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COST AND BENEFIT SPILLOUTS AS FACTORS AFFECTING
LOCAL TAXATION FOR PUBLIC SCHOOLS

DISSERTATION
Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

John Hemphill Bowman, B.Sc., M.A.

The Ohio State University
1973

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The invaluable assistance of the persons listed above notwithstanding, any remaining errors of fact or judgment are the responsibility of the author.
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CHAPTER 1

INTRODUCTION

An Overview of Educational Finance

Governmental expenditures for publicly provided elementary and secondary education (hereafter referred to simply as public education) amount to about four percent of the gross national product of the United States, and students enrolled in the public schools comprise nearly one-fourth of the nation's population. In 1969-70, for example, outlays for local public schools were equivalent to over 10 percent of total governmental expenditures at all levels, or about 28 percent of state and local direct general expenditures, or about 45 percent of direct general expenditures of local governments only. Public education is, in short, a very significant user of resources.

Nationally, local governments raised over half the revenue for public education in 1969-70, and about 98 percent of locally-raised revenue came from taxes.  


revenues came from the property tax. In that same year, state governments provided a little more than 40 percent of the total revenues available to public schools, and the federal government provided approximately seven percent.\(^3\) As Table 1 shows, the relative importance of the various levels of government has changed substantially over the previous 40 years, although the state share has remained rather constant at about 40 percent since 1949-50. Increases in federal aid in the postwar period have tended to relieve the relative burden on local governments for the support of public schools.

**TABLE 1.--Sources of Public School Revenues by Level of Government, United States, 1929-30 to 1969-70 (Millions of Dollars)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Federal Amount</th>
<th>Federal Percent</th>
<th>State Amount</th>
<th>State Percent</th>
<th>Local Amount</th>
<th>Local Percent</th>
<th>Total Amount</th>
<th>Total Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929-30</td>
<td>7</td>
<td>0.3</td>
<td>354</td>
<td>17.0</td>
<td>1,728</td>
<td>82.7</td>
<td>2,089</td>
<td>100.0</td>
</tr>
<tr>
<td>1939-40</td>
<td>40</td>
<td>1.8</td>
<td>685</td>
<td>30.3</td>
<td>1,536</td>
<td>67.9</td>
<td>2,261</td>
<td>100.0</td>
</tr>
<tr>
<td>1949-50</td>
<td>156</td>
<td>2.9</td>
<td>2,166</td>
<td>39.8</td>
<td>3,155</td>
<td>57.3</td>
<td>5,437</td>
<td>100.0</td>
</tr>
<tr>
<td>1959-60</td>
<td>649</td>
<td>4.4</td>
<td>5,766</td>
<td>39.1</td>
<td>8,332</td>
<td>56.5</td>
<td>14,747</td>
<td>100.0</td>
</tr>
<tr>
<td>1969-70</td>
<td>2,545</td>
<td>6.6</td>
<td>15,645</td>
<td>40.7</td>
<td>20,286</td>
<td>52.7</td>
<td>38,476</td>
<td>100.0</td>
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Table 1 also documents the sharp rise in the total number of dollars available for public education over the 40-year period. Public education expenditures accounted for only 2.2 percent of the gross national product in 1929-30, compared with 4.2 percent in 1969-70. Adjusting for inflation and increased school enrollments, per-pupil public school expenditures in real (1969) dollars increased by over 300 percent in this same time period, and the absolute level of expenditure in current dollars increased more than 16-fold. The very strong growth in public school expenditures in recent years is illustrated by data in Table 1 which show that the four-fold increase in federal dollars between 1959-60 and 1969-70 was sufficient to increase the federal share by only 50 percent.

The 1969-70 mean state share of public school revenues—40.7 percent—given above masks a good deal of variation among states. National Education Association figures for 1970 reveal a range of from 8.5 percent in New Hampshire to 87 percent in Hawaii (where the public schools are financed and operated by the state). The median percentage was 41.8, with 12 states contributing less than 30 percent and 13 contributing more than 50 percent.

The state-local education finance system

Local resources.--Even though 21 states and the District of

4Johns, "Development of State Support," Table 1-3, p. 18.
6As reported in Johns, "Development of State Support," Table 1-6, p. 22.
Columbia utilized local non-property taxes for public schools in 1968-69, Moore has estimated that as much as 98 percent of locally-raised school revenue was derived from the property tax. These figures reflect the fact that most non-property taxes are levied by multi-purpose units of government having dependent schools while most independent school districts have access only to the property tax. For this reason, the measure of local school fiscal ability or tax capacity most frequently used is some measure of property value.

Many authors have documented the great disparities in relative taxable wealth (property). Even among states, the per-pupil tax base in the wealthiest state is estimated to be more than three times as great as that of the poorest. In 1966, for example, the per-pupil (full) property values ranged from a high of $72,161 in Wyoming to a low of $21,179 in Georgia. Using full-value property values per classroom unit in 1959-60, the Advisory Commission on Intergovernmental Relations found the range to be from $311 thousand (43 percent of the national average) in Mississippi to $1,128 thousand (153 per-

---


8Richard A. Rossmiller, James A. Hale, and Lloyd E. Frohreich, Fiscal Capacity and Educational Finance, National Educational Finance Project Special Study Number 10 (Madison, Wisconsin: Department of Educational Administration, The University of Wisconsin, 1970), Table 7.9, pp. 217-18. Contrary to rather popular belief, the authors' findings indicate that the rankings of the states are quite different when per capita income is used instead of per-pupil property. On the basis of income, for example, Wyoming dropped from first to twenty-eighth while Georgia rose from fiftieth to thirty-seventh (see Table 7.10, pp. 219-20, in the above-cited study).
cent of the national average)—also a ratio of more than three-to-one from highest to lowest.

But as large as the inter-state differences are, the intra-state differences (on which we later focus) are often much greater. In Ohio, for example, it has been estimated that the local property tax base per pupil in the state's wealthiest school district is nearly 60 times as great as in the poorest, and in California the ratio is reported to be 10,000 to 1.

State aid programs.--The two-fifths of public school revenue that are provided by the states are largely funded from non-property tax sources. The aid is distributed in a variety of ways and for numerous special purposes as well as for general purposes.  


10Figures on assessed values (as opposed to the full-value figures cited above for states) collected by the Ohio Education Association indicate a per-pupil taxable value in Cuyahoga Heights of about $183 thousand contrasted with about $3,100 for Huntington Local in 1971. Basic Financial Data of Ohio School Districts (Columbus; Ohio Education Association, 1971), Table VIII, pp. 16-39.


National Educational Finance Project estimates indicate that over 85 percent of state aid in 1968-69 was extended for general purposes, and that nearly half of all state aid was allocated on a "fiscal-client-modified" basis which took into account not only the fiscal ability of the school district but also the educational needs of the clientele served by the schools. One-fifth of all state aid was found, however, to be allocated on a "uniform" basis which took into account neither of the considerations reflected in "fiscal-client-modified" aid.\footnote{Alexander, Hamilton, and Forth, "Classification of State School Funds," pp. 35-40.}

These national average figures conceal a great deal of variation among states. Whereas approximately half of all state aid was extended on a "fiscal-client-modified" basis, Nevada distributed all of its aid on this basis and New York, Alabama, and Louisiana all allocated about 90 percent of state school monies in this manner. At the other extreme, several states, including California, allocated none of their 1968-69 aid payments on the combined bases of the fiscal capacities and clientele needs of the school districts. Uniform aid, on the other hand, accounted for more than half of California's school aid payments—compared with 21 percent nationally—while Connecticut and Arkansas distributed 90 percent or more of their aid funds on a uniform basis. Other distribution schemes used to greater or lesser degrees among the states include "fiscal-modified" only...
An increasing share of state aid is allocated in a manner intended to minimize the effects of local resources and other factors beyond the control of the local school district on the district's expenditure level. Between 1949-50 and 1968-69, such "equalizing" state aid increased from 45 percent to 78 percent of total state aid, a finding consistent with Johns and Salmon's statement that "... the 'equalization concept' is a highly esteemed value in American culture."16

The degree of equalization actually achieved, however, is considerably less than might be expected on the basis of a finding that over three-fourths of state aid is allocated through equalizing-type formulas. The explanation lies in two basic factors: (a) local school districts generally are permitted to add additional funds above some "foundation" amount without benefit of equalization by the state; and (b) many states--while employing equalization-type formulas--funnel relatively little money through them. It may also be the case, of course, that some of the formulas used are inherently


15 Alexander, Hamilton, and Forth, "Classification of State School Funds," Table 2-1, p. 32.


not very strongly equalizing.

The basic device used by states in distributing equalization funds to local schools is the "foundation program." In 1968-69, 34 of the 50 states used a foundation program of the "Strayer-Haig" or "Strayer-Haig-Mort" variety, and another eight states used other equalization formulas. Hawaii had state funded and operated schools, leaving only seven states with flat-grant school support programs.18

A foundation program of the Strayer-Haig variety is intended to allocate state aid in inverse proportion to local school fiscal capacity, and works in the following manner. A (legislatively approved) basic or "foundation" level of expenditures per unit (e.g., pupil, classroom) is determined, and a minimum or qualifying local tax rate is set. The local contribution toward the foundation program is the product of the local tax base times the minimum tax levy, and the state aid is the difference between the foundation support level and the local share.19 In operation, the minimum foundation spending level has tended to be set rather low, and flat-grant guarantees have been incorporated for districts that would otherwise qualify for no state aid. Both these situations tend to greatly diminish the extent to which a foundation program can equalize educational resources among districts.

18Johns and Salmon, "Financial Equalization of Public School Support Programs," Table 4-1, p. 122

Among the findings of the National Educational Finance Project's investigation of state aid is the statement that "... that the extent to which financial resources for education are equalized does not depend as much on the type of plan used as on the content of the plan and the extent to which it is financed."²⁰ Thus, two of the states in the top ten in terms of the degree of equalization in 1968-69 (as rated by Johns and Salmon) used flat-grant support (Delaware and North Carolina), while several of the less-equalizing systems employed the Strayer-Haig foundation approach (including New Hampshire, which Johns and Salmon ranked forty-ninth).²¹ Reference to the state-aid statistics reported by Johns reveals that Delaware and North Carolina both provided large percentages of school revenue from the state level (about 71 percent in each in 1970), whereas New Hampshire provided the lowest percentage of school monies from state sources (8.5 percent in 1970).²²

Similarly, Briley concluded that although both Indiana and Idaho, as examples, used Strayer-Haig foundation programs in 1968-69, Idaho achieved a much greater degree of equalization than Indiana because in the former state about three-fourths of the state-local monies were channeled through the (equalizing) formula, whereas in the latter state the percentage was about 30. On the same theme,


²¹Johns and Salmon, "Financial Equalization of Public School Support Programs," Table 4-2, p. 137.

²²Johns, "Development of State Support," Table 1-6, p. 22.
between New Mexico and Connecticut—both of which used flat grants—New Mexico achieved a greater degree of equalization than Connecticut, because their respective state support shares were about 71 percent and 20 percent.23

Results of the state-local finance system. When a local property tax system characterized by large inequalities in per-pupil or per-classroom taxable wealth is joined with a system of state aids subject to political manipulation or influence in such matters as the state share of school funds and the basic support level, it probably is not too surprising that the results, in terms of inputs per pupil or classroom, are unequal. Using data for 1959-60, Harrison and McLoone found the interquartile range (the ratio of the 75th to the 25th percentile) of expenditures per classroom unit for single states went from a low of 1.11 (for Utah) to a high of 1.87 (for Missouri).24 Moreover, while the per-classroom expenditure at the second percentile was $9,300 in New York, there were about 300 classroom units with less than $7,000 in expenditures.25 Using 1968-69 data and samples of school districts having at least 1,500 pupils, Briley found intra-state ratios of high-to-low revenues per pupil


25Harrison and McLoone, Profiles in School Support, Tables 2 and 5, pp. 10 and 69.
ranging from 1.24 (Nebraska) to 3.90 (Missouri).\textsuperscript{26}

With this brief overview of the school finance system, we now move to a consideration of recent court challenges to this system.

\textbf{Legal Challenges to the School Finance System}

The prevailing system of educational finance currently is under serious legal attack because of its alleged denial of equal protection as required by the Fourteenth Amendment to the United States Constitution and similar provisions of some state constitutions. Since August, 1971, decisions of several courts have held existing school finance systems of several states unconstitutional because of their reliance upon local property taxation, and the apparent strong relationship between per-pupil property valuation disparities and disparities in per-pupil school expenditures; disparities in tax rates for school support, also traceable to unequal tax bases, have come in for special criticism in some of the cases. In brief, the courts have, in at least eight cases, upheld plaintiffs' contention that educational opportunity is a function of parental and/or school district wealth. The states affected (and the cases) are California (Serrano v. Priest), Minnesota (Van Dusartz v. Hatfield), Texas (Rodriguez v. San Antonio Independent School District), New Jersey (Robinson v. Cahill), Wyoming (Sweetwater County Planning Committee for the Organization of School Districts v. Hinkle),

\textsuperscript{26}Briley, "School District Revenue and Financial Ability," Table 3-1, pp. 57-8.
Arizona (Hollins v. Shofstall), and Kansas (Caldwell v. The State of Kansas). Of these, the California, Texas, and New Jersey cases are perhaps the most significant as landmark cases, and each is briefly treated below.

The first of the current wave of cases ruling against existing educational finance systems on the equal protection argument, Serrano v. Priest, was decided by the California Supreme Court on August 30, 1971. In reaching its opinion, the court made three basic arguments or findings: (1) that wealth is a "suspect" classification for legislative discrimination, and that the then-current California school finance system employed this classification; (2) that education is a "fundamental interest" which cannot be conditioned on suspect criteria such as wealth; and (3) that there was no "compelling


The eighth case (Milliken v. Green), announced by the Michigan Supreme Court at the end of December, 1972, leaves the legality of current Michigan school finance situation in doubt. Relying upon state constitutional provisions (but otherwise following the Serrano reasoning closely), the court found that the school finance program in effect in 1971 when the suit was brought denied equal protection. Whether 1972 legislative changes in state aid were sufficient to establish equal protection was not decided, however. (Milliken v. Green, 389 Mich. Advance, processed copy used; publication scheduled for March, 1973.)
state interest" served by the then-current school finance system.\textsuperscript{28} Based on these findings, the court ruled that the California school finance system violated the equal protection clause of the Fourteenth Amendment to the United States Constitution, and noted that the same conclusion could be supported by California's state constitution.\textsuperscript{29} The \textit{Serrano} case is of considerable interest both because it was the first to find the present school finance schemes unconstitutional and because it has served as a pattern for most of the later decisions.

The Texas school finance case, \textit{Rodriguez v. San Antonio Independent School District}, was decided by a three-judge federal court on December 23, 1971, and, like the \textit{Serrano} case, was based upon the United States Constitution. The \textit{Rodriguez} ruling went somewhat beyond \textit{Serrano} in stating that the quality of education provided cannot be a function of wealth other than the wealth of the state as a whole.\textsuperscript{30} The \textit{Rodriguez} case is of considerable interest in its own right because the court gave the State of Texas only two years in which to develop a new system for financing public education. This case is, moreover, the first of the post-\textit{Serrano} school finance cases to be accepted by the United States Supreme Court.\textsuperscript{31}


\textsuperscript{29}Federation of Tax Administrators, \textit{School Finance}, p. 2. Technically, the California Supreme Court in \textit{Serrano} simply reversed a lower court decision and remanded the case to that court for rehearing.

\textsuperscript{30}Schoettle, "Judicial Requirements," p. 460.

\textsuperscript{31}Schoettle, "Judicial Requirements," p. 472. Scheduled for hearing in the fall, 1972, term of the court, a decision on \textit{Rodriguez} probably will be announced in the late spring of 1973.
Another of the several recent school finance cases worth separate mention here is that of Robinson v. Cahill, decided January 19, 1972, by the New Jersey Superior Court. The New Jersey ruling went beyond the Serrano and Rodriguez rulings in apparently requiring statewide financing of New Jersey public education. Moreover, the Superior Court ruling stated that the court would cause all minimum grants that would otherwise benefit rich districts to be distributed instead among the poor districts if the State of New Jersey did not enact a non-discriminatory school finance plan by January 1, 1973, and it provided further that all New Jersey state school funds would be enjoined after January 1, 1974, if a satisfactory program had not been enacted by that date.

One or more Serrano-type cases have been filed in many, if not most, of the other states. The pace of judicial overturning of educational finance systems has abated in recent months, however, but this is probably attributable at least in part to the fact that the United States Supreme Court has accepted the Rodriguez case, and may reasonably be expected to rule upon it by mid-1973. It must be noted in this regard, however, that the courts have not uniformly ruled against existing school finance institutions—although the trend is in that direction. The U. S. Supreme Court ruling should remove a good deal (but, as noted below, not all) of the uncertainty regarding the future of public school finances.

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33 Advisory Commission on Intergovernmental Relations, School Finance, p. 8.
School Finance in the Post-Serrano World

The exact implications of Serrano and similar cases for the future of public school finance are not yet known,\(^\text{34}\) and consensus seems to be that they will not be known for some time to come. A common comparison relates school finance to school desegregation. Noting that the United States Supreme Court first ruled against racial segregation and ordered its halt in the 1954 *Brown v. Board of Education* decision, and that such segregation is still rife, it has been suggested that one should not expect a drastic and far-reaching overhaul of the school finance system in the next few years. Moreover, there is the chance that the Supreme Court will rule in favor of current school finance systems and overturn the Serrano-like school finance decisions of the lower federal courts.

The United States Supreme Court did rule against plaintiffs in cases involving allegations similar to those in Serrano and the other equal protection cases in 1969 (*McInnis v. Ogilvie*, an Illinois case originally titled *McInnis v. Shapiro*) and in 1970 (in the Virginia case of *Burruss v. Wilkerson*). In its Serrano ruling, however, the California Supreme Court was careful to note that whereas the McInnis plaintiffs had sought a solution on a basis that the courts found non-justiciable—namely, funding education solely on the basis of need—the Serrano plaintiffs sought only to have the current

system declared unconstitutional. Noting this distinction, Schoettle has suggested that the earlier McInnis and Burruss rulings ought not be binding precedent. Moreover, he has expressed the opinion that the Supreme Court of the United States will ultimately affirm the result reached in Serrano v. Priest and similar cases. However, I am not sure whether this position will be reached in one of the current cases or will be preceded—as in cases concerning desegregation and voting—by an opinion which goes the other way.

Indeed, from the California Supreme Court’s August, 1971, Serrano ruling through October, 1972, only one school finance equal protection decision had followed the McInnis precedent: Spano v. Board of Education, decided by the Westchester County, New York, Supreme Court.

The feeling that educational finance cannot remain unchanged in the post-Serrano world is shared by this writer, both for reasons stated above and also because some of the decisions already handed down—e.g., the New Jersey case—are based upon state constitutions and may stand regardless of what the United States Supreme Court rules in the Rodriguez case, and also because some of the recent decisions—again, the New Jersey case is an example—prescribe a maximum period of time for accomplishing a revision of the school finance system in question before the court will step in to impose a solution.

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37Ohio Legislative Service Commission, Equal Protection of the Laws, p. 13. As discussed in this same report, however, a federal court in Maryland has ruled (in Parker v. Mandel) contrary to the Serrano findings that education is a fundamental interest and that wealth is a suspect classification (pp. 9-10).
The courts have found that inter-district disparities in per-pupil taxable property values are so great that equality of educational opportunity is precluded under existing state-local school finance arrangements. Even at very much higher rates of taxation than in rich districts, the poor districts cannot hope to achieve nearly as high a level of spending as their richer neighbors. Furthermore, state aid programs do not very effectively offset differences in the local tax base. As the California court observed in a much-quoted statement in the Serrano decision, "Affluent districts can have their cake and eat it too: they can provide a high quality of education for their children while paying lower taxes. Poor districts, by contrast, have no cake at all."

To satisfy the courts, a financing system must be developed that promotes "equality of educational opportunity." And while the correspondence between increased inputs (expenditures) and increased outputs isn't known with any precision (and probably isn't perfect), there is a strong presumption that you generally "get what you pay

Certainly, it seems reasonable to assume that there must be considerably less significance attaching to the wealth of individual school districts in the determination of educational spending, and—in the absence of professional agreement—to assume that "equal educational opportunity" may be taken to mean approximately equal financial resources per pupil (with due allowance for cost differences in different areas and for different clientele). This assumption is rather commonly made in the literature treating the post-Serrano school finance situation.

If one accepts as a reasonable approximation of equal educational opportunity some "equal-dollars-per-pupil" concept, there is still the question of whether the emphasis should be on approximate equality of per-pupil taxable resources or approximate equality of per-pupil expenditures. A reasonable defense for either inter-

39In view of the inconclusive results of the inquiries into the relationship between educational inputs and outputs, it may be more appropriate simply to suggest that with differences in per-pupil wealth as great as they are, poor districts almost certainly are unable to provide education on a par with that offered in wealthy districts, especially at any given level of taxation, without suggesting that more inputs will necessarily always lead to more output.

40The knotty problem of defining equal educational opportunity is beyond the scope of this dissertation. Where the concept is used, it is done either by use of one or more plausible definitions or supported by the literature in the area.

41A third possible interpretation of equality of educational opportunity—"equal outcomes"—is suggested by Schoettle, "Judicial Requirements," p. 457. This possibility is viewed as one that the courts are unlikely to adopt, in part because of the virtual impossibility of defining educational output on a widely-accepted basis. As noted above, the courts have avoided getting entangled in defining educational needs in the McInnis and related cases; there is little reason to assume the judiciary will be more anxious to tackle the measurement of educational output.
pretation probably could be put forward.

If, for example, a high premium continues to be placed on local autonomy in school expenditure decisions, equalization of the tax base per pupil would perhaps be the more appropriate conception of equality of opportunity. With an equal amount of wealth behind each pupil, any differences in actual local revenues per pupil would reflect only differences in tax effort arrived at through exercise of local discretion. Moreover, differences in tax rates for public education also would reflect local preferences and differences in program levels. Proponents of minimal state interference would argue that any resulting differences in local taxes per pupil (or in school tax rates) would be a reasonable price to pay for preservation of local choice—indeed, that such differences, growing out of "consumer" choice, would be preferable to statewide uniformity of per-pupil school revenues.

Opponents of simple base equalization would argue that it is an inadequate remedy for existing ills. Indeed, it already has been argued that "place" discrimination—as opposed to the "wealth" discrimination that is the subject of the Serrano-type cases—would result from simple per-pupil tax base equalization, and that place discrimination would, in fact, simply tend to be wealth discrimination (given existing residential patterns and school district boundaries) arrived at in a less conspicuous manner.42

42 Charles S. Bensen, "Economic Analysis of Institutional Alternatives for Providing Education (Public, Private Sector)," in Economic Factors Affecting the Financing of Education, ed. by
There are, of course, factors other than local choice to be considered. Thus, if education benefits affect an area larger than the decision-making local school district, it may seem more desirable to strive for approximate equality of dollars spent. This will be particularly true if local school taxing and spending decisions are affected significantly by costs and/or benefits that extend (spill-over) beyond the school district boundaries, or by sharing of tax base with one or more overlapping local governments ("municipal over-burden"). If one or more such factors has a significant effect on local public school spending levels, mere equalization of per-pupil local tax base almost certainly would not lead to substantial equality of educational opportunity. In such circumstances the desirability of continuing to entrust each local district with vital control over education taxing and spending decisions would be called into serious question. 43 If education benefit spillouts from the area providing the benefits are substantial, for example, then "consumers" who live outside the local school district also ought to have some voice in deciding the level of educational services provided. Such a situation would tend to favor something like statewide expenditure equalization.

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43Wise has raised a legal question--the answer to which he has noted is not clear--as to whether mere equalization of available per-pupil resources would meet with the approval of the courts: "If it is children who are entitled to equal protection, then the quality of a child's education could not be subject to a vote of his neighbors." (Wise, "The California Doctrine," p. 82.)
Finally, it must be noted that the Serrano-type cases do not mean that the property tax cannot be used to support public schools. With appropriate changes in its state-local school finance system, a state could continue to derive a large percentage of its school revenues from the property tax. One sort of "appropriate change" would be replacement of the local property tax with a statewide tax on property, with distribution of revenues to local schools based on some set of criteria relevant to the provision of equal educational opportunity. In general, however, even this drastic an overhaul in the property tax apparently would not be required by the courts, since truly equalizing state aid formulas--coupled, perhaps, with restrictions on the amount of local supplemental taxation or spending that would be permitted--could accomplish the same objective of greatly diminishing or even eliminating the functional relationship that now exists between local per-pupil property values and per-pupil revenues or expenditures.45

44The New Jersey and Wyoming school finance cases cited earlier, however, are said to require statewide taxation. (Schoettle, "Judicial Requirements," p. 462. A discussion of the New Jersey, Wyoming and Arizona decisions--all of which were based on state constitutions--and dwelt upon disparities in tax rates--is contained in: Ohio Legislative Service Commission, Equal Protection of the Laws, pp. 9-12.)

The Present Research Task

It is the purpose of this dissertation to raise and seek answers to a number of questions concerning the determinants of per-pupil local school taxes, including: Are local taxes per pupil a positive function of local wealth or capacity? Do local tax levels vary directly with the ability of the school district to export its taxes? Do local tax levels vary inversely with the exporting of education benefits from the school district? What is the effect on local taxes of intergovernmental school aid? Do socio-economic characteristics of the local population appear to strongly influence local school taxation decisions?

If there are discernible and significant patterns or relationships between taxing and expenditure decisions of local school districts and the economic, social, and/or demographic characteristics of the districts, such information would be useful in developing new approaches to educational finance.

Concentration on local taxation is warranted, even in the post-Serrano world, because it seems reasonable to assume that maximum feasible local involvement in educational decisions will continue to be a popular objective and, as noted above, the recent equal protection decisions do not mean (at least for most states) that local school taxation must end.

Because local school taxation is now virtually synonymous with local property taxation, the empirical portion of the research is necessarily concerned with the property tax. Thus, certain of the variables used below in the statistical models that seek to measure
the effects of cost (tax) and benefit exporting on local school taxation relate rather closely to the property tax. It is important to note, however, that the variables in the statistical work generally would not change substantially if a non-property tax were used. Benefit spillouts, for example, should be unchanged by the form of the local tax used, as would taste-for-education variables. Cost spillouts (tax exporting) still would exist, although perhaps in modified patterns and/or proportions, since property tax exporting would tend to arise through non-local ownership of property and/or presence of business property, whereas local sales and income taxes would tend to be exportable to the extent that local sales are made to non-local residents and the extent that persons employed locally have residences outside the taxing locality, respectively.

The realization that many of the factors affecting, or at least presumed to affect, local educational taxation might be essentially unchanged by the substitution of some local non-property tax for the property tax is important. For one thing, it suggests that findings from the present research may, although based upon empirical data on school finance utilizing the local property tax, be applicable to systems using local non-property taxes. Thus, if ability to export local taxes varies among school districts, and if it is found that this situation appears to cause disparities in per-pupil local school

46 Despite all the difficulties with the property tax, it is likely to remain with us in one form or another. One reason is simply the great amount of revenue raised by the property tax and the increases in other taxes that would be necessary to replace it. In recent years, for example, the property tax has amounted to about one-third of the federal individual income tax.
taxes, this finding would suggest that local non-property taxes and local property taxes both may be deficient if the objective is to achieve approximately equal per-pupil expenditures from local sources.

The remainder of this dissertation is devoted to a quantitative and qualitative study of the factors affecting local educational taxes per pupil. While variables representing educational "tastes" and other rather traditional "determinants" are included, the focus of the research is on the "marginal" effects of cost and benefit exporting on local educational taxation.

The next chapter reviews the literature on educational expenditure determinants, and distinguishes the focus of the present research from earlier research efforts. The statement of the conceptual framework for the present research follows in the third chapter. The fourth chapter is devoted to the statistical analyses, while the fifth chapter qualitatively evaluates the quantitative results in the context of earlier research on educational expenditure determinants and in terms of their general applicability. The implications of the research for policy are discussed in the sixth and final chapter.
CHAPTER 2

LITERATURE RELATED TO THE PRESENT STUDY:
A REVIEW

The present research is concerned with factors affecting local taxation for the support of public elementary and secondary education. While there is no body of empirical research with this specific focus, there is a fairly sizable literature on the determinants of educational spending which is closely related to the current topic.

The research on education-spending determinants is part of a broader literature whose subject is the determinants of governmental expenditures in general. The research in this area is rather diverse, but the general aim is to "explain" governmental expenditures--including differences either among governments at a given point in time or for a given government or set of governments over time--in terms of a relatively small number of factors (independent variables, or determinants), including economic, social, demographic, geographic, and institutional characteristics of the study area.

Although some expenditure determinants studies have focused on particular services (e.g., highways, education) of one or more levels of government while others, more aggregative in nature, have dealt with all expenditures of one or more levels of government, all such
studies have in common the assumption—stated or implied—that governmental expenditures can be explained by a set of variables of general applicability.

If successful in establishing rather stable relationships between governmental activity and some observable (independent) variables, research on determinants of governmental expenditures (or taxation) would serve both practical and academic objectives. Examples of practical applications of such knowledge include the ability to predict future activity (assuming availability of information on the independent variables) and the ability to affect future activity by influencing one or more of the variables. If, for example, it were known that high population density causes governmental service costs to increase, a policy of maintaining a relatively low density might be indicated.

According to Miner, Adolph Wagner is credited with having first hypothesized, in the 1890s, "... that public spending is subject to regularities and can be explained in terms of changing characteristics of a nation or of local governments. ..."¹ Since Wagner, several writers have dealt with historical trends in government expenditures ²


and/or variations in expenditures among governmental units at a given point in time.\(^3\) Use of sophisticated statistical techniques such as multiple regression analysis, permitting the evaluation of the effects on public expenditures of several variables considered simultaneously, is traceable to Fabricant's 1952 study;\(^4\) hence, the specific literature on which the present research builds has a history spanning only 20 years.

Of the many statistical studies of public expenditure determinants that have followed the Fabricant study,\(^5\) only those presenting

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separate analysis of public elementary and secondary education are
directly relevant to the present study. Several such education-
specific studies are discussed in the next part of this chapter and
most of those also are treated in considerable detail in Appendix A.
The last part of this chapter discusses two studies of interest to
this dissertation because of their focus on spillovers of public
education benefits and costs.

Empirical Studies of Education Expenditures

The empirical studies of the determinants of education expendi-
tures discussed below have certain general characteristics in common:
most fall within the economics literature and/or were written by
economists; the multiple regression technique of statistical analysis
was used in all; and most were published in early or middle 1960s.

Weisbrod, "Geographic Spillover Effects and the Allocation of
Resources to Education," in The Public Economy of Urban Communities,
ed. by Julius Margolis (Baltimore: The Johns Hopkins Press for
Resources for the Future, Inc., 1965), pp. 192-206; Woo Sik Kee,
"Central City Expenditures in Metropolitan Areas," National Tax
Journal, XVIII (December, 1965), pp. 337-53; H. Thomas James, James A.
Kelly, and Walter I. Garms, Determinants of Education Expenditures in
Large Cities of the United States (Stanford: Stanford University,
School of Education, 1966); Roy W. Bahl and Robert J. Saunders, Inter-
county Differences in West Virginia Government Expenditures, West
Virginia University, Business and Economic Studies, Vol. 10, No. 3
(June, 1967), pp. 18-30; Roy W. Bahl, Metropolitan City Expenditures:
A Comparative Analysis (Lexington: University of Kentucky Press,
1969); and John C. Lechter, "Determinants of Central City Expendi-
tures: Some Overlooked Factors and Problems," National Tax Journal,

Notable exceptions are the studies by H. Thomas James and his
associates at the Stanford University School of Education (see
footnote 5).
The studies differ in such matters as their exact focus (i.e., some included education as one of many expenditure categories, while others focused exclusively on education) and the number and types of variables used (the most general studies typically have used fewer, more "basic" variables or "determinants," while the education-specific studies were more likely to use more variables and to select those used for their presumed relevance to education).

Multiple Program Studies

Several statistical studies of public expenditure determinants have included "local schools" as one of several expenditure functions treated separately, but have used the same independent or "predictor" variables for all functions. Most studies of this type have used Fabricant's 1952 study as a starting point. Several of these studies are briefly described below.

**Fabricant.**—The Fabricant study of expenditure determinants employed data from the 1942 Census of Governments aggregated to the state level to study ten individual expenditure functions. The same three "basic" independent variables were used in the analysis of each function: population per square mile (1942), percent of population in urban places (1940), and per capita income (1938-42 average). These three variables "explained" 59 percent of the variation among states in the dependent variable, per capita operating expenditures for local schools (1942). Both the population density and urbaniza-

tion variables had negative coefficients, while the income variable had a positive coefficient. The density and income variable was found to be statistically significant at the five percent level.

**Fisher: 1961.**--Fisher replicated Fabricant's study using data from the 1957 Census of Governments. Regressing per capita total expenditures for local schools in 1957 on population per square mile in 1957, percent of population in urban places in 1950, and per capita income in 1956-57, Fisher obtained a coefficient of multiple determination ($R^2$) for local schools of 0.62; thus, 62 percent of the variation among states in per capita local public school expenditures was found to be associated with (or "explained by") differences in the three "basic" independent variables. Fisher did not provide information regarding statistical significance, but the signs of the coefficients for the density and income variables were negative and positive, respectively (same signs as in Fabricant's study), while the sign of the urbanization variable was positive (negative in Fabricant's study).

**Sacks and Harris.**--A 1964 article by Sacks and Harris repeated the Fabricant-Fisher regression analyses using 1960 data for all variables. An $R^2$ of 0.60 was obtained for the local schools function and the signs of the three independent variables were the same as in Fisher's study and, as in Fabricant's pioneering study, the coeffi-

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8Fisher, "Determinants."
9Sacks and Harris, "Determinants."
cients for both density and income were statistically different from zero at the five percent level of significance. More important in the authors' view, however, was the addition in another set of regression models of intergovernmental aid variables (per capita state aid only in the case of local schools, although federal aid also was added for several other expenditure programs) to the three basic variables. With this fourth variable included, the $R^2$ for local schools rose to 0.72. The coefficient of the state aid variable was found to be positive and significant at the five percent level. In the expanded model the signs and significance of the density and income variables were unchanged (although their magnitudes differed somewhat), but the urbanization coefficient was negative (as in Fabricant's study) while remaining statistically non-significant.

Fisher: 1964.--In a 1964 study, Fisher expanded to seven the number of independent variables in attempting to explain variations among states in combined state and local government expenditures for various functions in 1960. In this study he dropped per capita income as a measure of fiscal capacity in favor of two variables: percent of families with less than $2,000 income (1959), and yield of a representative tax system as a percent of the U. S. average (1960). In the regression for local schools, both these variables were significant (i.e., the coefficient was at least 1.5 times as large as the standard error), and the coefficient of the first was negative while that of the second was positive. Of Fisher's three

10Fisher, "Interstate Variation."
demographic variables, two—population per square mile and percent of population in urban places—had negative coefficients (only the density coefficient was significant), while the coefficient of the third—increase in population 1950-1960—was positive and significant. Also included were two socio-political variables—an index of two-party competition, and percent of population over 25 with less than five years of schooling—both of which had positive, insignificant coefficients in the regression for local schools. A coefficient of multiple determination ($R^2$) of 0.66 was obtained for the local schools analysis.

Education-Specific Studies

After the initial multiple-program studies using relatively few basic or general-purpose variables for all programs, specialization began to emerge in the expenditure-determinants literature through the use of variables specifically keyed to individual expenditure programs, including education. Fisher has suggested one reason for this specialization:

The decision to use the same independent variables for every functional category . . . resulted in somewhat lower coefficients of multiple correlation for some expenditure categories. However, using different independent variables for each category would have . . . reduced the generality of the conclusions.11

Thus, there is a trade-off between general applicability of findings to all expenditures and the explanatory (or predictive) power of the models for a specific function.

11Fisher, "Interstate Variation," fn. 8, p. 60.
It is not surprising that statistical studies of a specific expenditure program—justified at least in part by the desire to understand that program more fully than may be possible with the basic-variable approach of Fabricant and Fisher—became, in the quest for better explanatory or predictive power, more complicated through the addition of more function-specific (and more numerous) independent variables. This is, indeed, what has happened in the literature on education expenditure determinants. Moreover, the dependent variables used are more numerous in this literature; various authors have included separate analyses of total versus non-capital, local versus all-source, and per-pupil versus per capita education expenditures.

Because of this added complexity, the straight textual treatment of the sort used in the preceding section would be more complicated and less satisfactory for the education-specific studies. Moreover, the numerous differences in variables and in areas and periods of time studied render construction of a relatively simple tabular summary of this literature infeasible. Therefore, Appendix A is devoted to a detailed consideration of the findings for eleven independent variable categories of seven studies of education expenditure determinants and one more general study (Fisher's three-variable 1961 study, treated above).

Summary of individual studies

Because Appendix A treats rather thoroughly the several education-specific studies covered below, the balance of this section
provides only an overview of this literature.\textsuperscript{12} The treatment here, however, is study-by-study, whereas Appendix A (and the following section of this chapter) presents findings variable-by-variable to facilitate evaluation of the stability of the influence of a given factor in different areas, at different times, and in combination with other variables.

\textbf{Hirsch.--}In studying the determinants of educational expenditures in the St. Louis area in the early 1950s, Hirsch used two dependent variables (per pupil expenditures with and without debt service) and regressed them on seven independent variables (the variables are given in Appendix A, pages 191-92).\textsuperscript{13} Three variables had statistically significant coefficients with both dependent variables: percentage of pupils in high school (positive sign); assessed real property value per pupil (positive sign); and a six-part scope and quality index (positive sign). Among the variables found not to be significant were two measures of scale of operation and a measure of population density. The coefficient of multiple determination ($R^2$), adjusted for degrees of freedom, was 0.82 for both runs.

\textbf{Renshaw.--}In studying the effects of state aid on expenditures for education, Renshaw used state-level data for the entire

\textsuperscript{12}The Kee study, not included in Appendix A, is covered somewhat more fully than the others in this section.

\textsuperscript{13}Hirsch, "Determinants of Public Education Expenditures," pp. 29-36.
U. S. for the early 1950s. Like Hirsch, Renshaw included two dependent variables, one representing only "current" operations and one, the "total" school budget. Nine independent variables (all variables are given in Appendix A, pages 192-93) were used two, three, or four at a time in four regression problems (two for each dependent variable). Regressing current expenditures per pupil on a measure of the significance of state aid in the total school budget, per capita income, and percentage of population non-white, Renshaw found all three independent variables to be statistically significant at least at the five percent level, and the signs were positive, positive, and negative, respectively. The $R^2$ for this run was 0.81.

Each of two regressions employing the "total" formulation of the dependent variable included four independent variables—an income measure, a state school aid measure, and a measure representing local revenues "mandated" by the state in both runs, plus a density measure in one run and a measure of school-age population as a percentage of the total in the other. Renshaw obtained positive and significant coefficients for the three common variables and negative but insignificant coefficients for each of the other variables. The $R^2$ values for these runs were 0.80 and 0.76.

Shapiro. -- Shapiro studied expenditures for (a) public education only and (b) public plus private education (the distinction between his two dependent variables) using state-level data for the United

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14Renshaw, "Expenditure Effect of State Aid."
States for 1920, 1930, 1940, and 1950. He presented his findings, contained in a 1962 article, separately for the South and the Non-South. Starting with nine independent variables (actually eleven, but four school-specific variables reflected the public and public-plus-private distinction, and really represented only two distinct measures), Shapiro reduced the number to five after an "exploratory" run by: (a) dropping a variable giving school-age children as a percentage of the population because it proved to be statistically insignificant; (b) dropping percentage non-white because it was significant only in the South prior to 1950 and, even then, only through the influence of two states; (c) dropping percentage of children in public schools in favor of a "dummy" regional variable after finding the former to be significant for the country as a whole but not for either region alone; and (d) dropping percentage of population living in urban areas in favor of percentage of civilian labor force in non-agricultural pursuits. Only four of the remaining variables—per capita income, pupils as a percentage of school-age population, percentage of labor force not in agriculture, and high school enrollment as a percentage of total enrollment—were used in runs for the South and Non-South. The regional variable was used only in runs for the entire U. S., for which Shapiro did not report detailed results.

Shapiro obtained $R^2$ values ranging from 0.40 to 0.67 for the Non-South, 0.50 to 0.80 for the South, and 0.65 to 0.90 for the

15Shapiro, "Determinants of Expenditures for Education."
entire country. Findings for individual variables are treated in detail in Appendix A, but it is worth noting that only one variable--percentage of population in urban areas, which was dropped after the exploratory run--yielded similar results with respect to both sign and statistical significance in both the South and Non-South in each time period (negative in 1920 and 1930, positive in 1940 and 1950, significant only in 1920). The income variable--the most significant, according to many authors--was consistently positive and significant in the Non-South, but had mixed signs and was not significant in the South; yet using income alone, Shapiro found, reversed the situation, making income significant only in the South.

Miner.--The analyses presented in Miner's 1963 book\textsuperscript{16} are too complex for adequate treatment via a short verbal description--which, as previously noted, is the reason for including Appendix A. The complexity resulted from Miner's (a) use of four dependent variables (total and local-source expenditures on both per capita and per pupil bases), (b) use of 22 independent variables (most of which were used in the regressions for the total of about 1,100 school districts, but no more than nine of which were used for any one state), and (c) presentation of results not only for the total sample, but also for each of the 21 states having enough districts in the sample to permit separate analysis, with many differences in the specific variables used for individual states. Eighty-eight separate regres-

\textsuperscript{16}Miner, Spending for Public Education.
sion runs were made by Miner. (Appendix A lists Miner's variables on pages 196 and 197, where the sample also is discussed; findings for each variable also are presented in Appendix A.)

Of the 20 independent variables used in the regressions for the total sample, not one was statistically significant for all four runs (four dependent variables), although three—percent of families with income above $10,000, percent of pupils in secondary grades, and number of full-time employees in auxiliary services—were statistically significant (at the five percent level) in three runs; all three of these variables also had positive coefficients in all four runs. Several variables were not significant in any run, including percent non-white, median family income, and median years of educational attainment of adults. For some variables the difference between the per-pupil and per capita runs affected the sign of the coefficient, while for others it didn't; the same statement can be made for the total and local-only expenditures distinction.

Results for individual state runs were likewise mixed. Few variables yielded uniform results with respect to sign and significance for all states within Miner's three groups even for a single dependent variable, let alone for all four runs (see Appendix A). In Miner's words:

In the over-all analysis the proportion of variance explained for per capita expenditures is rather low, and the higher multiple regression coefficients for per pupil expenditures are attributable to the unanticipated strong effect of auxiliary services. In the state-by-state analysis, the same
basic sets of independent variables yield widely divergent multiple correlation coefficients.\textsuperscript{17}

James et al.--The 1963 study by James and his associates used a sample of school districts drawn from 10 states to study differences in current educational expenditures per pupil in 1958-59.\textsuperscript{18} Eight independent variables were used in the regressions for nine individual states (New Hampshire, with only 12 school districts in the sample, was excluded from the individual-state runs). These variables included per-pupil property value, median family income, unemployment, extent of rural residence, and proportion of children in private schools (a list of the variables is on pages 198-99 of Appendix A).

The authors concluded that their research demonstrated wealth and educational expenditures to be significantly (and positively) related, but noted that the effects of other types of variables were less clear-cut. Of the overall study they commented:

The pattern of the relationship between expenditures and our measures of wealth and aspiration seems to vary significantly from state to state, not only in the level of expenditures but also in the strength of the effects of the different explanatory variables.\textsuperscript{19}

Thus, while the equalized property value variable had positive coefficients in all nine runs, they were statistically significant

\textsuperscript{17}Miner, Spending for Public Education, p. 136. It should be noted that, although Miner talked of "the proportion of variance explained," he did not report R or $R^2$ statistics.

\textsuperscript{18}James, Thomas, and Dyck, Wealth, Expenditure and Decision-Making for Education, especially Chapter 4, pp. 69-100.

\textsuperscript{19}James, Thomas, and Dyck, Wealth, Expenditure and Decision-Making for Education, p. 99.
Median family income took a positive sign in eight states, but was significant in only four. Percent non-white was positive (but not significant) in five states, negative in four (but significant in only one). Educational attainment of adults was found to have positive coefficients in five states (significant in one) and negative coefficients in four (significant in one). (See Appendix A.)

Weisbrod.--A study by Weisbrod first reported in 1964 is somewhat simpler to report than several of the other studies treated here because of the smaller number of variables—one dependent (current expenditures per pupil) and eight independent (a list is given on page 200 of Appendix A). Included among these variables, however, were four representing concepts not apparent in other studies: separate variables for state and federal aid (presumably on the theory their effects might be different, although Weisbrod made no a priori judgment about the signs) and two variables to represent population change through migration (to test hypotheses—borne out by his results—that in-migration has no significant effect on school spending per pupil while out-migration has a significant and negative effect). Three variables were found to be significant at at least the five percent level: personal income per pupil (posi-

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20 Weisbrod, "Geographic Spillover Effects." The research reported in this paper is part of an earlier study: Burton A. Weisbrod, External Benefits of Public Education: An Economic Analysis (Princeton: Princeton University, Industrial Relations Section, 1964).
tive); high school students as a percentage of total students (positive); and percentage population change resulting from net out-migration. The $R^2$ value obtained was 0.78. The data were state-level aggregates for the 48 contiguous states in the period around 1960.

Kee. — In a 1965 study of local government finance in 36 central cities in 1957, Kee employed a total of 14 independent variables in regression analyses of several expenditure categories. Kee did not use all independent variables for all programs, however, and only six of the 14 were used in the public education regressions. Kee's two dependent variables were per capita measures of total education expenditures and of non-capital education expenditures.

With the exception of the variable giving the ratio of owner-occupied housing units to total units, the coefficients had the same signs in both education runs; the owner-occupancy variable was positively related to total outlays and negatively related to non-capital outlays, with neither coefficient being statistically significant. The coefficient of the variable giving the proportion

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21Kee, "Central City Expenditures."

22The Kee study and the Bahl and Saunders study (treated below) actually are part of a set of studies falling between those which study a broad range of public expenditures programs using the same "basic" or "general" variables for all functions (e.g., the Fabricant and Fisher studies), and those addressed solely to public education using variables selected specifically for that purpose. They are included in this section because of their use of variables deemed by the authors to be specially suited to the analysis of public education spending.
of population in central cities, negative for both education regressions, was significant at at least the five percent level only in the non-capital outlay run. Both per capita state education aid and pupils in average daily attendance per 1,000 population were positively related to the dependent variable in both education regressions, but none of the coefficients were significant at at least the five percent level. The variable giving the proportion of locally-funded expenditures also took a positive sign in both regressions, but was significant at at least the five percent level only in the non-capital run. Finally, the relationship between per capita income and the dependent variable was positive and significant at the one percent level in both education runs. The $R^2$ was 0.60 for the total education outlays run and 0.71 for the non-capital regression.

Bahl and Saunders.--Bahl and Saunders' 1967 study of several categories of public expenditures in West Virginia counties in 1957 and 1962\(^23\) included separate regression models for public education expenditures (a) from local sources only and (b) by all levels of government. Their education regressions used sets of variables differing from those used in studying other expenditure functions (a list of the variables is given on page 201 of Appendix A). Four education models--two for each dependent variable--were run for each year. Only two models are treated here, but all findings are given in Appendix A.

\[^23\text{Bahl and Saunders, Intercounty Differences, pp. 18-30.}\]
The five variables used by Bahl and Saunders in one model for analyzing per capita education expenditures from local sources are: ratio of agricultural employment to manufacturing employment (found to be negative and significant at the five percent level for both 1957 and 1962); percent of labor force unemployed (negative for 1957, positive for 1962, but significant in neither year); per capita income (positive and significant at the five percent level for both years); ratio of county population living in cities to total county population (positive for 1957, negative for 1962, but significant in neither year); and ratio of county assessed value to county income (positive and significant at the five percent level for both years). The $R^2$ was 0.59 for the 1957 run, 0.61 for the 1962 run.

One model used by Bahl and Saunders to analyze per capita public education expenditures by all levels of government utilized four variables and yielded an $R^2$ of 0.41 for 1957 and 0.09 for 1962. The results for 1957 and 1962 were quite different. Percent of families in county with incomes less than $3,000 was positive and significant at the five percent level for 1957, but negative and not significant for 1962. Population density had a negative coefficient for both years, but was significant at the five percent level only for 1957. The coefficient for per capita assessed property value was positive and significant at the five percent level in the 1957 run, but negative and not significant for the 1962 run. Finally, the ratio of agricultural employment to manufacturing employment was found to be negative and not significant in both years.
Findings by variable: A summary

The foregoing two sections of this chapter have presented some of the results of several selected studies of the factors affecting spending for public elementary and secondary education. In view of the number of studies involved, and the differences among them, it is desirable to take stock of what has been learned about the various determinants of spending for public schools. This section, therefore, attempts to summarize the findings of the literature for each of several variables or types of variables studied. It is intended to complement the most austere, although more comprehensive, variable-by-variable rundown presented in Appendix A. The variables are taken up in the same order as in Appendix A.

Fiscal capacity measures.--Fiscal capacity or wealth, as represented by measures of average property value, average income level, and/or income distribution, generally has been found to be among the most (if not the most) powerful explanatory variables. Consider, for example, Hirsch's comment on the results of his 1960 study, that "... a district's financial ability to afford education (X₆), measured in terms of per pupil assessed valuation of real property, was by far the single most significant determinant." Hirsch used no income measure due to the inavailability of such information by

24To enhance the readability of this section, footnotes are used sparingly, in favor of textual references to Appendix A or other places in the dissertation where details referred to are more thoroughly treated.

school district. Weisbrod, who used no property variable, found per-pupil personal income to be statistically significant at the one percent level (see Appendix A). Fisher included in his 1964 study a measure of concentration at the low end of the income distribution (no property value variable was used), and reported that "(p)erhaps the most important finding of the analysis is the high degree of negative association between levels of expenditure and percent of low income families in the state."26 James, Thomas, and Dyck, on the other hand, used both per-pupil equalized property value and median family income in their separate regressions for nine states, and "... conclude from the results of the study that expenditure levels for education are, indeed, related to wealth, as measured by equalized valuation and median family income."27

As shown in Appendix A, however, the findings of James and his associates were not completely uniform among the nine states. The property variable was found to be significant in only five states (although positive in all), and the income variable actually was negative in one state (and significant in only four of the other eight). Lack of uniformity of findings--or stability of relationships--both within and among studies, is, in fact, a rather general situation in the literature, as revealed by Appendix A and by the quotations from Miner and from James, Thomas, and Dyck in the preceding section. And while the non-uniformity is less striking for

26 Fisher, "Interstate Variation," p. 73.

27 James, Thomas, and Dyck, Wealth, Expenditure and Decision-Making for Education, p. 100.
fiscal capacity measures than for some other variables, it nevertheless exists.

To the extent that there are effective equalization-aid programs, it perhaps is not too surprising to learn the relationship between total expenditures of local school districts and district fiscal capacity is not uniformly strong or even uniformly positive. But lack of such uniformity in the relationship between local capacity and local-source spending is somewhat more surprising. Yet Miner's findings for local expenditures show evidence of weak, or even negative, correlation between local spending and capacity in some states (see Appendix A).

In summary, while the literature generally reports a positive relationship between fiscal capacity and educational expenditures per pupil or per capita, the relationship appears not to be as uniform or strong as one might think, even when only local-source spending is considered.

**Per-pupil costs.**—Because secondary education costs more per pupil than elementary education, many studies of education spending have included a variable expressing high school pupils as a percentage of total to control for relative costs per pupil. Four of the seven education-specific studies included in Appendix A employed such a variable. In general, the variable has taken the expected positive sign in the regressions, and it often has been found to be statistically significant (at the five percent level). But in many instances, this relative cost variable has had a non-significant coefficient
and/or a negative sign. Thus, while Hirsch found the variable to be positive and significant in his 1960 study of the St. Louis area, Shapiro's study of the South and Non-South in four periods yielded no statistically significant coefficients and the signs were about evenly divided between plus and minus. The uniformity produced in Miner's four regressions for his total sample did not occur in his individual state runs; while positive signs predominated (with mixed results as to significance), the variable was negative in several instances. (See Appendix A.)

Scale of operations.—It frequently has been suggested that economies of scale can be achieved in larger schools, principally through spreading costs for "fixed" or "lumpy" factors (e.g., school administrators, guidance counselors, the auditorium, the cafeteria) over a larger number of pupils. Accordingly, some researchers have sought to determine whether such economies do or do not exist. In general, their findings indicate an absence of economies of scale. Hirsch, for example, included two variables—number of pupils and number of pupils squared—in his 1960 study to test for economies of scale, and concluded that "... perhaps the most important finding is the absence of significant economies of scale in the school districts of the St. Louis City-County area."\(^{28}\) Miner, using number of pupils, reported zero coefficients for many runs, but also reported several non-zero coefficients with the expected negative sign.

\(^{28}\)Hirsch, "Determinants of Public Education Expenditures," p. 36.
for several runs (one significant at the five percent level) and others with a positive sign (two significant at the five percent level). At the most aggregated level—all districts in the sample—however, Miner obtained zero coefficients for his scale variable in all four runs. Bahl and Saunders, who used a somewhat different measure of scale—average pupils per school, rather than per district—reported negative coefficients for the "total" (all government levels) runs for both 1957 and 1962 (significant only in the earlier year), and positive coefficients (significant only in the latter year) for the local-only runs. (See Appendix A.)

Presence of school-age children. — "Need" for educational services has sometimes been represented by the percentage of the population comprised of school-age children. Three of the studies reviewed in Appendix A included such a variable. One author (Shapiro) dropped the variable, however, after finding it to be insignificant in initial regressions. Renshaw found the variable to be non-significant and negative. The other author (Miner) reported a set of rather complex findings that may be represented generally as indicating this variable is not a particularly strong determinant of educational spending. For 14 of 82 single-state regressions employing this variable, however, Miner reported a statistically significant (five percent level) relationship between education expenditures and proportion of school-age children in the population; nine of the significant coefficients were negative, and five were positive. Closer examination reveals, however, that the five positive coeffi-
coefficients occurred in per capita expenditure runs, while eight of the nine negative coefficients occurred in per-pupil regressions. (See Appendix A.) Thus, where this variable was found to be significant, it seems, as indicated by these results, that a larger concentration of school-age children (a) results in increasing the absolute level of education spending—per capita spending—but (b) tends to reduce somewhat the per-pupil spending level as available resources must be spread more thinly over a larger service group. Such a dichotomy seems reasonable.

Role of non-public schools. —Just as communities with relatively large concentrations of school age children might be expected to "need" and tend to provide more educational services, it may also be (and has been) argued that communities with relatively large non-public school enrollments will tend to spend less for public schools. Several tests of this hypothesis concerning the effect of non-public schools on public school spending exist in the literature, including four of the studies presented in Appendix A (three used non-public as a percentage of total, while Weisbrod used public as a percentage of total). As for most other variables, findings have been mixed.

The per-pupil/per-capita dichotomy discussed above in connection with school-age children also is evidenced by Miner's results for non-public schools. The three negative and significant (five percent level) coefficients occurred in per capita regressions—a smaller service group tends to suppress total spending—while the three significantly positive coefficients occurred in per-pupil runs—
spreading available resources over a smaller service group tends to increase expenditures per member of that group. In general, however, Miner's regressions suggest this variable is not significant—a finding shared by Shapiro, who dropped the variable in favor of a regional variable after finding the former to be significant for the country as a whole but not for either the South or Non-South. Weisbrod's study yielded a positive (equivalent to negative for the other three, due to variable specification) coefficient significant at only the eight percent level. But the mixed results for this variable are represented by the findings of James, Thomas, and Dyck, who obtained in their nine single-state regressions seven non-significant coefficients (two positive, five negative) and two significant (negative) coefficients. (See Appendix A.)

Education of adults.--It is sometimes argued that persons with higher levels of educational attainment have a greater "taste" for education and will, as a consequence, tend to spend more on the public education function. The studies by Miner and by James, Thomas, and Dyck used median years of education of adults as a variable to test this notion and obtained inconclusive results. In the James study the variable was positive in five states and negative in four, but statistically significant ($T \geq 2.0$) in only two (one negative, one positive). In the Miner study, on the other hand, the variable—used only in the four aggregated, total-sample regressions—was consistently negative, although statistically not significant. (See Appendix A.)
Measures of "urban-ness."—Lumped together here under the headings of "urban-ness" measures are population density and percentage of population living in urban areas. Urban populations often are said to have a higher taste for public services, so positive correlation would be expected between percent urban and public spending. For some services, high population density might lead to lower service outlays due to economies of scale or lower transportation costs, while for others outlays might be higher due to greater need or higher costs in high-density (urban) areas. For public education, the net result of opposing tendencies is not obvious.

Several studies have included percent urban and/or density; the results are mixed, as shown in Appendix A. Hirsch, Renshaw, and Fisher all obtained negative density coefficients, and at least two were found to be statistically non-significant. Bahl and Saunders also reported negative density coefficients for both 1957 and 1962 (significant only in the earlier year). Miner's findings included a good mixture of positive and negative signs, but the only two significant coefficients obtained were positive. Population density, thus, generally has not been found to be a significant determinant of educational spending.

The same general statement also applies to percent urban. In Shapiro's study of the South and Non-South in four periods, the only

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29 Fisher, "Determinants," did not report significance of findings. The Fabricant and Sacks and Harris studies that employed the same three variables as Fisher, however, both yielded significant negative coefficients (see Sacks and Harris, "The Determinants of State and Local Government Expenditures," p. 77).
significant coefficients were for 1920 (negative in both regions). Fisher's percent-urban variable took a positive sign. Miner and James both obtained mixed signs and many more non-significant coefficients than significant ones—but with apparent contradiction in the implications of the statistically significant relationships found. (See Appendix A.)

Non-white population.--It has been rather common to hypothesize a negative correlation between percentage of the population that is non-white and the level of spending for education. Only one of the studies reported in Appendix A—that of Renshaw—has "confirmed" this notion, however, and his finding may be attributable to the use of state-level data and may reflect only the fact that the highest concentrations of non-whites (in the South) coincide with generally lower levels of public spending and income. At the highest level of aggregation, Miner's data for about 1,100 school districts yielded no significant coefficients for percent non-white in any of the four runs, and Miner obtained insignificant coefficients about four times as numerous as significant ones for his many single-state runs (of the significant ones, most were positive). James, Thomas, and Dyck likewise reported mixed results, with percent non-white not significant in most runs. The variable likewise was not significant at the five percent level in the Weisbrod study. In short, color per se appears to have no significant effect on educational spending, when other factors correlated with color are controlled for; no a priori reason comes to mind for expecting color, as such, to matter.
Benefit spillover measures.--Measures of benefit spillovers are discussed at greater length in the last part of this chapter and in Chapter 3, but it may be noted briefly here that population migration represents one of the best proxy measures for the spillover of education benefits beyond jurisdictional boundaries. Lacking the more desirable gross in-migration and out-migration data, Weisbrod used net migration data for states and, as noted earlier in this chapter and reported in Appendix A, his results (both variables negative, but only out-migration statistically significant) suggest benefit spillouts tend to diminish spending for education while benefit spillins have no significant effect on such spending. Miner used percent moved into district in the preceding five years to represent instability of population, and hypothesized a negative correlation with spending for education; he obtained negative, but non-significant, coefficients for all six runs employing the variable. Hirsch also reported negative, non-significant coefficients for percent increase in public school pupils between two given years (a positive sign had been expected). (See Appendix A.)

Intergovernmental aid.--The propriety of using intergovernmental aid as a determinant of education (or other) expenditures has created considerable controversy. Some authors have argued that to exclude intergovernmental aid as a variable in studying spending for an aided function borders on foolishness and risks overlooking a very significant determinant, while others have termed inclusion of such
aid variables "rubbish" and argued that little purpose (other than increased R\textsuperscript{2} values) can be served by regressing expenditures on revenues.\textsuperscript{30} There would seem to be valid uses for intergovernmental aid variables, however, such as determining the extent to which such aid is a substitute for funds raised by the recipient governments (although it would seem desirable to omit amounts of such aid from the dependent variable to avoid regressing the variable on itself) or the extent to which intergovernmental aid acts as a general increase in fiscal capacity to affect non-aided, as well as aided, functions.\textsuperscript{31}

Renshaw’s 1960 study of the expenditure effects of state education aid (using variable formulations that did not conform to the suggestion in the preceding sentence--see pages 192-93, below, for variables) found such state aid to be a significant factor in

\textsuperscript{30}As examples of the pro and con arguments, see: Sacks and Harris, "The Determinants of State and Local Government Expenditures," esp. pp. 75, 78-79 (pro); Miner, Spending for Public Education, esp. pp. 75-76 (con); Elliott R. Morss, "Some Thoughts on the Determinants of State and Local Expenditures," National Tax Journal, XIX (March, 1966), pp. 95-103, esp. pp. 95-96 (con); and Jack Osman, "On the Use of Intergovernmental Aid as an Expenditure Determinant," National Tax Journal, XXI (December, 1968), pp. 437-47 (pro).

\textsuperscript{31}Several researchers have found evidence that intergovernmental aid extended for a particular function tends to serve as a general increase in fiscal capacity by releasing local funds from the aided function to allow increased spending for non-aided functions. See, for example: Jack W. Osman, "The Dual Impact of Federal Aid on State and Local Government Expenditures," National Tax Journal, XIX (December, 1966), pp. 362-72; Weicher, "Determinants of Central City Expenditures;" and Charles Waldauer, "Fiscal Interdependence Among Tax Base-Sharing Local Governments: The External Effects of School Aid," National Tax Journal, XXIII (December, 1970), pp. 457-61.
increasing total spending for education, but found the increase to be much less than the amount of the aid—i.e., evidence of a large substitution effect was found. James, Thomas, and Dyck also reported a positive, significant relationship between percent of total school revenue from state sources and spending for education, while Bahl and Saunders' coefficient for the ratio of state and federal school aid to local-source school monies in West Virginia was positive and significant for 1957, but negative and non-significant for 1962. Finally, using separate state aid and federal aid variables (each expressed aid as a percent of total education expenditures), Weisbrod found neither source of aid to be significant for state-level aggregates around 1960. (See Appendix A.)

Reflections on the State of Knowledge

In summary, the literature on education expenditure determinants includes tests for many types of variables (including some not singled out above), but this writer has been unable to find a variable for which several researchers report the same findings with respect to both direction (or sign) and statistical significance. For a few variables, such as those representing fiscal capacity, the effects on educational spending seem relatively well established but, as noted above, even here important exceptions to the general situation exist in the literature. One must conclude, therefore, that after two decades of research of the type dealt with in this chapter, there is very little that we know—with confidence or certainty—about forces shaping educational expenditure levels.
Should we conclude from the research to date that there is no relatively stable relationship between educational expenditures and other factors (such a relationship is implicitly assumed by research on "the determinants" of expenditures)? Or should we conclude that the important variables have yet to be identified? Perhaps deficient research methods have caused the inconclusiveness of the findings. The truth is not clear at this point, but at least a partial answer may lie in the last two possibilities suggested above.

Certain possibly-important variables seem to have been largely, if not wholly, overlooked; some of these are discussed in Chapter 3 and included in the later empirical sections of this research. That there have been shortcomings in the research approach also seems obvious. There appears, for example, to have been a rather general failure by researchers to state carefully the problems they were addressing. This, in turn, has led to the inclusion of some variable formulations that may not have been the most appropriate ones (different problems tend to be answered by asking different questions, as earlier discussion of Miner's per capita and per-pupil regressions, for example, shows). Another problem is that some studies have used very small samples together with rather large numbers of variables, thereby reducing the statistical reliability of their findings. And, as a final example, some researchers have used independent variables that were too closely related to their dependent variables.

It is hoped that earlier shortcomings are avoided in the present study. It would seem premature, however, to conclude at this point that the sort of stable relationship among factors that
Analyses of Education Cost and Benefit Spillovers

Spillovers of benefits and costs associated with public education have been the subject of at least two major studies, one by Hirsch, Segelhorst, and Marcus and one by Weisbord. Their inclusion in this survey of literature relevant to the present research is warranted by the role played by the Weisbrod and Hirsch, Segelhorst, and Marcus studies in focusing attention upon the nature and extent of spillovers in education and by the emphasis placed upon cost and benefit spillovers in the current research.

Both studies appeared in 1964. They are, in fact, outgrowths of a single study undertaken by the authors when all were in St. Louis. Perhaps for this reason, Clayton, Missouri (a St. Louis suburb), was used by both as the study area for empirical implementation of concepts developed. The two studies are summarized below, the Weisbrod study first.

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32This and other questions are taken up in Chapter 5, after presentation of findings of the present study.


Weisbrod.—Weisbrod considered only benefits, and he devoted considerable space to conceptualization of education benefits and their geographic incidence. He identified a variety of education benefit types, including child care services, the inculcation in students of certain socially-desirable behavior norms and attitudes. General literacy development, increased worker productivity, increased earnings, and—as a result of higher earnings—higher taxes (which benefit those other than the student). Because of quantification problems, however, not all benefit types identified were implemented. In fact, the only geographic spillovers Weisbrod quantified (in Chapters 4 and 5) were the value of educational capital and the tax effects of additional earnings attributable to capital.

In quantifying education benefit spillovers, Weisbrod conceived of spillovers as losses from or gains to the community (i.e., school district). Migration of students was viewed as the primary means by which spillovers occur. Thus, when a student moves from the community in which he was educated, the community loses the educational capital and additional taxes associated with the education provided; the receiving community registers a comparable gain. Present-value calculations (using alternative discount rates of five and ten percent) were made for both educational capital and additional taxes to give their estimated value in the year the training was received.

Weisbrod defined educational capital created through education "... as the present value of the expected additional marginal net
productivity stream resulting from that education. With apologies for the shortcomings of the data on current wages for measurement of marginal productivity, Weisbrod nevertheless used census data on income by sex, age, and educational attainment for this purpose. All income differentials between levels of education were multiplied by an arbitrary factor of 0.6 to take account of the fact that only part of the total earnings differential associated with a given increment in education is caused by that education. Migration data were employed to calculate the probabilities of students leaving the community in different time periods.

Weisbrod estimated that from 85 percent (10 percent discount) to 91 percent (five percent discount) of the educational capital created in Clayton would be exported. He also estimated that the imports of educational capital would be approximately the same size for Clayton. Weisbrod's hypothesis and tentative findings (discussed earlier in this chapter) that benefit spillins and spillouts have different effects on education spending should be borne in mind, however, in considering the significance of benefit spillouts for education spending.

The extent to which additional taxes attributable to additional education spillover was estimated by Weisbrod by applying estimated effective tax rates for taxes of selected levels of government to previously-derived estimates of educational capital. Some tax

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36 Weisbrod, External Benefits of Public Education, Table 4-3, p. 57.
spillovers result from the fact that a person educated and residing, say, in Clayton, pay state and federal taxes as well as local taxes. Moreover, the prices paid for locally-purchased goods may include some taxes levied by other states and localities. Weisbrod measured such spillovers, which result simply from the existing economic and fiscal structure, by the tax-effect estimates for jurisdictions other than the one providing the additional education (Clayton). Tax spillovers resulting from migration, on the other hand, were measured by applying to the additional tax figure for Clayton (calculated as described in the first sentence of this paragraph) the spillover percentages for educational capital. Thus, on a percentage basis, the migration-related loss of potential additional taxes and of locally-created educational capital are the same, but the tax spillovers resulting from the economic and fiscal structure can bring about differences in the relative tax and education capital spillovers.

Weisbrod cautioned that the findings for Clayton should not be taken as "typical" since migration rates for Clayton probably are above average.

Hirsch, Segelhorst, and Marcus.--Hirsch and his associates (hereafter shortened to HSM) dealt with both cost and benefit spillovers in their rather lengthy manuscript. Their treatment of benefits was similar to Weisbrod's in many respects, including the

37Hirsch, Segelhorst, and Marcus, Spillover of Public Education Costs and Benefits, pp. 205-285, comprise the benefit portion of the study (estimates of benefits quantified are developed in pp. 227-62).
types of education benefits identified—e.g., increased productivity of students, child care services, neighborhood tranquility, informal education of students' future children, tax reductions and/or service increases for non-students made possible by students' higher taxes on (their higher) incomes.

Some important differences exist in the treatment of benefits in the Weisbrod and HSM studies, however. Perhaps the most important of these differences arose from the fact that HSM conceptualized spillovers relative to the community as it existed at the time the education was provided (time t). Because students were a part of the community in time t, HSM treated them as permanent members of the community for purposes of analyzing the "direct" benefits of education (i.e., those that accrue to students and their families). In this view, students' increased education capital and disposable income related thereto can never spillover to persons not in the community at time t, even though students may later move to another place, say 10 years after the education was provided (time t+10). By theoretical construct, therefore, HSM precluded consideration of education capital spillovers, which represented a major category of benefit spillovers for Weisbrod. Thus, unlike Weisbrod, migration was considered by HSM to have no effect on the spatial distribution of direct (student) benefits. As noted below, however, HSM did allow for the effect of migration on the geographic incidence of "indirect" (non-student) benefits.

HSM quantified only two types of benefits--those arising from students' increased earnings and their mothers' increased earnings.
attributable to the students' being in school—using estimation procedures similar to Weisbrod's. Thus, present value estimates of increased lifetime earnings were developed using alternative discount rates, and these figures were used in conjunction with estimates of effective tax rates by governmental jurisdiction to calculate additional taxes on the additional income. The resulting estimates of students' increased taxes due to education were categorized as "indirect" benefits—i.e., tax-related benefits (tax reductions and/or service increases) accruing to non-students. Such benefits spillover across jurisdictional boundaries through effects of both the existing fiscal structure and population migration, in the manner discussed above in connection with the Weisbrod study. Using estimates for Clayton and other parts of the United States, HSM estimated Clayton to be a substantial net importer of tax benefits.

For reasons similar to those related above for students' increased incomes, HSM also restricted the spillovers associated with increased incomes of mothers whose labor force entry was due to their children being in school to the (indirect) tax-benefit effects. The authors estimated the average income of such mothers and the taxes thereon, and multiplied these by the estimated numbers of women brought into the labor force through education of their children in Clayton and elsewhere to derive estimates of total tax benefits. Again, Clayton was found to be a net importer of tax benefits, so Clayton's net benefit spillovers for both quantified benefits were positive benefit spillovers.
Unlike Weisbrod, HSM devoted considerable space to identifying the costs of education and to estimating the magnitude and spatial distribution of those costs. Whereas benefit spillovers were considered to arise through both the fiscal structure and migration, cost spillovers were considered by HSM to arise only through the fiscal and economic structure; this difference largely reflects the differences in the time horizons of the costs (borne in the year incurred) and benefits (realized over a long period) of public education.

HSM categorized costs as direct operating (basically those items shown in fiscal records of schools), imputed operating (e.g., students' foregone earnings, services provided to schools by other governments without charge), direct capital (principal and interest payments), and imputed capital (imputed interest and capital consumption). Estimates of the imputed items were developed by the authors.

The authors conceived spatial distribution of virtually all costs as occurring through fiscal interdependence and the tax structure (imputed interest—a negative cost—was said to be similar to a tax reduction in its spatial distribution). HSM estimated the amounts of various taxes (local property, state income, state sales and excise) used in financing public education and then developed detailed models (necessarily employing many assumptions about impact and incidence) to allocate the tax costs to Clayton and

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38Hirsch, Segelhorst, and Marcus, Spillover of Public Education Costs and Benefits, pp. 15-201. The cost and benefit estimates for public education provided by Clayton, Missouri, are merged in pp. 289-311.
other areas. Overall, Clayton was estimated to be able to spillout to other areas over 40 percent of the costs associated with education provided in Clayton, but to spillin from other areas substantially more of the costs associated with education provided elsewhere. Clayton, in short, was found to be a net importer of education costs (owing largely to Clayton's high income position).

Putting the cost and benefit sides together, Hirsch and his associates estimated Clayton derived net positive benefits from education provided in Clayton, while surrounding areas incurred net costs from education provided in Clayton (not the same as the total education-wherever-provided cost figures just discussed).

Summary.—Education benefit spillovers were the subject of both the studies reviewed in this section of the chapter, and one study (HSM) also included an analysis of education cost spillovers. Although both the Weisbrod and the Hirsch, Segelhorst, and Marcus studies concluded that education benefit spillovers are substantial, they came to rather different conclusions regarding the exact nature and extent of geographic benefit spillovers to and from Clayton resulting from education provided in Clayton. They also differed in their conclusions regarding the effects of spillovers on education spending.

Taking the latter point first, the different conclusions regarding the effects of spillovers on education spending are traceable to different assumptions about spillins. HSM assumed symmetrical effects for both cost and benefit spillins and spillouts. Thus,
while benefits lost to a community through spillouts would tend to depress demand for locally-provided education, benefits gained through spillins from other areas would offset this effect. Weisbrod, on the other hand, hypothesized that decision-making communities would ignore spillins, viewing them as a factor beyond the influence of the community. Thus, Weisbrod assumed the net effect of spillins and spillouts on spending would be to suppress local-source spending—the same as the effect of spillouts only. (As noted earlier in this chapter, Weisbrod undertook a preliminary statistical analysis, the results of which supported his hypothesis.) For equity considerations—as opposed to resource-allocation decisions—however, Weisbrod also argued that spillins and spillouts have offsetting effects.

Differences in the nature of benefit spillovers quantified by Weisbrod and by HSM also are traceable to conceptual differences. Whereas Weisbrod considered the loss of education capital through student migration to be a major source of benefit spillouts, HSM argued that migration cannot give rise to the spillover of education benefits that accrue directly to students and their families. In Weisbrod's view, when a student educated in a community later moves away from that community, those remaining behind may feel some loss from the loss of education capital that their tax dollars helped to create. In the view of HSM, on the other hand, the community that is important is the resident population at the time the education capital in question was created (time t). Because students receiving education are members of the community at time t, the benefits
created cannot, it is argued, be lost from the community of time t, even though the students may migrate from that area in some later (t + n) period. Thus, by definition, HSM precluded consideration of a category of benefit spillouts that Weisbrod considered to be very significant.

For both Weisbrod and HSM, the major form of non-student (indirect) education benefits quantified were tax-related benefits (tax reductions and/or public expenditure increases accruing to non-students made possible by the higher taxes paid by students because of their higher incomes attributable to education). Both studies considered both migration and the economic and fiscal structure to be important mechanisms for the spillover of benefits of this type.

The consideration of education cost spillovers by HSM paralleled their treatment of benefit spillovers in that the effects of spillins and spillouts were assumed to be symmetrical. In the case of costs, however, they noted that migration does not result in cost spillovers since, unlike benefits, education costs are realized at the time the education is provided.

The studies treated above have both concluded that the spillovers of benefits and costs associated with public education are quite substantial, and they lend support to the hypothesis underlying the present research—that local taxation for public education may be affected by spillovers of costs and benefits beyond the decision-making school district. The following chapter develops in detail the conceptual framework for approaching the research problem.
CHAPTER 3

A POSITIVE THEORY OF LOCAL TAXATION
FOR PUBLIC SCHOOLS

A Statement of the Research Problem

Perhaps the most significant problem facing policy makers concerned with the financing of public schools in the next several years will be conforming school finance programs with the long-espoused ideal of equality of educational opportunity. Several recent state and federal court decisions finding the school finance systems of many states unconstitutional have placed the issue prominently before the public and are serving to bestow a sense of urgency on the problem.

As discussed in Chapter 1, two potential approaches to meeting the courts' mandate for greater equality of opportunity would entail provision of approximate equality—with deviations from absolute equality allowed for bona fide differences in cost—of either (a) taxable resources per pupil or (b) per-pupil expenditures. Both these approaches have the advantage of relying on rather objective criteria and, therefore, appear more likely to gain court acceptance than, say, requiring distribution of funds solely on the basis of
"educational needs" or requiring equal educational outcomes.¹

Equalizing among school districts the taxable resources per pupil would, at least at the outset, place the same amount of resources behind each pupil. But beyond this point, decisions made at the local level very probably would result in differences in per-pupil expenditures in excess of those necessitated by differences in costs of providing the same program. It is not clear whether such differences would meet the courts' equal protection requirements, but it seems clear that many persons would not find such differences objectionable.

Differences in per-pupil expenditures arrived at solely through differences in local taxation decisions would be consistent with the widely-held ideal of local control over local schools, an institution that is almost sacred in American political life. Differences arrived at in this manner would also seem to be consistent with the doctrine of consumer sovereignty, an economic doctrine

¹It was noted in Chapter 1 (pp. 15-16) that the courts (in the McInnis and Burruss cases) have found "needs" to be a non-justiciable standard. On the other hand, the only court that has given any indication of what a constitutional school finance system might look like (the Wyoming Supreme Court in the Sweetwater case) suggested--for legislative consideration only--equal school property tax millage throughout the state and equal per-pupil distribution of all monies so raised. But while the courts generally have not spelled out the requirements of a financing system that would be consistent with equality of educational opportunity, several decisions (e.g., Rodriguez and Robinson) have expressly stated that absolute equality of expenditures would not be required. (For a fuller discussion of the cases and issues noted here, see, for example: Ohio, General Assembly, Legislative Service Commission, Serrano v. Priest, Equal Protection of the Laws, and Ohio Public School Finance, Staff Research Report No. 106 [Columbus: 1972], especially Chapters 1, 4-6.)
which is at the heart of the American economic system. Partly for these reasons, some believe that to allow the Serrano doctrine to lead to statewide uniformity in per-pupil education expenditures would be unfortunate.²

But is the case for equalizing only taxable resources—or the case against equalizing expenditures—really so compelling? (Except where noted, "equal expenditures" always means expenditures adjusted for differences in the costs of educating pupils.) One possible legal interpretation of the Serrano ruling on equal protection seems, in fact, to rule out the simple equalization of taxable resources per pupil as an alternative: "If it is children who are entitled to equal protection, then the quality of a child's education could not be subject to a vote of his neighbors."³ Thus, it is possible that making the quality of education a function of voters' attitudes toward public education might be little better, in the eyes of the courts, than having the quality of education be a function of the wealth of the district.⁴ If this view were to predominate, a mandate


⁴As noted in Chapter 1 (p. 19), Charles S. Benson has argued that the "place" discrimination that would result from differences in voters' support of school taxes would tend to amount to the "wealth" discrimination to which the courts are now objecting.
for equal expenditures per pupil would seem to exist.\(^5\)

With regard to consumer sovereignty, the current public education system already makes several compromises of this principle. Two examples are the compulsory attendance laws and the "competitive advantage" of public schools vis-a-vis private institutions that exists in each local area. In other words, elementary and secondary education is not treated as a strictly private good. Rather, it falls under the "merit" goods category whose provision, according to Musgrave, necessarily entails interference with consumer sovereignty and the market.\(^6\) From this perspective, a requirement of uniform per-pupil expenditures (at least for basic educational programs) may be a logical development.

At least the theoretical or conceptual support for considerable local autonomy in determining educational expenditures may be further undermined by the existence of significant geographic spillovers. If education benefits extend beyond the boundaries of the decision-making local district, the case for not interfering in that

\(^5\)In the court rulings based on state constitutional provisions clearly making elementary and secondary education a state function (e.g., the New Jersey and Wyoming cases), equal protection of taxpayers--i.e., equal tax rates for the common state function--is at least as important as equal protection of the students or the school district (see Chapter 1, p. 21, fn. 44). Neither base equalization nor expenditure equalization, in and of themselves, would be sufficient to assure such taxpayer equality, although base equalization would tend to result in equal tax rates for any given level of education spending.

district's decisions is weakened and the case for uniformity of expenditures over a larger area (perhaps statewide) is enhanced. The case for simply equalizing per-pupil taxable resources may also be weakened if the tax base in some areas must be shared with one or more overlapping units of government ("municipal overburden"), although a satisfactory solution in such instances might be to adjust the per-pupil tax base to reflect such base-sharing.\(^7\)

Whether the courts ultimately will find it necessary to require equal tax base per pupil, equal expenditures per pupil, or some other alternative cannot be known at this point. It seems reasonable to assume, however, that the judiciary will wish to minimize its interference with the decision-making process. This assumption suggests equalization of per-pupil taxable resources as a logical first step, although the courts might later feel compelled to impose further restrictions on local decision-making authority if sizable per-pupil expenditure disparities resulted.

The adequacy of equalizing per-pupil taxable resources for meeting equal protection requirements may rest on the similarity or dissimilarity of the expenditure levels and/or tax rates supported by local voters, once they were given equal access to taxable resources.

Research into the factors affecting local taxation for the

\(^7\)Such an adjustment might entail, as an example, reducing nominal per-pupil assessed value figures in areas with a population of 100,000 or more by the average percentage of taxes levied for non-school purposes in such areas. Several difficult questions would arise, including the problem of equating property and non-property taxes in areas where local governments are not restricted to the property tax.
support of public schools seems desirable, since such research can shed light on the approaches that may or may not be fruitful in achieving various objectives. If it were known, for example, that geographic spillovers of benefits and costs associated with public education are significant factors in local taxation decisions, then the need for a means of coping with such spillovers would be indicated if approximate equality of per-pupil expenditures were to be achieved. Or if it were known that municipal overburden has no perceptible effect on local school taxation decisions, policy-makers could then safely disregard this factor in designing an educational finance program to meet equal protection requirements.

The balance of this chapter develops the analytical framework used in the balance of the dissertation to explore the factors affecting local school taxation and to relate those factors to the post-Serrano school finance situation.

The Research Approach

If we assume differences in per-pupil expenditures are to be reduced to some stated level (perhaps zero), there are two unanswered normative questions which concern: (a) the appropriate relative emphasis upon different types of students and programs; and (b) the proper level of overall spending for public education. Both are beyond the scope of this dissertation. The problem of indicating what services should be rendered to different types of pupils is in
the bailiwick of educators. The question of what ought to be spent on public education (or individual educational programs) vis-a-vis all competing resource uses, on the other hand, is a general-equilibrium welfare economics problem.

Positive economics, in contrast to (normative) welfare economics, seeks only to explain what does happen or, by extension of past experience plus assumptions about future conditions, to predict what will happen. The need for a positive theory of local taxation for public schools to determine the effects of various factors on voters' decisions has been indicated by the foregoing statement of the research problem. The quantitative portion of this dissertation, which seeks better understanding of the effects of certain factors on local public school taxation, falls in the realm of positive economics.

The equal protection challenges to current school finance arrangements focus attention on per-pupil expenditure variations which, at least in the long-run, may be equated with variations in revenue per pupil. Because of this fact, plus the assumption that policy makers will wish to preserve a major role for local school


9For discussions of the analytic approach appropriate to such problems, see: Musgrave, The Theory of Public Finance, Chapters 4-7; and Bernard P. Herber, Modern Public Finance: The Study of Public Sector Economics (Homewood, Illinois: Richard D. Irwin, Inc., 1971), Chapters 1, 3-6.
systems, the variable of interest is locally-raised revenues per pupil. Emphasis on the local role should not be taken as implying a lesser role in school finance for state governments than they now have; if anything, the states' role will probably increase. As long as local governments must raise some significant share of school revenues, however, the states' program must be designed to complement the local role in seeking to comply with the demands of providing equal educational opportunity. Hence, the need to focus on the local situation.

In addressing the question of local school systems' ability to meet the challenge of providing equal educational opportunity, factors that affect local public school taxes per pupil must be analyzed. Multi-variate regression analysis is the statistical tool selected for this analysis, because this technique makes possible analysis of variation in a "dependent" variable—in this case, locally raised public school taxes per pupil—in terms of variation in a number of "independent" variables. The dependent variable is treated as a function of the independent variables, and the net significance of each independent variable in "explaining" variations in the dependent variable can be assessed.

Ability to infer causality running from the independent variables to the dependent variable, however, comes only through careful conceptualization of the analytic problem; correlations between two variables in regression analysis do not, per se, enable one to say anything about causality. The balance of this chapter is, therefore,
devoted to development of the conceptual model and the selection of dependent and independent variables.

The Conceptual Framework

Voted Taxes as the Dependent Variable

The population to be served by a local public school system is determined by decisions not readily affected by local school policy makers—e.g., locational and procreational decisions of residents and attendance laws passed by state governments. In the United States, state governments have primary responsibility for providing public education, although most states delegate much responsibility to local jurisdictions (within state-set guidelines). The major policy variable that is subject to local control and also has direct bearing on the equal protection issue is the tax rate. Tax rate changes, moreover, are decided by local voters either directly, when they vote on rate changes proposed by the administrative body (generally school boards in the case of fiscally independent systems, or town councils or county commissions in the case of fiscally dependent systems), or indirectly, when they elect their representatives who comprise the administrative body.

The tax rate, however, is less important to schools than the total amount of funds raised, and school administrators typically arrive at tax rate proposals on the basis of the rate needed (given local taxable property values, or the tax base) to raise a given amount of revenue. For this reason, and also because expenditure (and, hence, revenue) per pupil is the most important variable in the
Serrano-type equal protection suits (notwithstanding the New Jersey and Wyoming emphasis on tax rates), locally-raised school taxes per pupil was selected as the dependent variable in the present study.

If we are to better understand what actions would be likely to increase equality of local school taxes per pupil, we must improve our understanding of what factors affect voters' decisions on school tax levies. This same research may also be expected to yield information that will be useful in designing complementary state school aid programs. The analytic models must, therefore, include independent variables thought to affect voters' attitudes toward local school taxes.

**Family as the decision-making unit**

After deciding that locally-voted school taxes are to be analyzed, one still faces the question of how to conceptualize the voter's decision-making framework or perspective. Two possible alternatives are to focus on the voter as an individual or as a member of a family unit. For several reasons it seems preferable to consider the family, rather than the individual, as the relevant decision-making unit; this approach is, in fact, standard practice in economic analysis.

Most economic decisions, such as how much public education to buy, may reasonably be viewed as family decisions or—recognizing that two persons in the same family may come to different decisions—at least as family-influenced decisions. The family as a unit typically decides, for example, how many of its members will enter
the labor market to seek employment, and the economic resources of all family members (especially husbands and wives) become commonly-held or owned family resources. Decisions by family members regarding the use of these resources may reasonably be assumed, therefore, to reflect the family situation.

Independent variables for regression analysis must, therefore, appropriately reflect the role of the family in arriving at decisions concerning public school taxation.

Independent, county-wide school districts as the unit of study

Several studies of educational expenditures have utilized data for state-level aggregates of school systems. This approach was rejected for the present research in favor of using data for local school systems. That the individual school district should be the unit of observation for the analysis of taxation decisions made at the local school district level seems obvious. Use of aggregates of school districts would tend to diminish the variability of both the dependent and independent variables and would, moreover, cause districts having different taxing (and other) characteristics to be lumped together so that the findings would not pertain to any identifiable district or type of district.

Within the population of all local school systems, two basic types of fiscal systems for financing public education may be distinguished: independent and dependent. Fiscally independent school systems are single-function governmental units; they are empowered
to levy taxes. For fiscally dependent school systems, by contrast, education is but one function of a broader, multi-function government. Taxes are not levied specifically for schools in fiscally dependent systems; rather, such schools must depend upon appropriations from the broader governmental unit of which they are a part.

Because it was felt that the analysis of factors affecting local school taxation would be more clear-cut if schooling were considered separately, divorced from other governmental functions, the quantitative portion of the present study utilizes data for independent school systems.

Another important consideration in the selection of a study area is the geographic extent of the school systems. The practical consideration of data availability points up the advantage of studying school systems that are coterminous with units for which decennial census statistics are reported. In most states, local school districts are quite small and are not coterminous with other government units. As an example, in 1970-71 Ohio had 631 school districts (compared to 88 counties), and roughly one-third of these school districts lay in more than one county.

Quite aside from the physical chore of aggregating school districts to the county level, the problem discussed above ruled out even this level of aggregation since single counties often contain school districts with strikingly different economic and social characteristics. Aggregating census tract data to the school district level also was an unattractive alternative, both because of
the difficulty of the aggregation task\textsuperscript{10} and because of the unavailability of the census tract data from the 1970 census at the time data were being gathered.

All these considerations led to the conclusion that a state having county-wide (county level data were available when needed), fiscally independent school districts should be selected as the study state. Such states are few in number—only Florida and West Virginia, to the author's knowledge, have such districts on a state-wide basis. Of the two, West Virginia was selected as the study state for arbitrary reasons. West Virginia has 55 county-wide, independent school districts.

**Acceptance of institutional arrangements**

Before moving on to the discussion of specific formulations of dependent and independent variables, a general consideration affecting several of the variables is noted here. Specifically, the institutional arrangements affecting educational finance in West Virginia—e.g., the state school aid programs and the classified property tax system—are accepted and treated as constraints on the actions of the school districts. (Appendix B briefly describes the West Virginia institutional setting.)

As an example of what acceptance of institutional arrangements means in terms of conceptualization of the research problem, it is

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\textsuperscript{10}The U.S. Office of Education is said recently to have made available computer programs for each state to accomplish this aggregation.
noted that assessed property values are preferred to equalized full, or market, values for purposes other than measuring family fiscal capacity. The basic justification for this is that the local school districts must take assessed value as a given datum; assessed value is not a policy variable since the school districts have no role in property assessment, just as they do not determine what properties are exempted from property taxation. Moreover, assessed value, not market value, determines (together with the tax rate) the amount of property tax.

Development of Specific Variable Formulations

The balance of this chapter is devoted to the development of specific formulations of variables drawn upon in the regression models treated in Chapter 4. Because many of the variables discussed below are alternative measures of the same factors, not all are used in the regressions reported in the next chapter.

For reasons set forth in the earlier portions of this chapter, the empirical research is directed toward better understanding of factors that affect local voters' decisions concerning taxation for the support of public schools. Thus, although several forces must be controlled for in the regressions, the emphasis is upon variables affecting voters' demand for public schools. The variables discussed below are grouped into a few broad categories or types of factors--e.g., benefit spillover measures and price-related variables. Each variable is given a number (such as $X_1$) and a shorthand symbol (such as LOCTAX/P, for locally-raised taxes per pupil) to facilitate later
Appendix C presents in considerable detail information on the data sources and calculations for the variable formulations discussed below. Thus, the conceptual discussion is not cluttered with these details.

Dependent Variable

The rationale for the dependent variable being some measure of locally-raised school taxes per pupil has been stated earlier. To summarize briefly, it is that the recent wave of legal challenges to current educational finance systems focus on the deficiencies of the local property tax (as it is currently constituted) for promoting equality of educational opportunity, and lay considerable emphasis on the vast disparities in per-pupil educational expenditure (revenue) as evidence of unequal opportunity. On the theory that better understanding of the causes of unequal per-pupil (local) revenue is essential to intelligently-developed corrective actions, the decision to use some measure of per-pupil local school taxes as the dependent variable was virtually automatic. Having arrived at this point, however, certain specifics of the dependent variable formulation remain to be decided.

Because school systems undertake various types of expenditures (and may therefore be said to have taxes for different purposes), it must be decided whether to study all or part of the operation. Probably the major distinction that might be made is between current and capital budgets, although current revenue (expenditure) might be
subdivided into major categories such as instruction, transportation, and administration. But while the exact uses to which school revenue is put may be very important in determining the quality of education, the implications of different mixes of expenditures (at least among broad categories of outlay) for educational quality are not clear. What are the relative effects, for example, of air conditioning the school and of making an equivalent expenditure for higher teacher salaries? Moreover, the basic operating assumption of both this dissertation and the courts in the equal protection rulings—that "you get what you pay for," or "more money is better than less money"—suggests that the division of revenue among various uses is less important than the total amount of money available. The case against subdividing revenue is further strengthened if one believes that local decisions as to the composition of the school budget will continue to be highly valued.

Thus, there are several reasons for believing that the total amount of taxes per pupil that local voters are willing to approve is a more pertinent question than how much happens to be put in each of several pots in a given year. These reasons have led to the

\[11\] Even if it had seemed desirable to separate revenues into those for capital budgets and those for current budgets, this apparently would not have been possible without gathering the necessary data from each school system in West Virginia (which, in turn, may not have been possible, given the accounting system used). While some West Virginia school systems keep separate records for "current expense," "permanent improvement," "bond construction," and "debt service," many do not. According to information obtained from Aaron Rapking, Jr., Assistant Superintendent, Bureau of Finance and
decision to include all locally raised school taxes, for whatever purpose, in the dependent variable.

Still to be decided is the measure of pupils to be used in converting the taxes to per-pupil amounts (which is necessary both because of the focus of the equal protection challenges and as a means of making comparable different-sized school districts). The two most widely used and available measures are average daily attendance (ADA) and average daily membership (ADM). The two measures probably would give very similar relative patterns for the 55 school districts in West Virginia, so the choice of one over the other is not critical. ADM is preferred, however, for the reason that many costs (and therefore revenue needs) depend more upon membership than on attendance; classrooms, teachers, books, and buses, for example, all must be provided on a membership basis rather than on the basis of attendance.

The exact formulation of the dependent variable, \( X_1 \), is: total local public school taxes per pupil in ADM. It is represented by \( \text{LOCTAX/P} \).

Independent Variables

The research problem, as developed earlier, is to study factors affecting \( \text{LOCTAX/P} \)--including such factors as educational tastes and other traditional "determinants," but giving emphasis to

Administration, West Virginia Department of Education (interview, July 27, 1972), the school systems have the option of breaking their taxes into these categories or lumping them all into the "current expense" budget. Thus, comparable data for all school systems appear to be unavailable.
the possible role of cost and benefit spillovers—and to relate the findings to current policy issues in educational finance, most notably the development of an approach to educational finance that is consistent with equality of educational opportunity.

Because local school taxation is generally restricted to property taxation (in the study state, West Virginia, school districts have access to no other tax), the empirical analysis necessarily deals with the property tax. Thus, such variables as those representing cost (tax) exporting are tied to the local property tax. It is important to note, however, that the independent variables generally would not be changed significantly if schools were financed by local sales taxes, local income taxes, or other local levies. Benefit spillouts and tastes probably would be represented by the same measures described below. Cost spillouts still would exist through the mechanism of tax exporting, although the measures—and perhaps the patterns and proportions—would be changed.

This realization suggests that a shift from the local property tax to other local taxes for the support of public schools would not alter substantially the basic factors affecting taxation for the support of public elementary and secondary education. This, in turn, suggests that the results of the dissertation research should be helpful in designing alternative public school finance systems based on either local property or local non-property taxes.

Specific independent variables are discussed below. They are grouped under several headings or categories of variables (such as
benefit spillouts and fiscal ability) although many of the variables conceivably could fit into more than one of the categories.

Cost spillouts

A central hypothesis to be tested by regression analysis is that the dependent variable (\(\text{LOCTAX/P}\)) is positively related to the exporting of locally-levied school taxes beyond the boundaries of the taxing district. The mechanism by which costs of schooling in district A may spillout, or be exported, from district A is the shifting of (property) taxes imposed by district A to point of incidence outside the district. For the spillout analysis, property is divided into a "local" component (the taxes on which do not lend themselves to exporting) and a non-"local" component (the taxes on which can rather readily be exported). Generally speaking, local property consists of residential and farm property, and non-local property consists of commercial and industrial property (the exact composition of these two categories is described in Appendix C).

There is little specific evidence of the ultimate incidence of the property tax. Studies of tax incidence by area or by income class, therefore, commonly make one or more sets of assumptions about shifting for various types of property. See, for example: Richard A. Musgrave and Darwin W. Daicoff, "Who Pays the Michigan Taxes?" in Michigan Tax Study Staff Papers (Lansing: State of Michigan, 1958), pp. 131-83, especially pp. 144-45; O. H. Brownlee, Estimated Distribution of Minnesota Taxes and Public Expenditure Benefits, University of Minnesota Studies in Economics and Business No. 21 (Minneapolis: University of Minnesota Press, 1960), especially pp. 21-24; and Dick Netzer, Economics of the Property Tax (Washington, D.C.: The Brookings Institution, 1966), especially pp. 32-66, and 259. The exportability assumptions described in this section are generally consistent with this literature.
The assumption that taxes on residential property generally are not shifted outside the taxing districts is commonly employed in the economics literature. In the case of owner-occupied property, the assumption reflects the fact that the impact of the tax is on the person who "consumes" the taxed item; there is no further transaction to give rise to tax shifting. On the other hand, the assumption that the tax on rented residential property is not shifted geographically (does not spillout) does not imply no shifting. To assume forward-shifting of property taxes on rented residences seems reasonable and is standard in the literature. The assumption that the property tax on rented residences does not spillout can be correct only if non-resident landlords shift their property taxes forward to their tenants.

The taxes on industrial and commercial business property may be borne outside the taxing jurisdiction through any of several circumstances. First, if the taxes are forward-shifted and the customers are non-residents, geographic incidence will differ from geographic incidence.

Deductibility of property taxes from federal income tax base is recognized as a means of shifting property taxes, but it is ignored here, largely because federal income taxation will have the same effect on all counties in West Virginia except to the extent that there are differences in income, property value, and/or home ownership—all of which are separately controlled for. Thus, the relative rankings of the counties would be unaffected by introducing federal taxation's effects as a consideration.

Analytically, the same purpose would be served by assuming tenants perceive themselves as bearing the property taxes on their rented residences as by assuming that such taxes are, in fact, forward-shifted.
graphic impact. Backward shifting to suppliers who are non-residents of the taxing area will have the same result. Finally, if the business properties are owned by non-residents, shifting need not occur for the taxes to be exported. Through one or more of these sets of circumstances, it seems likely that most—but perhaps not all—local taxes levied on local business properties will be exported. Actually, local residents' perceptions of tax incidence are more important than the fact of exporting; if local voters do not perceive taxes impacting on local businesses as being borne by themselves, the analysis will be the same as if 100 percent exporting occurs.

The cost-exporting factor is formulated in two ways—a percentage variable and a dollar variable, each of which is explained below. Both calculations make use of weighted assessed values\(^\text{15}\) of "local" and non-"local" property, and are explained in Appendix C.

\(X_2\), non-"local" weighted assessed value per family, is represented by the symbol \(\text{EXPORT-}\$\); this variable is expressed in dollars per family. Standardization in family units reflects the notion that voters act in the context of the family. The property taxes from non-local property can be viewed as a supplement to family income in that, for any given level of school support, each dollar of

\(^{15}\)The need for weights arises from West Virginia's property tax classification system by which all real and personal property is assigned to one of four classes; school taxes on these four classes are levied in a fixed set of ratios which cannot be changed—i.e., any change in the levy on one class of property automatically translates into a change for all other classes in accordance with the fixed ratios. The classification system and the weighting procedures employed are described in Appendixes B and C.
taxes paid on business property is one dollar that does not have to be raised from family resources.

$X_3$, non-"local" weighted assessed value as a percentage of total weighted assessed value, is represented by EXPORT-% and is expressed in percentage terms.

EXPORT-$ and EXPORT-% can produce different rankings of school districts on the basis of ability to export costs, as shown by the examples that follow.

<table>
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<th>Non-Local</th>
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Local, non-local, and total property values per family, as well as the percentage of total property that is non-local, are shown for each of eight hypothetical school districts. The eight districts are divided into four pairs designed for illustrative purposes, with one poor and one rich district (richness or poorness is evaluated in terms of local property only) in each pair. Differences in the non-local (i.e., business) property serve to illustrate the differences between the percentage and dollar formulations of the exporting variable.
Each of the first pair of districts (A and B) has $20,000 of non-local property per family, which means approximately equal non-local taxes per pupil at any given tax rate (on the reasonable assumption of rough comparability of the average number of pupils per family in the two districts). Under the fungibility assumption noted above, this also means that at any given tax rate each family in each district would receive an equal income supplement (or "own"-tax savings) through the mechanism of taxing non-local property and thereby lessening local, or own, property taxes for any given level of tax-supported services. But in terms of the percentage of total property value comprised of non-local property, A and B are very different—80 percent and 50 percent, respectively—because of the different levels of local property.

C and D, the second pair of districts, each have 67 percent of property value represented by non-local property; measured by the percentage variable, each district appears equally able to export locally-levied school taxes. But on the basis of the dollar formulation, exporting ability differs markedly in the two districts, since D has four times as much non-local property per family as C. Here, the poor county is also poorer in terms of non-local property.

District E is the poor district in the third pair of districts, but its ability to export school taxes appears superior to F's export potential by either the dollar or the percentage formulation. This is because E has four times as much non-local property as F, which makes non-local property eight times as significant as local property.
in E but only one-half as significant as local property in the total property base in F.

Finally, in the fourth pair of districts, non-local property exceeds local property by the same amount per family ($10,000) in each district, making non-local property a higher percentage of total in the poor county but a larger absolute amount per family in the rich county.

Clearly, the two formulations of the cost exporting factor appear to be measuring two different phenomena. The percentage of each locally-voted school tax dollar coming from outside the taxing district is given by EXPORT-%; 100 percent minus the value of this variable gives the fraction of a dollar local residents must pay for a dollar's worth of public education. The dollar formulation of the cost exporting variable (EXPORT-$), on the other hand, focuses on how many dollars of outside aid\(^{16}\) will be brought into the district by each mill of voted levy. It is not clear which formulation is more appropriate in seeking to understand how the ability to export locally-voted school taxes affects voters' decisions regarding those taxes; each approach to the school cost-exporting factor has some merit.

In attempting to evaluate the two formulations, the following reasoning is advanced: To provide some "acceptable minimum" level of public education requires some (knowable) level of per-pupil

\(^{16}\)The authority to impose taxes that have their incidence outside the taxing jurisdiction may be viewed as a form of financial aid bestowed, in this case, by state governments.
support. For a variety of reasons—including the generally high value people place on education for their children—a community is likely to provide at least this minimum level of support if it does not entail an extreme financial sacrifice; the tax rate necessary to provide this level of support will vary inversely with the per-pupil wealth of the school district. Education appears to be a normal good (i.e., the quantity demanded increases as income or wealth increases), however, so that communities with greater wealth, or tax capacity, tend to exceed the minimum support level. Still, the effective demand for public education is not limitless since education must compete with other uses of limited resources; thus, the higher spending of wealthy districts probably is not proportional to the higher wealth of these districts (i.e., the elasticity of demand with respect to wealth probably is less than 1.0).

The voter's own situation probably is the most important factor determining his support for school taxes, and may serve to provide an effective limit on locally-voted taxes. Because the decision to tax non-local property also is a decision to tax local property (and vice versa), local voters are unlikely to vote exceedingly high taxes on their homes even though in doing so they would be making available large amounts of non-local taxes. But because both local and non-local tax dollars are made available through locally-made taxation decisions, two districts with the same level of local wealth per family but different levels of non-local wealth are likely to end up with quite different amounts of per-pupil support from locally-
voted taxes.

If the voter's own situation is the major factor in determining his attitude toward school taxes, the dollar formulation of the cost exporting variable seems preferable to the percentage formulation. $\text{EXPORT-}S$ seems better able to explain differences in locally-voted taxes per pupil since this formulation better describes the fact that, for any given tax rate, more dollars of non-local taxes will automatically be forthcoming in a district having more dollars of non-local property per pupil. The percentage formulation is somewhat lacking in this regard, however, since the same percentage can be found in districts having very different total tax bases (districts C and D in the examples) or a higher percentage can be found in a district having considerably less non-local property per pupil than another district which has a lower non-local percentage (districts G and H in the examples).

**Benefit spillouts**

If school district voters feel that public education benefits created locally are being lost to outside areas, their willingness to vote for school taxes may be diminished, especially if such benefit spillovers seem significant. Thus, an inverse relationship between benefit spillouts and the dependent variable, LOCTAX/P, is hypothesized. The basis for this hypothesis is the common sense notion that a person is less willing to pay for benefits that accrue to someone other than himself.
It is not assumed, however, that an inflow of benefits from other areas will offset the effects of loss of locally-created benefits. Even if a voter perceives an inflow of educational benefits, that does not provide a reason for his paying more for locally-created benefits unless he believes such spill-ins are attributable to the local creation of education benefits. Weisbrod has made this argument in the following terms:

... (T)o some extent a community is to the nation what a purely competitive firm is to the industry. Thus, the spill-ins (or imports) of benefits to a community from education provided elsewhere may be independent, in some degree, of its own education expenditures. To the extent that they are, the spill-ins constitute fixed benefits, which will have no influence on decisions at the margin, assuming community welfare maximizing behavior.17

As noted in Chapter 2, Weisbrod's early research tended to support not assuming symmetrical effects on education expenditures of benefit spillins and spillouts.

The principal mechanism by which education benefits may spillout from the area in which they were created is the subsequent geographic mobility of area students.18 Benefits accruing to other areas without geographic movement include the benefits of literacy


18Recall that a central role also was assigned to migration in the analyses of education benefit spillovers contained in both the Weisbrod and the Hirsch, Segelhorst, and Marcus studies, which were reviewed in Chapter 2 (pp. 57-66).
training that are important to good citizenship in a democracy and
the beneficial effects on productive efficiency that result from the
development and enhancement of work-related skills; but benefit
spillouts of this nature seem unlikely to affect adversely local
voters' attitudes toward public school taxes since such externalities
do not diminish the benefits available locally. In the case of out-
migration, however, an exodus of locally-trained persons may cause
residents remaining behind to feel that they are losing access to
such benefits as trained personnel capable of helping to develop or
maintain the local area, and increased tax payments from those whose
earnings potential had been increased by education--benefits made
possible by locally-raised tax dollars.

Thus, residents of an area experiencing net population loss or
even substantial gross out-migration may be expected to be less
willing to vote in favor of public school taxes than residents of a
growing area. There is a potential exception to this reasoning,
however. Relatives of students may well feel little or no loss of
education benefits if students leave the area after receiving their
schooling; parents may even wish to provide more education for their
children if their home area is experiencing economic decline, feeling
that more education will better prepare their children to leave the
area and find satisfactory employment. In other words, students'
relatives may tend to view all education benefits as a form of con-
sumption, including even the income-enhancing benefits that generally
are treated as human capital formation. To the extent that such a
view prevails, the hypothesized negative relationship between educa-
tion benefit spillouts (as measured by out-migration) and locally-raised public school taxes (LOCTAX/P) may not materialize.

In general, however, some measure of out-migration seems to be the best measure of education benefit spillouts for the present research. In particular, gross out-migration data for locally-trained students might seem desirable. Lacking data for this particular population, however, it is necessary to use migration data for a broader population. This is not as inappropriate as it may seem at first blush, since out-migration of non-students also may affect support for public schools. Persons whose attachment to the community is expected to be short-term, for example, may not be inclined to vote for taxes to provide education benefits to (other) residents in the future. Although this phenomenon is not what we have called education benefit spillout, its effect on education taxes would be similar, and both phenomena are picked up (and inseparably mixed) in out-migration data.

Four different variables intended to measure education benefit spillouts are included (Appendix C discusses the data and calculations used for each, and also notes some of the limitations of the data). Three are measures of migration or net population change:

\[ X_4: \text{1970 population as a percentage of 1960 population (represented by the shorthand symbol POP70/60)}; \]

\[ X_5: \text{Percent population loss through net migration, 1955-60 (represented by NETMIGR)}; \]

\[ X_6: \text{Percent population loss through out-migration, 1955-60 (represented by OUTMIGR)}; \]
The fourth formulation of the benefit-spillouts factor attempts to measure attachment to the community:

\[ X_7: \text{Percent of occupied housing units occupied by owners (represented by \text{OWNEROCC}).} \]

Gross out-migration data, preferred for reasons discussed above, were not available for a period more recent than 1955-60 when the data were being prepared. Moreover, the decennial census, which is the source of out-migration data, does not present the data for areas as small as a single county (see Appendix C). To make use of these data, it was necessary to impute to each county the out-migration experience of the multi-county state economic area (SEA) of which it is a part.\(^\text{19}\) Because the net migration data used (which are somewhat less desirable as a benefit spillout measure than out-migration data) came from the same source, they suffer the same deficiencies.\(^\text{20}\)

The net population change variable (\text{POP70/60}) has the dual advantages of (a) permitting use of more recent (1970 census) data

\(^\text{19}\)As noted in Appendix C (pp. 245-46), the 1965-70 data from the 1970 census were not incorporated in the study when they became available because evidence then existed that the SEA-based migration data were not suitable for use in studying individual counties.

\(^\text{20}\)As noted in Appendix C (p. 245, fn. 18), net migration data for individual counties are available from the 1970 census, although they were not obtained until the statistical analyses for the current research had been completed. These more detailed, more recent data were not brought into the study at that point because it was found that they correlated 0.958 with the net population change variable described below (\text{POP70/60}).
and (b) being based on data for each individual county (school district). It suffers somewhat from the fact that it includes all sources of population change—including birth and death rates—and not just population changes resulting from migration; this deficiency is not serious, however. On balance, POP70/60 is a better measure of the benefit-spillout factor than either NETMIGR or OUTMIGR.

Because of the formulation of POP70/60, counties having higher values of the variable are those with increasing populations, whereas decreasing populations are indicated by indexes of less than 100. On the assumption of a negative relationship between education benefit spillouts and locally-levied school taxes per pupil, the coefficient of this variable is expected to be positive. The coefficients of both NETMIGR and OUTMIGR are expected to be negative; because all SEAs (and, by imputation, all school districts) in West Virginia experienced population loss through migration, both these variables are stated as percentages of population loss. Therefore, the higher the value, the greater the benefit spillouts.

The fourth benefit spillout proxy—OWNEROCC, the percentage of occupied housing units occupied by owners—is intended primarily as a measure of community attachment (the theory being that owner-occupants are more attached to the community than renters). OWNEROCC can also serve as a measure of population stability. In any event,  

\[ \text{Note the correlation statistic cited in the preceding footnote.} \]
because the effect on public school taxes of community attachment is felt to be similar to the effect of benefit spillouts, and also because the two tend to be measured by the same variables, OWNEROCC is considered to be a benefit spillout measure. A high percentage of owner-occupants would indicate either (a) strong attachment to the community or (b) low population turnover, either of which is expected to be positively associated with the dependent variable. Therefore, the sign of OWNEROCC is expected to be positive.

**Fiscal ability**

Seven variables that fit under the general heading of fiscal ability or capacity are considered below. They include a measure of per-family property values, two measures of tax "overburden," a measure of intergovernmental aid, and three measures of income level or distribution. These variables, which are expected to affect voters' demand for public education, are treated separately below.

**Property value.**—Property is a form of wealth and, therefore, an indication of taxpaying capacity. Education being a normal good, it is hypothesized that school taxes per pupil will vary directly with property values. The specific measure of property values used here is assessed value of local property per family or, in abbreviated form, PROPERTY; this is variable $X_8$. (The data and calculations are described in Appendix C.)

The per-family formulation follows directly from the assumption, set forth earlier in this chapter, that the voter makes his
decisions regarding school taxes in the context of his family's situation. Other aspects of this particular formulation require further explanation, however.

Use of assessed property value (rather than "full" or market values) to measure fiscal ability is, unlike the situation for the tax exporting variable, a matter of necessity rather than choice. While assessed value figures by class of property were readily obtained for each county, no assessment-sales ratios or similar data that would permit converting assessed values to equalized values were available when the data for this study were being compiled.²² Property values equalized at a constant percentage of market value would provide a better indication of relative taxpaying capacity of the residents of the several school districts. In other words, two families each having homes worth $25,000 on the market may be presumed to have equal taxpaying ability, other things being equal, even though one home may be assessed at 50 percent of value and the other at 60 percent.

From the standpoint of the taxing school district, of course, assessed values are more important than equalized values, since they determine, together with the tax rate, the district's ability to raise tax revenues. For this reason, assessed values determine the cost

²²West Virginia recently has undertaken assessment-sales ratio studies, although at the time data for this research were being developed the first such study had not yet been completed. Moreover, the planned series of assessment-sales ratio studies commenced with a period of time later than the one used in this research (interview with John R. Melton, Director, Local Government Relations Division, West Virginia Tax Department, July 27, 1972).
of public education to the family. Thus, although less than perfect for measuring family fiscal ability, use of assessed property values is not without some merit. These figures are used unweighted since weighting assessed property values in proportion to relative tax rates, necessary in constructing the tax exporting variables, would be inappropriate in measuring the relative wealth or fiscal capacity of families.

Finally, the use of local, or "own," property values only is based on the argument that taxpaying ability (and also cost, or amount of taxes paid) for each family does not depend in any direct way upon business (or non-local) property values.23

The coefficient of PROPERTY is expected to have a positive sign.

Tax overburden.--Because school districts and other governmental units overlap and, therefore, must look to the same tax base for their support, the extent to which other governmental units utilize the tax base affects the ability and willingness of voters to support public school taxes. Recognizing this, and noting that the highest property values per family or per capita often are found in urban areas where public service needs also are generally acknowledged.

23 Taxes paid on non-local property may, of course, indirectly supplement resident families' fiscal ability. Such property is viewed as the principal vehicle for tax exporting in the current research, and is used separately in variables $X_2$ and $X_3$. 
edged to be greatest, it is possible that an area with high property values and high taxes for other governmental units may be less able to support public education than an area having lower property values and lower taxes for other governments. The existence of such a disparity between apparent fiscal capacity and effective ability to raise revenues is termed "municipal overburden."^24

Only those non-school taxes levied by other local units of government concern us, since residents of all West Virginia school districts face the same state and national tax systems. If voters' attitudes toward the property tax (the only tax available to school districts in West Virginia and most other states) is not affected by the presence or absence of local non-property taxes, the focus of the overburden variable can be further narrowed to include only local non-school property taxes. It seems probable, however, that voters are more sophisticated than this--that they view property and non-property taxes as fungible, so that a dollar of one type of tax has the same effect on them as a dollar of any other type.^25 Partly to

^24 There is a fairly extensive literature on the overburden problem in the economics literature, and particularly the literature of urban economics. For a review of this literature as it relates to school finance, see: LeRoy J. Peterson, Municipal Overburden, State-of-the-Knowledge Series No. 13 (Eugene, Oregon: ERIC Clearinghouse on Educational Management, University of Oregon, August, 1971).

^25 Any individual taxpayer, however, may not view two different taxes as being completely comparable. A family with a relatively low-cost home and a high income, for example, probably would not be indifferent between income and property taxes; such a family would tend to prefer that a given increment in total taxes be raised through the property tax. Available data, however, do not permit consideration of intra-district distributional effects of different types of taxes.
test the comparability of the total tax and property tax formulations of the overburden variable, and partly because available data for one formulation appear better than for the other (see Appendix C), two overburden formulations are included:

$$X_9: \text{Total local non-school taxes per family (abbreviated as TTOVRBUR, standing for total tax overburden);}$$

$$X_{10}: \text{Local non-school property taxes per family (PTOVRBUR, standing for property tax overburden).}$$

Each formulation of the overburden factor is expected to take a negative sign in the regressions, since diminished ability or willingness to support public school taxes is assumed to result from increased non-school taxes. Should the coefficients of these variables be positive, however, it would seem to indicate that they serve as a measure of taste for public services, with higher taxes for all (local) functions being a matter of taxpayer preference. A negative sign for the property tax formulation coupled with a positive sign for the total tax formulation, on the other hand, would tend to discredit the assumption of fungibility between types of taxes.  

**Intergovernmental school aid.**—As noted in Chapter 1, local school systems receive substantial amounts of aid from state and federal government aid programs. Such aid can be separated into two basic types for our purposes: (a) aid dispensed in such a manner

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26Because the property tax comprises the bulk of locally-raised taxes in West Virginia, the two overburden variables are highly correlated (0.8—see Table 9 in Appendix C); their use in the same regression model would create problems of multicollinearity. Thus, the theoretically interesting notion of fungibility of property and non-property taxes cannot be tested.
that local residents' marginal considerations, or relative prices, are affected; and (b) aid dispensed in such a manner that decisions at the margin are not affected. In general, aid that is conditioned on local matching monies or maintenance of effort is classed as affecting marginal considerations, and aid extended without such conditions is placed in the second (non-marginal) category, above. Most federal aid programs impose matching or maintenance-of-effort requirements, while West Virginia state school aid programs do not impose such requirements (Appendix C describes the breakdown of intergovernmental aid programs into these two categories).

Matching of intergovernmental aid monies with locally-raised monies encourages use of local funds in programs that qualify for aid, since only a fraction of a dollar of local monies need be spent to buy a dollar's worth of educational service (in the case of increasing expenditures); conversely, removal of a dollar of locally-raised monies from an aided category results in a reduction of educational services by more than a dollar (in the case of decreasing expenditures). Local maintenance-of-effort (in contrast to matching) requirements are not symmetrical; an increase in local funds does not bring in more intergovernmental funds, whereas reduction of local funds results in a greater loss of total funds. Thus, matching and maintenance-of-effort requirements affect relative prices of services for which aid is available vis-a-vis those not qualifying for aid.

Variable $X_{23}$, "marginal" intergovernmental aid per pupil in ADM (represented by AIDAFMAR, or aid affecting marginal values), is con-
sidered to be a price-related variable; it belongs in a later section dealing with such variables. AIDAFMAR is discussed here to make clearer the distinction between types of intergovernmental aid. The coefficient of AIDAFMAR is expected to be positive, on the theory that such aid induces more local funds to be spent for public education because aided (education) services appear to be bargains relative to non-aided functions. A negative coefficient is a possibility, however, and would tend to indicate a substitution within the educational function, with non-aided education functions being curtailed in favor of aided functions. (Such a substitution effect could, of course, involve non-education programs as well.

In contrast, aid extended without local matching or maintenance-of-effort requirements is assumed not to affect marginal considerations. Such aid (which includes state aid in West Virginia, as well as a few types of federal aid) is made available as a flat amount per pupil or per program, or in some other manner that does not alter relative prices. Therefore, such aid may be viewed as a net increment in school revenues, at least in the first analysis. But some researchers have found (as noted in Chapter 2 and Appendix A) evidence of substitution of non-marginal (state) aid for locally-raised school revenues. Such substitution seems to be a reasonable development, indeed, and it suggests viewing such aid as an income supplement to local residents (an increase in fiscal capacity, in some sense).27

27Footnote 31 in Chapter 2 (p. 54) cites evidence that supports viewing non-marginal aid as an income supplement, or an increase in general fiscal ability.
By extending school aid without requiring local matching monies or maintenance of effort, higher levels of government make it possible for local voters to achieve a given level of educational services and to "drain off" local dollars for other purposes. Thus, non-marginal school aid dollars are fungible with other (local) dollars.

Non-marginal intergovernmental school aid per family28 (variable \( X_{11} \), represented by NNMARAID) is expected to have a negative regression coefficient. This is in line with the assumption that non-marginal aid to schools will be substituted for locally-raised school dollars. Although non-marginal aid is considered to be a fiscal capacity measure, the usual assumption that increased capacity leads to increased expenditures on normal goods and, therefore, to a positive regression coefficient is not applicable here; non-marginal aid is a special capacity variable. Such aid makes possible the attainment of a given level of educational services with a lesser local input (the dependent variable includes locally-raised taxes only) than without such aid, thereby increasing the overall capacity of the area to finance not only public education, but other functions as well. Total spending for education still may be increased by such aid, however, even though less local money may be allocated to education than would have been without non-marginal school aid.

28The marginal intergovernmental aid variable (AIDAFMAR) is expressed in dollars per pupil because of its treatment as a factor affecting the per-pupil price of public education, whereas the non-marginal aid variable (NNMARAID) is expressed in dollars per family in line with its treatment as a factor affecting the family's fiscal capacity.
Income.--The relationship between family income and the capacity of the family to pay taxes seems obvious, and in many respects income probably is a better measure of fiscal capacity than property value, particularly where equalized property values are not available. The use of per-family income measures, of course, follows from the assumption that taxpayers or voters make their decisions regarding school taxes in the context of the family situation.

Three separate income measures are included, two of which focus on distributional patterns while the other measures average family income:

\[ X_{12}: \text{Median family income (abbreviated as INCOME MD);} \]

\[ X_{13}: \text{Percent of families with income of $15,000 and over (INCOME HI);} \]

\[ X_{14}: \text{Percent of families with income under $3,000 (INCOME LO).} \]

The data for each variable are described in Appendix C.

Median income measures differences among school districts in the overall level of income, as represented by the family in the middle of the array. The sign of the regression coefficient for INCOME MD is expected to be positive, on the theory that the demand for education increases as income increases. But while the median is better for our purposes than, say, the mean, any given median income value may be consistent with very different income distributions. Because an unusually high concentration of families in either the high or the low income tail would have different implications for "average" family taxpaying capacity than a normal distribution of families throughout
the income range, distributional variables also are included.

A high value of INCOMEHI would indicate a large concentration of high-income families and would tend to indicate a somewhat higher level of fiscal capacity than a lesser concentration of such families, other things being equal. The regression coefficient for INCOMEHI is expected to be positive. A high value for INCOMELO, on the other hand, would indicate a large concentration of low-income families, which would suggest a somewhat lower level of fiscal capacity, other things being equal. The sign of the regression coefficient is expected to be negative.

It should be noted that the income variables—and particularly the two distributional measures—may represent "taste" for education, as well as taxpaying capacity. Because high-income persons often are said to have a relatively high "taste" for education, it will be necessary to consider the use of the income variables together with the use of the "taste" variables described below when the regression models are constructed in the next chapter.

**Other demand or taste measures**

Most of the variables discussed above under the capacity and spillout headings affect voters' demand for education at least indirectly. The seven variables included in this section are other variables that relate in some way to "taste" or demand for public education. They are considered separately below.
Presence of children.—Families having children who may now or in the future attend public schools are more likely to vote for public school taxes than families without such children. Most consumption-type advantages of education accrue to students and their families, and the higher incomes that are associated with increased education capital also are largely captured by such families. Other families still may value public education for any of a variety of reasons, of course, including the advantages of education for democratic government, the advantages of having children in school and off the streets, and a genuine desire to help (others') children get a good start in life. On balance, however, communities with a higher percentage of families having children who may attend public schools are likely to support public school taxes more than communities with a lower percentage of such families.

Two specific variables focusing on different dimensions of the presence of children are included (see Appendix C for data and calculations):

X₁₅: Percentage of families with children under age 18 (represented by CHILD-18);

X₁₆: Average number of public school pupils in ADM per family (or ADM/FAM).

Although children typically attend school between the ages of six and 18, it seems desirable to include children under age six, as well. Families having children below the age of six probably will have begun thinking about the time when their children will be in school. Therefore, for families that anticipate being in the same area
when their children start to school, attitude toward public school taxes may be expected to be more favorable for families with children under six years than for families having no children below age 18. The sign of CHILD-18 is expected to be positive.

ADM/FAM is expected to have a negative regression coefficient, since a larger number of public school students per family, everything else equal, dilutes the available wealth in per-student terms. Imagine two school districts each having the same number of families and the same per-family wealth, but where one district has twice as many public school pupils per family as the other. Unless the elasticity of demand for per-pupil public education with respect to the number of pupils per family is at least 1.0, per-pupil local support for public education will be less in the district with the greater number of pupils per family. In the example set forth above, such an elasticity seems unlikely and would be inconsistent with the usual finding that the demand for education is positively associated with income (while income and family size tend to vary inversely).

Non-public schools.--Just as families with no children under age 18 are expected to be less favorably disposed toward public school taxes than families with such children, families whose children attend non-public schools also are expected to be less favorably disposed toward public schools than families that send their children to public schools. Conversely, the greater the significance of public school pupils among all pupils in a district, the greater the support for public schools is expected to be. Thus, public school pupils in ADM
as a percent of total (variable $X_{17}$, represented by PUBLCADM) is expected to vary directly with LOCTAX/P, the dependent variable. (This formulation tends to focus more on public schools, which are the subject of the research, than would the percentage of pupils in non-public schools.)

A negative coefficient is possible, however, and would tend to indicate that a relatively large public school enrollment dilutes the available tax base on a per-pupil basis (or, conversely, that a relatively large concentration of non-public school pupils tends to stretch the available tax base).

Non-white population.--It has sometimes been alleged that non-whites place a lower value on education than whites, so that a large concentration of non-whites would tend to indicate a relatively low taste for education. The a priori basis for expecting color, per se, to affect demand for education is not clear to this writer, however. A negative effect seems more likely to reflect the fact that non-whites generally have lower incomes than whites. Thus, a large concentration of non-whites would tend to indicate less taxpaying capacity in a regression model that did not include an explicit low-income variable. Variable $X_{18}$--percentage of population non-white, represented by NONWHITE--is, therefore, included largely because it has been a standard variable in the literature. If significant, it is expected to have an inverse relationship with the dependent variable, locally-raised public school taxes per pupil.
Educational attainment.--It frequently is argued that adults who have a relatively high educational attainment value education for their children (and perhaps others, as well) more highly than adults with less education. The rationale supporting this argument presumably is that those who have gone farther in the educational process and have, therefore, benefitted more from education are more appreciative of the advantages of education.

Two measures of educational attainment of adults are included (the data are described in Appendix C):

\[ X_{19} \]: Median years of schooling, persons aged 25 and over (represented by \textit{MEDYRSED}, or median years of education);

\[ X_{20} \]: Percentage of persons aged 25 and over having 16 or more years of schooling (\textit{EDUC16+}).

There is no clear reason for favoring one formulation over the other; two are included primarily to permit greater freedom of selection when the educational attainment variables are compared with other variables potentially measuring similar factors (e.g., the income variables).

Both educational attainment variables are expected to have positive regression coefficients, in line with the reasoning advanced above. A negative correlation is possible, however, and would tend to indicate that persons having relatively low levels of educational attainment (and, therefore, having experienced the disadvantages of little education) may have a very high demand for education for their children, so that they may lead better lives than their parents.
Urban residence.--The final variable intended to measure taste or demand for public education, \( X_{21} \), is the percentage of population living in urban areas (represented by URBAN), as defined by the Bureau of the Census (see Appendix C). URBAN is expected to have a positive regression coefficient, reflecting the assumption that persons residing in urban areas tend to have a greater taste for public services in general than residents of non-urban places. A positive sign also would be predicted if URBAN were taken to represent differential costs. Assuming costs to be higher in urban areas, expenditures--and therefore taxes--per pupil would have to be higher in urban areas to provide any given level of (real) educational services.

Price-related variables

Two variables are included that are intended to measure certain aspects of per-pupil costs or prices of public education. The discussion of one of these, "marginal" intergovernmental school aid per pupil (AIDAFMAR), is contained in an earlier section dealing with intergovernmental aid. The other, an index of relative per-pupil costs (CSTINDEX, designated as variable \( X_{22} \)), is treated below.

CSTINDEX is, as described in Appendix C, an index of pupils in each of three major education program categories--elementary, secondary, and vocational--weighted by the relative costs associated with a full-time student in each category. It is, therefore, an index of the relative prices of a unit of educational output (a full-time student) in these three programs. Although the price-based weights
are the same for all counties, the index will differ among counties to the extent that the mix of programs differs. The regression coefficient is expected to be positive, on the theory that school districts with greater concentrations of high-cost pupils need more revenue per pupil and will be able to demonstrate that need to the voters.

**Educational quality**

School districts providing a higher quality of education are expected to have higher costs per pupil and, therefore, to need more revenue per pupil. A positive relationship between educational quality and the dependent variable is hypothesized. In some sense, then, educational quality is another measure of costs; in this capacity, it would be a measure of supply. Assuming a program of quality education has voter support, educational quality may also be interpreted as a measure of demand or taste. Moreover, devotion to higher quality may lead to higher costs, or the availability of more funds may bring about higher spending which, in turn, may enhance education quality; in short, causation may run either way (but the implications of the two directions may, in the long-run, differ). Thus, the interpretation of any "quality" variable will not be unambiguous.

Selection of a variable to measure educational quality also is not simple or clear-cut. This is largely a reflection of the fact that there is no commonly accepted measure of educational output; this being the case, it is difficult to know how to measure the quality of that output. The "solution" to this dilemma is to use a
measure of the quality of education inputs, and to make the rather standard assumption that higher-quality resources command higher prices.

The particular quality variable used here is average teacher salary for teachers in West Virginia public schools (represented by SALARY, and designated as variable $X_{24}$). While many other variables might possibly have been selected—such as Hirsch's scope and quality index and Miner's measure of employment of personnel providing auxiliary services (both discussed in Chapter 2 and Appendix A)—average teacher salary was selected on the basis of Raymond's finding that this was the only input variable significantly related to various output measures in a study using a sample of graduates from West Virginia high schools. 29

Summary

This chapter has developed the conceptual framework for the empirical study of factors affecting locally-voted (either directly or indirectly) taxes for public elementary and secondary education in West Virginia. Key features of that framework are the emphasis upon factors that seek to explain voters' attitudes toward public school taxes, and the decision to focus only upon the locally-raised revenues rather than on total expenditures from all funds.

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29 Richard Raymond, "Determinants of the Quality of Primary and Secondary Public Education in West Virginia," *Journal of Human Resources*, III (Fall, 1968), pp. 450-70.
In addition to the dependent variable, twenty-three independent variables have been identified. These have been grouped under the following general headings: cost spillouts, benefit spillouts, fiscal ability, other demand or taste measures, price-related variables, and educational quality. Several of the variables, however, would seem to fit into more than one of these categories.

Several features of this study make it different from most other empirical investigations of variations in educational funding, including the following: (a) the dependent variable focuses upon taxes, rather than expenditures, and upon the local role rather than total funding; (b) measures of school cost (tax) exporting are included among the independent variables, so that the effect of cost spillouts can be studied; (c) measures of education benefit spillouts are included among the independent variables, again reflecting the emphasis of the current research upon geographic spillouts; and (d) the data used are for individual school districts, rather than aggregates of the decision-making units.
CHAPTER 4

QUANTITATIVE MODELS AND FINDINGS

Twenty-three specific independent variable formulations have been identified in Chapter 3 and quantified in Appendix C. This number of variables is too large to reasonably be used in any single regression model. Moreover, several variables included are alternative formulations of a single factor and are too closely related to be used together. Considerations weighing in the final selection of a small number of variables to be used in regression runs are described in the first part of this chapter, while regression findings are presented in a later section. The next chapter contains a qualitative evaluation of the quantitative findings of this research.

Selection of Variables

To assist in the process of reducing the number of independent variables from 23 to a smaller, less-redundant group, the following guidelines have been developed:

a) The number of variables should be minimized, subject to the constraint that certain key factors be represented;

b) Given the focus of the present research upon spillovers of benefits and costs associated with public education, the final group of variables must include ones representing cost and benefit spillovers;
c) Theoretical justification, rather than enhancement of the coefficient of multiple determination ($R^2$), must be the basic criterion for inclusion of a given variable;

d) Correlation between variables should be minimized, subject to the constraints of the other rules.

There are no hard-and-fast procedures to be used in applying these guidelines; thus, room is left for the exercise of judgment in the variable selection process. Use of factor analysis to aid in the screening of the several variables was attempted, but the effort was not fruitful.¹ More judgmental selection methods then were adopted, aided by the matrix of correlation coefficients presented in Appendix C, Table 9.

Some of the considerations that went into selecting among the variables in each category identified in Chapter 3 are discussed below. The discussion in this section relates only to the selection of what are later referred to as the seven "basic" variables. A few variables of general interest not among these basic ones nevertheless are included in some regressions reported in this chapter, and Appendix E is devoted to presentation of findings from some supplemental regressions.

Cost spillouts

Two possible measures of cost spillouts have been identified, one expressing so-called non-local (business) property as so many dollars per family (EXPORT-$), and the other expressing this same

¹This experiment with factor analysis is the subject of Appendix D.
property as a percentage of total property (EXPORT-%).

It was argued in Chapter 3 that the dollar formulation seems more appropriate in a model seeking basically to explain variations in dollars of locally-imposed school taxes in terms of factors affecting voters' willingness to approve school taxes; this formulation essentially tells how many dollars of "outside aid" (exported taxes) can be tapped at a given local tax rate. Because of the preference for the dollar formulation and the high correlation between the two formulations, only EXPORT-$ is included among the basic variables. There is, however, some validity in asking what percentage of locally-raised funds actually are non-local (or, stated alternatively, what fraction of a dollar local residents must pay for a dollar's worth of educational services), so EXPORT-% is substituted for EXPORT-$ in two of the regressions reported below.

Benefit spillouts

Three measures of population change and a measure of the extent of home owner-occupancy were set forth in Chapter 3 as possible representations of perceived exporting of education benefits. Two of the population change variables measure the percent of population loss through net migration (NETMIGR) and through out-migration (OUTMIGR); they were included initially because of their presumed greater relevance to benefit exporting through migration vis-a-vis the third population change variable, POP70/60, which measures net population change from all causes between 1960 and 1970.
POP70/60 has an advantage over the migration measures, however, in that the former is based on data for each school district (county) individually, while the migration data (as discussed in Appendix C) are based on data for multi-county state economic areas (SEAs). Moreover, evidence developed during the research shows that: (a) attributing the average migration experience of an SEA to each county within that SEA (as in NETMIGR and OUTMIGR) is quite unsatisfactory; and (b) gross population change correlates very highly and positively with change from net migration when data for both apply to the same areas.\(^2\) Thus, POP70/60 is included in the group of basic variables because it is the most suitable proxy for migration-related education benefit spillouts.

The theoretical rationale for measuring education benefit spillouts by the extent of home ownership (OWNEROCC) is not as strong as for the population-change proxies, as noted in Chapter 3. Therefore, under the criterion of using as few variables as possible, OWNEROCC is excluded from the group of basic variables.\(^3\)

**Fiscal ability**

Three of the seven measures grouped under the fiscal ability heading in Chapter 3 are included in the list of basic variables. Those included are: (a) PROPERTY, a measure of the average dollars

\(^2\)The evidence referred to is discussed in both Chapter 3 (pp. 96-97) and Appendix C (pp. 245-46).

\(^3\)OWNEROCC is included in supplemental regression I in Appendix E.
of (taxable) property per family; (b) INCOMEHI, a measure of income or wealth distribution; and (c) NNMARAID, a dollars-per-family measure of intergovernmental school aid supplied with no matching or maintenance-of-effort requirements. Some of the reasons for selection of these particular variables are considered briefly below.

PROPERTY and median family income (INCOMEMD) are viewed as alternative measures of average general fiscal capacity or ability; given the desire to use as few variables as necessary to represent a basic factor, it was decided not to use both these variables. PROPERTY was selected over INCOMEMD partly for the following reasons: (a) the use of the property tax to support schools makes property value a particularly appropriate measure of ability to support schools --better than income, to the extent that persons' property claims and incomes are not closely and positively correlated; and (b) INCOMEMD correlates very highly with both measures of income distribution (INCOMEHI and INCOMELO)—much higher than the correlation of PROPERTY with these measures of distribution. INCOMEMD is substituted for PROPERTY in one of the regressions reported below, however.

Because of their high inter-correlation, INCOMEHI (percent of families with incomes of $15,000 or over) and INCOMELO (percent of families with incomes of $3,000 and under) are viewed as alternative measures of the distribution of income or fiscal capacity. INCOMEHI is included among the basic variables; selection of the upper income tail over the lower one was based in part on the somewhat lower correlation of INCOMEHI with a few other basic variables. The choice
was largely arbitrary, however, and for this reason INCOMELO is substituted for INCOMEHI in one of the regressions reported below.

It was hypothesized in Chapter 3 that intergovernmental school aid extended without matching or maintenance-of-effort requirements might be substituted for locally-raised school monies (and, therefore, that such aid is a type of income supplement). Testing of this hypothesis is important if one is concerned with how to design efficient aid programs to achieve higher and/or more uniform levels of education spending. Thus, keeping NNMARAID among the basic variables was nearly as high a priority as keeping the spill-over measures.

The two measures of municipal overburden—dollars of total local non-school taxes per family (TTOVRBUR), and dollars of non-school property taxes per family (PTOVBRUR)—are highly intercorrelated; they are, therefore, viewed as alternative measures of capacity (actually, capacity reduction). Neither is among the basic variables selected, however. The reasons for this are (a) the desire to keep the number of variables low, together with (b) the fact that results probably would be ambiguous, as discussed in Chapter 3.4

Other demand or taste measures

The percentage of families with children under 18 years of age (CHILD-18) is a theoretically important variable, representing the proportion of family units having a (potential) direct interest in

4Nevertheless, TTOVRBUR is included in supplemental regression L in Appendix E.
public schools. The theoretical justification, moreover, appears clear-cut: a positive sign is expected, and nothing consistent with utility maximizing behavior suggests a negative relationship between the percentage of families with school-age children and level of per-pupil local school taxes, other things being equal. In this respect, CHILD-18 has an advantage over average number of public school pupils per family (ADM/FAM) and public school membership as a percentage of total (PUBLCADM), two other aspects of presence of children that may not be "equal." Moreover, the latter two variables correlate rather highly with some variables in the group of basic variables. For these reasons, CHILD-18 is included among the basic variables, while the other two are excluded.5

Percent of population non-white (NONWHITE) is excluded from the list of basic variables largely because of the very small proportion of the West Virginia population that is non-white. After gathering data on this variable, it was noted that most counties have very low percentages of non-white residents; the average in 1970 was about two and one-half percent (see Table 8, Appendix C). Although not a "basic" variable, NONWHITE is included in one of the regressions reported below because of general interest in this variable in the literature on determinants of education spending.

Two measures of adult educational attainment—median years of schooling (MEDYRSED) and percent with 16 or more years of education 5PUBLCADM is a rather standard variable in the determinants literature, however, so it is included as a matter of interest in supplemental regression H in Appendix E.
(EDUC16+) were put forward in Chapter 3 as possible measures of "taste" for education. Both are excluded from the basic variables group, however, largely because of the desire to keep the number of variables small and the feeling that other variables are conceptually more important. Moreover, MEDYRSED correlates highly with several of the variables in the basic group, particularly the fiscal capacity measures.

The last variable in the taste category is percent of population living in urban areas (URBAN). Only eight of West Virginia's counties had as much as 50 percent of their population in urban areas in 1970, however, and the statewide average for this variable was about 20 percent (see Table 8, Appendix C). Moreover, URBAN correlates highly with some of the variables included in the basic variable group. For these reasons, percent urban is excluded from the basic group. In view of its potential significance in some populous areas, however, and partly because of its role as one of the standard variables in the determinants literature, URBAN is included in one of the regressions reported below.

**Price**

Two possible price-related variables were identified in Chapter 3. The first, an index of relative per-pupil costs (CSTINDEX), weights pupils in three basic categories according to the average 

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6Both educational attainment variables are included in supplemental regression problems in Appendix E (runs J and K).
cost per full-time-equivalent student in those categories; it measures differences in the price of educating the "average" student which arise through differing proportions of students in the three categories. Although conceptually important, CSTINDEX is excluded from the list of basic variables. After the variable had been calculated, it was noted that the value of CSTINDEX is virtually constant in all school districts; as shown in Table 8, Appendix C, the average value is nearly 60 times as great as the standard deviation. So constant a variable could wreak havoc with the results of any regression including it.7

The other price-related variable is the number of dollars per pupil of intergovernmental school aid contingent upon local matching or maintenance of effort (AIDAFMAR). It was hypothesized in Chapter 3 that such conditions affect decisions at the margin by altering (reducing) the prices to recipient jurisdictions of aided programs; as noted, a positive relationship between such "marginal" aid and locally-raised taxes per pupil is expected. AIDAFMAR is a companion variable to NNMARAIM, discussed above. To test the hypothesis that aid granted with matching and/or maintenance-of-effort (marginal) conditions affects local taxation differently than aid extended without such conditions, AIDAFMAR also is included in the basic variables group.

7Like several other variables noted above, CSTINDEX is this dissertation's counterpart of a variable that is standard in the determinants literature. Largely for this reason, it is included in supplemental regression N in Appendix E.
Quality

With some apology for the fact that measurement of educational quality typically resorts to the prices (and presumably, therefore, the quality) of inputs, average teacher salary (SALARY) was advanced in Chapter 3 as a possible measure of quality of education. Other things being equal, better (more productive) inputs should command higher prices than inputs of lower quality; and higher-quality inputs should enhance the quality of the output or product. Higher input costs in different markets (school districts) may, however, reflect things other than quality, such as a higher salary schedule in area A vis-a-vis area B to overcome negative aspects of being in area A (including higher living costs).

Higher salary levels resulting from either of these causes would be expected to be positively associated with per-pupil local school taxes, since salaries bulk large in school budgets. Therefore, because of the ambiguity of interpretation of the results, plus the fact that SALARY correlates highly with certain variables included in the basic category, SALARY is excluded from the list of basic variables.8

Recapitulation: Basic variables

As a result of the screening process described above, a list of seven "basic" independent variables has been constructed from the

8SALARY is included in Appendix E, however, in supplemental regression M.
original list of 23. The seven are:

\[ X_2: \] EXPORT-$, non-"local" weighted assessed value per family;

\[ X_4: \] POP70/60, 1970 population as a percent of 1960 population;

\[ X_8: \] PROPERTY, assessed value of "local" property per family;

\[ X_{11}: \] NNMARAID, non-"marginal" intergovernmental school aid per family;

\[ X_{13}: \] INCOMEHI, percent of families with income of $15,000 or over;

\[ X_{15}: \] CHILD-18, percent of families with children under age 18;

\[ X_{23}: \] AIDAFMAR, "marginal" intergovernmental school aid per pupil in ADM.

All have conceptually strong reasons for inclusion, and are characterized by clear-cut a priori notions as to the direction of their effects upon the dependent variable, total local public school taxes per pupil in ADM (LOCTAX/P).

Results of regression problems including these and selected other variables (noted in the preceding pages of this chapter) follow in the next part of this chapter. In addition, Appendix E presents findings for seven other variables in seven supplemental runs; each run includes the seven basic variables.

The Quantitative Results

Using locally-raised school taxes per pupil in average daily membership (LOCTAX/P) as the dependent variable, a number of regression runs were made employing the seven basic variables identified
above as the core of the independent variables. (All runs, of course, employed data for West Virginia school districts, or counties, in 1969-70.) Table 2 presents results for five regression problems. Seven independent variables were used in each, and the same seven types of factors were represented. All seven basic variables were included in the first problem (A), while each of the other four incorporated one or two variable substitutions; in one (B), for example, INCOME MD was substituted for PROPERTY as the measure of average family fiscal ability. In all, ten variables were used in the five problems. Clearly, the possible combinations of these 10 variables have not been exhausted. The particular combinations used were selected in rather arbitrary fashion, but the general purpose was to test the sensitivity of the general findings to specific formulations of such variables as cost exporting and fiscal ability.

Each row of Table 2 represents a separate variable. The first column presents the signs the variables were expected to take as hypothesized in Chapter 3, and the other five columns report the results of the five regressions (labeled A through E). The T statistic for each variable appears in parentheses below the coefficient; a value of approximately 2.0 indicates statistical significance at the five percent level, while a value of 2.7 or higher indicates significance at at least the one percent level. Finally, the last row of the table presents the adjusted $R^2$ (coefficient of multiple determination adjusted for degrees of freedom) for each regression problem.
TABLE 2.--Regression Coefficients, Expected Signs, "T" Values, Constant Terms, and Adjusted Coefficients of Multiple Determination (R²), Five Regression Problems for West Virginia

<table>
<thead>
<tr>
<th>Variable</th>
<th>Expected Sign</th>
<th>Problem A</th>
<th>Problem B</th>
<th>Problem C</th>
<th>Problem D</th>
<th>Problem E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td></td>
<td>-69.697</td>
<td>10.545</td>
<td>-388.28</td>
<td>-109.92</td>
<td>75.085</td>
</tr>
<tr>
<td>EXPORT-$</td>
<td>(+)</td>
<td>0.0082</td>
<td>0.0080</td>
<td>4.8195</td>
<td>3.3970</td>
<td>0.0087</td>
</tr>
<tr>
<td>EXPOT-%</td>
<td>(+)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POP70/60</td>
<td>(+)</td>
<td>-0.4529</td>
<td>0.4855</td>
<td>-0.1293</td>
<td>1.4644</td>
<td>-0.9518</td>
</tr>
<tr>
<td>PROPERTY</td>
<td>(+)</td>
<td>0.0118</td>
<td>0.0301</td>
<td>0.0152</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NNMARAO</td>
<td>(-)</td>
<td>-0.4993</td>
<td>-0.4498</td>
<td>-0.5419</td>
<td>-0.5521</td>
<td>-0.4783</td>
</tr>
<tr>
<td>INCOME</td>
<td>(+)</td>
<td>0.0081</td>
<td>0.0091</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INCOMEHI</td>
<td>(+)</td>
<td>8.3794</td>
<td>9.0546</td>
<td>8.5575</td>
<td>11.3208</td>
<td></td>
</tr>
<tr>
<td>INCOMELO</td>
<td>(-)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.7492</td>
</tr>
<tr>
<td>CHILD-18</td>
<td>(+)</td>
<td>4.5643</td>
<td>1.3021</td>
<td>4.6280</td>
<td>-0.1255</td>
<td>4.7329</td>
</tr>
<tr>
<td>AIDAFMAR</td>
<td>(+)</td>
<td>0.0635</td>
<td>0.1004</td>
<td>0.0487</td>
<td>0.1239</td>
<td>0.0886</td>
</tr>
<tr>
<td>Adj. R²</td>
<td></td>
<td>.834</td>
<td>.822</td>
<td>.757</td>
<td>.676</td>
<td>.821</td>
</tr>
</tbody>
</table>
Table 3 presents the elasticity coefficients for the dependent variable with respect to each independent variable for the five problems reported in Table 2; the format of Table 3 is similar to that of Table 2.

**TABLE 3.--Elasticities for Local School Taxes Per Pupil (LOCTAX/P) with Respect to Ten Variables, Five Regression Problems for West Virginia**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Problem A</th>
<th>Problem B</th>
<th>Problem C</th>
<th>Problem D</th>
<th>Problem E</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPORT-$</td>
<td>0.533</td>
<td>0.520</td>
<td></td>
<td>0.566</td>
<td></td>
</tr>
<tr>
<td>EXPORT-%</td>
<td></td>
<td></td>
<td>1.523</td>
<td>1.073</td>
<td></td>
</tr>
<tr>
<td>POP70/60</td>
<td>-0.213</td>
<td>0.228</td>
<td>-0.061</td>
<td>0.688</td>
<td>-0.447</td>
</tr>
<tr>
<td>PROPERTY</td>
<td>0.319</td>
<td></td>
<td>0.813</td>
<td></td>
<td>0.410</td>
</tr>
<tr>
<td>NNMARAILD</td>
<td>-0.803</td>
<td>-0.724</td>
<td>-0.872</td>
<td>-0.888</td>
<td>-0.770</td>
</tr>
<tr>
<td>INCOMEMD</td>
<td></td>
<td></td>
<td></td>
<td>0.214</td>
<td>0.240</td>
</tr>
<tr>
<td>INCOMEHI</td>
<td>0.303</td>
<td>0.327</td>
<td>0.309</td>
<td>0.409</td>
<td></td>
</tr>
<tr>
<td>INCOMELO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.393</td>
</tr>
<tr>
<td>CHILD-18</td>
<td>1.176</td>
<td>0.335</td>
<td>1.192</td>
<td>-0.032</td>
<td>1.219</td>
</tr>
<tr>
<td>AIDAFMAR</td>
<td>0.029</td>
<td>0.046</td>
<td>0.022</td>
<td>0.056</td>
<td>0.040</td>
</tr>
</tbody>
</table>
The seven basic variables

Problem A was comprised of the seven basic variables identified above. As shown in Table 2, five of the seven were found to be highly significant (the exceptions were the benefit spillover measure, POP70/60, and the "marginal" intergovernmental school aid variable, AIDAFMAR); an adjusted $R^2$ of 0.83 was obtained. Thus, more than four-fifths of the variation in per-pupil local school taxes was accounted for by (or associated with) the seven independent variables. With the exception of POP70/60, all the variables took the expected signs.

Some of the results of Problem A are of particular interest. EXPORT-$\$, for example, not only had the expected positive sign but also was the most significant of all the variables, thereby tending to confirm one of the central hypotheses of this research: that per-pupil local school taxes vary directly with the opportunity to spillout, or export, the taxes. Recalling that EXPORT-$\$ is expressed in dollars per family, the coefficient of 0.0082 suggests that a $100 per family increase in non-local property value was associated with an $.82 increase in per-pupil local taxes. Such response of the dependent variable to changes in EXPORT-$\$ was found to be inelastic, however, as shown in Table 3. The elasticity coefficient of 0.533 means that a one percent increase in non-local property value per family "caused" only a half percent increase in local school taxes per pupil.

Another hypothesis that was tentatively confirmed by the
results of problem A is that intergovernmental school aid extended without requirement of either matching or maintenance of effort is, to some extent, a substitute for local monies. The coefficient of this variable was negative and highly significant. As shown in Table 3, the response of the dependent variable to change in non-marginal school aid (NNMARAJD) was found to be inelastic—a one percent increase in the latter was associated with a 0.8 percent decline in the former.

While the coefficient of the companion variable—AIDAFMAR, school aid affecting marginal relationships—was not found to be statistically significant, the sign was positive, as expected. Comparing the findings for these two aid variables, it seems clear that the presence or absence of matching or maintenance-of-effort requirements has important implications for the effect of intergovernmental aid on final school expenditure levels.

The hypothesis that benefit spillouts are negatively associated with locally-raised public school taxes per pupil was not borne out by the results of problem A. The sign of the proxy for education benefit spillouts, net population change between 1960 and 1970, was negative rather than positive (as benefit spillovers are measured by POP70/60, a negative association between spillouts and the dependent variable would require a positive sign, on the assumption that growing areas—with higher values of POP70/60—experience net benefit spillins and declining areas experience net benefit spillouts), although the coefficient was not statistically significant.
As expected, both general fiscal capacity measures--PROPERTY (dollars of local, or non-business, property value per family) and INCOMEHI (percent of families with income of $15,000 or more)--took positive signs; moreover, both were found to be highly significant. Both these variables were found to be inelastic in problem A. The elasticity coefficients in Table 3 suggest that only a 0.3 percent increase in locally-raised school taxes per pupil was caused by a one percent increase in either PROPERTY or INCOMEHI.

Finally, the percentage of families with children under 18 years of age (CHILD-18) also was found to be positive and statistically significant in problem A. This suggests that families with children of or nearing school age may value public education more highly than those without such children. In fact, only this variable was found to be elastic in problem A; a one percent increase in the percentage of families with children under 18 was associated with more than a 1.1 percent increase in per-pupil local school taxes.

Substitutions for basic variables

Considered below are four regression problems (B through E in Table 2) that differ from problem A in that alternative formulations of one or two of the seven basic variables have been substituted. Median family income was substituted for per-family local property value as the measure of average "own" fiscal capacity of families in problem B, for example, to evaluate the sensitivity of both the overall findings and the findings for average fiscal capacity to specific variable formulations. The more stable the results among problems A
through E, the greater will be our confidence in the tentative con-
cclusions drawn above based on the findings for problem A.

In problem B, the only change from the basic model was the
substitution of INCOMEMD for PROPERTY, noted above. Comparing coef-
ficients and T values for problems A and B reveals several interesting
changes. The number of variables significant at at least the five
percent level, for example, dropped from five in problem A to three in
problem B; not only was INCOMEMD found to be non-significant (where-
as PROPERTY, the variable for which it was substituted, was signifi-
cant), but the substitution resulted in robbing CHILD-18 of its
statistical significance while cutting its coefficient by more than
two-thirds. Also in problem B vis-a-vis A: (a) a higher, although
still non-significant, coefficient was obtained for AIDAFMAR; (b)
the coefficient of INCOMEHI was found to be somewhat higher and still
highly significant; and (c) the coefficient of POP70/60 was positive
rather than negative, although both its absolute magnitude and level
of non-significance were essentially unchanged.

Perhaps as important as the changes between problems A and B
is the stability that was demonstrated in the cost exporting variable
(the coefficient and very high level of significance of EXPORT-$ were
virtually the same in both A and B) and the non-marginal intergovern-
mental aid variable. The elasticity coefficients for problem B were
all less than unity and, with the exception of CHILD-18, all were of
roughly the same magnitude as for problem A. Also, the adjusted $R^2$
for B, at 0.82, was only slightly lower than that for problem A.
Problem C restored PROPERTY and dropped INCOMEMD while substituting the percentage formulation of the cost exporting variable (EXPORT-%) for EXPORT-$; thus, problem C differed from A only in the formulation of the cost spillout measure used. Table 2 shows that the signs obtained were the same for all the variables and the same five variable types had significant coefficients in both A and C; moreover, the coefficients of NNMARAID, INCOMEHI, and CHILD-18 (all significant) were only slightly larger in problem C. PROPERTY had a coefficient in C more than double its coefficient in A, however, and there was some increase in statistical significance (to the one percent level); this variable also was less inelastic in problem C. The percentage formulation of the tax or cost exporting variable, like the dollar formulation in problem A, was positive and easily significant at the one percent level. The elasticity coefficient in Table 3 indicates that, in problem C, a one percent increase in the proportion of property value comprised of non-local (business) property was associated with a 1.5 percentage increase in LOCTAX/P; thus, EXPORT-% was found to be quite elastic in problem C.

Turning to the non-significant factors in regression runs A and C, we note that the proxy for benefit spillouts (POP70/60) was less than one-third as large in the latter run; the sign was negative in both runs, whereas a positive sign had been expected. AIDAFMAR had a lower coefficient in C than in A, but was positive and non-significant in both runs. The adjusted $R^2$ for problem C was approximately 0.76; thus, about seven percent less of the variation in LOCTAX/P, the
dependent variable, was explained in problem C than in problem A.

Both the substitutions made in problems B and C were made in problem D. With both EXPORT-% and INCOME-MD in and both EXPORT-$ and PROPERTY out, the adjusted $R^2$ dropped to the lowest level of any of the runs—0.68. As in run B, only three of the seven variables were significant at at least the five percent level: (a) EXPORT-%, with both regression and elasticity coefficients about one-third lower than those obtained for the variable in run C; (b) NNMARAID, with a regression coefficient only slightly larger than in run C but nearly a fifth larger than in run B; and (c) INCOME-HI, with a regression coefficient about a fourth higher than in any of the previous runs. All of the significant variables took the expected signs.

Other changes in problem D vis-a-vis the earlier runs shown in Table 2 include the large increase in the coefficient of POP70/60, which was positive in D and B, but negative in A and C; this variable was not found to be significant in any of the runs, however. It should also be pointed out that CHILD-18 fell apart in run D; the coefficient's absolute size dropped sharply, its sign reversed, and its statistical significance dropped to zero. The elasticity coefficient in Table 3 for CHILD-18 also dropped sharply and became negative.

Finally, the last of the variations on the seven basic variables was the substitution of the percentage of families in the low income tail (INCOME-LOW) for the percentage in the upper tail (INCOME-HI); the results for this run (E) are presented in the last column of
both Tables 2 and 3. The adjusted $R^2$ for run E was 0.82—which is comparable with those for runs A and B—and, as in runs A and C, five of the seven variables were statistically significant and also had the expected signs.

The newly-added variable in run E—INCOMELO—was negative and significant at the one percent level. The elasticity coefficient in Table 3 indicates that approximately a 0.4 percent decrease in per-pupil local school taxes was associated with a one percent increase in the percentage of families with income below $3,000. The average fiscal ability measure, PROPERTY, was positive and significant, but the size of its regression coefficient in E was only about half as large as in C (although still somewhat larger than in A). In comparison with problem A, the findings for EXPORT-$S$, NNMARAID, and CHILD-18—the three other significant variables—were virtually unchanged in problem E. POP70/60 and AIDAFMAR remained non-significant in run E; their regression coefficients took the same signs as in A, but they were of somewhat different magnitudes.

Findings for two additional variables are considered below, after which the general findings for each of the seven basic variable types are discussed.

Findings for two additional variables

In discussing the selection of basic variables earlier in this chapter, it was noted that two variables that are rather standard in the literature appeared not to warrant inclusion among basic variables. The two variables are percent of population living in urban
areas (URBAN) and non-white population as a percentage of total (NONWHITE). Despite the generally low values of these variables in West Virginia, however, it was felt that the general interest in their role as determinants of the level of government fiscal activities justified their inclusion here.9

Accordingly, two additional regression runs were made, adding first NONWHITE (run F) and then URBAN (run G) to the seven basic variables of problem A. The results for these runs are presented in Table 4 (regression coefficients, T values, R^2 values, and so forth) and Table 5 (elasticity coefficients). Problem A also is presented in both tables for comparison purposes.

Addition of percent non-white to the basic variables accounted for a little more than an additional one percent of the variation in the dependent variable, as shown by the adjusted R^2 of nearly 0.85 for problem F. As shown in Table 4, NONWHITE was found to be both positive (a negative sign was expected) and significant at the five percent level. This finding was unexpected and is difficult to explain.

Only four West Virginia counties had as many as 10 percent non-whites in 1970 (see Table 8). All were moderately large (20,000 to 70,000 population), non-urban counties. Although the writer was unable to discover any characteristic not controlled for in the regressions that NONWHITE might be representing, the possibility

9Fortunately, there appears to be enough variability in both variables that their use in regression analysis is not precluded (see Table 8, Appendix C).
TABLE 4.—Regression Coefficients, Expected Signs, "T" Values, Constant Terms, and Adjusted Coefficients of Multiple Determination (R²), Three Regression Problems for West Virginia

<table>
<thead>
<tr>
<th>Variable</th>
<th>Expected Sign</th>
<th>A</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td></td>
<td>-69.697</td>
<td>-97.367</td>
<td>-109.91</td>
</tr>
<tr>
<td>EXPORT-$</td>
<td>(+)</td>
<td>0.0082</td>
<td>0.0084</td>
<td>0.0084</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(9.4)</td>
<td>(9.9)</td>
<td>(9.2)</td>
</tr>
<tr>
<td>POP70/60</td>
<td>(+)</td>
<td>-0.4529</td>
<td>-0.0781</td>
<td>-0.2191</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.6)</td>
<td>(0.1)</td>
<td>(0.2)</td>
</tr>
<tr>
<td>PROPERTY</td>
<td>(+)</td>
<td>0.0118</td>
<td>0.0118</td>
<td>0.0125</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.3)</td>
<td>(2.3)</td>
<td>(2.3)</td>
</tr>
<tr>
<td>NNMARIAID</td>
<td>(-)</td>
<td>-0.4993</td>
<td>-0.5481</td>
<td>-0.4151</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.0)</td>
<td>(3.4)</td>
<td>(2.0)</td>
</tr>
<tr>
<td>INCOMEHI</td>
<td>(+)</td>
<td>8.3794</td>
<td>7.0502</td>
<td>7.2308</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.7)</td>
<td>(3.1)</td>
<td>(2.6)</td>
</tr>
<tr>
<td>CHILD-18</td>
<td>(+)</td>
<td>4.5643</td>
<td>4.6528</td>
<td>4.2988</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.5)</td>
<td>(2.7)</td>
<td>(2.3)</td>
</tr>
<tr>
<td>AIDAFMAR</td>
<td>(+)</td>
<td>0.0635</td>
<td>0.0901</td>
<td>0.0644</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.6)</td>
<td>(0.9)</td>
<td>(0.6)</td>
</tr>
<tr>
<td>NONWHITE</td>
<td>(-)</td>
<td></td>
<td>3.0616</td>
<td>(2.1)</td>
</tr>
<tr>
<td>URBAN</td>
<td>(+)</td>
<td></td>
<td></td>
<td>0.2916</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.7)</td>
</tr>
<tr>
<td>Adj. R²</td>
<td></td>
<td>.834</td>
<td>.846</td>
<td>.833</td>
</tr>
</tbody>
</table>
should not be ruled out that percent non-white served as a surrogate for some other factor which, if identified, might more logically explain the effect attributed to NONWHITE. A literal interpretation of the results for run F, however, suggests that a one percent increase in the percentage of the population that is non-white was accompanied by a 0.04 percent increase in per-pupil local school taxes.

TABLE 5.--Elasticities for Local School Taxes Per Pupil (LOCTAX/P) with Respect to Nine Variables, Three Regression Problems for West Virginia

<table>
<thead>
<tr>
<th>Variable</th>
<th>Problem</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>F</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>EXPORT-$</td>
<td>0.533</td>
<td>0.546</td>
<td>0.546</td>
<td></td>
</tr>
<tr>
<td>POP70/60</td>
<td>-0.213</td>
<td>-0.037</td>
<td>-0.103</td>
<td></td>
</tr>
<tr>
<td>PROPERTY</td>
<td>0.319</td>
<td>0.319</td>
<td>0.338</td>
<td></td>
</tr>
<tr>
<td>NNMARAID</td>
<td>-0.803</td>
<td>-0.882</td>
<td>-0.668</td>
<td></td>
</tr>
<tr>
<td>INCOMEHI</td>
<td>0.303</td>
<td>0.255</td>
<td>0.261</td>
<td></td>
</tr>
<tr>
<td>CHILD-18</td>
<td>1.176</td>
<td>1.199</td>
<td>1.108</td>
<td></td>
</tr>
<tr>
<td>AIDAFMAR</td>
<td>0.029</td>
<td>0.041</td>
<td>0.029</td>
<td></td>
</tr>
<tr>
<td>NONWHITE</td>
<td>0.040</td>
<td></td>
<td></td>
<td>0.032</td>
</tr>
<tr>
<td>URBAN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overall findings for the seven basic variables were affected very little by inclusion of NONWHITE, as can be seen by comparing columns A and F of Table 4. The five significant variables in run A also were significant in F, and the signs of all seven basic variables were unchanged. Even the sizes of the coefficients were relatively stable, with the biggest changes occurring in those of the non-significant variables (POP70/60 and AIDAFMAR).

Problem G added percent urban to the seven basic variables with no striking effect (see Table 4). The adjusted $R^2$ was essentially the same as for problem A. The five variables that were significant in A were significant in G, as well. None of the signs were different in problem G in comparison with A. And, while some coefficients were different (generally smaller) in G, the changes from A were not striking. The percent-urban variable itself was found to be positive (as expected) but non-significant—a result that was not unexpected for this particular case study. What is somewhat surprising, however, is that the fit of the regression equation was not improved for the urban counties by addition of URBAN to the model.10

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10Percentage errors of fit for runs A and G were compared for West Virginia's nine urban counties—the seven standard metropolitan statistical area (SMSA) counties of Brooke, Cabell, Hancock, Kanawha, Marshall, Ohio, and Wayne—plus two other counties at least 50 percent urban (Wood and Monongalia). Five had negative errors (model calculated LOCTAX/P below actual) from each run, and four had positive errors after each. URBAN worsened the percentage error by one or two points for four, improved the error by one percentage point for one, and left four counties unaffected. (Errors for the urban counties ranged from one percent to 16 percent for both runs.)
Recapitulation: Findings for basic variables

This section summarizes the findings for each of the basic variable types included in runs A through E, including the stability of the results when one or more variables was changed, as in problems B through G. The major quantitative research findings, as reflected by regressions using data for West Virginia school districts in 1969-70, are, therefore, presented in this section.\textsuperscript{11} Chapter 5 considers the applicability of these findings to other settings, and otherwise qualitatively evaluates the regression results.

Cost spillouts.—Perhaps the major finding from the regression analyses was the very strong, positive effect the ability to export school costs (taxes) had on locally-levied school taxes per pupil. This was true whether the ability to spillout taxes was represented by EXPORT-\$ (dollars of non-local, or business, property per family) or by EXPORT-\% (non-local property value as a percent of total property value), although the coefficient for EXPORT-\$ was found to be more stable than that for EXPORT-\%, as shown in the regressions reported in Tables 2 and 4. It was noted in Chapter 3 and earlier in this chapter that these two formulations provide somewhat different information; while the dollar formulation seems conceptually better suited to the current research, EXPORT-\% also is of consider-

\textsuperscript{11}As noted earlier, several supplemental regression runs are presented in Appendix E.
able interest.

In the five problems using EXPORT-$, the regression coefficients exhibited considerable stability, ranging only from 0.0080 to 0.0087. In other words, a $100 per family increase in non-local property was associated with an increase in per-pupil local taxes somewhere between 80 and 87 cents. The elasticity coefficients for EXPORT-$ ranged only from 0.520 to 0.566. Also, the statistical significance was consistently at better than the one percent level. Thus, based on findings for West Virginia in 1969-70, ability to export school taxes appears to be a significant determinant of locally-raised school taxes per pupil.12 This finding offers tentative confirmation of one of the major hypotheses underlying this research.

Benefit spillouts.--Another central hypothesis concerning the effect of spillouts (benefit spillouts, in this instance) on local education taxation was not confirmed by the quantitative results. Education benefit spillouts were represented by POP70/60 (1970 population as a percent of 1960 population), which was not significant in any of the regression problems in Tables 2 and 4. The regression coefficients for POP70/60 ranged from -0.0781 (run F) to 1.4644 (run D); positive signs occurred only in runs B and D, in which INCOMEMD was substituted for PROPERTY.

12Entering the variables in the regressions stepwise, EXPORT-$$ entered first yielded an adjusted \( R^2 \) of 0.37. It remained strong when entered at the seventh step of problem A--raising the adjusted \( R^2 \) from 0.53 after step 6 to 0.83.
This, of course, is not proof—even for West Virginia—that benefit spillouts do not affect school taxes. Given the lack of gross out-migration data for each county, data on net population change were used. For several reasons, POP70/60 is a less-than-ideal proxy for benefit spillouts.

It was thought that the negative signs generally taken by POP70/60 might be explained by declines in property taxes lagging behind (school) population declines in contracting areas, which would tend to cause higher per-pupil taxes in such areas. Given the positive simple correlation between POP70/60 and LOCTAX/P (see Table 9), however, this attempt at rationalization appears deficient. In view of the shortcomings of POP70/60 as a benefit spillout measure and the variability of the results noted above, however, it perhaps is not too fruitful to try rationalizing the findings for POP70/60.

**Intergovernmental school aid.**—Two intergovernmental aid variables were included among the seven basic variables. As noted in Chapter 3 and Appendix C, one measure is considered to be a price-related variable (AIDAFMAR) and the other to be a measure of supplemental fiscal capacity (NNMARAID). They are considered together here to facilitate comparison of the findings for the two, a comparison that suggests some important implications for policy (which are taken up in Chapter 6).

The rationale for separating intergovernmental aid into two categories—aid affecting marginal values or prices (AIDAFMAR) and aid lacking such effects (NNMARAID)—is supported by the regression find-
ings for the two. The coefficients for NNMARAID were consistently negative (as hypothesized) and significant at at least the five percent level, although they ranged from -0.4151 (run G) to -0.5521 (run D)--a difference of over twenty-five percent from smallest to largest. By contrast, coefficients for AIDAFMAR were consistently positive (as hypothesized), although statistically non-significant and of variable magnitude (from a low of 0.0635 in run A to a high of 0.1239 in run D). Based on findings for West Virginia school districts in 1969-70, it seems clear that the presence or absence of marginal (maintenance-of-effort or matching) requirements is an important basis for distinguishing between types of intergovernmental aid.

Aid extended on a uniform basis or otherwise without matching or maintenance requirements to be met by the receiving governments was found to decrease local school taxes per pupil by roughly 50 cents for each dollar per family of such aid, while aid contingent upon local matching or maintenance-of-effort requirements was found to have an effect on per-pupil local taxes that was statistically no different from zero. Elasticity coefficients for NNMARAID ranged from -0.668 to -0.888, while those for AIDAFMAR ranged from 0.029 to 0.056. If the intent of school aid is other than to relieve pressure on local taxes, it appears that matching or maintenance-of-effort requirements are desirable.

Fiscal ability.--The findings for the fiscal ability measures were generally as hypothesized. Average amount of local (non-busi-
ness) property per family (PROPERTY) was used as the basic measure of average "own" family wealth or capacity, and it was consistently positive and statistically significant, as expected. The size of the coefficient was somewhat more sensitive to inclusion or exclusion of certain other variables than was true for EXPORT-$ or NNMARAID, for example; in particular, in run C, where EXPORT-% was substituted for EXPORT-$, the coefficient of PROPERTY was more than twice as high as in most other runs. In general, however, an increase of $100 in local property per family was found to be associated with an increase in per-pupil local school tax of roughly $1.20. The larger coefficient for PROPERTY than for EXPORT-$ suggests that LOCTAX/P is more sensitive to variations in local or "own" capacity than in non-local wealth --which is consistent with rational decision-making by voters.13

Use of median family income (INCOME M D) in lieu of PROPERTY as a measure of average family fiscal capacity (runs B and D) resulted in positive but insignificant coefficients. The somewhat surprising non-significance of median income may be attributable to the other variables included in the run--particularly INCOMEHI--with which INCOME M D is highly correlated.14 At least for this particular

13The elasticity coefficients for PROPERTY were generally lower than for the cost spillout measures. Because elasticity is given by the percentage change in the dependent variable divided by the percentage change in the independent variable, however, this difference is accounted for by the fact that a change of, say, $100 per family in EXPORT-$ is a smaller percentage change (smaller denominator) than a $100 per family change in PROPERTY.

14A regression run made with both INCOME M D and PROPERTY included, and all other income measures excluded, yielded positive and significant coefficients for both average measures of fiscal ability.
sample, if representation of both average fiscal capacity and distribution of income or wealth is to be achieved, PROPERTY is a better average measure than median income.

The distribution of income or wealth about the average appears from the empirical findings for West Virginia to be a significant determinant of local school taxation. Whether income distribution was represented by the high or low income tail, the regression coefficients in Tables 2 and 4 generally were significant at the one percent level. A fair amount of variation was found in the size of the coefficient for INCOMEHI, however, which ranged from 7.0502 to 11.3208—a difference from low to high of more than half. Whether such variability would occur for INCOMELO is not known, since it was used in only one run. From the sizes of the coefficients, however, per-pupil local school taxes appear to be more sensitive to concentration in the upper income tail than in the lower tail, although changes in the arbitrary cut-off points for the upper ($15,000 floor) and lower ($3,000 ceiling) tails might alter the relationship.

Presence of children.--Of the several "taste" and other demand factors identified in Chapter 3, only one--percentage of families with children under age 18 (CHILD-18)—was included among the seven basic variables. (Two other taste measures, URBAN and NONWHITE, also have been considered earlier, however.) In five of the runs reported in Tables 2 and 4, CHILD-18 had positive, rather stable coefficients (fluctuating only between 4.30 and 4.73) that were statistically significant at the one percent level; these findings are
consistent with the hypothesized behavior of this variable. But in two other runs (B and D), CHILD-18 was not significant, and in one of these (D) the coefficient was negative and quite low (-0.13). The reason for this is not obvious. The simple correlations between CHILD-18 and other variables, for example, are not high; more complex intercorrelation among three or more variables, not detectable from the simple correlations in Table 9, may be the cause. In any event, percentage of families with children under age 18 appears not to be a stable determinant of local school taxes per pupil.\textsuperscript{15}

In summary, the most important positive conclusions to be drawn from the quantitative research concern the implications for levels of locally-raised school taxes of (a) ability to export locally-levied taxes beyond the decision-making district, (b) the differential effects of "marginal" and non-"marginal" intergovernmental school aid, and (c) the more obvious and generally-recognized findings regarding the significance of fiscal capacity.

\textsuperscript{15}Fluctuations in the elasticity coefficients for CHILD-18, which parallel those in the regression coefficients, were extreme. Except for runs B and D, response of the dependent variable to CHILD-18 was found to be elastic (coefficients were in the vicinity of 1.2), but the elasticities in B and D were, respectively, 0.335 and -0.032.
CHAPTER 5

QUALITATIVE EVALUATION OF FINDINGS

This chapter is devoted to qualitative evaluation of the results of the quantitative research reported in Chapter 4. The first section below considers the generality of the research findings and the possibility of extending findings for West Virginia to other areas, and the second considers the applicability of the findings to non-property taxes. Another section compares the findings reported in Chapter 4 with the pre-existing literature, forming a sort of addendum to Chapter 2. The final section considers the general research approach used in determinants studies and urges caution in use of the findings of such research. Finally, the policy implications of the research on factors affecting local school taxes are discussed in Chapter 6.

Extension of Findings to Other Areas

In evaluating quantitative research based on observations for a portion of the total population, an important question concerns the applicability of the findings to areas not included in the sample. Is it reasonable to draw conclusions for other states on the strength of findings based on West Virginia data?
First of all, it must be noted that West Virginia is not a microcosm of the United States; it is not a "typical" state in several aspects. West Virginia is considerably more rural than most states, for example. In addition, 1970 census statistics show that West Virginia is one of only three states that experienced a net population loss between 1960 and 1970. Continued population decline has roots in the declining employment opportunities in industries important in West Virginia (such as mining) and no doubt has affected the demographic composition of the state through greater out-migration of the young. The extent of differences in economic and social structure in West Virginia vis-a-vis the country as a whole or other states in particular is not documented here, however; even if it were, the exact implications of these differences for the applicability of the research findings would not be known. Caution always is called for in the use of research findings; this may be particularly true for the present study.

More positively, however, it should be noted that the regression analyses employed variables that exhibited a good deal of variability in West Virginia (see Table 8, Appendix C) as well as in


2A possibly significant exception pertains to the variables intended to measure benefit spillouts. As shown in Table 8, the standard deviation for POP70/60, for example, is less than one-ninth the size of the mean. Perhaps the general population decline in West Virginia has resulted in too little variability of out-migration for this state to permit a reasonable test of the benefit spillout hypothesis.
other states. In general, the types of variables found to be important in West Virginia may be presumed to be important in other states, although the exact relationships among variables almost certainly would be different; it would not be advisable, in other words, to apply the West Virginia coefficient for value of non-business property per family (PROPERTY) to New York data.

The effects of West Virginia institutions also need to be considered. As noted in Appendix B, at least during the period under study, West Virginia required a 60 percent affirmative vote for approval of voted school tax levies and imposed such other restrictions as periodic renewal of voted levies and maximum rates of levy (except for debt retirement). There is no obvious reason, however, to expect these institutional factors to have influenced the pattern of relationships among the variables. Rather, since all these provisions relating to school taxation in West Virginia would tend to make it more difficult to impose additional (voted) property tax rates, their probable effect is to have suppressed the level of locally-raised school taxes. The state's higher-than-average ratio of state funds to total state and local school monies (also noted in Appendix B) is indicative of the lower level of local school taxes. Nevertheless, the data reveal considerable variation among school districts in per-pupil local taxes, and variation is more important than level in regression analysis.

It does seem possible, however, that West Virginia's county-wide school districts contributed to the lack of variation in the
elementary-secondary-vocational mix of pupils which accounted for the virtual uniformity of the per-pupil cost index (CSTINDEX). As noted in Chapter 4, CSTINDEX could not be used responsibly in regression analysis because it was too nearly constant among West Virginia school districts. Such uniformity would be less likely to occur in states having (a) smaller, more heterogeneous school districts, and (b) greater diversity in residence-area types (city, suburban, rural).

Another West Virginia institution—the classified property tax (described in Appendix B)—may have affected the magnitude (but not the nature) of the tax exporting variable, EXPORT-$. At least in the study period, tax rates for the four classes of property in West Virginia were set in such a manner that classes III and IV (including what is here termed non-local property) were taxed at twice the rate for class II (including most local property), so that a dollar of non-local property gave rise to roughly twice as much tax as a dollar of local property. To account for the different rates applicable to different types of property, calculation of EXPORT-§ included application of weights in proportion to the rates (see Appendix C). Therefore, PROPERTY and EXPORT-§ overstated the differences in the raw magnitudes of local and non-local property.

If voter approval of school property taxes turns more on voters' own wealth (PROPERTY) than on business wealth (EXPORT-§), the West Virginia classified property tax results in more non-local taxes than would be generated without classification, everything else being equal. Thus, to the extent that the mix of absolute or
raw dollars of local and non-local property in West Virginia is
typical of other areas, one would expect non-local taxes (tax ex­
porting) to be less in areas without West Virginia-type property
classifications than the West Virginia regression findings indicate
(voter motivations, assessment practices, and other factors being
equal).

In summary, the general findings of the research reported here
do not seem to rest in any crucial way on peculiarities in the West
Virginia situation; they appear, therefore, to have rather general
applicability. Access to a tax base that enables local voters to
impose taxes for local use while exporting part of the burden out­
side the taxing jurisdiction may be expected to have a significant
and positive effect on the level of taxes wherever this situation
occurs. School aid made available to local school districts without
any pledge of matching monies or of continuation of the level of
local contribution may be expected to be used in part to reduce
locally-raised school revenues below the level that would prevail
either without such aid or if the aid were made contingent upon local
matching or maintenance of effort. Also, the level and distribution
of local (family) fiscal capacity may be expected to affect local
school taxation in a significant manner. Thus, the major conclusions
suggested by the research presented in Chapter 4 should have general
applicability.3

3As noted later in this chapter, however, the results of all
determinants studies must be used with caution since there is evidence
that the average relationships developed may represent any given area
Extension of Findings to Other Taxes

The research reported in Chapter 4 used measures of average fiscal capacity and of tax exporting based upon the property tax. Moreover, the dependent variable measured per-pupil local property taxes. This emphasis upon the property tax reflects the fact that the property tax is in West Virginia—and most other states—the only tax local school districts can impose; as noted in Chapter 1, property taxes account for virtually all locally-raised school taxes nationwide. Still, many school districts make some use of non-property taxes, and use of such taxes may increase in the future. It is appropriate, therefore, to consider the applicability of the major findings of the current research to situations involving school district use of non-property taxes.

The major finding that per-pupil local school taxes vary directly with ability of school districts to export locally-imposed taxes would be generally applicable to non-property taxes as well. Local voters tend to consider their own situation—the benefits and costs to them—in deciding on tax issues. When such locally-made decisions involve taxes that will have their incidence partly outside the decision-making jurisdiction, tax exporting occurs. Both of the two most likely non-property tax alternatives—income and sales taxes—present exporting opportunities for most areas, although to differing degrees.

rather poorly. This may suggest that the strongest general statements that can be made responsibly on the strength of such research are ones of tendencies for certain factors to be associated with certain effects.
In the case of the sales tax, for example, taxes on motel and restaurant services and other items purchases by non-residents have their incidence outside the taxing area. School districts that include large shopping facilities serving a wide market would be better able to export their taxes than would areas having only neighborhood shopping facilities. Data for local sales tax collections in 1966-67 for various cities in Los Angeles County, California, help to illustrate the disparities that can result under such taxes. On a per capita basis, the range was from $.04 to $12,051.78—a ratio from high to low of 301,294.5 to 1.0. While this variation may be extreme, other California counties were reported to have differences as high as 100 or 200 to one.4

Local income taxes also offer exporting opportunities through the taxation of non-residents who work within the taxing jurisdiction and the taxation of businesses operating within the taxing jurisdiction. School districts encompassing industrial and commercial establishments would be better able to export local income taxes than would residential or bedroom communities. Disparities in fiscal capacity under local income taxation would tend to be on the same order of magnitude as under local property or sales taxation. In short, the type of tax probably is a less important source of such disparities in fiscal capacity than the extent of the taxing jurisdiction.

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Returning to other regression variables, a measure of average fiscal capacity other than average value of own property probably would be warranted in a study of non-property taxes; the exact results of such research cannot be known. While median family income was found to be non-significant in the research reported in Chapter 4 (although average property value was significant), it is probable that measures of the level and distribution of fiscal capacity would generally be significant determinants of taxes.

The findings concerning the substitution of intergovernmental school aid for locally-raised monies when such aid does not require local matching or maintenance of effort would also seem to be unaffected by the type of local tax used.

In short, although exact relationships undoubtedly would differ from those reported for research based on the property tax, one would not expect the general nature of the findings to be affected by the substitution of a non-property tax.

The Regression Results and the Pre-Existing Literature

Given the variability in the findings for education expenditure determinants described in Chapter 2 and Appendix A, it could be stated with some confidence that the research findings reported in Chapter 4 are consistent with (or at odds with) the pre-existing literature—even without knowing the details of the findings of the current research. There is enough basis for such an assertion to make a detailed, variable-by-variable comparison a rather unproductive exercise. Moreover, in view of the earlier detailed descriptions of the
pre-existing literature and of the findings of the present study, an additional recounting of findings would be redundant. The following discussion is, therefore, directed toward points: (a) that are not made elsewhere in the literature; (b) that are made in the literature but with which this writer wishes to take issue; and (c) that are made elsewhere in the literature but that merit emphasizing.

As a general observation, it is worth noting that one feature of the present research that distinguishes it from the pre-existing literature is the dependent variable. Whereas this study has analyzed factors affecting locally-raised school taxes, the most-nearly comparable literature (as noted in Chapter 2) has dealt with factors affecting education expenditures and—more often than not—expenditures financed from all sources of funds rather than just local sources. This is an important distinction. Unlike the earlier research, the research in this dissertation has focused on the fiscal variable most readily affected by locally-made decisions. Therefore, assuming continuation of a significant local role in public education finance, the findings of the present study will be more directly applicable to the policy considerations outlined in Chapter 1 and explored more fully in Chapter 6 than would findings from a differently-focused study.

Cost spillouts

Another unique feature of the present research that is of major importance is the inclusion of variables to represent cost spillouts (tax exporting). In a study of education benefit and cost spillovers,
Hirsch, Segelhorst, and Marcus (HSM) attempted to identify the ways in which costs of public education spillover beyond the decision-making unit (largely through the tax structure) and to quantify such spillovers (both spillins and spillouts) for a case study community; they concluded that spillovers constitute large shares of gross costs.\(^5\) There has been no attempt, however, to control for cost spillovers in the studies of education (or other) expenditure determinants.

It was found in the present research that cost spillouts have a positive and statistically very significant effect on per-pupil local taxes for public schools. This is perhaps the major contribution of this research. This finding, together with the evidence of the magnitude of cost spillovers presented by HSM, strongly suggests the need to consider cost spillovers when designing or evaluating school finance programs.

It should be noted that the measures of cost spillovers used in the present research (EXPORT-\(\$\) and EXPORT-\(\%\)) consider only the cost spillouts, ignoring spillins from other areas. (By contrast, HSM attempted to measure spillouts, spillins, and the net effect.) The rationale for this treatment, as noted in Chapter 3, is that cost spillins are beyond the control of local voters and, unlike cost spillouts, are unlikely to affect locally-voted school taxes in any direct way. In short, cost spillins and spillouts are thought not to

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\(^5\) Werner Z. Hirsch, Elbert W. Segelhorst, and Morton J. Marcus, Spillover of Public Education Costs and Benefits (Los Angeles: University of California, Institute of Government and Public Affairs, 1964), pp. 15-201. This study was reviewed in the last section of Chapter 2, above.
have symmetrical effects on voted levels of school taxes.⁶

Benefit spillouts

The Hirsch, Segelhorst, and Marcus study referred to above also included a section devoted to the conceptualization and tentative measurement for a case study community of education benefit spillovers, and a separate study by Weisbrod was devoted almost exclusively to these tasks.⁷ Although several studies of education expenditure determinants have included population change variables (see Chapter 2 and Appendix A), apparently only Weisbrod has discussed the conceptual significance of education benefit spillovers and attempted to measure their significance as a determinant of education spending.⁸

As in the case of cost spillovers, it was suggested in Chapter 3 that benefit spillouts and spillins do not have symmetrical effects on locally-voted school taxes. Specifically, it was suggested that spillins tend to be ignored, being taken as "given" by local resi-

⁶Spillouts and spillins do have exactly opposite, symmetrical effects on distribution of total tax burdens, however, and for purposes of evaluating the equity of financing arrangements, both types of spillovers need to be considered.

⁷Hirsch, Segelhorst, and Marcus, Spillover of Public Education Costs and Benefits, pp. 205-285; and Burton A. Weisbrod, External Benefits of Public Education: An Economic Analysis (Princeton: Princeton University, Industrial Relations Section, 1964). Both studies' treatments of education benefit spillovers were summarized in the last section of Chapter 2, above.

dents. It was hypothesized that benefit spillouts, on the other hand, are inversely related to locally-raised public school taxes.

Measurement of gross spillouts is complicated by data shortcomings, as noted elsewhere in this study. Using state-level data on population gains through net migration (to represent in-migration) and population losses through net migration (to represent out-migration), Weisbrod tentatively confirmed his hypothesis that spill-ins have no effect on expenditure levels while spillouts tend to depress expenditures; but he cautioned that state-level aggregates of individual communities’ experiences represent less-than-perfect data for the purpose.®

The net population change data used in the present study (POP70/60) represent an improvement over Weisbrod’s data in that the data used pertain to individual school districts. These data are inferior to Weisbrod’s, however, in that the former do not separate population change due to migration from change due to all causes. (As noted in Chapter 3 and Appendix C, POP70/60 correlates quite closely with change due to net migration--but their relationship to the conceptually-preferable out-migration patterns is not known.)

The conclusion to be drawn from this is that a good test of the effect of benefit spillouts on local school taxes is yet to be made.

The mixed signs and non-significance of the coefficients for POP70/60 are interpreted as failure of the present research to confirm the hypothesis of a negative relationship between benefit spillouts

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®Weisbrod, “Geographic Spillover Effects,” pp. 201-205.
and per-pupil local school taxes. But the evidence of the magnitude of education benefit spillouts (such as that reviewed in Chapter 2) and the logic of the economist's model of utility-maximizing behavior suggest that a better empirical test of the effect on school taxation of benefit spillouts is a goal worth pursuing.

Intergovernmental school aid

The controversy in the literature over the wisdom of using intergovernmental aid as an independent variable in determinants-of-spending studies was discussed in Chapter 2. However questionable the use of intergovernmental aid variables may be for studying total expenditures, their appropriateness for analyzing expenditures from local sources or levels of local taxes is asserted. Exception is taken to Miner's reasons for excluding intergovernmental aid variables from his research (which included separate analyses of expenditures from all sources and from local sources only): "Grants-in-aid for education must be spent for education alone. . . . These grants are spent dollar-for-dollar for education, and including them in a model does not explain school expenditures because they are, in fact, a component of expenditures."\(^1\) This position seems to deny the possibility of substitution of grants from higher governmental units for locally-raised funds.

There is evidence, however, that substitution of intergovernmental aid for local funds occurs. Renshaw, for example, has found

\(^1\)Jerry Miner, Social and Economic Factors in Spending for Public Education (Syracuse: Syracuse University Press, 1963), p. 76.
Evidence of considerable substitution of state school aid for local monies, and other researchers have reported similar findings for aid for school and other functions. The findings of the present research also indicate a strong substitution for locally-raised taxes, of intergovernmental aid that is extended without requiring local matching or maintenance of effort (so-called non-marginal aid, represented by NNMARAID). Through substitution of outside aid for local funds, residents of local school districts are able to appropriate school aid for more general use; in this sense, non-marginal school aid may be viewed as a supplement to income or fiscal capacity.

As opposed to non-marginal school aid, "marginal" aid (represented by AIDAFMAR) is aid conditioned on local matching and/or maintenance of effort. Whereas NNMARAID was found to be a negative and statistically significant determinant of local school taxes, the coefficients for AIDAFMAR reported in Chapter 4 were positive but non-significant. Substitution can, apparently, be eliminated by requiring matching or maintenance of effort. The differential effects on locally-raised taxes of the two forms of intergovernmental aid have important implications for school finance programs. The pre-existing literature generally has not attempted to discover whether different types of intergovernmental school aid have different

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effects. The findings for marginal and non-marginal intergovernmental school aid, taken together, are considered to be an important contribution of the present study.

**Distribution of fiscal capacity**

While most studies of education expenditure determinants have included measures of average fiscal capacity and generally have found them to be significant, relatively few have attempted to measure the effects of distribution of income or wealth. The researchers who have included measures of income distribution or concentration, however, generally have reported significant coefficients. (See the literature reviews in Chapter 2 and Appendix A.)

Two measures of income distribution were used in the present research: percentage of families with income of $15,000 or over (INCOMEHI), and percentage of families with income under $3,000 (INCOMELO). As reported in Chapter 4, both variables were found to be statistically significant and both had the expected signs (positive and negative, respectively) when used separately, but together with measures of average fiscal capacity. These findings tend to

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12In his study of education expenditure determinants, Weisbrod included separate state aid and federal aid variables (as noted in Chapter 3 and Appendix C, this corresponds roughly to the break between what are here labeled marginal and non-marginal aid), suggesting the thought that the effects might be different, although he advanced no specific hypotheses for the variables. (Weisbrod, "Geographic Spillover Effects."

confirm the importance of the distribution of fiscal capacity as an influence separate from average capacity.

On the Limitations of Determinants Studies

It was stated in Chapter 2 that studies of the determinants of governmental fiscal activity proceed on the assumption that governmental expenditures or taxes "... can be explained by a set of variables of general applicability."\(^\text{14}\) The detailed review of the literature on determinants of education expenditures, however, revealed differences or instabilities in the findings for individual variables, both among studies and within individual studies. The presentation of findings for the present research in Chapter 4 also revealed some variability in the signs and sizes of the coefficients of some variables (although of the seven "basic" variables, only one shifted from significance to non-significance or otherwise fluctuated wildly--Child-18, percentage of families with children under age 18).

Variations in the findings for a particular variable often occur with the addition or deletion of other variables in the regression equation. Because the variable for which the results are altered and the newly added or deleted variable often are very lowly intercorrelated, the variations in findings in such instances appear to result from subtle interrelationships among variables that are difficult to identify or to understand. Unfortunately, complexities of relationships are not described and explained by regression

\(^\text{14}\)See p. 26, above.
analysis— their consequences simply appear in the results. Differences also frequently appear when comparison is made of findings based on data for different settings— different times, different places, and/or different institutions. In such instances, the differences in findings may be attributable at least in part to true differences in underlying forces affecting the dependent variable.

The existence of a relatively stable set of relationships among a set of independent variables and the dependent variable is of crucial importance if the findings of determinants studies are to have applicability in any detail either over time or among areas.

Table 6 presents some evidence on the uniformity (or lack thereof) of the ability of seven independent variables to explain 1969-70 local school taxes per pupil (LOCTAX/P) in selected West Virginia counties.

Specifically, Table 6 reports the percentage errors of estimated values of LOCTAX/P compared to the actual values for 24 counties at each step of a regression problem employing the seven basic variables of problem A in Chapter 4. A positive error indicates the estimated value of the dependent variable exceeded the actual value of the dependent variable. Each data column represents one step in the regression analysis, and the name of the variable entering at a given step is shown at the top of the appropriate column; results for the first step are given in the column farthest

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The variables, represented by abbreviations in Table 6, are defined in Table 7, Appendix C, as well as in Chapter 3.
TABLE 6.--Percentage Errors of Calculated Dependent Variable Compared to Actual Value and Adjusted Coefficient of Multiple Determination ($R^2$) at Each of Seven Steps of Regression Problem A, Selected West Virginia Counties

<table>
<thead>
<tr>
<th>County</th>
<th>PROPERTY</th>
<th>INCOMEHI</th>
<th>CHILD-18</th>
<th>AIDAFMAR</th>
<th>NNMARAID</th>
<th>POP70/60</th>
<th>EXPORT-£</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pendleton</td>
<td>165</td>
<td>114</td>
<td>110</td>
<td>112</td>
<td>62</td>
<td>64</td>
<td>53</td>
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<tr>
<td>Tucker</td>
<td>113</td>
<td>104</td>
<td>92</td>
<td>94</td>
<td>95</td>
<td>89</td>
<td>49</td>
</tr>
<tr>
<td>Roane</td>
<td>96</td>
<td>42</td>
<td>40</td>
<td>38</td>
<td>44</td>
<td>46</td>
<td>45</td>
</tr>
<tr>
<td>Webster</td>
<td>84</td>
<td>51</td>
<td>51</td>
<td>42</td>
<td>7</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>Barbour</td>
<td>82</td>
<td>50</td>
<td>40</td>
<td>42</td>
<td>48</td>
<td>48</td>
<td>22</td>
</tr>
<tr>
<td>Calhoun</td>
<td>68</td>
<td>64</td>
<td>45</td>
<td>46</td>
<td>23</td>
<td>19</td>
<td>38</td>
</tr>
<tr>
<td>Greenbrier</td>
<td>82</td>
<td>64</td>
<td>62</td>
<td>63</td>
<td>47</td>
<td>47</td>
<td>36</td>
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<tr>
<td>Nicholas</td>
<td>54</td>
<td>54</td>
<td>61</td>
<td>65</td>
<td>69</td>
<td>71</td>
<td>45</td>
</tr>
<tr>
<td>Gilmer</td>
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<td>-10</td>
<td>-9</td>
<td>4</td>
<td>4</td>
<td>54</td>
</tr>
<tr>
<td>Grant</td>
<td>-55</td>
<td>-61</td>
<td>-60</td>
<td>-60</td>
<td>-56</td>
<td>-57</td>
<td>-18</td>
</tr>
<tr>
<td>Marshall</td>
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<td>-32</td>
<td>-31</td>
<td>-23</td>
<td>-23</td>
<td>-16</td>
</tr>
<tr>
<td>Hancock</td>
<td>-41</td>
<td>-8</td>
<td>-8</td>
<td>-9</td>
<td>-13</td>
<td>-12</td>
<td>9</td>
</tr>
<tr>
<td>Pleasants</td>
<td>-40</td>
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<td>-14</td>
<td>-14</td>
<td>-16</td>
<td>-17</td>
<td>5</td>
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<tr>
<td>Brooke</td>
<td>-35</td>
<td>-11</td>
<td>-11</td>
<td>-10</td>
<td>-3</td>
<td>-3</td>
<td>-4</td>
</tr>
<tr>
<td>Doddridge</td>
<td>-15</td>
<td>-33</td>
<td>-42</td>
<td>-38</td>
<td>-49</td>
<td>-50</td>
<td>2</td>
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<tr>
<td>Lewis</td>
<td>-18</td>
<td>-33</td>
<td>-36</td>
<td>-35</td>
<td>-23</td>
<td>-21</td>
<td>3</td>
</tr>
</tbody>
</table>
TABLE 6.--(continued)

<table>
<thead>
<tr>
<th>County</th>
<th>PROPERTY</th>
<th>INCOMEHI</th>
<th>CHILD-18</th>
<th>AIDAFMAR</th>
<th>NNMARAID</th>
<th>POP70/60</th>
<th>EXPORT-$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jackson</td>
<td>-32</td>
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<td>-24</td>
<td>-25</td>
<td>-17</td>
<td>-18</td>
<td>4</td>
</tr>
<tr>
<td>Ritchie</td>
<td>7</td>
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<td>-32</td>
<td>-27</td>
<td>-10</td>
<td>-8</td>
<td>-11</td>
</tr>
<tr>
<td>Mingo</td>
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<td>-23</td>
<td>-18</td>
<td>-16</td>
<td>-32</td>
<td>-31</td>
<td>-21</td>
</tr>
<tr>
<td>Fayette</td>
<td>(a)</td>
<td>(a)</td>
<td>-2</td>
<td>-2</td>
<td>-26</td>
<td>-25</td>
<td>-24</td>
</tr>
<tr>
<td>Wirt</td>
<td>28</td>
<td>17</td>
<td>18</td>
<td>21</td>
<td>-19</td>
<td>-21</td>
<td>-36</td>
</tr>
<tr>
<td>Taylor</td>
<td>4</td>
<td>-9</td>
<td>-17</td>
<td>-14</td>
<td>(a)</td>
<td>(a)</td>
<td>-22</td>
</tr>
<tr>
<td>Raleigh</td>
<td>-10</td>
<td>9</td>
<td>6</td>
<td>7</td>
<td>1</td>
<td>(a)</td>
<td>-22</td>
</tr>
<tr>
<td>Lincoln</td>
<td>32</td>
<td>29</td>
<td>35</td>
<td>34</td>
<td>17</td>
<td>13</td>
<td>-21</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>.20</td>
<td>.48</td>
<td>.48</td>
<td>.48</td>
<td>.54</td>
<td>.53</td>
<td>.83</td>
</tr>
</tbody>
</table>

(a) = less than 1.0
to the left. The coefficient of multiple determination adjusted for
degrees of freedom (adjusted $R^2$) for the entire set of 55 counties is
shown in the last row of Table 6 to permit evaluation of each vari-
able's contribution to explanatory power of the total model.

The 24 counties included are those that represented the five
largest positive and the five largest negative estimation errors at
each of the seven steps; the fact that 24 counties (rather than just
10) are included is indication of the step-to-step changes in the
counties having the largest estimation errors. These 24 counties
give a fair indication of the differential effects of the same vari-
ables on different areas.

After just one variable (PROPERTY) had entered, some counties' per-pupil local school taxes were estimated rather closely while
others were estimated poorly; the range for the counties in Table 6
was from minus 55 percent to plus 165 percent, and for one county
shown (Fayette) average value of local property per family almost
perfectly explained per-pupil local school taxes. Each successive

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16The order of entry, of course, affects the net contribution
of any given variable and its effect on the percentage error for any
particular county. For example, POP70/60 entered sixth (after all
other variables but EXPORT-$S$) in Table 6 made a slight negative
contribution to adjusted $R^2$ (from 0.54 to 0.53), and increased the
estimation error for Webster County by five percentage points (from
seven to twelve). But when the same regression was run with POP70/60
entering second (before all variables but EXPORT-$S$), its contribution
to adjusted $R^2$ was large and positive (from 0.37 to 0.58), and it
decreased the estimation error for Webster County by 105 percentage
points (from 127 to 22).
variable entered likewise had different impacts upon different counties, as reflected by the differences in the changes in errors after each step.

Consider the fifth step, at which NNMARAID (dollars per family of non-marginal intergovernmental school aid) entered. The estimation error was reduced by 50 percentage points for Pendleton County, increased by 13 points in Gilmer County, and left virtually unchanged in some others. Entrance of the tax exporting variable (EXPORT-$$) in the seventh and last step sharply improved the explanatory power of the model for the total sample (as shown by the R^2), but produced mixed results for individual counties. The percentage error for Tucker County, for example, dropped by 40 percentage points, the error for Gilmer County rose by 50 percentage points, and the errors for other counties were barely affected.

Perhaps the message of the residual errors presented in Table 6 should not be belabored. Differential effects of any given force on taxation (or other) decisions made by persons in different areas are, perhaps, to be expected. The phenomenon may well have its roots in two related problems that constantly confront economists and other social scientists: the inability to conduct controlled laboratory experiments and the lack of completely suitable data for the testing of theories.

Data available for testing hypotheses of the sort advanced in the current research are imperfect measures of the forces they are intended to represent. Net population change between 1960 and 1970
(POP70/60) was used in Chapter 4 as a proxy for education benefit spillouts, in lieu of a better proxy—gross out-migration—which still would not have been ideal. POP70/60 in fact measures population change resulting from several forces (including economic growth or decline and natural changes through birth and death), many of which do not reflect the education benefit spillouts we were attempting to get at. As another example, median family income (INCOMEMD)—used here as an alternative measure of average fiscal capacity—reflects many characteristics of the area, including occupational structure, educational attainment, unemployment, and labor force participation. And so on, for most other variables.

More generally, we may use indicator X to measure a given factor K. But X is, in fact, an amalgam of N forces (A, B, . . . , N). Moreover, because different areas have their own distinct populations and institutions, the relative strengths of forces A, B, . . . , N, may be expected to differ among areas. In view of this situation, it probably is unrealistic to expect X to yield stable, consistent findings over time and/or among areas. A related problem is that indicators X and Y, used to represent two conceptually different factors K and L, each may have some C and D, causing them to interact when used together in a regression problem.

In summary, there is a variety of evidence from the present research and the pre-existing literature indicating some instability or non-uniformity in the relationships between school taxes (or expenditures) and particular independent variables or factors. This
non-uniformity may be evidence of lack of a stable, generally applicable set of relationships, or—perhaps more likely—may reflect our current inability to measure precisely the factors that are conceptually important determinants of governmental fiscal activity.

Whatever the cause, the instability or non-uniformity of relationships revealed by determinants research to date suggests that care is demanded in interpretation and application of the findings. The findings, moreover, may be of rather limited usefulness in understanding fully the reasons for differences in levels of taxes or expenditures. Perhaps the strongest statements of broad applicability that can be made responsibly on the strength of findings for particular areas or aggregates of governments are statements of tendencies for certain relationships to exist between levels of taxes (or expenditures) and selected independent or explanatory variables. In this same vein, findings from determinants studies may serve as a guide to the types of factors to be studied in analyses of fiscal actions of individual governments.

Morss has argued that "... the wisdom of making additional studies of the expenditure behavior of several government units taken together is questionable. Putting it more positively, there is considerable need for and much to be learned from studies of individual government units."\(^{17}\) In view of the evidence considered above, it may be that full understanding of the factors affecting decisions on

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public revenues and expenditures in a particular jurisdiction can
best be achieved by the separate study of the social, economic, and
political forces in that jurisdiction.

Determinants studies for a group of governments can serve the
sometimes-useful purpose of describing average relationships. For
determinants studies to be useful, it is not necessary for some
purposes to be able to predict or describe exactly the effect of a
certain factor on, say, taxes in each school district considered
individually.

In other words, for a state legislature to decide it wishes
to eliminate the effects of tax exporting on the level of local school
taxes, it may need to know only the general nature of such effects,
rather than the specific effects for each and every school district.
It is argued in the next chapter, therefore, that knowledge of the
average statewide effects of various factors on per-pupil local school
taxes is an adequate basis for some types of policy decisions.
CHAPTER 6

POLICY IMPLICATIONS OF THE RESEARCH

The Objective of Equal Educational Opportunity

The policy issue that provided the impetus for the present research concerns the need to reform public elementary and secondary school finance systems to provide equality of educational opportunity.¹ Starting with the August, 1971, Serrano v. Priest, ruling in California, at least eight court decisions have ruled that the school finance systems of as many states deny equal protection of the laws, in violation of the Fourteenth Amendment to the United States Constitution and/or certain state constitutional provisions.² One of these cases (Rodriquez v. San Antonio Independent School District) currently is before the United States Supreme Court, where affirmation would affect school finance arrangements in all states but Hawaii (which has a single, statewide school system).

Even if the Supreme Court does not uphold the rulings of the lower federal courts at this time, several of the decisions already handed down were written by state courts and based on state constit-

¹The discussion of the policy issue in this section is a summary of fuller discussions in Chapters 1 and 3.

²Chapter 1 includes a review of these cases and some speculation regarding their implications.
tutions; at least in these states, the need to reform public school finance is clear. Also apparent is the need--regardless of the Supreme Court's decision on the Rodriguez case--for general review of the educational finance systems that spawned the current wave of equal protection litigation. It seems unlikely that the drive for change would be terminated by an unfavorable ruling by the U.S. Supreme Court, especially since change already seems assured in those states where the equal protection rulings have been based on state constitutional provisions. If the prospect for relief under federal law were to diminish, the alternative state approach probably would be pursued more intensively.

As noted in Chapter 1, the vastly different levels of per-pupil expenditures within a single state constitute the major evidence of unequal educational opportunity cited by the courts. Notice also has been taken of the even greater disparities among school districts in per-pupil property values, however, and the courts have commented that these disparities often mean that poor districts raise less revenue per pupil with a high tax rate than rich districts raise with a low tax rate. Under current systems, the courts have ruled, educational opportunity is dependent upon the wealth of an area, and the distribution of wealth is so uneven that equal educational opportunity is denied.

Precisely what would constitute "equality of educational opportunity" in the courts' eyes is not now known. As suggested in Chapter 1, however, some equal-dollars-per-pupil approach--either
equal taxable base per pupil or equal expenditures per pupil, probably with allowance for demonstrable differences in costs—is not unlikely. Hence, the decision to study the factors contributing to variations in per-pupil local school taxes.

Implications of the Research

The balance of this chapter is devoted to consideration of what the research findings reported in previous chapters can tell us about the problem of designing school finance systems that might promote equality of educational opportunity. First, some general implications or conclusions for school finance are stated. This is followed by a brief evaluation, in the light of the research findings, of several types of possible changes in school finance systems. Actual development or specification of a new school finance system that might meet the requirements of equal educational opportunity is, however, a separate and sizable problem that is beyond the scope of the present study.

General Implications for School Finance

Limitations on the uses to which findings derived from cross-sectional determinants studies may be put were discussed in Chapter 5. Such limitations make it rather obvious that research findings

3Consideration is restricted to the state-local relationship; the possible role of the federal government is not discussed. This treatment is consistent with both the scope of the current research (which does not in any way explore the possible justification for a federal role), and the fact that the states have legal responsibility for public education either directly or through such local entities as they may create.
based on West Virginia data cannot be used confidently either to estimate or to explain the exact effects of the independent variables on local school taxes in any individual school district (with the possible exception of those in West Virginia for which the estimation errors were near zero). Fortunately, however, such detail is not necessary for some state-level policy decisions.

Consider, for example, a state that wishes to equalize local school taxes per pupil. If it is known that per-pupil local taxes are positively related to ability to export locally-imposed taxes, and it is further known that such potential is unevenly or irrationally distributed among school districts, this information is adequate to support a decision to eliminate or at least limit the effects of local tax exporting. Detailed knowledge of tax exporting and its effects by individual school district still would be needed, however, if ability to export taxes were not to be eliminated, but only compensated for through a state aid distribution formula. In other words, the sufficiency of cross-sectional determinants analysis as support for policy decisions depends in part on the anticipated nature of the response.

The most important conclusions to be drawn from the research reported in Chapter 4 concern the significant implications for the level of per-pupil local school taxation of: (a) the ability to export locally-voted taxes; (b) the differential effects of intergovernmental school aid conditioned on local matching or maintenance of effort (referred to as marginal aid) and aid not based on such requirements (non-marginal aid); and (c) the importance of both the
level and distribution of fiscal capacity. The first two points are considered in turn below. The third general finding has very broad implications for restructuring public school finance, and it underlies much of the discussion that follows.

**Tax exporting as state aid.**—Separation of school district tax base into local and non-local components provides some helpful insights. First, such disaggregation makes it obvious that not all locally-imposed taxes are truly local. This, in turn, calls into question the soundness of letting local school districts "tax themselves" (a phrase often used) to provide whatever level of schooling they desire.

When a state confers upon a locality the authority to impose taxes that are readily exportable (e.g., taxes on what is referred to here as non-local property, or on earnings or purchases of non-residents), it is, in effect, extending a form of state aid. Taxing decisions made by residents of one area result in tax burdens to be borne by residents of other areas.

The implicit distribution formula for revenues provided from exported taxes consists of access to non-local base (which is uneven and often accidental) and a tax rate determined by local residents and their representatives. Only by the greatest coincidence might aid distributed in this manner just compensate for benefit spillouts. Thus, intergovernmental school aid that takes the form of local tax exporting is based upon the chance location of business property and the accident of jurisdictional borders, and does not
promote rational allocation of resources. In fact, such aid promotes inefficient resource use by permitting residents of a school district with considerable non-local tax base to vote to increase revenues available to the school district without having to recognize the full costs.\(^4\)

A possible solution to the problem of non-rational resource allocation caused by tax exporting would be to deny local school districts direct access to tax bases of non-local nature, and to replace the lost revenues with state monies distributed according to some formula that would more rationally account for budgetary needs and for benefit spillovers. Another possible approach would be to leave current tax institutions (complete with tax exporting) intact and to try to adjust in another state aid distribution formula for state aid extended through tax exporting. Conceptually, at least, either approach could eliminate the disequalizing effects of local tax exporting on taxing and spending for education; but each has its own drawbacks (largely operational) as well as its own merits.

Consider a specific approach to denying school districts direct access to taxes of a non-local character. Residential property (including apartments), and perhaps agricultural property, would be left to local jurisdictions, and such jurisdictions would be

\(^4\)It is not suggested that non-local funds should not be available to local school districts. Much has been written about the vast extent to which education benefits accrue to areas other than the one providing the education; efficient resource allocation requires internalization of costs and benefits in some manner so that full costs and benefits will be reflected in resource allocation decisions.
permitted to impose whatever tax they wished on this base. All other property--industrial, commercial, and public utility real and personal property--would be made a state resource and would be taxed at a uniform rate statewide, with distribution of the proceeds to local schools on the basis of rational, objective criteria. This approach would have the advantage of removing (property) taxes from intra-state business locational decisions and would enhance tax equity. In comparison with full and uniform state funding of education, this approach also would have the advantage of recognizing the existence of private consumption benefits of education and, by permitting local residents truly to "tax themselves" to raise more revenues for schools, it would permit the application of the principle of consumer sovereignty.

Under the program just described, taxation of truly local property would be a matter of local choice, and at the same time local governments would be denied direct access to resources non-local in nature. Both distributional equity and allocative efficiency should be enhanced, vis-a-vis the current system.

Admittedly, the states would be back in the property tax business on a large scale, but compared to, say, eliminating the property tax (or the non-local portion of it), this arrangement has the advantages of both preserving a productive revenue source and avoiding windfall gains to current property owners.

On the negative side of the ledger, such far-reaching change would, at least in many states, entail constitutional amendment. Moreover, since such changes probably should apply to other local
governments as well as to schools, new means would have to be developed to finance local services used by business that are now paid for by the property tax. Finally, strong resistance from persons and institutions who would fare less well than under the current system would be certain to materialize.

Resistance from much the same group of persons and institutions also would hamper adoption of the second approach (cited above) to denying school districts direct access to taxes of a non-local character—namely, leaving such taxes intact but adjusting for them through a state formula. As with the first approach, local schools also would lose the benefit of having business properties located within their boundaries under the second approach. Unlike the first approach, however, this result would not be brought about neatly; rather, some cumbersome adjustments would be necessary—e.g., subtraction of locally-imposed taxes on (non-local) business from state aid (where entitlements for such aid exceeded such taxes) or payment by the school district to the state any excess of such taxes over state aid entitlements. Constitutional amendment would not be as likely to be needed for this approach, but the adjustment mechanisms would be bothersome and difficult. Moreover, uniform taxation of businesses would not be achieved under the second approach as described, and it could be achieved only through very complex and costly systems of tax refunds and supplemental tax payments between the state and individual businesses.
Intergovernmental aid and the substitution effect.---It has been reported that intergovernmental school aid extended without marginal (matching or maintenance of effort) conditions appears to be substituted, to a large extent, for locally-raised school monies, while aid extended contingent upon such conditions apparently is not so substituted. This set of findings has important implications for school finance programs.

If the intent of state aid is to increase the level of education spending dollar-for-dollar, effective matching or maintenance-of-effort requirements, or some alternative procedures to assure that the state aid is not used to replace local dollars, apparently must be incorporated. Mere statutory statement of such intent would not be sufficient, since economic responses to a situation can often subvert legislative intent.\(^5\) Failure to require either matching or maintenance of effort invites substitution of state aid for locally-raised revenues, and the result may be diversion of much state school aid to non-school purposes.

Substitution of state aid for local monies causes state aid programs to be inefficient, since raising school spending by a targeted $100 requires $100 + S, where S is the amount of locally-raised school funds freed by the state aid. Equity implications of such substitution may also be adverse. There is evidence from several

\(^5\)As an example, while it could be required by statute that corporate property taxes be borne by owners of capital, this would not guarantee that such taxes would not be shifted to consumers and/or resource suppliers where corporations faced market circumstances that would enable such shifting.
studies that the demand for education is income-inelastic. Therefore, the relatively wealthy school districts (where school spending levels already are relatively high) may have a higher substitution rate than poorer districts; to the extent that this is the case, the subsidization through school aid of non-school functions will be relatively greater for high-income areas than for low-income areas. One implication of all this is that minimum-guarantee payments to wealthy districts under state school foundation programs probably should be discontinued, since they are not only inefficient, but also tend to be disequalizing for both school and other spending.

State education aid may have objectives other than dollar-for-dollar increases in education spending. There might be some desire to permit high-tax areas to cut back on local contributions, for example. If this is the purpose, however, aid should not be extended to high-expenditure, low-tax districts (or, at the very least, state policy makers should be made well aware of the strong possibility that state monies will be used to reduce local school taxes). On the other hand, if full or approximately-full state funding of elementary and secondary education is to be phased in over several years, state aid payments probably should be increased over the period for all school districts, so that all might adjust to the new funding scheme.

Implications for Various Reform Proposals

Several proposals for changes in school finance institutions have been advanced in recent years by interested persons and groups. Full or essentially full state funding of elementary and secondary
education has been endorsed most widely. In 1969, the Advisory Commission on Intergovernmental Relations (ACIR) recommended that states assume essentially all non-federal costs of public education; it was suggested that local districts be permitted to supplement state monies by an "add-on" of not more than 10 percent. In 1972, both the President's Commission on School Finance and the New York State Commission on the Quality, Cost, and Financing of Elementary and Secondary Education (the so-called Fleishmann Commission) recommended full state funding. Like the ACIR, the President's Commission opted for a local add-on of up to 10 percent, but the Fleishmann Commission specifically recommended termination of all local option in funding education.\(^6\)

An alternative approach to diminishing the effects of wealth distribution on educational opportunity is generally termed district power equalizing. The concept is explained somewhat more fully below, but, briefly, it is a means by which one mill of levy would raise the same amount of tax dollars per pupil in every school district in a given state. Unlike full state funding, power equalizing would leave

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the tax rate (and, therefore, the level of funding) to local discretion. Originators and major proponents of the concept are Coons, Clune, and Sugarman, although others interested in preserving a major local role in school finance have endorsed the concept.\textsuperscript{7}

In addition to these rather specific types of change, other more general proposals, motivated primarily by the desire to minimize the disruption of the existing school finance system in the wake of Serrano, have been advanced. Such proposals would, generally speaking, preserve the local role through adoption of local non-property taxes for school districts or through changing state aid programs to better compensate for local wealth disparities.

Each of the basic approaches noted above is considered briefly below from the standpoint of its ability to enhance equality of educational opportunity. The list of reform proposals considered here is, admittedly, not exhaustive; just as design of a new approach to school finance is beyond the scope of this dissertation, so is evaluation of all the many proposals for change thus far advanced.\textsuperscript{8}


Proposals to maximize local discretion

Adopt local non-property tax. —Because the court decisions in the equal-protection challenges to current public school finance programs have emphasized weaknesses in the local property tax (because that is the tax used for public schools), some have interpreted the court decisions as precluding continued use of the local property tax for the support of public schools. (As noted in Chapter 1, this is not the general thrust of the decisions.) Given the high value placed on local control of the schools, the possibility of using local non-property taxes has, rather naturally, been raised.

As discussed in Chapter 5, however, there is no reason to expect use of a different local tax source—changing nothing else—to result in greater equality of per-pupil resources. Local sales taxation, for example, would be characterized by marked differences among school districts in tax base (retail sales) per pupil because of the existence of large shopping centers and trade districts in some areas while other areas have only neighborhood stores. Local income tax base differences per pupil also would be pronounced, particularly if employment areas could tax non-resident workers and business establishments. In short, the inequalities that characterize the local property tax are not unique to that tax.

Education cost spillouts through tax exporting would continue to occur under either local sales taxation or local income taxation, since each would afford local areas the opportunity to tax non-local resources. Moreover, because the distribution of non-local resources
under either of these alternatives would vary substantially among school districts, tax exporting would—as under the local property tax—have a disequalizing effect on locally-raised school taxes per pupil.

If tax-related determinants that tend to produce variations in per-pupil school support would not be materially affected by adoption of a local substitute for the property tax, other factors that tend to affect per-pupil local taxes certainly would not be expected to change. Thus, the effects of benefit spillouts or socio-economic characteristics on school taxes would be expected to be unaffected by substitution of a local non-property tax. In short, local non-property taxation would be neither a necessary nor a sufficient solution to the problem of unequal distribution of educational resources.

**Alter state aid programs.**—Except for a few equal protection cases based on state constitutions (e.g., New Jersey and Wyoming—see Chapter 1), the courts generally have not precluded use of the local property tax. Noting this, some have suggested that the property tax might be left unchanged, leaving it to state aid program revisions to effect greater equality in per-pupil education expenditures. Because it is not clear precisely what the courts will consider to represent equality of educational opportunity, the sufficiency of this proposal cannot be known.

If the courts' only concern is wealth-related expenditure inequality, this approach could be workable. State aid could be made more truly equalizing; a good start would be elimination of minimum-
aid guarantees to wealthy districts (on the other hand, a completely flat-grant approach would be equalizing if such grants accounted for a very large percentage of all school revenue).

If, on the other hand, the courts' concern extends to school tax-rate inequality and/or to expenditure inequality caused by differing voter tastes and preferences, a more far-reaching change would be needed. Large tax rate differences among school districts might remain, and, as noted earlier, this situation would not be satisfactory to the courts in at least some states. Leaving the current property tax structure intact also would mean continuation of the inequities and inefficiencies that result from cost and benefit spillovers, unless the sort of complex adjustments of non-local taxes and state aid entitlements mentioned earlier in this chapter were incorporated in the state aid program.

Power equalizing

Power equalizing would leave the existing property tax unchanged except--and the exception is major--that any given tax rate would raise the same amount of money per pupil in each school district within a state. To equalize the power of a mill of levy in all school districts, something like the following would have to be done: 9

9The example given here is for illustrative purposes only, and it represents only one of several possible formulations. Rather than levelling every district up or down to the state average, for example, it would be possible to bring all districts up to the level of the highest district. Clearly, such "levelling-up" would increase total school costs substantially, and would require a sizable supplemental state appropriation.
calculate the statewide average equalized property value per pupil (say it is $20,000), and calculate the average revenue per mill of levy ($20). Then provide that each district with above average per-pupil wealth pay the excess of actual collections over $20 per mill into a state fund;\(^1\) this fund would be used to bring poorer districts' revenue per mill up to $20.\(^2\) If wealthy districts levied fewer mills than poorer ones, a supplemental state appropriation would be required.

Power equalizing has the advantage, vis-a-vis full state funding at a uniform level, of promoting consumer sovereignty by permitting local districts to determine their own tax rates and expenditure level. Moreover, equalizing the revenue-raising power of

\(^{10}\)Schoettle has observed that if power equalizing applied only to school taxation, wealthy areas would find themselves able to buy more non-school services per mill of levy than public schools, thereby tending to discourage taxation for public schools relative to other public (and private) expenditures. (Ferdinand P. Schoettle, "Judicial Requirements for School Finance and Property Tax Redesign: The Rapidly Evolving Case Law," National Tax Journal, XXV (September, 1972), pp. 465-66.)

\(^{11}\)The effect of the arrangements in this particular example of power equalizing would be to equalize all districts in the state at the statewide average property value per pupil. Under these circumstances, the implications of power equalizing for equality of educational opportunity (resources) appear to be the same as under a program that would actually give each district the same amount of per-pupil wealth through physical realignment of district boundaries. Voters' "own" wealth would be identical under the two programs, for example. Under power equalizing, non-"local" base would include not only business property inside and outside the district, but would also include residential property outside the district; but the composition of non-local property is not an important distinction. The preceding footnote points up what appears to be the major difference for public school funding between the two approaches.
a mill of levy for all school districts would overcome the dis-
equalizing effects on per-pupil local taxes of unequal fiscal capa-
city and of different tax exporting capabilities. The effects of
benefit spillouts or such socio-economic factors as presence of
school-age children on voted school taxes would be unaffected, how-
ever. It is not clear whether the courts will consider differences
in educational expenditure (opportunity) resulting from neighbors'
tastes and attitudes to be permissible. As noted in Chapter 1,
however, Benson has suggested that "place discrimination" under
power equalizing, while ostensibly reflecting only differences in
preferences, would actually tend to be the same "wealth discrimina-
tion" that now exists.

State assumption of education costs

The widely-promoted proposal for state assumption of full
financial responsibility for funding public education would, of
course, internalize and neutralize the effects of inter-district
cost and benefit spillovers occurring within the state. Intra-state
differences in fiscal capacity, educational tastes, and other deter-
minants of educational taxation (expenditure) also would be neu-
tralized. By combining all areas into a single, statewide district,
only statewide average relationships between taxation for public
education and various determinants would matter. Full state assump-
tion is, therefore, the "best" solution to unequal educational
opportunity within a state; if expenditures are to be equalized,
state assumption of all costs would seem to be the most foolproof approach. Tax rates also would be equalized and the possibility of "place discrimination" eliminated. Full state funding is, therefore, the only alternative so far advanced that would seem certain to satisfy the courts.

Full state funding is not ideal in many respects, however. One of the primary costs of this approach would be loss of local leeway.\[^{12}\] Even for pure consumption-type expenditures, local residents could not exercise any discretion or preferences through the public schools. There would also be a tendency for local experimentation to be lessened, with the possible loss of so-called "lighthouse" districts. Through preservation of local control over curriculum and administrative matters, differences in local desires could find expression--but only within the constraint of the state-determined budget.

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\[^{12}\]The "fullness" of state funding assumed in this discussion is 100 percent. If local supplementation were allowed through locally-voted property taxes, inequalities in wealth would tend to continue wealth-related inequalities in educational opportunity; differences in tax exporting ability would, for example, continue to have an effect. Possible ways around objectionable aspects of this problem include (a) basing the add-on on local (non-business) property only, and (b) using power equalizing for the add-on.
APPENDIX A

DETERMINANTS OF EDUCATION EXPENDITURES:
A LITERATURE REVIEW

This appendix presents in some detail the findings for eleven selected independent variables in eight significant studies of the determinants of education expenditures. To better demonstrate the consistency (or lack thereof) of the relationships between the dependent variable (always some measure of education expenditures) and the selected independent variables, the presentation is arranged by independent variable--i.e., the findings of all eight studies for a given variable are presented together.

It is not suggested that the selected studies are a comprehensive representation of the literature on education expenditure determinants. Nor do the eleven selected independent variables exhaust the variables used in that literature. The studies and variables selected do, however, give fair representation to the literature in that several major studies and the major independent variables are included here. To treat exhaustively the existing literature would require a separate volume, and such treatment is not essential for the present purposes.

Description of Selected Studies

In this section, each of the eight selected studies is described
very briefly, with the nature of the data (cross-section or time series), the unit of study (state, school district, or nation), the period of time covered, and the dependent and independent variables all being indicated. The studies, taken up below in chronological order, all employed the multiple regression technique of statistical analysis.

Hirsch.—In a 1960 article on the determinants of public education expenditures,¹ Werner Hirsch reported findings of a study of the 27 school districts in the St. Louis City-St. Louis County area that operated both elementary and secondary schools. He used cross-sectional data for the 27 districts in each of two years (1951-52 and 1954-55), with the two years' data merged into a single sample to increase the sample size. Two dependent variables were used, differing in the inclusion or exclusion of debt service expenditures, and all the independent variables were used with each formulation of the dependent variable. The variables used were:

**Dependent**

X_{1a}: Total current expenditures plus debt service per pupil in ADA (average daily attendance);

X_{1b}: Total current expenditures without debt service per pupil in ADA;

Independent

\[ X_2: \text{ Number of pupils in ADA in public primary and secondary schools; } \]
\[ X_2^2: \text{ Square of the number of pupils in ADA in public primary and secondary schools; } \]
\[ X_3: \text{ High school pupils in ADA as a percent of all pupils in ADA; } \]
\[ X_4: \text{ Number of public school pupils in ADA per square mile; } \]
\[ X_5: \text{ Percent increase in public school pupils in ADA, 1951-56; } \]
\[ X_6: \text{ Average assessed valuation of real property per pupil in ADA; } \]
\[ X_7: \text{ A six-part index intended to represent the scope and quality of public education. } \]

Renshaw.--Edward Renshaw used cross-section data from the early 1950s for each of the 48 states to study the effect of state school aid on public educational expenditures. Although the focus of his study was on state aid, a number of other variables also were included in the regression models. They were the following:

Dependent

\[ X_1: \text{ Annual current expenditures per pupil in ADA; } \]
\[ X_5: \text{ Total school revenue per pupil in ADA; } \]

Independent

\[ X_2: \text{ State contribution to current expenditure (i.e., } \]

$X_1$ multiplied by percentage of total revenue receipts obtained from the state;

$X_3$: Per capita income in 1949;

$X_4$: Nonwhite population as a percentage of total;

$X_6$: Per capita personal income in 1954;

$X_7$: Estimate of state-mandated local revenue per pupil in ADA (i.e., local levies imposed to meet state-set minima for state aid qualification);

$X_8$: Total state aid per pupil in ADA;

$X_9$: Population density in 1950;

$X_{10}$: Income per school-age population;

$X_{11}$: School-age population as a percentage of total.

Not all independent variables were used in each regression run.

**Fisher.**--Glenn Fisher's 1961 study of the determinants of public expenditures by state and local governments\(^3\) used cross-sectional data from the 1957 Census of Governments. Fisher used the 1957 data to analyze all general expenditures of all 48 states both jointly and individually, and also disaggregated by expenditure function so that major expenditure programs were treated separately (but only for the aggregate of the 48 states). The three independent variables used in all regressions--which were the same ones used earlier by Fabricant\(^4\)--


\(^4\)Solomon Fabricant, *The Trend of Government Activity in the United States Since 1900* (New York: National Bureau of Economic Research, 1952). This study was among the first to use the multiple regression technique in the analysis of government expenditures.
were the following:

- $X_2$: Population per square mile (1956);
- $X_3$: Percent of population living in urban places (1950);
- $X_4$: Per capita income (1956-57).

The dependent variable ($X_1$) was actual expenditures for whatever function or group of functions was being analyzed. (Only Fisher's findings regarding expenditures for local schools are summarized in the next section.) Statistical significance of the variables was not indicated in Fisher's study.

**Shapiro.**—A 1962 article by Sherman Shapiro⁵ reported on one of the more ambitious research efforts in the educational expenditure determinants area. Cross-sectional data were used for each of four time periods—1920, 1930, 1940, and 1950—for the 48 states, and the results were reported for two "subsocieties"—the South and the Non-South. Although he used no more than seven independent variables in any one of the several sets of regression models, Shapiro defined two dependent and eleven independent variables:

**Dependent**

- $X_1$: Current expenditures per pupil in ADA, public schools only;
- $X_{1.1}$: Current expenditures per pupil, public and private schools;

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Independent

\[ X_2: \] Per capita personal income in constant 1947-49 dollars;

\[ X_3: \] Nonwhite population as a percentage of total;

\[ X_4: \] Non-public school enrollment as a percentage of total;

\[ X_5: \] Percentage of children aged 5-17 years enrolled in public schools;

\[ X_{5.1}: \] Percentage of children aged 5-17 years enrolled in all schools;

\[ X_6: \] Population aged 5-17 years as a percentage of total;

\[ X_7: \] Percentage of population in urban areas;

\[ X_8: \] Percentage of civilian labor force in non-agricultural pursuits;

\[ X_9: \] Percentage of total public school enrollment in public high schools;

\[ X_{9.1}: \] Percentage of total enrollments in all high schools;

\[ X_{10}: \] "Dummy" regional variable.

Miner.--The 1963 book by Jerry Miner\(^6\) is perhaps the most thorough and ambitions study of educational expenditure determinants. A special questionnaire survey of about 1,700 school districts in 23 states, undertaken to supplement data from the decennial census and from a special survey of school districts administered by the U.S. Office of Education, yielded a sample of about 1,100 school districts. The sample was designed to be as representative as possible of

public school systems enrolling 300 or more pupils, with care being taken to represent all parts of the country and various institutional arrangements, and to provide enough districts in each of the states to permit state-by-state analyses (except that two of the states selected for other reasons had too few districts to permit separate analyses).^7

The Miner study also was thorough from the standpoint of the number of variables used: four dependent variables were used together with 22 independent variables (listed below). The states were grouped into three categories—states with equalized property values used in the state aid calculations, southern states, and a residual category—and results of four regressions were presented for each state in each category (with some differences in the combinations of independent variables used for each category), as well as for the total sample of 1,100-odd school districts. The variables are given below, and the results are summarized in the following section of this appendix.

Dependent

1. Total current expenditures per capita (abbreviated as TE/C);
2. Local expenditures per capita—i.e., total current expenditures minus state and federal aid (LE/C);
3. Total current expenditures per pupil (TE/P);
4. Local expenditures per pupil (LE/P);

Independent

5. Median family income (Y);

^7For a discussion of the sample design, data sources, and analytic approach, see Miner, Spending for Public Education, pp. 87-93.
6. Percent of families with income of $10,000 or more (Y+);

7. Amount of equalized property value per capita (PROP);

8. Amount of debt service per capita (DS);

9. Statewide personal income per capita (Y/C);

10. Statewide equalized value of property per capita (PROP/C);

11. Salary of beginning teachers (SAL);

12. Percent of children under 18 (CHILD);

13. Percent of children in non-public schools (PRIV);

14. Median years of education (ED);

15. Percent non-white (NON-W);

16. Percent moved into district in last five years (MIGR);

17. Located in standard metropolitan statistical area (SMSA);

18. Density (DEN);

19. Number of pupils in average daily attendance (ADA);

20. Insurable value of school capital per pupil (CAP);

21. Percent of pupils in secondary grades (SEC);

22. Number of full time employees in auxiliary services per pupil (AUX);

23. Dependent or independent school system (DEP);

24. State collected revenues as a percentage of total revenues for education (SR/TR);

25. Equalization aid as a percentage of total state aid for education (EA/TA);

26. General purpose aid as a percentage of total state aid for education (GPA/TA).
Another major study, part of a series of educational finance studies at Stanford, was conducted by James, Thomas, and Dyck and reported in 1963. Cross-sectional data for 1958-59 obtained by questionnaire for 772 school districts were supplemented by data from the 1960 decennial census; the districts, each enrolling 1,500 or more students, were from 10 states throughout the United States (except that the southeast was not represented). Results of regression runs for the total sample and for nine of the ten states individually were reported (one state—New Hampshire—was omitted from the individual-state runs, although runs were made for Nebraska, which had only 18 districts in the sample in comparison with New Hampshire's 12). The variables used are given below:

**Dependent**

Y: Current educational expenditures per pupil in ADA, 1958-59;

**Independent**

X₁: Equalized property value per resident pupil in ADA, 1958-59;
X₂: Median family income, 1960;
X₃: Percentage of occupied housing occupied by owners, 1960;
X₄: Median years of schooling for population aged 25 years and over, 1960;
X₅: Percentage of labor force unemployed, 1960;

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In the runs for individual states (which are summarized in the next section), independent variables $X_7$ through $X_8$ were used for all states, and $X_{19}$ was used for states having both dependent and independent districts; variables $X_9$ through $X_{18}$, on the other hand, were used only in the runs for the aggregate of the states (which are not summarized in the next section).

Weisbrod.---Burton Weisbrod's 1964 study of the external benefits of public education$^9$ included in Chapter 9 an empirical analysis of the determinants of public educational expenditures to test hypotheses concerning the effects of benefit spillovers on educational expenditure decisions; that analysis was also the subject of a 1965 paper.$^{10}$ Cross-sectional data for each of the 48 contiguous states

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were used, with the study period being the period around 1960. Because state-level data were used, the only regression was for the United States as a whole. The variables used are given below:

**Dependent**

$X_1$: Current expenditures per pupil;

**Independent**

$X_2$: Federal aid as a percentage of total current expenditures;

$X_3$: State aid as a percentage of total current expenditures;

$X_4$: Personal income per pupil;

$X_5$: Percentage of population aged 6-17 years in public schools;

$X_6$: Public high school students as a percentage of total public school students;

$X_7$: Non-white public school enrollments as a percentage of total;

$X_8$: Percentage change in population resulting from net in-migration;

$X_9$: Percentage change in population resulting from net out-migration.

_Bahl and Saunders._--A 1967 research monograph by Roy Bahl and Robert Saunders analyzed governmental expenditures (a) in total and by major function and (b) by all levels of government and from local sources only, using data for the 55 West Virginia counties. Cross-sectional analyses for 1957 and 1962 were presented. Only those

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analyses pertaining to public education are of immediate interest to the present study; hence, only these analyses are summarized in the next section. The variables used in the education analyses are given below (because the same variables were used for each of the two years, the dates are omitted here rather than presenting two lists):

**Dependent**
1. Per capita education expenditures, all governments;
2. Per capita education expenditures, local sources only;

**Independent**

\[ X_1: \text{Percentage of families with income below } \$3,000; \]
\[ X_2: \text{Ratio of county population to county land area (population density);} \]
\[ X_3: \text{Per capita assessed value;} \]
\[ X_4: \text{Ratio of agricultural employment to manufacturing employment;} \]
\[ X_5: \text{Percent of labor force unemployed;} \]
\[ X_6: \text{Per capita income;} \]
\[ X_7: \text{Ratio of city population to county population;} \]
\[ X_8: \text{Ratio of assessed value to income;} \]
\[ X_9: \text{Ratio of state and federal education aid to local-source educational expenditures;} \]
\[ X_{10}: \text{Average number of students per school.} \]

No more than five of the 10 independent variables were used in any regression model.

**Summary of Findings**

This section presents in summary form the findings of the above eight studies for each of eleven selected variables. To facilitate
comparison, the presentation is by variable rather than by study. In the presentation the following abbreviations or symbols are used for shorthand: (+) and (-) denote, respectively, positive and negative regression coefficients; NS denotes a coefficient that is not statistically significant; S denotes a statistically significant coefficient and an S followed by a percentage figure indicates the level of significance. (Statistical significance was not reported by all authors, so information given below is more informative for some studies and some variables than for others.)

I. Property value

A. Hirsch--findings for average assessed value per pupil in ADA (X₆)

1. Dependent $X_{1a}$: (+) S 5%
2. Dependent $X_{1b}$: (+) S 5%

B. Renshaw--variable not used.

C. Fisher--variable not used.

D. Shapiro--variable not used.

E. Miner

1. All school systems in sample--findings for statewide equalized value of property per capita (PROP/C)

   a) Dependent TE/C: (+) NS
   b) Dependent LE/C: (+) NS
   c) Dependent TE/P: (-) NS
   d) Dependent LE/P: (-) NS

2. States with equalized property values (7)--findings for amount of equalized property value per capita (PROP)
a) Dependent TE/C: (+) S 5% (3 states)  
(+NS (3 states)  
(-) NS (1 state)  
b) Dependent LE/C: (+) S 5% (6 states)  
(-) NS (1 state)  
c) Dependent TE/P: (+) S 5% (2 states)  
(+NS (3 states)  
(-) NS (2 states)  
d) Dependent LE/P: (+) S 5% (3 states)  
(+NS (2 states)  
(-) NS (2 states)  

3. Southern states--variable not used.  
4. Other states--variable not used.  

F. James et al.--findings for equalized property value per pupil in ADA (X₁)  
(+S(T=2) (5 states)  
(+NS (4 states)  

G. Weisbrod--variable not used.  

H. Bahl and Saunders--findings for per capita assessed value (X₃); used with dependent variable 1, expenditures by all governments, only  
1. 1957: (+) S 5%  
2. 1962: (-) NS  

II. Income  

A. Hirsch--variable not used.  

B. Renshaw  
1. For per capita income in 1949 (X₃), with dependent variable X₁  
(+) S  
2. For per capita personal income in 1954 (X₅), with dependent variable X₅  
(+) S
3. For income per school-age population \((X_{10})\), with
dependent variable \(X_5\)

\[(+) \quad S\]

C. Fisher--findings for per capita income \((X_4)\)

\[(+)\]

D. Shapiro--findings for per capita personal income by state
in constant 1947-49 dollars \((X_2)\), several runs for South
and Non-South

1. Dependent variable \(X_1\), with other independent vari-
ables \(X_3, X_4, X_5, X_6, X_7, X_8\)

a) 1920: South (-) NS
    Non-South (+) S 5%

b) 1930: South (-) NS
    Non-South (+) S 1%

c) 1940: South (-) NS
    Non-South (+) S 1%

d) 1950: South (+) NS
    Non-South (+) S 1%

2. Dependent variable \(X_1\), with other independent vari-
ables \(X_5, X_8, X_9\)

a) 1920: South (+) NS
    Non-South (+) S 5%

b) 1930: South (-) NS
    Non-South (+) S 1%

c) 1940: South (+) NS
    Non-South (+) S 1%

d) 1950: South (+) NS
    Non-South (+) S 1%

3. Dependent variable \(X_{1.1}\), with other independent
variables \(X_{5.1}, X_8, X_{9.1}\)

a) 1920: South (+) NS
    Non-South (+) NS

b) 1930: South (-) NS
    Non-South (+) S 1%
c) 1940: South (-) NS
    Non-South (+) S 1%

d) 1950: South (+) NS
    Non-South (+) S 1%

E. Miner

1. For median family income (Y)

a) All school systems in sample

  (1) Dependent TE/C: (-) NS
  (2) Dependent LE/C: (+) NS
  (3) Dependent TE/P: (-) NS
  (4) Dependent LE/P: (+) NS

b) States with equalized property values--variable not used.

c) Southern states (8)

  (1) Dependent TE/C: (-) NS (7 states)
      (+) NS (1 state)
  (2) Dependent LE/C: (+) S 5% (1 state)
      (-) NS (5 states)
      (+) NS (1 state)
      not used (1 state)
  (3) Dependent TE/P: (+) S 5% (1 state)
      (-) NS (4 states)
  (4) Dependent LE/P: (+) S 5% (6 states)
      not used (1 state)

  (5) Dependent TE/P: (+) NS (3 states)
  (6) Dependent LE/P: (+) NS (2 states)

  (7) Dependent TE/P: (+) NS (1 state)
  (8) Dependent LE/P: (+) NS (1 state)

  (9) Dependent TE/P: (+) NS (1 state)
  (10) Dependent LE/P: (+) NS (1 state)
2. For percent families with income of $10,000 or more (Y+)

a) All school systems in sample
   (1) Dependent TE/C: (+)  S 5%  (1 state)
   (2) Dependent LE/C: (+)  S 5%  (2 states)
   (3) Dependent TE/P: (+)  NS  (4 states)
   (4) Dependent LE/P: (+)  NS  (1 state)

b) States with equalized property values--variable not used.

c) Southern states--variable not used.

d) Other states--variable not used.

3. For statewide personal income per capita (Y/C)

a) All school systems in sample
   (1) Dependent TE/C: (+)  S 5%
   (2) Dependent LE/C: (+)  NS  (4 states)
   (3) Dependent TE/P: (+)  NS  (1 state)
   (4) Dependent LE/P: (+)  S 5%

b) States with equalized property values--variable not used.

c) Southern states--variable not used.

d) Other states--variable not used.

F. James et al.--findings for median family income (X2)

(+) S(T≥2)  (4 states)
(+) NS  (2 states)
(-) NS  (1 state)
I. Relative cost per pupil

A. Hirsch—findings for high school pupils in ADA as percent of all pupils in ADA (X3)

1. Dependent X1a:
   (+) S 5%

2. Dependent X1b:
   (+) S 5%

B. Renshaw—variable not used.

C. Fisher—variable not used.

D. Shapiro—findings for high school enrollment as a percentage of total enrollments, in public schools (Xg) and in all schools (Xg)

1. Xg—used only with dependent variable X1
   a) 1920: South (+) NS
       Non-South (-) NS
   b) 1930: South (-) NS
       Non-South (-) NS
   c) 1940: South (-) NS
       Non-South (+) NS
d) 1950: South (+) NS  
Non-South (+) NS

2. X9.1--used only with dependent variable X1.1
   a) 1920: South (+) NS  
   Non-South (+) NS
   b) 1930: South (-) NS  
   Non-South (-) NS
   c) 1940: South (+) NS  
   Non-South (+) NS
   d) 1950: South (-) NS  
   Non-South (+) NS

E. Miner--findings for percent of pupils in secondary grades (SEC)

1. All school systems in sample
   a) Dependent TE/C: (+) S 5%  
   b) Dependent LE/C: (+) S 5%  
   c) Dependent TE/P: (+) NS  
   d) Dependent LE/P: (+) S 5%

2. States with equalized property values (7)
   a) Dependent TE/C: (+) NS  
   (-) NS (5 states) 
      (2 states)
   b) Dependent LE/C: (+) S 5%  
   (+) NS (1 state)  
   (-) NS (3 states)
   c) Dependent TE/P: (+) S 5%  
   (+) NS (4 states)  
   (-) NS (1 state)
   d) Dependent LE/P: (+) S 5%  
   (+) NS (3 states)  
   (-) NS (1 state)

3. Southern states (8)
   a) Dependent TE/C: (+) S 5%  
   (+) NS (2 states)  
   (+) NS (4 states)
<table>
<thead>
<tr>
<th>(-)</th>
<th>NS</th>
<th>(1 state)</th>
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<tbody>
<tr>
<td>not used</td>
<td></td>
<td>(1 state)</td>
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</tbody>
</table>

b) Dependent LE/C:

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<thead>
<tr>
<th>(+)</th>
<th>S 5%</th>
<th>(1 state)</th>
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<tbody>
<tr>
<td>(+)</td>
<td>NS</td>
<td>(1 state)</td>
</tr>
<tr>
<td>(-)</td>
<td>NS</td>
<td>(2 states)</td>
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<tr>
<td>not used</td>
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<td>(2 states)</td>
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c) Dependent TE/P:

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<tr>
<th>(+)</th>
<th>S 5%</th>
<th>(1 state)</th>
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<tbody>
<tr>
<td>(+)</td>
<td>NS</td>
<td>(4 states)</td>
</tr>
<tr>
<td>(-)</td>
<td>NS</td>
<td>(2 states)</td>
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<tr>
<td>not used</td>
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<td>(1 state)</td>
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</table>

d) Dependent LE/P:

<table>
<thead>
<tr>
<th>(+)</th>
<th>S 5%</th>
<th>(1 state)</th>
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<tbody>
<tr>
<td>(+)</td>
<td>NS</td>
<td>(2 states)</td>
</tr>
<tr>
<td>(-)</td>
<td>NS</td>
<td>(3 states)</td>
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<tr>
<td>not used</td>
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<td>(2 states)</td>
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4. Other states (6)

a) Dependent TE/C:

<table>
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<tr>
<th>(+)</th>
<th>S 5%</th>
<th>(3 states)</th>
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<tbody>
<tr>
<td>(+)</td>
<td>NS</td>
<td>(1 state)</td>
</tr>
<tr>
<td>(-)</td>
<td>NS</td>
<td>(1 state)</td>
</tr>
<tr>
<td>not used</td>
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<td>(1 state)</td>
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b) Dependent LE/C:

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<tr>
<th>(+)</th>
<th>NS</th>
<th>(4 states)</th>
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</thead>
<tbody>
<tr>
<td>(-)</td>
<td>NS</td>
<td>(1 state)</td>
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<tr>
<td>not used</td>
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c) Dependent TE/P:

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<tr>
<th>(+)</th>
<th>S 5%</th>
<th>(4 states)</th>
</tr>
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<tbody>
<tr>
<td>(+)</td>
<td>NS</td>
<td>(2 states)</td>
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</table>

d) Dependent LE/P:

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<thead>
<tr>
<th>(+)</th>
<th>S 5%</th>
<th>(1 state)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+)</td>
<td>NS</td>
<td>(4 states)</td>
</tr>
<tr>
<td>(-)</td>
<td>NS</td>
<td>(1 state)</td>
</tr>
</tbody>
</table>

F. James et al.--variable not used.

G. Weisbrod--findings for public high school students as a percentage of total public school students ($X_6$)

<table>
<thead>
<tr>
<th>(+)</th>
<th>S 5%</th>
</tr>
</thead>
</table>

H. Bahl and Saunders--variable not used.

IV. Scale of operations

A. Hirsch

1. For number of pupils in ADA for public primary and
secondary schools ($X_2$)

a) Dependent $X_{1a}$: (-) NS
b) Dependent $X_{1b}$: (-) NS

2. For square of pupils in ADA for public primary and secondary schools ($X_{2^2}$)

a) Dependent $X_{1a}$: (+) NS
b) Dependent $X_{1b}$: (+) NS

B. Renshaw--variable not used.

C. Fisher--variable not used.

D. Shapiro--variable not used.

E. Miner--findings for number of pupils in average daily attendance (ADA)

1. All school systems in sample

a) Dependent TE/C: zero coefficient
b) Dependent LE/C: zero coefficient
c) Dependent TE/P: zero coefficient
d) Dependent LE/C: zero coefficient

2. States with equalized property values (7)

a) Dependent TE/C: zero coefficient (1 state) not used (6 states)
b) Dependent LE/C: zero coefficient (1 state) not used (6 states)
c) Dependent TE/P: $(-)$ NS (2 states) zero coefficient (1 state) not used (4 states)
d) Dependent LE/P: $(+)$ NS (1 state) $(-)$ NS (1 state) zero coefficient (1 state) not used (4 states)

3. Southern states (8)
a) Dependent TE/C: 

\[
\begin{array}{ccc}
(+) & NS & (3 \text{ states}) \\
(-) & S & 5\% & (1 \text{ state}) \\
(-) & NS & (3 \text{ states}) \\
zero \text{ coefficient} & (1 \text{ state}) \\
\end{array}
\]

b) Dependent LE/C: 

\[
\begin{array}{ccc}
(+) & NS & (4 \text{ states}) \\
(-) & NS & (1 \text{ state}) \\
zero \text{ coefficient} & (2 \text{ states}) \\
not \text{ used} & (1 \text{ state}) \\
\end{array}
\]

c) Dependent TE/P: 

\[
\begin{array}{ccc}
(+) & NS & (4 \text{ states}) \\
(-) & NS & (3 \text{ states}) \\
zero \text{ coefficient} & (1 \text{ state}) \\
\end{array}
\]

d) Dependent LE/P: 

\[
\begin{array}{ccc}
(+ ) & S & 5\% & (1 \text{ state}) \\
(+ ) & NS & (5 \text{ states}) \\
(-) & NS & (1 \text{ state}) \\
not \text{ used} & (1 \text{ state}) \\
\end{array}
\]

4. Other states (6)

a) Dependent TE/C: 

\[
\begin{array}{ccc}
(+ ) & NS & (2 \text{ states}) \\
(-) & NS & (1 \text{ state}) \\
zero \text{ coefficient} & (1 \text{ state}) \\
not \text{ used} & (2 \text{ states}) \\
\end{array}
\]

b) Dependent LE/C: 

\[
\begin{array}{ccc}
(+ ) & NS & (1 \text{ state}) \\
(-) & NS & (2 \text{ states}) \\
zero \text{ coefficient} & (1 \text{ state}) \\
not \text{ used} & (2 \text{ states}) \\
\end{array}
\]

c) Dependent TE/P: 

\[
\begin{array}{ccc}
(+ ) & S & 5\% & (1 \text{ state}) \\
(+ ) & NS & (2 \text{ states}) \\
(-) & NS & (1 \text{ state}) \\
zero \text{ coefficient} & (1 \text{ state}) \\
not \text{ used} & (1 \text{ state}) \\
\end{array}
\]

d) Dependent LE/P: 

\[
\begin{array}{ccc}
(+ ) & NS & (4 \text{ states}) \\
zero \text{ coefficient} & (1 \text{ state}) \\
not \text{ used} & (1 \text{ state}) \\
\end{array}
\]

F. James et al.—variable not used.

G. Weisbrod—variable not used.

H. Bahl and Saunders—findings for average number of students per school \(x_{10}\)

1. Dependent 1, expenditures of all governments, only

a) 1957: 

\[
\begin{array}{ccc}
(-) & S & 5\% \\
\end{array}
\]
b) 1962:  

2. Dependent 2, local expenditures, only  
a) 1957:  

b) 1962:  

V. Presence of school-age children  
A. Hirsch—variable not used.  
B. Renshaw—findings for school-age population as a percentage of total ($X_{11}$), with dependent variable $X_5$ only  

C. Fisher—variable not used.  
D. Shapiro—findings for population aged 5-17 years as a percentage of total ($X_g$)  
Dropped after preliminary runs.  
E. Miner—findings for percent of children under 18 (CHILD)  
1. All school systems in sample  
a) Dependent TE/C:  

b) Dependent LE/C:  

c) Dependent TE/P:  

d) Dependent LE/P:  

2. States with equalized property values (7)  
a) Dependent TE/C:  

b) Dependent LE/C:  

c) Dependent TE/P:  

States with equalized property values (7):  
(1 state)  
(4 states)  
(1 state)  
(1 state)  
(3 states)  
(4 states)  
(2 states)  
(2 states)  
(3 states)
<table>
<thead>
<tr>
<th>State Type</th>
<th>Dependent LE/P:</th>
<th>States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern states (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Dependent TE/C:</td>
<td>(+) NS</td>
<td>(7 states)</td>
</tr>
<tr>
<td>b) Dependent LE/C:</td>
<td>(-) S 5%</td>
<td>(1 state)</td>
</tr>
<tr>
<td>c) Dependent TE/P:</td>
<td>(+) NS</td>
<td>(2 states)</td>
</tr>
<tr>
<td>d) Dependent LE/P:</td>
<td>(-) S 5%</td>
<td>(1 state)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State Type</th>
<th>Dependent LE/P:</th>
<th>States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other states (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Dependent TE/C:</td>
<td>(+) S 5%</td>
<td>(2 states)</td>
</tr>
<tr>
<td>b) Dependent LE/C:</td>
<td>(+) S 5%</td>
<td>(1 state)</td>
</tr>
<tr>
<td>c) Dependent TE/P:</td>
<td>(+) NS</td>
<td>(2 states)</td>
</tr>
<tr>
<td>d) Dependent LE/P:</td>
<td>(+) NS</td>
<td>(2 states)</td>
</tr>
</tbody>
</table>

F. James et al.—variable not used.
G. Weisbrod—variable not used.
H. Bahl and Saunders—variable not used.

VI. Non-public enrollment
A. Hirsch—variable not used.
B. Renshaw—variable not used.
C. Fisher—variable not used.
D. Shapiro--findings for non-public enrollment as a percentage of total (X4); used with independent variable for public schools (X1), found to be non-significant for both the South and Non-South in all periods, but statistically significant for the U.S. as a whole. Variable was dropped in favor of a regional variable (X10).

E. Miner--findings for percent of children in non-public schools (PRIV)

1. All school systems in sample
   a) Dependent TE/C: (-) S 5%
   b) Dependent LE/C: (+) NS
   c) Dependent TE/P: (+) NS
   d) Dependent LE/P: (+) S 5%

2. States with equalized property values (7--used in only 4)
   a) Dependent TE/C: (+) NS (1 state)
      (-) S 5% (2 states)
      (-) NS (1 state)
   b) Dependent LE/C: (+) NS (2 states)
      (-) NS (2 states)
   c) Dependent TE/P: (+) NS (2 states)
      (-) NS (2 states)
   d) Dependent LE/P: (+) S 5% (1 state)
      (+) NS (2 states)
      (-) NS (1 state)

3. Southern states--variable not used.

4. Other states (6--used in only 2)
   a) Dependent TE/C: (-) NS (2 states)
   b) Dependent LE/C: (+) NS (1 state)
      (-) NS (1 state)
   c) Dependent TE/P: (+) S 5% (1 state)
      (-) NS (1 state)
   d) Dependent LE/P: (+) NS (1 state)
      (-) NS (1 state)
F. James et al.—findings for percentage of elementary school children attending private schools ($X_8$)

\begin{align*}
(+)&\quad NS \quad (2 \text{ states}) \\
(-)&\quad S(T\geq2) \quad (2 \text{ states}) \\
(-)&\quad NS \quad (5 \text{ states}) 
\end{align*}

G. Weisbrod—findings for percentage of population aged 6-17 years in public schools ($X_5$)

\(+\quad S \quad 8\%

H. Bahl and Saunders—variable not used.

VII. Educational attainment

A. Hirsch—variable not used.

B. Renshaw—variable not used.

C. Fisher—variable not used.

D. Shapiro—variable not used.

E. Miner—findings for median years of education ($ED$)

1. All school systems in sample
   a) Dependent $TE/C$: $(-)\quad NS$
   b) Dependent $LE/C$: $(-)\quad NS$
   c) Dependent $TE/P$: $(-)\quad NS$
   d) Dependent $LE/P$: $(-)\quad NS$

2. States with equalized property values—variable not used.

3. Southern states—variable not used.

4. Other states—variable not used.

F. James et al.—findings for median years of schooling for population aged 25 years and over ($X_4$)

\begin{align*}
(+)&\quad S(T\geq2) \quad (1 \text{ state}) \\
(+)&\quad NS \quad (4 \text{ states}) \\
(-)&\quad S(T\geq2) \quad (1 \text{ state}) \\
(-)&\quad NS \quad (3 \text{ states}) 
\end{align*}
VIII. Measures of "urban-ness"

A. Hirsch—findings for number of public school pupils in ADA per square mile \( X_4 \)
   1. Dependent \( X_{1a} \): (-) NS
   2. Dependent \( X_{1b} \): (-) NS

B. Renshaw—findings for population density \( X_9 \), used with dependent variable \( X_5 \), only
   (-) NS

C. Fisher
   1. For population per square mile \( X_2 \)
      (-)
   2. For percent of population living in urban places \( X_3 \)
      (+)

D. Shapiro—findings for percentage of population in urban areas \( X_7 \), used only with dependent variable \( X_1 \)
   1. 1920: South (-) S 5%
      Non-South (-) S 5%
   2. 1930: South (-) NS
      Non-South (-) NS
   3. 1940: South (+) NS
      Non-South (+) NS
   4. 1950: South (+) NS
      Non-South (+) NS

E. Miner
   1. For located in standard metropolitan statistical area (SMSA)
      a) All school systems in sample
(1) Dependent TE/C: (-) S 5%  
(2) Dependent LE/C: (-) NS  
(3) Dependent TE/P: (+) NS  
(4) Dependent LE/P: (+) NS  

b) States with equalized property values--variable not used.  
c) Southern states--variable not used.  
d) Other states--variable not used.  

2. For density (DEN)  
a) All school systems in sample  
(1) Dependent TE/C: (-) NS  
(2) Dependent LE/C: (-) NS  
(3) Dependent TE/P: (+) NS  
(4) Dependent LE/P: (+) S 5%  

b) States with equalized property values (7--used in only 2)  
(1) Dependent TE/C: (+) NS (1 state)  
(2) Dependent LE/C: (+) NS (2 states)  
(3) Dependent TE/P: (+) NS (2 states)  
(4) Dependent LE/P: (+) S 5% (1 state)  

 c) Southern states--variable not used.  
d) Other states (6)  
(1) Dependent TE/C: (-) NS not used (2 states)  
(2) Dependent LE/C: (+) NS not used (1 state)
(3) Dependent TE/P: 

\[ (+) \ NS \ (1 \ state) \]
\[ (-) \ NS \ (2 \ states) \]
not used \ (3 \ states) 

(4) Dependent LE/P: 

\[ (+) \ NS \ (2 \ states) \]
\[ (-) \ NS \ (1 \ state) \]
not used \ (3 \ states) 

F. James et al.--findings for percent of county population living on rural farms \( (X_7) \)

\[ (+) \ NS \ (1 \ state) \]
\[ (-) \ S(T\geq2) \ (2 \ states) \]
\[ (-) \ NS \ (6 \ states) \]

G. Weisbrod--variable not used.

H. Bahl and Saunders

1. For ratio of county population to county land area \( (X_2) \), used with dependent variable 1, only

a) 1957: \[ (-) \ S \ 5\% \]

b) 1962: \[ (-) \ NS \]

2. For ratio of city population to county population \( (X_7) \), used with dependent variable 2, only

a) 1957: \[ (+) \ NS \]

b) 1962: \[ (-) \ NS \]

IX. Non-white

A. Hirsch--variable not used.

B. Renshaw--findings for non-white population as a percentage of total \( (X_4) \), used with dependent variable \( X_1 \), only

\[ (-) \ S \ 5\% \]

C. Fisher--variable not used.

D. Shapiro--findings for nonwhite population as a percentage of total \( (X_3) \)

1. 1920: South \[ S \]
   Non-South \[ NS \]
2. 1930: South S
Non-South NS

3. 1940: South S
Non-South NS

4. 1950: South NS
Non-South NS

Found significance in South prior to 1950 to be due to only two states, so variable was dropped; signs not reported.

E. Miner--findings for percent non-white (NON-W)

1. All school systems in sample
   a) Dependent TE/C: (+) NS
   b) Dependent LE/C: (+) NS
   c) Dependent TE/P: (+) NS
   d) Dependent LE/P: (+) NS

2. States with equalized property values (7--only 3 used)
   a) Dependent TE/C: (-) S 5% (1 state)
      (-) NS (2 states)
   b) Dependent LE/C: (-) S 5% (1 state)
      (-) NS (2 states)
   c) Dependent TE/P: (+) NS (2 states)
      (-) NS (1 state)
   d) Dependent LE/P: (+) NS (2 states)
      (-) NS (1 state)

3. Southern states (8)
   a) Dependent TE/C: (+) NS (5 states)
      (-) NS (3 states)
   b) Dependent LE/C: (+) S 5% (2 states)
      (+) NS (3 states)
      (-) NS (2 states)
      not used (1 state)
   c) Dependent TE/P: (+) S 5% (2 states)
      (+) NS (3 states)
      (-) NS (3 states)
d) Dependent LE/P: (+) S 5% (3 states) 
   (+) NS (2 states) 
   (-) NS (2 states) 
   not used (1 state) 

4. Other states (6--only one used) 
   a) Dependent TE/C: (+) NS 
   b) Dependent LE/C: (+) NS 
   c) Dependent TE/P: (-) NS 
   d) Dependent LE/P: (-) NS 

F. James et al.--findings for percentage of population non-white (X_6) 
   (+) NS (5 states) 
   (-) S(T=2) (1 state) 
   (-) NS (3 states) 

G. Weisbrod--findings for non-white public school enrollments as a percentage of total (X_7) 
   (-) S 11% 

H. Bahl and Saunders--variable not used. 

X. Benefit spillover measures--population change, etc. 

A. Hirsch--findings for percent increase in public school pupils, 1951-56 (X_5) 
   1. Dependent X_1a: (-) NS 
   2. Dependent X_1b: (-) NS 

B. Renshaw--variable not used. 

C. Fisher--variable not used. 

D. Shapiro--variable not used. 

E. Miner--findings for percent moved into district in last five years (MIGR) 
   1. All school systems in sample 
      a) Dependent TE/C: (-) NS
b) Dependent LE/C:  (-)  NS

c) Dependent TE/P:  (-)  NS

d) Dependent LE/P:  (-)  NS

2. States with equalized property values--variable not used.

3. Southern states--variable not used.

4. Other states {6--used only for California, and only the per-pupil runs}

   a) Dependent LE/P:  (-)  NS

   b) Dependent TE/P:  (-)  NS

F. James et al.--variable not used.

G. Weisbrod

1. For percentage change in population resulting from net in-migration \((X_g)\)

   (-)  NS

2. For percentage change in population resulting from net out-migration \((X_g)\)

   (-)  S 1%

H. Bahl and Saunders--variable not used.

XI. Intergovernmental aid

A. Hirsch--variable not used.

B. Renshaw

1. For total state aid per pupil in ADA \((X_g)\), with dependent variable \(X_5\), only

   (+)  S

2. For estimate of state-mandated local revenue per pupil in ADA \((X_7)\), with dependent variable \(X_5\), only

   (+)  S
C. Fisher—variable not used.

D. Shapiro—variable not used.

E. Miner—variable not used.

F. James et al.—findings for percentage of total school revenue from state sources ($X_g$)

1. Single-state runs (reported above)—variable not used.

2. 10-state aggregate sample

   (+) $S(T \geq 2)$

G. Weisbrod

1. For federal aid as a percentage of total current expenditures ($X_1$)

   (-) NS

2. For state aid as a percentage of total current expenditures ($X_2$)

   (+) NS

H. Bahl and Saunders—findings for ratio of state and federal education aid to local-source educational expenditures ($X_g$), with dependent variable 1, only

1. 1957: (+) $S 5\%$

2. 1962: (-) NS
APPENDIX B

WEST VIRGINIA SCHOOL FINANCE INSTITUTIONS
IN 1969-70

The overview of public school finance in the United States presented in Chapter 1 includes statistics showing the local, state, and federal governments' percentages of elementary and secondary school funding in 1969-70 to have been 52.7, 40.7, and 6.6, respectively, and showing further that virtually all the local funds came from the property tax. In the same year, West Virginia derived an above-average share (10.8 percent) of public school funds from federal sources, while receiving shares that were above average (55.4 percent) from state and below average (33.2 percent) from local district sources. About 95 percent of the local school districts' funds (or 31.5 percent of the total) were derived from the local property tax,1 which is the only tax available to local school districts in West Virginia.2

1West Virginia, State Board of School Finance, The School Dollar: 1969-70 (Charleston, March, 1971), pp. 56-57. The percentages given are for "current expense fund" receipts only, and so are not precisely applicable to total receipts. Nevertheless, the general relationships are accurately portrayed. Moreover, more than 90 percent of all school expenditures in 1969-70 were from the current expense fund (West Virginia, Department of Education, 1969-70 Educational Statistical Summary [Charleston, undated], p. 196) which may--and often does--include capital-related revenues and expenditures (interview with Aaron Rapking, Jr., Assistant Superintendent for Finance and Administration, West Virginia Department of Education, July 27, 1972).

2Interview with Aaron Rapking, Jr.
This appendix presents a very brief summary of institutional arrangements of the local property tax and the state school aid programs as they related to public school finance in West Virginia in 1969-70.

Property Tax

West Virginia has had a classified property tax for several decades. At least as the system existed in the study period, all property was placed in one of the following four classes:

Class I. All tangible personal property employed exclusively in agriculture, including horticulture and grazing;

All products of agriculture (including livestock) while owned by the producer;

All notes, bonds, bills and accounts receivable, stocks and other intangible personal property;

Class II. All property owned, used and occupied by the owner exclusively for residential purposes;

All farms, including land used for horticulture and grazing, occupied and cultivated by their owners or bona fide tenants;

Class III. All real and personal property situated outside of municipalities, exclusive of classes I and II;

Class IV. All real and personal property situated inside of municipalities, exclusive of classes I and II.

The features of the property tax described in this section remained unchanged at least through the summer of 1972, when information for the present research was gathered.

Nine purposes for which property taxes could be levied were defined and maximum rates that could be imposed without a vote of the people were set for each purpose. The sums of the unvoted rate maxima for all purposes were five mills (i.e., five dollars per $1,000 of assessed value) for class I, 10 mills for class II, 15 mills for class III, and 20 mills for class IV. The only difference between rates for classes III and IV was the provision for municipal levies on class IV property. Aside from the municipal levies (excluded only from class III), the rates for class I were one-half those for class II, and those for classes III and IV were twice those for class II.  

Less than the maximum rates could be imposed—or more, with a vote of the people—but the ratio of rates (exclusive of municipal levies) for the four classes had to be 0.5:1.0:2.0:2.0. The rates were required to remain in these same, fixed proportions, so that a change for one class would necessarily entail a change for all other classes.

Three of the nine purposes for which property taxes could be levied were for public school support: "school current," "school debt," and "school permanent improvement." The rate maxima for unvoted levies for these three purposes were, respectively, 4.22, 0.07, and 0.3 mills (class II—residential and farm real property—rates, which were twice the class I and one-half the class III and IV

5West Virginia Tax Department, Thirty-Third Biennial Report, p. 33.

6Telephone conversation with John R. Melton, Director, Local Government Relations Division, West Virginia Tax Department, July 6, 1972.
rates). Individual school systems were permitted, however, to merge the three rate categories, in which case the unvoted rate maximum was the sum of the three; many school districts followed this practice.\textsuperscript{8}

The unvoted rate maxima could be exceeded by the taxing authority if at least 60 percent of the voters in either a general or special election voted in favor of a levy increase proposed by the taxing authority. In the case of school districts, voted increases could not exceed 100 percent of the unvoted maxima and could not continue for a period longer than five years without being resubmitted to the electorate. The one exception was in the area of school debt. Any rate required to pay the principal and interest of school bonds approved after November, 1958, could be imposed, although the amount of such indebtedness could not exceed five percent of the assessed value of property in the school district.\textsuperscript{9}

Although West Virginia has imposed more stringent limits on school property taxation than, say, Ohio, the flexibility allowed by the provisions for voted increases and by levies to fund debt obligations has resulted in a good deal of variability in aggregate school tax rates. Total school levy rates for 1969-70, for example, ranged from a low of 4.59 mills (maximum unvoted rate only) in three of the

\textsuperscript{7}West Virginia Tax Department, \textit{Thirty-Third Biennial Report}, p. 33.

\textsuperscript{8}Interview with Aaron Rapking, Jr.

\textsuperscript{9}West Virginia Tax Department, \textit{Thirty-Third Biennial Report}, p. 34. The restrictions for non-school purposes were less liberal, both with regard to magnitude and duration of additional voted levies.
55 school districts to a high of 12.55 mills (rates for class II property). Rates were above 9.18 mills (i.e., maximum voted and unvoted rates plus additional debt-related millage) in 26 districts, and below seven mills in 13.\textsuperscript{10}

Assessed values to which the tax rates applied were determined by elected assessors in each county, with the exception of public utility property, which was assessed by a board of public works with guidance from the tax commissioner; general supervisory responsibilities over the entire administration of the property tax rested with the state tax commissioner. Annual appraisal of all taxable property at 100 percent of market value was required, and assessed value for tax purposes was to be set at some percentage of appraised value (between 50 and 100) that was to be uniformly applied to all taxable property within any given county.\textsuperscript{11} In practice, however, complete physical reappraisal has been accomplished only every several years, with the (irregular) cycle differing among counties.\textsuperscript{12}

Because of the irregularity of reappraisal at market value, and

\textsuperscript{10}West Virginia Tax Department, \textit{Thirty-Third Biennial Report}, pp. 154-55.

\textsuperscript{11}West Virginia, Tax Department, \textit{State of West Virginia Assessor's Manual} (Charleston, June, 1970, with periodic revisions), pp. G:1-10. Assessment levels were required to be between 50 percent and 100 percent of appraised values.

\textsuperscript{12}Interview with John R. Melton, Director, Local Government Relations Division, West Virginia Tax Department, July 27, 1972.
because of the lack of assessment-sales ratio studies, the degree of uniformity of assessment either within a given county or among counties cannot be determined. This means, as noted in Chapter 3, that equalized property values could not be computed for use in the current research.

Local school district-imposed property taxes accounted for about 31.5 percent of school district revenues in West Virginia in 1969-70, as noted above, but they comprised as little as 8.8 percent in one county and as much as 51.7 percent in another. In per-pupil terms, the range was from a low of $80 to a high of $472, with the mean being $201 (the per-pupil local property taxes are given in the first column of Table 8 in Appendix C).

State School Aid

State school aid to local districts, as noted earlier, comprised 55.4 percent of West Virginia school district revenues in 1969-70, with the range being from 40.6 percent to 71.7 percent among the 55 school districts. This state school aid was distributed through

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13 Interview with John R. Melton. West Virginia has recently embarked upon a program calling for regular assessment-sales ratio studies, but as of late summer, 1972, none had been completed. Moreover, the first such study undertaken was for a period later than 1969-70, the study period for the present research.

14 West Virginia State Board of School Finance, The School Dollar: 1969-70, pp. 56-57. As noted in footnote 1, above, these figures relate to the current expense fund only.

15 West Virginia State Board of School Finance, The School Dollar: 1969-70, pp. 56-57. As noted in footnotes 1 and 14, above, these figures relate only to the current expense fund.
10 aid programs, of which one—the public school support program—was by far the largest.

The public school support program in 1969-70 was made up of three portions—foundation program, supplemental instructional support, and supporting services—which accounted for about 47 percent, 41 percent, and 9 percent, respectively, of total state school aid (1968-69 figures). To participate in the latter two portions, the local districts essentially had only to operate schools and employ teachers, and no local share was required; the supplemental instructional support program was simply a program for subsidizing teacher salaries under the basic state pay scale, while the supporting services program was the state's contribution toward increased expenditures for "supporting services" beyond the level in a base year.\(^\text{16}\)

The foundation program, which accounted for the largest portion of state aid going into any one program, utilized a more complex formula than the other two portions of the public school support program. In general, a basic or "foundation" level of support was calculated for each district by means of a formula taking into account such things as teachers' salaries, pupil transportation, and pupils (weighted for level of educational program and size of school). The

local share of, or contribution toward, this foundation program was calculated by (1) applying stipulated tax rates (1.96 mills for class I, 3.92 mills for class II, and 7.84 mills for classes III and IV) to the appraised property values of non-public utility property in the districts and dividing by two (the same effect as using the minimum assessment level of 50 percent of appraised value), (2) deducting a five percent normal-loss allowance, and (3) adding 97.5 percent of the estimated proceeds from applying the above rates to public utility property. The state share was simply the residual of the foundation amount less the local share, except that every district was guaranteed state aid equal to at least 50 percent of the foundation amount.

The other nine state aid programs, accounting for less than five percent of state school aid in the study period, included support for such things as pupil transportation, school lunches, free textbooks, county superintendents' salaries, and programs for exceptional children. In general, the state share of these programs was 100 percent, and the local school districts had only to operate programs in the aided functions to qualify.

Using the terminology developed by the National Educational Finance Project (NEFP), something over two-fifths of West Virginia

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17Note that these local contributions, or "charge-off," rates are less than the unvoted rate maxima discussed in the previous section, and also lower than the rates actually levied by even the lowest-tax school districts in 1969-70.
state school aid was distributed on a "uniform" basis, approximately 10 percent was "client-modified," and the balance was "fiscal-client-modified."¹⁸

¹⁸Kern Alexander, Oscar Hamilton, and Douglas Forth, "Classification of State School Funds," in Status and Impact of Educational Finance Programs, ed. by Roe L. Johns, Kern Alexander, and Dewey H. Stollar (Gainesville, Florida: NEFP, 1971), Table 2-3, pp. 38-39. (This classification system is discussed in Chapter 1.) The percentages apply specifically to 1968-69, but probably represent 1969-70 quite accurately, as well.
APPENDIX C

DESCRIPTION OF DATA

It frequently is the case in economics, and other disciplines concerned with the analysis of human behavior, that data ideally suited to the conceptual problem at hand either do not exist or, little better, can be made available only with prohibitively high expenditures of time and money. When this is the case, the researcher must get along with less-than-perfect data. This dissertation is no exception.

This appendix describes the development of operational measures of the dependent variable and the several types of independent variables identified in Chapter 3 as being conceptually important in the explanation of observed differences in the dependent variable. The data "massaging" techniques applied to these basic data sources are described here to give the reader an appreciation of the nature and limitations of the specific numbers used in the statistical analyses presented and discussed in Chapters 4 and 5.

The theoretical justification for each variable is discussed in the text of the dissertation in Chapter 3.

General Considerations

Selection of West Virginia school systems for studying the effects on local school taxation of benefit and cost spillovers
beyond the local school district was based on many considerations. For practical reasons, it seemed desirable to minimize the effects of differences in institutional arrangements by restricting the analysis to a single state; in this way, only one tax system, one system of state education aid, and one set of records-keeping would have to be dealt with. (Even so, some local differences in property assessment and school budgeting categories, to cite only two prominent examples, were encountered within the study state.)

Conceptual considerations required a sample comprised of fiscally independent school districts so that school taxing decisions would not be intertwined with the overall taxing decisions of a broader "parent" jurisdiction. Moreover, given the inclusion of variables relating to economic and social characteristics of the school districts, practical considerations of data availability suggested the desirability of selecting school districts coterminous with counties or other governmental units separately reported in the decennial censuses (which are the only source of many of the needed social and economic data) since the censuses do not report such statistics for school districts. In fact, counties are the smallest jurisdictions covering an entire state for which such data are reported.¹

¹The possibility of using data for census tracts and untracted areas and conforming these units to school districts in a state such as Ohio was explored. But because the task of conforming such units to the Ohio school districts would have been an enormous clerical task (at least prior to availability of a program prepared by the U. S. Office of Education to accomplish this), and because the Bureau of the Census had not, as of late summer, 1972, issued 1970 census data for census tracts, this approach was ruled out.
Of the few states having independent school districts coterminous with counties, West Virginia was selected as the study area.

The 1969-70 school year was selected as the study period because the income statistics in the 1970 Census of Population pertain to 1969 incomes, while the social and demographic statistics to be obtained from the 1970 Censuses of Population and Housing relate to the 1970 population. Where possible, the data used to implement the various measures of the dependent and independent variables relate to the period 1969-70.

Table 7 presents the following information for each of the variables prepared for statistical analysis: number, such as \( X_1 \); name, in form of a short definition; units of measure, such as percent; and abbreviation or symbol. Table 8 presents the values of each of the 24 variables for each of the 55 West Virginia school districts or counties (the terms "county" and "school district" are used interchangeably below). Table 9 is a matrix of correlation coefficients for the several variables. These tables follow the descriptions of all 24 variables.

All the variables have been converted to standardized units—dollars per family, dollars per pupil, percentages, etc.—to avoid difficulties arising from differences in sizes of the 55 school districts' populations, wealth, and other variables.

**Dependent Variable**

\[ X_1: \text{Total local public school taxes per pupil in ADM (LOCTAX/-P).} \]—The dependent variable was calculated by dividing total local
school taxes levied for assessment year 1969\(^2\) (represented by LT) by pupils in average daily membership in school year 1969-70\(^3\) (represented by ADM):

\[ X_1 = \frac{LT}{ADM}. \]

The values of \(X_1\) are given in the first column of Table 8.

**Independent Variables**

**Cost spillsouts**

Two formulations of the tax-exporting variable—-one expressed in terms of dollars per family and the other as a percentage—are given in the second and third columns of Table 8. They are:

- \(X_2\): Non-"local" weighted assessed property value per family (\(\text{EXPORT-}$\));
- \(X_3\): Non-"local" weighted assessed property value as percent of total weighted assessed value (\(\text{EXPORT-}$\%$\)).

Both variables are based on the division of all taxable property into "local" and non-"local" components (discussed in Chapter 3). For this purpose, local property was considered to be: residential and agricultural realty (all class II); household personalty (parts of classes III and IV); private cars and other non-commercial vehicles (parts of classes III and IV); agricultural personalty (part of class I); and apartments and other rental housing.


classes III and IV). All other property was assigned to the non-local category. The data adjustments and calculations necessary to arrive at the local and non-local assessed values are described below.

Using data for assessment year 1969, assessed values in each of four property classes were weighted in proportion to their respective tax rates under West Virginia’s classified property tax system described in Appendix B: weight of 0.5 for class I, weight of 1.0 for class II, and weights of 2.0 for classes III and IV. Summing across the four classes gave weighted total assessed value (represented by WTAV), the denominator term in the percentage formulation.

Next, each of five components of local property was identified and the raw assessed values weighted appropriately.

(a) Residential and agricultural realty (represented by RES & AG) is all of class II, for which data were readily available; a weighting factor of 1.0 was used.

(b) Household personalty was not reported separately in any published reports. Moreover, such detail has only recently begun to be recorded in the West Virginia Tax Department files, starting with assessment year 1971.

The unpublished 1971 assessed value figures for household goods (HHG) were obtained for 42 counties that reported such

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4 West Virginia Tax Department, Thirty-Third Biennial Report, Table B, pp. 37-147.

5 West Virginia Tax Department, Thirty-Third Biennial Report, Table B, pp. 37-147.
detail, weighted 2.0, and used directly. To estimate the values of HHG for the other 13 counties, use was made of the relationship between the weighted values of household goods (HHG) and all agricultural and residential realty (RES & AG plus apartments and other rental housing--see step e, below) in the 42 counties reporting HHG detail.

Thus, a value for HHG equal to 9.6 percent of the value of all residential and farm realty in the county (all values weighted) was attributed to each of the 13 non-reporting counties. Although less than ideal, this approach seems as reasonable as any available, in view of the differences in assessment practice with respect to household goods and other factors.

Use of 1971 values of HHG together with 1969 values of other property also introduced some error unknown effect—which no doubt affected different counties in different ways—reflecting, among other things, differences in trend of values of different types of property. But no adjustment could have been made that seemed likely to improve the results enough to be worthwhile.

(c) Private, non-commercial motor vehicles (represented by PMV), like household goods, were not identified separately in Tax Department reports for 1969-70; but, also like household goods, 1971 assessed value of all motor vehicles was

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6West Virginia, Tax Department, Local Government Relations Division, "Detailed Assessed Valuations of All Personal Property" (unpublished table, undated).
recorded for most counties--40, in this case--in an unpublished table.\(^7\)

The estimation problems, then, were two: (1) separate the value of PMV from total motor vehicle values for the 40 counties reporting motor vehicle values; and (2) estimate PMV for the 15 non-reporting counties. Because of the availability of details for each county on vehicle registrations by type by county,\(^8\) it was decided to approach the second estimation task first, estimating the total value of motor vehicles in the 15 non-reporting counties, and then separating PMV from the total for all 55 counties (task one) in the same manner.

To estimate total weighted assessed value of vehicles for each of the reporting counties, first the assessed value figures for the 40 reporting counties were weighted 2.0 (vehicles are class III and IV property) and summed; dividing the resulting figure by the weighted total assessed value of all property (WTAV) for the same 40 counties, vehicles were estimated to comprise 8.5 percent of total weighted property value. This percentage then was applied to the WTAV figure for each non-reporting county. As in the case of HHG, the crudeness of this methodology is recognized, and its reasonableness as a means of estimating non-existent data is asserted.

\(^7\)West Virginia Tax Department, "Detailed Assessed Valuations of All Personal Property."

\(^8\)West Virginia, Department of Motor Vehicles, Title and Registration Division, Quarterly Report of Vehicle Registration by Counties, Quarter and Fiscal Year Ending June 30, 1971, (unpublished tabulation, undated).
A number of steps (and assumptions) were necessary to arrive at weighted assessed values for "local" or private motor vehicles (PMV). Working from the report of vehicle registrations, the types representing non-commercial vehicles were first identified. This procedure was by no means clear-cut, since many vehicles have many uses; fortunately, however, private passenger cars were separately identified in the state data. In addition to private passenger cars, the local or private vehicles were assumed to include motorcycles, housetrailers, antique motor vehicles, farm trucks (all separately-identified registration classes), and a portion (estimated in the manner described below) of other trucks "other than those operated for compensation."

Using statewide data on the proportion of trucks in West Virginia used for "personal" or "agriculture" uses (i.e., local, in our terminology) and the ratio of cars to trucks in 1969,9 local or private trucks were estimated to amount to a number equal to 13 percent of private automobiles. Thus, a number of non-farm, not-for-hire trucks such that farm and other "personal" trucks would equal 13 percent of private autos was attributed to the "private" category in each county. Adding this number to the first five classes of "private" vehicles given above yielded an estimate of the number of private or non-commercial vehicles in each county, and this number was

then expressed as a percentage of total vehicles.

Next, the thorny problem of attributing values to the estimates of numbers of private vehicles was faced. Evidence on values of vehicles was found to be scarce, and especially evidence pertaining directly to the categories of registrations used. For this reason, and also because the ultimate interest was in taxable or assessed values, federal statistics on average West Virginia personal property taxes on various classes of vehicles\textsuperscript{10} were studied.

The classes of vehicles used in the federal data do not correspond well with those the state used in reporting registrations. Whereas registration statistics reported all private passenger cars in only one class, three classes were given in the tax statistics—and the average tax for the highest class was more than four times as great as for the lowest. Similarly, truck taxes were differentiated by engine type while registrations were not. Moreover, some types of vehicles were entirely omitted from the tax statistics.

The best use of the tax statistics—which showed some truck taxes being more than double the highest automobile taxes (and nearly 10 times the lowest automobile tax), while other truck taxes were about one-fourth the highest automobile tax—seemed

to be to get a rough feel for the relative magnitudes involved. Eventually, relying largely on judgment, it was decided that non-local vehicles would be weighted three times as heavily as local ones.

Thus, the local vehicles were weighted 1.0 and the non-locals 3.0 to arrive at estimated shares of motor vehicle values. The percentages of motor vehicle values estimated for each county in this manner were then applied to the (weighted) total assessed values of motor vehicles in the respective counties, which yielded estimates of PMV for each county.

(d) Agricultural personal property (AGPP) values for 46 reporting counties were obtained from the unpublished table of detailed personal property values cited above in b and c, and were used directly after weighting by 0.5.

It did not seem reasonable to estimate the value of agricultural personalty for the nine non-reporting counties by relating such property to some other class of property, given the differences in agriculture's significance among counties. Therefore, the percentage of each county's employed workers employed on farms was calculated from 1970 census data; then for a county not reporting agricultural personal

11West Virginia Tax Department, "Detailed Assessed Valuations of all Personal Property."

property value, the average relationship between agricultural personal property value and total class I value in three other (reporting) counties having about the same percentage of employment in agriculture was used to estimate the value of AGPP. (Agricultural personal property, all class I, was weighted by 0.5.)

While there is considerable room for error in this procedure, it at least has the merit of taking account of the relative importance of agriculture in each county. Moreover, any error is not likely to have seriously affected the total value of local property because of the relative smallness of agricultural property values in most counties.

(e) As with the three classes of personal property treated above, the values of apartments and other rental housing (APTS) were not given in published reports; moreover, because such housing is real property, the values were not included in the unpublished table used in b, c, and d. Fortunately, however, it was learned that detailed breakdowns of the basic appraised values of real property by county were available in West Virginia Tax Department files for a period starting with assessment year 1970.13

The values of APTS in class III and in class IV were

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13Unpublished property appraisal work sheets for the period June, 1969, through June, 1972, from the files of the Local Government Relations Division, West Virginia Tax Department (undated).
separately estimated for assessment year 1969, county-by-county, by projecting backward from the assessment year 1970 appraised values on the basis of the average annual change exhibited by the three years' data available. These estimates of appraised values then were converted to assessed values by multiplying them by the appropriate (class III or class IV) county ratios of assessed-to-appraised values for assessment year 1969.\(^{14}\) Adding the class III and class IV assessed value estimates and weighting them by 2.0 yielded the needed estimates of apartment and rental housing values.

Differences among counties in rates of change in appraised values of APTS seemed to justify the extra effort of projecting from 1970 values back to 1969, and converting them to assessed values was made simple by the availability of ratios of assessed-to-appraised values. Applying these ratios for entire classes to a portion of those classes, albeit crude, was the best adjustment possible with available data.

Summation within individual counties of the weighted assessed values estimated in steps a through e, above, gave estimates of total weighted local assessed value (WLAV). Subtracting WLAV from WTAV and dividing the difference by the number of families reported in each county by the 1970 census\(^ {15}\) gave the values of variable \(X_2\), non-local


weighted assessed property value per family (EXPORT-$). Variable $X_3$, EXPORT-\%, was gotten by dividing non-local weighted assessed property value (WTAV minus WLAV) by total weighted assessed property value and multiplying the result by 100. In symbols:

\[
WLAV = (\text{RES & AG}) + \text{HHG} + \text{PMV} + \text{AGPP} + \text{APTS}
\]

\[
\text{WTAV} - \text{WLAV}
\]

\[
\frac{\text{EXPORT-$$}}{\text{number of families}} = \frac{\text{WTAV} - \text{WLAV}}{\text{number of families}}
\]

\[
\text{EXPORT-\%} = \frac{\text{WTAV} - \text{WLAV}}{\text{WTAV}} \times 100.
\]

**Benefit spillouts**

$X_4$: 1970 population as a percentage of 1960 population (POP70/60).—This variable, given in percentage terms, was calculated by dividing 1970 population by 1960 population\(^\text{16}\) and multiplying the ratio by 100.

The values of $X_4$ are presented in the fourth column of Table 8.

$X_5$: Percent population loss through net migration (NETMIGR).—The values of $X_5$ given in the fifth column of Table 8 were calculated from 1960 census data for state economic areas (SEAs) as follows: net migration between 1955 and 1960 divided by 1960 population\(^\text{17}\)

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multiplied by 100. (Use of 1955 population for the denominator would have been preferable, but such information was not available. And because simply adding algebraically the population change through net migration to 1960 population would have accounted for only a portion of the 1955-60 population change, this was not done.) Signs have been omitted because all nine West Virginia SEAs—which range in size from one county (Kanawha, Charleston SMSA) to 16 counties—experienced net population loss through migration between 1955 and 1960.

Use of 1955-60 data for SEAs was initially justified by the facts that (a) 1970 census migration data were not available when data for the current research were being prepared, and (b) SEAs were the smallest areas for which migration data were reported in the 1960 census. The more recent (1965-70) data from the 1970 census was brought to the author's attention after the regressions had been run (see U.S., Department of Commerce, Bureau of the Census, Census of Population and Housing: 1970, General Demographic Trends for Metropolitan Areas, 1965 to 1970, Final Report PHC(2)-50, West Virginia [Washington, D.C.: Government Printing Office, 1971], Table 3, pp. 11-12). The correlation between net population change due to net migration (the 1965-70 county-level data) and net change due to all causes (POP70/60) was found to be 0.958. The regressions were not rerun to incorporate the county-level net migration statistics, since new runs using these data would not have differed materially from the runs using POP70/60.

18 In the case of net migration data, this statement is not wholly accurate, although it is in the case of gross out-migration statistics. A careful search for county-specific migration information prior to preparation of data for the present research proved fruitless, but the availability of net migration statistics for individual counties from the 1970 census was brought to the author's attention after the regressions had been run (see U.S., Department of Commerce, Bureau of the Census, Census of Population and Housing: 1970, General Demographic Trends for Metropolitan Areas, 1965 to 1970, Final Report PHC(2)-50, West Virginia [Washington, D.C.: Government Printing Office, 1971], Table 3, pp. 11-12). The correlation between net population change due to net migration (the 1965-70 county-level data) and net change due to all causes (POP70/60) was found to be 0.958. The regressions were not rerun to incorporate the county-level net migration statistics, since new runs using these data would not have differed materially from the runs using POP70/60.

19 U.S., Department of Commerce, Bureau of the Census, Census of Population: 1970, Subject Reports, Migration Between State Economic Areas, Final Report PC(2)-2E (Washington, D.C.: Government Printing Office, 1972), Table 2, pp. 35-36. Had the SEA data been used in final regressions, it would have been desirable to substitute the 1965-70 data for the 1955-60 series since the correlation between the two periods' figures was found to be only 0.633. In the case of
were not substituted when they became available (after the regressions had been run) because available evidence suggested the SEA data were not good substitutes for county-level data,\textsuperscript{20} which led to the decision not to use NETMIGR in the final regressions.

\begin{itemize}
\item \textbf{\textit{X}_6:} Percent population loss through out-migration (OUTMIGR).
\end{itemize}

This variable differs from \textit{X}_5, NETMIGR, only in the use of gross out-migration\textsuperscript{21} in the numerator. The rationale for using 1960 census gross out-migration (OUTMIGR, the next-considered variable) the correlation between the figures for the two periods was found to be 0.733.

\textsuperscript{20}The correlation between SEA-based NETMIGR and county-specific POP70/60 was found to be -0.591 (see Table 9, below), while the correlation between population change due to net migration between 1965 and 1970 using county-level detail (U.S. Census Bureau, Census of Population and Housing: 1970, General Demographic Trends for Metropolitan Areas, 1965-1970, West Virginia, Table 3, pp. 11-12) and population change from all sources between 1960 and 1970 (POP70/60) was found to be 0.958.

Given the virtual identity of relationships among county areas for net migration-related and total population change, plus the finding (reported in the preceding footnote) that the 1955-60 and 1965-70 net migration statistics for SEAs correlate positively and at a rather high level, it seems reasonable to interpret the high negative correlation between NETMIGR and POP70/60 (noted above) as evidence of the inappropriateness of imputing average SEA experience to each county within an SEA. This interpretation is reinforced when one notes, for example, that Putnam County, which had the largest percentage gain in population between 1960 and 1970 (POP70/60 value of 117.2 percent), and Webster County, which had one of the largest percentage losses in population between 1960 and 1970 (POP70/60 value of 71.5 percent), each had the same migration-related population loss (NETMIGR value of seven percent) imputed to them using the SEA-based data (see Table 8, below).

\textsuperscript{21}U.S. Census Bureau, Census of Population: 1960, Mobility for States and Economic Areas, Table 31, p. 183.
data is the same, and the same considerations that led to the conclusion that SEA-based data could not appropriately be used to represent single counties in the case of NETMIGR also are applicable here.

The values of \( X_6 \) are in the sixth column of Table 8.

\[ X_7: \text{Percent of occupied housing units occupied by owners (OWNEROCC).} \]

This variable expresses owner-occupied housing units as a percentage of total occupied, year-around housing units.\(^{22}\)

The denominator was restricted to occupied units only to avoid differences in population change—which are measured by other variables—and concomitant vacancy rates. Similarly, seasonal housing units were omitted to avoid picking up differences in significance of tourism among the counties.

The values of \( X_7 \) are in the seventh column of Table 8.

**Fiscal ability**

\[ X_9: \text{Assessed value of local property per family (PROPERTY).} \]

This variable expresses in dollars per family taxable "own" or local wealth of the county—described in steps a through e, above, in conjunction with variables \( X_2 \) and \( X_3 \), except without the weights in this case. (Unweighted values were used here since the different tax rates applicable to the various classes of property, although indicative of differences in revenue-raising potential from the standpoint of the taxing jurisdiction and tax costs from the standpoint

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of the taxpayer, have no bearing on the fiscal capacity of families.)
Number of families\textsuperscript{23} was used in the denominator.

Variable $X_g$ is presented in the eighth column of Table 8.

$X_g$: Total local non-school taxes per family (TTOVRBUR).—This variable, a "total-tax" measure of municipal overburden, expresses total local non-school taxes (property and non-property) as a dollar amount per family.

The only known source of published county-level information on total local taxes is the \textit{Compendium} volume of the quinquennial Census of Governments, the most recent of which (1967) contains data for 1966-67.\textsuperscript{24} Total local taxes are subdivided only into "property" and "other" in the \textit{Compendium}.

Checking \textit{Compendium} property tax figures against state-reported figures for the same year\textsuperscript{25} revealed discrepancies in some counties that seemed too large to be explained by the fact that collections were given in the census data while taxes levied were reported in the state report. With census data differing from actual property taxes reported by the state by 10 percent or more in nearly half the .

\footnotesize
\begin{itemize}
\item \textsuperscript{25}West Virginia, Tax Department, \textit{Thirty-Second Biennial Report of the Tax Commissioner} (Charleston, undated), Table A, pp. 40-464.
\end{itemize}
counties—and by 50 percent or more in three counties—it was decided the census data on total property taxes should not be used. Still wishing to have an overburden measure based on total non-property and property taxes combined (TT), it was decided to use the state data on property taxes in 1966-67 (PT), together with all other local tax (OT) data from the Compendium report—in the hope that any errors in non-property taxes would be minimal. These data were merged to calculate total local non-school taxes, the numerator term, and the number of families in 1970\textsuperscript{26} was used in the denominator.

With subscripts T, S, and NS representing total, school, and non-school, respectively, and the letter F representing families, the formulation of $X_g$ is given as follows (all "other taxes" are non-school):

$$\frac{(PT_T + OT_T)}{F} - \frac{(PTS)}{F} = \frac{TT_{NS}}{F}.$$  

The values of $X_g$ (TTOVRBUR) are given in the ninth column of Table 8.

Use of 1969-70 tax data would have been preferable, but the required detail was not available for that year. Another potential weakness of the formulation of $X_g$ is the use of tax data from two different sources that employed different concepts. Again, however, there was no apparent practical alternative.

**X_{10}: Local non-school property taxes per family (PTOVRBUR).** -- This second overburden measure is based only on property taxes. It was calculated by dividing the total non-school property taxes levied in assessment year 1969\(^{27}\) by the number of families in 1970.\(^{28}\) The values, in dollars per family, are given in Table 8, column 10.

**X_{11}: Non-'marginal' intergovernmental aid per family (NNMAR-AID).** -- As explained in Chapter 3, it is conceptually desirable to separate intergovernmental aid into two classes: (1) aid that, through local matching or maintenance-of-effort requirements, may be expected to affect marginal quantities and the conception of "price" by local school district residents; and (2) aid that is granted without maintenance-of-effort and/or local matching requirements.

Based on various descriptions of state and federal aid programs and talks with several education finance specialists at both the state (West Virginia and Ohio) and federal levels, it was determined that the dividing line between the aid programs falling into the "marginal" and non-"marginal" categories is roughly the distinction between state and federal aid. The state programs, being non-marginal in character, were placed in variable \(X_{11}\), together with four federal programs (in-lieu-of-taxes, forest lands, impacted areas, and civil defense). The marginal aid variable, \(X_{23}\), is comprised of the

\(^{27}\)West Virginia Tax Department, *Thirty-Third Biennial Report*, Table B, pp. 36-147.

federal aid programs other than the four listed above, and is described later in this appendix.

The calculation of $X_{11}$ was straightforward, with total aid for 1969-70 from the four federal and all state programs\(^{29}\) being the numerator term, and number of families\(^{30}\) being the denominator.

The values of $X_{11}$, expressed in dollars per family, are given in the eleventh column of Table 8.

$X_{12}$: Median family income (INCOMEMD).--The median income values for each county were taken directly from a 1970 census report,\(^{31}\) and entered in the twelfth column of Table 8.

$X_{13}$: Percentage of families with income $\geq$ $15,000 or over (INCOMEHI).--The percentage of families in each county having total income greater than or equal to $15,000 was calculated from 1970 census data,\(^{32}\) as follows:

$$\frac{\text{number of families with income } \geq$ $15,000}{\text{number of families}} \times 100.$$
The resulting percentages are given in Table 8, column 13.

\[ X_{14}: \text{Percentage of families with income less than $3,000 (INCOMELO).} \]

The total number of families with income below $3,000 as reported in the 1970 census,\(^{33}\) was divided by the number of families.\(^{34}\) The resulting figures, converted to percentages, are given in the fourteenth column of Table 8.

Other demand or taste measures

\[ X_{15}: \text{Percentage of children under 18 years of age (CHILD-18).} \]

This percentage also was calculated directly from 1970 census data on the number of families with children under age 18 (numerator) and the number of families (denominator).\(^{35}\) The percentage figures for the 55 counties are given in the fifteenth column of Table 8.

\[ X_{16}: \text{Average number of public school pupils in ADM per family (ADM/FAM).} \]

This variable is the ratio of public school average daily membership (ADM) in 1969-70\(^{36}\) to the number of families in 1970.\(^{37}\)

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This ratio is given in column 16 of Table 8.

\[ X_{17}: \text{Public school pupils in ADM as percentage of total (PUBLICADM).--This variable is the product of 100 times the ratio of public elementary and secondary average daily membership (ADMp) to the total of public elementary and secondary ADM plus non-public elementary and secondary ADM (ADMNp):} \]

\[ \frac{\text{ADM}_p}{\text{ADM}_p + \text{ADM}_{NP}} \times 100. \]

The \( \text{ADM}_p \) term was obtained directly from West Virginia Department of Education reports,\(^{38}\) but non-public ADM was not reported. A county-by-county tabulation of non-public school enrollments was available,\(^{39}\) however, and \( \text{ADM}_{NP} \) was estimated to be 97 percent of enrollment for each county. Support for this procedure was gained from statements by West Virginia and Ohio education officials that public ADM is a rather constant percentage of enrollment; the specific percentage used here was calculated from state-level 1969-70 ADM and enrollment figures for West Virginia.\(^{40}\)

The values of variable \( X_{17} \) are given in Table 8, column 17.

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$X_{1q}$: Percentage of population that is non-white (NONWHITE).--This percentage was calculated from 1970 census data on total and non-white population by county.\textsuperscript{41} This variable is found in Table 8, column 18.

$X_{1q}$: Median years of schooling, population aged 25 years and over (MEDYRSED).--The median years of school completed for the population aged 25 and over was calculated for each county using 1970 census statistics. Specifically, the values of $X_{1q}$ are the averages of the educational attainments of males and females in this age group weighted by their respective shares of population of this age.\textsuperscript{42} The values calculated are given in column 19, Table 8.

$X_{2q}$: Percentage of population aged 25 years and over with 16 or more years of education (EDUC16+).--To calculate this percentage, the 1970 census statistics on the numbers of males and females aged 25 years and over who had completed 16 or more years of schooling were summed within each county and divided by the sum of males and females aged 25 years and over in the respective counties.\textsuperscript{43} Multiplying the resulting ratios by 100 yielded the percentage figures entered in the twentieth column of Table 8.

\textsuperscript{41}U.S. Census Bureau, Census of Population: 1970, General Population Characteristics, West Virginia, Table 34, pp. 84-85.

\textsuperscript{42}U.S. Census Bureau, Census of Population: 1970, General Social and Economic Characteristics, West Virginia, Table 120, pp. 289-93.

\textsuperscript{43}U.S. Census Bureau, Census of Population: 1970, General Social and Economic Characteristics, West Virginia, Table 120, pp. 289-93.
X21: Percent of population in urban areas (URBAN).--This variable was calculated directly from 1970 census data by subtracting from 100 percent the sum of the percentages of population living in rural farm and rural nonfarm areas.44 The residual "urban" areas basically are places with 2,500 or more residents.45 The values of variable X21 are presented in column 21 of Table 8.

Price

X22: Index of relative per pupil costs (CSTINDEX).--Estimates of relative per-pupil costs for full-time-equivalent pupils in each of several educational programs are presented in a report of the National Educational Finance Project (NEFP).46 Enrollment statistics for 1969-70 for West Virginia school districts for each of the categories in the NEFP index were sought, but data were obtained for only three of the major categories: elementary pupils, secondary pupils,47 and vocational course enrollments.48


48Compiled from a computer print-out prepared by the West Virginia Department of Education, giving vocational education teacher assignments and enrollments by section and by school district for school year 1969-70.
To make the statistics comparable, it was necessary to convert elementary and secondary ADM numbers to enrollments (which was accomplished by dividing through by the 0.97 conversion factor discussed above in connection with variable \( X_{17} \)) and to convert the vocational course enrollments into full-time student equivalents. The latter conversion was accomplished by calculating the statewide average number of course enrollments per pupil in secondary grades (5.8) from published data for the state,\(^{49}\) and dividing this number into the total vocational enrollments per county, or school district.

To force the sum of vocational and non-vocational enrollment (\( SP_V \) and \( SP_{NV} \), respectively) to equal the total of known secondary enrollment (\( SP_T \)), non-vocational enrollment was taken to be the residual of total secondary enrollment less full-time equivalent vocational enrollment in each county (\( SP_T - SP_V = SP_{NV} \)). No further modification of elementary enrollments (EP) was needed. Thus, the NEFP indexes of relative costs for independent school districts\(^{50}\) of pupils in basic elementary, basic secondary, and vocational programs were applied to the estimated numbers of students in each, and the sum of these products was then divided by the numbers of students in the three categories:

\[
\frac{EP(1.0) + SP_{NV}(1.28) + SP_V(1.81)}{EP + SP_{NV} = SP_V}.
\]


\(^{50}\)NEFP, Alternative Programs for Financing Education, Table 6-2, pp. 160-62.
The resulting ratios are given in column 22, Table 8.

\( X_{23} \): "Marginal" intergovernmental aid per pupil in ADM (AIDAFMAR).--As noted above in the discussion of variable \( X_{11} \), all but four categories of federal aid were placed in the category of aid affecting marginal values and prices for local school districts because of the requirements of local matching and/or maintenance of effort that typically accompany federal aid. The amounts of such aid received in 1969-70 by West Virginia school districts\(^{51}\) were divided by the numbers of pupils in ADM.\(^{52}\)

The dollars-per-pupil figures calculated in this manner are presented in the next-to-last column of Table 8.

Quality

\( X_{24} \): Average teacher salary (SALARY).--The average salaries of teachers in 1969-70 in West Virginia's 55 school districts were entered in the last column of Table 8 directly from a state report.\(^{53}\)

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TABLE 7.--Definitions, Units, and Symbols for Dependent and Independent Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Units</th>
<th>Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>(X_1)</td>
<td>Total local public school taxes per pupil in ADM</td>
<td>$/pupil</td>
</tr>
<tr>
<td>(X_2)</td>
<td>Non-&quot;local&quot; weighted assessed value per family</td>
<td>$/family</td>
</tr>
<tr>
<td>(X_3)</td>
<td>Non-&quot;local&quot; weighted assessed value as percent of total weighted assessed values</td>
<td>%</td>
</tr>
<tr>
<td>(X_4)</td>
<td>1970 population as percent of 1960 population</td>
<td>%</td>
</tr>
<tr>
<td>(X_5)</td>
<td>Percent population loss through net migration</td>
<td>%</td>
</tr>
<tr>
<td>(X_6)</td>
<td>Percent population loss through out-migration</td>
<td>%</td>
</tr>
<tr>
<td>(X_7)</td>
<td>Percent of occupied housing units occupied by owners</td>
<td>%</td>
</tr>
<tr>
<td>(X_8)</td>
<td>Assessed value of &quot;local&quot; property per family</td>
<td>$/family</td>
</tr>
<tr>
<td>(X_9)</td>
<td>Total local non-school taxes per family</td>
<td>$/family</td>
</tr>
<tr>
<td>(X_{10})</td>
<td>Local non-school property taxes per family</td>
<td>$/family</td>
</tr>
<tr>
<td>(X_{11})</td>
<td>Non-&quot;marginal&quot; intergovernmental aid per family</td>
<td>$/family</td>
</tr>
<tr>
<td>(X_{12})</td>
<td>Median family income</td>
<td>$/family</td>
</tr>
<tr>
<td>(X_{13})</td>
<td>Percent of families with income $15,000 or over</td>
<td>%</td>
</tr>
<tr>
<td>(X_{14})</td>
<td>Percent of families with income under $3,000</td>
<td>%</td>
</tr>
</tbody>
</table>
### TABLE 7.--(continued)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Units</th>
<th>Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>(Other Demand or Taste Measures)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( X_{15} ) Percent of families with children under age 18</td>
<td>%</td>
<td>CHILD-18</td>
</tr>
<tr>
<td>( X_{16} ) Average number of public school pupils in ADM per family</td>
<td>ratio</td>
<td>ADM/FAM</td>
</tr>
<tr>
<td>( X_{17} ) Public school pupils in ADM as percent of total</td>
<td>%</td>
<td>PUBLICADM</td>
</tr>
<tr>
<td>( X_{18} ) Percent of population non-white</td>
<td>%</td>
<td>NONWHITE</td>
</tr>
<tr>
<td>( X_{19} ) Median years of schooling, population aged 25 and over</td>
<td>years</td>
<td>MEDYRSED</td>
</tr>
<tr>
<td>( X_{20} ) Percent of persons aged 25 and over with 16 or more years of schooling</td>
<td>%</td>
<td>EDUC16+</td>
</tr>
<tr>
<td>( X_{21} ) Percent of population in urban areas</td>
<td>%</td>
<td>URBAN</td>
</tr>
<tr>
<td><em>(Price)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( X_{22} ) Index of relative per pupil costs</td>
<td>ratio</td>
<td>CSTINDEX</td>
</tr>
<tr>
<td>( X_{23} ) &quot;Marginal&quot; intergovernmental aid per pupil in ADM</td>
<td>$/pupil</td>
<td>AIDAFMAR</td>
</tr>
<tr>
<td><em>(Quality)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( X_{24} ) Average teacher salary</td>
<td>$/teacher</td>
<td>SALARY</td>
</tr>
</tbody>
</table>
TABLE 8.--Values of Dependent and Independent Variables, a West Virginia Counties

<table>
<thead>
<tr>
<th>County</th>
<th>$X_1$</th>
<th>$X_2$</th>
<th>$X_3$</th>
<th>$X_4$</th>
<th>$X_5$</th>
<th>$X_6$</th>
<th>$X_7$</th>
<th>$X_8$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOCTAX/P ($)</td>
<td>EXPORT- ($)</td>
<td>EXPORT- (%)</td>
<td>POP70/60 (%)</td>
<td>NETMIGR (%)</td>
<td>OUTMIGR (%)</td>
<td>OWNEROCC (%)</td>
<td>PROPERTY ($)</td>
</tr>
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<td>Barbour</td>
<td>106</td>
<td>9,046</td>
<td>59.1</td>
<td>90.7</td>
<td>7.1</td>
<td>16.0</td>
<td>65.5</td>
<td>5,147</td>
</tr>
<tr>
<td>Berkeley</td>
<td>232</td>
<td>8,612</td>
<td>45.0</td>
<td>107.6</td>
<td>1.9</td>
<td>12.4</td>
<td>62.8</td>
<td>7,605</td>
</tr>
<tr>
<td>Boone</td>
<td>179</td>
<td>14,561</td>
<td>78.4</td>
<td>87.3</td>
<td>16.0</td>
<td>22.3</td>
<td>55.3</td>
<td>2,864</td>
</tr>
<tr>
<td>Braxton</td>
<td>115</td>
<td>10,328</td>
<td>66.5</td>
<td>83.6</td>
<td>7.0</td>
<td>18.3</td>
<td>64.5</td>
<td>4,306</td>
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<td>Brooke</td>
<td>334</td>
<td>15,300</td>
<td>67.4</td>
<td>102.6</td>
<td>1.5</td>
<td>14.2</td>
<td>74.1</td>
<td>5,981</td>
</tr>
<tr>
<td>Cabell</td>
<td>286</td>
<td>13,205</td>
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<td>5.7</td>
<td>17.6</td>
<td>59.2</td>
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</tr>
<tr>
<td>Calhoun</td>
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<td>14,106</td>
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<td>88.7</td>
<td>7.0</td>
<td>18.3</td>
<td>65.5</td>
<td>4,518</td>
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<td>Clay</td>
<td>103</td>
<td>11,805</td>
<td>73.0</td>
<td>78.1</td>
<td>7.0</td>
<td>18.3</td>
<td>54.7</td>
<td>3,148</td>
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<td>Doddridge</td>
<td>234</td>
<td>26,001</td>
<td>79.1</td>
<td>91.7</td>
<td>7.0</td>
<td>18.3</td>
<td>60.6</td>
<td>5,301</td>
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<td>Fayette</td>
<td>174</td>
<td>11,904</td>
<td>66.7</td>
<td>79.9</td>
<td>16.0</td>
<td>22.3</td>
<td>65.0</td>
<td>4,345</td>
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<td>Gilmer</td>
<td>164</td>
<td>22,974</td>
<td>77.9</td>
<td>96.7</td>
<td>7.0</td>
<td>18.3</td>
<td>58.5</td>
<td>5,317</td>
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<tr>
<td>Grant</td>
<td>472</td>
<td>35,077</td>
<td>83.5</td>
<td>103.6</td>
<td>7.9</td>
<td>17.6</td>
<td>68.5</td>
<td>5,837</td>
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<td>Greenbrier</td>
<td>117</td>
<td>10,204</td>
<td>58.4</td>
<td>93.2</td>
<td>7.9</td>
<td>17.6</td>
<td>63.7</td>
<td>5,906</td>
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<td>Hampshire</td>
<td>218</td>
<td>8,693</td>
<td>46.0</td>
<td>100.0</td>
<td>7.9</td>
<td>17.6</td>
<td>61.5</td>
<td>9,017</td>
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<td>Hancock</td>
<td>418</td>
<td>26,418</td>
<td>74.7</td>
<td>100.3</td>
<td>1.5</td>
<td>14.2</td>
<td>74.1</td>
<td>7,090</td>
</tr>
<tr>
<td>Hardy</td>
<td>172</td>
<td>11,844</td>
<td>59.7</td>
<td>95.1</td>
<td>7.9</td>
<td>17.6</td>
<td>63.8</td>
<td>7,463</td>
</tr>
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*aSee Table 7 for definitions and symbols.*
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<tr>
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<tr>
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<td>EDUC16+</td>
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<td></td>
<td></td>
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<td></td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSTINDEX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIDAFMAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
APPENDIX D

AN ATTEMPTED APPLICATION OF FACTOR ANALYSIS

Factor analysis is a statistical tool by which statistically independent forces underlying a set of data may be identified. Each such force constitutes a "factor" which is presented as a vector of numbers comprised of the "loadings" on each variable in the set of data subjected to the analysis. Thus, if there are 23 variables in the data set, each factor will have 23 loadings. The higher the absolute value of a loading, the more significant in the factor is the variable to which it pertains.

Because factor analysis is said to have the power not only to identify the number of independent statistical forces underlying a set of variables, but also to indicate the relative importance of each variable within each factor, it was felt that factor analysis might be useful in screening a relatively large number of variables (such as those described in Chapter 3 and Appendix C) to select a smaller number to represent the separate forces or factors. This was to be accomplished either by selecting the single variable with the highest loading in each factor or by constructing synthetic variables to represent the identified forces through merging two or more highly-loaded variables in each factor.
Twenty-three variables were submitted to factor analysis. The results are summarized in Table 10, which presents the loadings for each variable in each of three factors identified as being of interest.

### Table 10.—Varimax Loadings on Twenty-Three Variables in Each of Three Factors, West Virginia Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPORT-1</td>
<td>0.1190</td>
<td>0.8494*</td>
<td>-0.2073</td>
</tr>
<tr>
<td>EXPORT-2</td>
<td>0.2738</td>
<td>0.7740*</td>
<td>-0.0975</td>
</tr>
<tr>
<td>POP70/60</td>
<td>-0.1765</td>
<td>-0.0413</td>
<td>0.5585*</td>
</tr>
<tr>
<td>NETMIGR</td>
<td>-0.3801*</td>
<td>0.3282</td>
<td>-0.2440</td>
</tr>
<tr>
<td>OUTMIGR</td>
<td>-0.3592</td>
<td>0.3935*</td>
<td>-0.3131</td>
</tr>
<tr>
<td>OWNEROCC</td>
<td>-0.1078</td>
<td>0.1275</td>
<td>-0.1516</td>
</tr>
<tr>
<td>PROPERTY</td>
<td>0.4881*</td>
<td>0.6789*</td>
<td>0.3671*</td>
</tr>
<tr>
<td>TOVORBUR</td>
<td>0.7100*</td>
<td>0.0932</td>
<td>0.3450*</td>
</tr>
<tr>
<td>PTOVORBUR</td>
<td>0.6821*</td>
<td>0.4348*</td>
<td>0.3990*</td>
</tr>
<tr>
<td>NNMARAIM</td>
<td>-0.2648</td>
<td>0.1503</td>
<td>-0.6525*</td>
</tr>
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<td>INCOMEMEMD</td>
<td>0.2080</td>
<td>0.1152</td>
<td>0.0063</td>
</tr>
<tr>
<td>INCOMEHI</td>
<td>0.4192*</td>
<td>-0.0574</td>
<td>0.4470*</td>
</tr>
<tr>
<td>INCOMEMEO</td>
<td>-0.1350</td>
<td>0.0049</td>
<td>-0.3970*</td>
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<tr>
<td>CHILD-18</td>
<td>-0.1801</td>
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<td>-0.2263</td>
</tr>
<tr>
<td>ADM/FAM</td>
<td>-0.1821</td>
<td>0.3418</td>
<td>-0.5726*</td>
</tr>
<tr>
<td>PUBLICADM</td>
<td>-0.6030*</td>
<td>0.1831</td>
<td>-0.2873</td>
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<td>NONWHITE</td>
<td>-0.0734</td>
<td>0.0140</td>
<td>0.0856</td>
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<tr>
<td>MEDYRSED</td>
<td>0.1621</td>
<td>-0.1698</td>
<td>0.5550*</td>
</tr>
<tr>
<td>EDUC16+</td>
<td>0.0277</td>
<td>-0.1464</td>
<td>0.9051*</td>
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<td>CSTINDEX</td>
<td>-0.0264</td>
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<td>AIDAFMAR</td>
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<td>SALARY</td>
<td>0.3344</td>
<td>0.0867</td>
<td>0.3166</td>
</tr>
<tr>
<td>LOCTAX/P</td>
<td>0.4312*</td>
<td>0.4161*</td>
<td>0.4729*</td>
</tr>
</tbody>
</table>

*Statistically significant loading.
in the current research. Statistically significant loadings are indicated by an asterisk. (The variable-name symbols appearing in the table are generally those used elsewhere in this dissertation, but the exact identification of all the variables is not important to the current discussion.) Six factors were identified, but the loading on the variable intended as the dependent variable (LOCTAX/P) for later regression analyses (factor analysis does not distinguish among variables in this manner) was not significant in three; hence, interest centered on only those that seemed likely to be able to help "explain" variation in the dependent variable.

To be able to use factor analysis fruitfully, it is necessary that the researcher be able to identify conceptually what the underlying or unifying force is for each factor and to attach a meaningful label to it—such as fiscal capacity, taste for education, cost spillouts. This is done by scrutinizing the collection of variables with significant loadings, drawing upon one's knowledge of the data. If such a label cannot be attached to a factor, the factor becomes a rather meaningless set of numbers; analysis requires that the factor represent some meaningful concept.

The attempt to place meaningful labels on the factors presented in Table 10 is basically where the attempted use of factor analysis

1The variables submitted to factor analysis early in the quantitative portion of the research are basically those described in Appendix C, except that the final 24 variables include one additional variable (URBAN) and also incorporate some later changes in the formulations of a few variables.
broke down. In part, the difficulty of identifying the unifying theme of each factor arose from the particular sets of significantly-loaded variables in each. A very important part of the difficulty, however, was an inability to think of the factors as being truly independent, given the fact of significant loadings on several variables in each of two or more factors (see Table 10).

As a partial test of the independence of the three factors, the significantly-loaded variables in each factor were used as the independent variables in three separate regressions; LOCTAX/P was the dependent variable in all three. On the theory that three truly independent forces should have different explanatory powers, the calculated values (explained portion) of the dependent variable for each county were tabulated for each regression (i.e., each factor). Three plots were then made, plotting the calculated values from each regression against the calculated values from each of the others, in pairs.

None of the plots produced the sort of widely-dispersed, random scatter that was expected, and the plots for two factors (one and three) formed a nearly perfect straight line.

With this, the attempted use of factor analysis to screen the variables was abandoned. The screening process employed is described in Chapter 4.
APPENDIX E

SOME SUPPLEMENTAL REGRESSION RESULTS

Results for seven separate regression problems were presented and discussed in Chapter 4. The seven variables identified as "basic" in the first part of Chapter 4 were used in the first problem (problem A), and the basic variables with substitution of alternative measures for one or two variables were used in the next four problems (B-E). One additional variable of particular interest was added in each of the sixth and seventh runs (F and G).\footnote{Tables 2 and 4 (pp. 128 and 138) present the regression findings for these seven runs.}

The purpose of this appendix is to report some additional runs to supplement those included in Chapter 4. Accordingly, findings for such runs (problems H through N) are presented in Tables 11 and 12.

The format of Tables 11 and 12 is the same as that used in Chapter 4. Findings for an individual problem are contained in a single column. Coefficients for the individual variables are reported in separate rows, and T values are given below the regression coefficients (a value of 2.0 indicates statistical significance at the five percent level, while a value of 2.7 or above indicates significance at at least the one percent level). The first column in each table indicates the expected signs of the regression coefficients.
<table>
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<tr>
<th>Variable</th>
<th>Expected Sign</th>
<th>A</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
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<td>POP70/60</td>
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<td>0.0113</td>
<td>0.0118</td>
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<td>(2.2)</td>
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<td></td>
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<td>(0.0)</td>
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<tr>
<td>MEDYRSED</td>
<td>(+)</td>
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<td></td>
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<td>(0.5)</td>
</tr>
<tr>
<td>EDUC16+</td>
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</tr>
<tr>
<td>Adj. R^2</td>
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<td>.835</td>
<td>.831</td>
<td>.831</td>
<td>.829</td>
</tr>
</tbody>
</table>
### TABLE 12.

Regression Coefficients, Expected Signs, "T" Values, Constant Terms, and Adjusted Coefficients of Multiple Determination ($R^2$), Three Regression Problems for West Virginia

<table>
<thead>
<tr>
<th>Variable</th>
<th>Expected Sign</th>
<th>$L$</th>
<th>$M$</th>
<th>$N$</th>
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</thead>
<tbody>
<tr>
<td>Constant</td>
<td>(−)</td>
<td>81.213</td>
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</tr>
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<td>POP70/60</td>
<td>(+)</td>
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<td>0.8304</td>
<td>−0.3699</td>
</tr>
<tr>
<td>PROPERTY</td>
<td>(+)</td>
<td>0.0116</td>
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<td>0.0118</td>
</tr>
<tr>
<td>NNMARAI D</td>
<td>(−)</td>
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<td>−0.3259</td>
<td>−0.4862</td>
</tr>
<tr>
<td>INCOME HI</td>
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<td>8.0723</td>
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<td>(+)</td>
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</tr>
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<td>TTOVRBUR</td>
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</tr>
<tr>
<td>SALARY</td>
<td>(+)</td>
<td></td>
<td>0.0616</td>
<td></td>
</tr>
<tr>
<td>CSTINDEX</td>
<td>(+)</td>
<td></td>
<td></td>
<td>528.1648</td>
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<tr>
<td>Adj. $R^2$</td>
<td></td>
<td>.831</td>
<td>.879</td>
<td>.846</td>
</tr>
</tbody>
</table>
cients, and the bottom row in each presents the coefficients of multiple determination adjusted for degrees of freedom (adjusted R²) for the various problems.

Problem A, comprised of the seven basic variables, was the starting point for each of the seven supplemental runs reported here. The basic reason for this approach to presenting findings for additional variables was to determine whether the findings for the basic variables were sensitive to inclusion of other variables; findings for problem A are repeated in Table 11 to facilitate comparison. The "other variables" used and reasons for their inclusion were indicated in several footnotes in Chapter 4; in general, however, the variables added to the seven basic ones are those that have been standard in the education expenditure determinants literature but were screened out of the primary regressions in the current research for reasons given in the first section of Chapter 4.

Of the supplemental variables used, only two were found to be statistically significant. They are SALARY (average teacher salary, intended as a measure of educational quality) and CSTINDEX (a measure of the relative price of education per pupil), included in runs M and N, respectively. Each variable took the expected positive sign. As shown in Table 12, inclusion of SALARY altered the results for several other variables (in comparison with problem A results)—although the major findings of this research, pertaining to intergovernmental aid (AIDAFMAR and NNMARAID) and spillout of locally-imposed taxes (EXPORT-$) were unaffected. Inclusion of CSTINDEX in run N, however, did not alter the general findings obtained in problem A for any of
the variables.

For reasons indicated elsewhere (primarily Chapter 4), little weight should be attached to the runs including SALARY and CSTINDEX. SALARY, for example, is in some sense a composite variable representing many forces inseparably intertwined; for this reason, interpretation of its positive coefficient is ambiguous. Moreover, as shown in Table 9 in Appendix C, SALARY is highly correlated with some of the seven basic variables; thus, multicollinearity was a problem in run M. Although CSTINDEX does not correlate highly with the other variables, it exhibits little variability which, as noted in Chapter 4, could wreak havoc with the regression results of any model including it.

The other supplemental variables reported in Tables 11 and 12 (in problems H through L, respectively) are: PUBLICADM (public school pupils as a percent of total); OWNEROCC (owner-occupied housing units as a percent of occupied units); MEDYRSED (median educational attainment of the adult population); EDUC16+ (percent of adult population with 16 or more years of schooling); and TTOVRBUR (local non-school taxes per family). As noted above, none was found to be statistically significant; moreover, only MEDYRSED took the expected sign. The findings for the seven basic variables were generally unaffected--i.e., signs and statistical significance or non-significance did not change--by inclusion of any of these variables.

In summary, if problem M results are discounted because of the problems with the SALARY variable, the general conclusions for the
basic variables reported in Chapter 4 still appear valid. Even in run M, moreover, the major findings--those regarding the effects of tax exporting and regarding the differential effects of so-called marginal and non-marginal intergovernmental school aid--remained unaffected.
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