Cherry Valley	Otsego
				Lyndonville	Orleans		Ellicottville	Cattaraugus
G212	Bradford	Steuben		Odessa-Montour	Schuyler		South Manor	Suffolk
	Harrisville	Lewis		Waterville	Oneida			
	Hinsdale	Cattaraugus		Brockton	Chautauqua	G233	Warrensburg	Warren
	Chateaugay	Franklin		Corinth	Saratoga		Coxackie-Athens	Greene
				Lyons	Wayne		Rott-Draper	Schenectady
G213	Bridgewater	Herkimer		Fonda-Fulton	Montgomery		Chester	Orange

APPENDIX B (Cont.)

Group Identifier	Component Districts	
	Name	County
G233 (Cont.)	Dover	Dutchess
G234	Monroe-Woodbury	Orange
	Goshen	Orange
	Port Jervis	Orange
	Canandaigua	Ontario
G235	Horseheads	Chemung
	Lockport	Niagara
G243	Liberty	Sullivan
	Cooperstown	Otsego
G244	Penn Yan	Yates
	Dunkirk	Chautauqua
G311	Edwards	St. Lawrence
G312	Copenhagen	Lewis
	Heuvelton	St. Lawrence
	Fort Edward	Washington
	Stockbridge	Madison
	Savona	Steuben
G313	Salmon River	Franklin
	Madrid-Waddington	St. Lawrence
	Altmar-Parish	Oswego
	Brasher Falls	St. Lawrence
	Sherburne-Earlville	Chenango
	S. Jefferson	Jefferson
	Barker	Niagara
	Salamanca	Cattaraugus
	Red Creek	Wayne
	Port Byron	Cayuga
G314	Chenango Forks	Broome
	Ogdensburg	St. Lawrence
G321	Richburg	Allegany
	Limestone	Cattaraugus
	Dannemora	Clinton
G321 (Cont.)	Crown Point	Essex
	Wyoming	Wyoming
G322	Knox Memorial	St. Lawrence
	Belleville	Jefferson
	New Berlin	Chenango
	Chazy	Cortland
	St. Johnsville	Montgomery
	La Fargeville	Jefferson
	Sherman	Chautauqua
	McGraw	Cortland
	Forestville	Chautauqua
G323	Tupper Lake	Franklin
	North. Adirondack	Clinton
	Wyandanch	Suffolk
	Beaver River	Lewis
	Pine Valley	Chautauqua
	Morrisville	Madison
	Adirondack	Oneida
	Union Springs	Cayuga
	Ausable Valley	Clinton
	Westmoreland	Oneida
	Randolph	Cattaraugus
	Whitehall	Washington
	Dalton-Nunda	Livingston
	Saranac	Clinton
	Beekmantown	Clinton
	Frewsburg	Chautauqua
	Clyde-Savannah	Wayne
	Pembroke	Genesee
	Watkins Glen	Schuyler
	Bainbridge	Chenango
	Weedsport	Cayuga
	Kendall	Orleans
	Sodus	Wayne
	Jordan-Elbridge	Onondaga
	Livonia	Livingston
	La Fayette	Onondaga
	Frankfort-Schu	Herkimer
	York	Livingston
G323 (Cont.)	Trumansburg	Tompkins
	Lowville	Lewis
	E. Bloomfield	Ontario
	Canton	St. Lawrence
	Dansville	Livingston
	Gowanda	Cattaraugus
	Royalton-Hartland	Niagara
	Sidney	Delaware
	Bath	Steuben
	Williamson	Wayne
	Silver Creek	Chautauqua
	Avon	Livingston
	Potsdam	St. Lawrence
	Herkimer	Herkimer
	Holley	Orleans
	Clinton	Oneida
	Northeastern	Clinton
	Mechanicville	Saratoga
	Rensselaer	Rensselaer
	Caledonia-Mumford	Livingston
G324	S. Country	Suffolk
	Roosevelt	Nassau
	Gouverneur	St. Lawrence
	Malone	Franklin
	Elwood	Suffolk
	Susquehanna	Broome
	Queensbury	Warren
	Niagara-Wheatfield	Niagara
	Phelps-Clifton	Ontario
	Chittenango	Madison
	Averill Park	Rensselaer
	Springville	Erie
	Hornell	Steuben
	Evans-Brant	Erie
	Owego-Apalachin	Tioga
	Alden	Erie
	Saugerties	Ulster
	Amsterdam	Montgomery
	Cohoes	Albany
	Spencerport	Monroe

APPENDIX B (Cont.)

Group Identifier	Component Districts		Group Identifier	Component Districts		Group Identifier	Component Districts	
	Name	County		Name	County		Name	County
G324 (Cont.)	Chenango Valley	Broome	G326 (Cont.)	Commack	Suffolk	G333 (Cont)	Skaneateles	Onondaga
	Burnt Hills	Saratoga		Patchogue-Medf	Suffolk		Southwestern	Chautauqua
	Churchville-Chili	Monroe		N. Syracuse	Onondaga		Wheatland-Chili	Monroe
	Newfane	Niagara		Elmira	Chemung		Honeoye Falls-Lima	Monroe
	Norwich	Chenango		Newburgh	Orange		Center Moriches	Suffolk
	Fulton	Oswego		Liverpool	Onondaga		Seneca Falls	Seneca
	Massena	St. Lawrence		Utica	Oneida		Westhill	Onondaga
	Lansingburgh	Rensselaer					Bellmore	Nassau
	Hilton	Monroe	G331	Border City	Seneca		Onondaga	Onondaga
	Sayville	Suffolk		Gilbertsville	Otsego		Eden	Erie
	Palmyra-Macedon	Wayne		Gonanda Centra	Wayne		Voorheesville	Albany
	Rott-Mohanasen	Schenectady		Lyme	Jefferson		N. Bellmore	Nassau
	Islip	Suffolk		Franklin	Delaware			
	Watertown	Jefferson		Brunswick Comm.	Rensselaer	G334	Rondout Valley	Ulster
	Glens Falls	Warren					Olean	Cattaraugus
	Maine-Endwell	Broome	G332	S. Kortright	Delaware		Island Trees	Nassau
	Peekskill	Westchester		Hancock	Delaware		Rocky Point	Suffolk
	Tonawanda	Erie		Stamford	Delaware		Iroquois	Erie
				Hamilton	Madison		Plainedge	Nassau
G325	William Floyd	Suffolk		Clymer	Chautauqua		Bayport-Blue Point	Suffolk
	Copiague	Suffolk		Willsboro	Essex		Ravena-Coeymans	Albany
	Central Islip	Suffolk		E. Moriches	Suffolk		Miller Place	Suffolk
	Brookhaven-Comse	Suffolk					Harborfields	Suffolk
	E. Islip	Suffolk	G333	Dundee	Yates		Cornwall	Orange
	N. Babylon	Suffolk		S. Cayuga	Cayuga		Hudson	Columbia
	W. Babylon	Suffolk		Gorham-Middles	Ontario		Cortland	Cortland
	Cheek-Maryvale	Erie		Thousand-Islands	Jefferson		Newark	Wayne
	W. Islip	Suffolk		Cambridge	Washington		Brockport	Monroe
	Jamestown	Chautauqua		Falconer	Chautauqua		Fredonia	Chautauqua
	E. Greenbush	Rensselaer		Mount Sinai	Suffolk		Grand Island	Erie
	Whitesboro	Oneida		Canajoharie	Montgomery		New Hartford	Oneida
	Lindenhurst	Suffolk		Red Hook	Dutchess		Johnson City	Broome
	W. Genesee	Onondaga		Westfield	Chautauqua		Plattsburgh	Clinton
	Vestal	Broome		Elmira Heights	Chemung		Lewiston-Porter	Niagara
	N. Tonawanda	Niagara		Bemus Point	Chautauqua		Geneva	Ontario
	Troy	Rensselaer		Northeast	Dutchess		Beacon	Dutchess
				Watervliet	Albany		Scotia-Glenville	Schenectady
G326	Middle Country	Suffolk		Merrick	Nassau		Jamesville-Dewitt	Onondaga
	Brentwood	Suffolk		N. Merrick	Nassau		Seaford	Nassau
	Sachem	Suffolk		Highland	Ulster		Fayetteville	Onondaga
	Connetquot	Suffolk		Cazenovia	Madison		Wantagh	Nassau

Group Identifier	Component Districts	
	Name	County
G334 (Cont.)	E. Aurora	Erie
G335	S. Huntington	Suffolk
	Lakeland	Westchester
	Kings Park	Suffolk
	Frontier	Erie
	Sweet Home	Erie
	Arlington	Dutchess
	Hyde Park	Dutchess
	S. Colonie	Albany
	Corning	Steuben
	Fairport	Monroe
	Orchard Park	Erie
	Baldwin	Nassau
	Penfield	Monroe
	Binghamton	Broome
	Happauge	Suffolk
	Mahopac	Putnam
	Carmel	Putnam
	Deer Park	Suffolk
	Lancaster	Erie
	Rush-Henrietta	Monroe
	Middletown	Orange
	Kingston	Ulster
	Harpursville	Broome
	Guilderland	Albany
	E. Meadow	Nassau
	Bay Shore	Suffolk
	Hamburg	Erie
G336	Clarkstown	Rockland
	Three Village	Suffolk
	Wappingers	Dutchess
	Smithtown	Suffolk
	E. Ramapo	Rockland
	Niagara Falls	Niagara
	Levittown	Nassau
	Syracuse	Onondaga
	Buffalo	Erie
	Schenectady	Schenectady
	Massapequa	Nassau
G336 (Cont.)	Mount Vernon	Westchester
	Williamsville	Erie
G341	Jefferson	Schoharie
	Westport	Essex
	Green Island	Albany
	Grand Gorge	Delaware
	Glens Falls Common	Warren
G342	Livingston Manor	Sullivan
	Delaware Valley	Sullivan
	Clifton-Fine	St. Lawrence
	Elizabethtown	Essex
	Germantown	Columbia
	New Lebanon	Columbia
	Jeffersonville	Sullivan
	Mayville	Chautauqua
	Florida	Orange
	New York Mills	Oneida
	Valley Stream 24	Nassau
G343	Luzerne	Warren
	Cleveland Hill	Erie
	Ticonderoga	Essex
	Hammondsport	Steuben
	Greenville	Greene
	Naples	Ontario
	Delhi	Delaware
	Honeoye	Ontario
	Catskill	Greene
	Putnam Valley	Putnam
	New Paltz	Ulster
	Waterford-Halfmoon	Saratoga
	Mount Pleasant	Westchester
	E. Rochester	Monroe
	Valley Stream 13	Nassau
	Franklin Square	Nassau
	Hastings-on-Hudson	Westchester
	E. Rockaway	Nassau
	Pleasantville	Westchester
	Babylon	Suffolk
G344	Wayne	Wayne
	Brewster	Putnam
	Clarence	Erie
	Yorktown	Westchester
	Batavia	Genesee
	Bethpage	Nassau
	Pearl River	Rockland
	W. Irondequoit	Monroe
	Warwick Valley	Orange
	Malverne	Nassau
	Lackawanna	Erie
	Amityville	Suffolk
	Elmont	Nassau
	Amherst	Erie
	Niskayuna	Schenectady
	Brighton	Monroe
G345	Middle Island	Suffolk
	E. Syracuse	Onondaga
	Farmingdale	Nassau
	Ramapo	Rockland
	Ithaca	Tompkins
	Gates-Chili	Monroe
	Long Beach	Nassau
	Huntington	Suffolk
	Monroe-Woodbury	Orange
	Freeport	Nassau
	Oceanside	Nassau
	Webster	Monroe
	N. Colonie	Albany
	Plainview-Old	Nassau
	Pittsford	Monroe
G346	Half Hollow Hills	Suffolk
	Greece	Monroe
	Rochester	Monroe
G351	Henderson	Jefferson
	Roxbury	Delaware
	Lyncourt	Onondaga
	Narrowsburg	Sullivan

APPENDIX B (Cont.)

Group Identifier	Component Districts		Group Identifier	Component Districts		Group Identifier	Component Districts	
	Name	County		Name	County		Name	County
G351 (Cont.)	Roscoe	Sullivan	G355	Hempstead	Nassau	G362 (Cont.)	Eldred	Sullivan
				Uniondale	Nassau		Greenport	Suffolk
G352	N. Warren	Warren		Northport	Suffolk		Sag Harbor	Suffolk
	Greenwood Lake	Orange		Albany	Albany		Elmsford	Westchester
	Johnsburg	Warren		Mamaroneck	Westchester		Colton-Pierrepont	St. Lawrence
				Hicksville	Nassau		Margeretville	Delaware
G353	Deposit	Broome		Haverstraw-Sto	Rockland		Town of Webb	Herkimer
	Copake-Taconic	Columbia					Hunter-Tannersville	Greene
	Blind Brook	Westchester	G356	Kenmore-Tonawanda	Erie		Chautauqua	Chautauqua
	Pine Plains	Dutchess		Yonkers	Westchester		Southold	Suffolk
	Lansing	Tompkins					Tuckahoe	Westchester
	Ellenville	Ulster	G361	Minerva	Essex			
	Saranac Lake	Franklin		Wells	Hamilton	G363	Jeffersonville	Sullivan
	Fallsburg	Sullivan		Newcomb	Essex		Rye Neck	Westchester
	Spackenkill	Dutchess		Bolton	Warren		Island Park	Nassau
	Haldane	Putnam		Schroon Lake	Essex		Hampton Bays	Suffolk
	Rhinebeck	Dutchess		Long Lake	Hamilton		Valley Stream UF	Nassau
	Solvay	Onondaga		Springs	Suffolk		Edgemont	Westchester
	Valhalla	Westchester		Fishers Island	Suffolk		Mattituck-Cutchog	Suffolk
	Geneseo	Livingston		Garrison	Putnam		E. Williston	Nassau
	Ardsley	Westchester		Bridgehampton	Suffolk		Westhampton Beach	Suffolk
	Floral Park	Nassau		Tuxedo	Orange		Croton-Harmon	Westchester
	Dobbs Ferry	Westchester		Amagansett	Suffolk		Southampton	Suffolk
	Briarcliffmanor	Westchester		Quogue	Suffolk		E. Hampton	Suffolk
	New Hyde Park	Nassau		Putnam Central	Washington		Manhasset	Nassau
				Indian Lake	Hamilton		Marlboro	Ulster
G354	Monticello	Sullivan		Lake Pleasant	Hamilton		Lake George	Warren
	Somers	Westchester		Oysterponds	Suffolk		Lake Placid	Essex
	S. Orangetown	Rockland		Keene	Essex		N. Salem	Westchester
	Nyack	Rockland		E. Quogue	Suffolk		Carle Place	Nassau
	Chappaqua	Westchester		Montauk	Suffolk		Nanuet	Rockland
	Pelham	Westchester		Remsenburg	Suffolk		Millbrook	Dutchess
	W. Hempstead	Nassau		Maplewood	Albany		Armonk	Westchester
	Schalmont	Schenectady		Shelter Island	Suffolk		Cold Spring Harbor	Suffolk
	Herricks	Nassau		Pocantico Hill	Westchester		Irvington	Westchester
	Katonah-Lewsboro	Webster		Menands CSD	Albany		Port Jefferson	Suffolk
	Lynbrook	Nassau		Tuckahoe	Suffolk		Oyster Bay	Nassau
	E. Irondequoit	Monroe					Bronxville	Westchester
	Glen Cove	Nassau	G362	Downsville	Delaware			
	Cheektowaga	Erie		Windham-Ashland	Greene	G364	Onteora	Ulster
				Gilboa-Conesville	Schoharie		Shoreham-Wading River	Suffolk

APPENDIX B (Cont.)

Group Identifier	Component Districts	
	Name	County
G364 (Cont.)	Riverhead	Suffolk
	Hendrick Hudson	Westchester
	North Shore	Nassau
	Locust Valley	Nassau
	Greenburgh	Westchester
	Port Chester	Westchester
	Mineola	Nassau
	Rye	Westchester
	Scarsdale	Westchester
	Eastchester	Westchester
	Jericho	Nassau
	Harrison	Westchester
	Bedford	Westchester
	Uf of Tarrytown	Westchester
	Rockville Center	Nassau
	Westbury	Nassau
	Garden City	Nassau
	Hewlett-Woodmere	Nassau
	Roslyn	Nassau
G365	Lawrence	Nassau
	Port Washington	Nassau
	White Plains	Westchester
	Syosset	Nassau
	New Rochelle	Westchester
	Great Neck	Nassau