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THE SPATIAL DISTRIBUTION OF ELEMENTARY SCHOOL EXPENDITURES: A CASE STUDY FOR THE COLUMBUS, OHIO, CITY SCHOOL SYSTEM.

THE OHIO STATE UNIVERSITY, PH.D., 1979
THE SPATIAL DISTRIBUTION OF ELEMENTARY SCHOOL EXPENDITURES:
A Case Study for the Columbus, Ohio, City School System

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 Terry Matson, B.S. in Ed., M.A.

* * * * * *

The Ohio State University
1979

Reading Committee:
Kevin R. Cox, Ph.D.
Henry L. Hunker, Ph.D.
Edward J. Taaffe, Ph.D.

Approved by

Adviser
Department of Geography
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VITA

May 11, 1943. Born - Detroit, Michigan

1966. B. S. in Ed., State University of New York, College at Cortland

1967-1968. Graduate Teaching Assistant, Department of Geography, University of Hawaii, Honolulu, Hawaii

1968. M. A., Geography, University of Hawaii, Honolulu, Hawaii

1968-1969. Graduate Teaching Assistant, Department of Geography, The Ohio State University, Columbus, Ohio

1969-1972. Graduate Teaching Associate, Department of Geography, The Ohio State University, Columbus, Ohio

1972-1976. Instructor, Department of Geography, State University of New York, College at Cortland

1977. Graduate Teaching Assistant, Department of Geography, The Ohio State University, Columbus, Ohio

1977-present. Assistant Professor, Department of Geography, Memphis State University, Memphis, Tennessee

PAPERS

Paper given before the Conference on Computer Applications in Geography, October 1972, Department of Geography, SUNY-Albany, New York (abridged text was published)
PAPERS (continued)

Paper given before the Annual Meeting, Middle States Division, Association of American Geographers, October 1975, Grand Island, New York (full text was published)

"On the Application of SYMAP for Comparative Analysis", before the Annual Meeting, South East Region, Association of American Geographers, November 1977, Knoxville, Tennessee

"Perceived Place Utility Across the 'South' and the Effects of Home: an Arkansas example", before the Annual Meeting, Arkansas Geographical Society, April 1978, Conway, Arkansas

"Perceived Place Utility Across the 'South'", before the Annual Meeting, South West Region, Association of American Geographers, April 1978, Houston, Texas

PUBLICATIONS

Geography 220: Course Outlines and Notes, (Columbus, Ohio: Collegiate Publishing Company), 1971.


FIELDS OF STUDY

Major Field: Geography

Studies in Urban/Social Geography. Professors Lawrence A. Brown and Kevin R. Cox

Studies in Political Geography. Professor Kevin R. Cox

Studies in Resource/Environmental Management. Professor Henry L. Hunker
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Chapter One - Study Context

The initial inspiration for this dissertation topic can be traced to the work of several researchers from rather different specializations in the behavioral sciences. The common thread tying their individual endeavors together is evaluation of geographic distributions of public expenditures in urban areas of the United States. Specific points of departure include the work of Sexton (1964) on school expenditure disparities within school districts; that of Wilson and Banfield (1964) on voting in public expenditure referenda; that of Becker (1952) on the implications of teacher mobility for intra-district expenditure disparities; and finally, that of Harvey (1971) and Levy et. al. (1974) on the welfare effects of intra-urban variations in public service provision.\(^1\) These efforts, while originally independent of one another, have a number of concerns in common. This dissertation focuses more specifically on explaining discretionary school expenditure disparities across elementary schools in Columbus, Ohio. However, this range of literature contributed significantly to the hypotheses and methodology developed.

The research problem for this dissertation is focused on matters of the geography of, and socio-economic correlates for, school expenditures within a school system. This introduction continues in a presentation of a basis for interest in the contribution of each of these scholars to this effort. The underlying themes of each are put in present context; a general model for the redistribution of public expenditures on elementary education is given form in light of these
precedents. The data and methodological problems associated with this type of research are briefly presented. Finally, the form of the overall study to follow is presented.

POINTS OF DEPARTURE AND THEIR IMPLICATIONS

Sexton, in her study of expenditure disparities for a large, but unidentified urban school system in the Mid-West, presents results suggesting a socio-economic status (SES) bias in spending at the elementary school level. The distributions of a cross-section of educational services were presented for groupings of schools, each distinctive with respect to SES. Strong evidence revealed that school authorities systematically provided more educational expenditures for higher SES schools. These variations, or more probably, the perception of their existence across the city, are also an important factor in choice of residential location. We will test for the existence of similar variations in expenditure for the Columbus School System.

In light of these expenditure variations, the work of Harvey and Levy et. al. becomes pertinent. Both propose that metropolitan residents receive a net increment of positive and negative spillover effects depending on their relative residential locations. A metropolitan system of private and public activities defines a geographically variable environment, including variations in public expenditures. Harvey's real income and the "outcomes" of Levy et. al. depend, among other things, on the combination of accessibilities and proximities by a residential location. Both agree that the qualities and quantities of urban services have been biased so as to favor higher SES residential neighborhoods.
More specifically, Levy et. al. suggest that educational expenditures are an important source of disparities in "outcomes." Evidence for this contention is drawn from neighborhoods in Oakland, California. In addition, they provide some guidance towards explaining the nature of specific school expenditure disparities. A strong distinction is made between compensatory and discretionary funding of various school services. Compensatory funding of programs is biased in distribution by design; higher levels of support should favor lower SES schools by legislative intent. However, there has traditionally been little or no federal or state control over discretionary spending. When in the hands of middle and upper class school authorities, allocations in this expenditure category within a school district have tended to favor higher SES schools. Such disparities have commonly been explained as a by-product of racial and economic favoritism on the part of school authorities; and/or in terms of the higher costs of the college entrance programs which must be provided for the more middle class students.

Discretionary expenditures were also of interest to Becker in the study he carried out in the late 1940s. He suggests that elementary school teachers, themselves, are responsible for the majority of discretionary expenditure disparities. Differences in these expenditures between differing school districts can be explained by variations in the fiscal abilities necessary to support school programs. However, differences on a school-by-school basis within school districts require other explanations. In the latter case, teachers of similar qualifications and experience would receive the same wage and benefit package in any
school of a particular district.\textsuperscript{5} This has been the manner in which teacher salary schedules have been organized.\textsuperscript{6} According to Becker, however, teacher transfers allow different schools to accumulate more experienced and more qualified and, therefore, higher cost staff.

Spending differentials could therefore result from teacher preferences for assignment to particular school environments. Teachers seek assignments in higher SES schools because of their inherent desirability as teaching environments. School principals, of course, prefer to hire more qualified, experienced teachers. Consequently, lower SES schools are left to be staffed by less qualified teachers. If we follow Becker's lead, a majority of discretionary expenditure disparities within a school district could be determined through the differential wage requirements generated by teacher transfers. The only effect school authorities could have on these expenditure disparities, therefore, would result from changes in the rules governing teacher transfer mobility within their district. This has not occurred in the past. Testing for the expenditure effect of teacher transfers is a major thrust of this dissertation.

Wilson and Banfield's work on voting behavior on various public expenditure referenda provides the final point of departure for this dissertation. In reviewing voting on such issues, Wilson and Banfield noted that voters can be divided into three SES groups, each with varying preference schedules for public expenditures. They propose and, ultimately, prove that lower and higher SES voters can be depended upon to favor most public expenditure increases. More intermediate SES
voters oppose the expenditures the other groups favor. However, the lower SES voter is difficult to turn out for referenda; issues often fail, therefore.

A second matter concerning referenda votes is also raised, though less directly. This involves the basis for increased voter opposition to public expenditure issues in general, and for public school levies in Ohio, specifically. In their discussion of middle class fiscal conservatism in Cleveland, Ohio, in the early 1960s, Wilson and Banfield seem to be probing for the roots of the eventual "taxpayers' revolt." Much interest has been expressed in this phenomenon, particularly as it pertains to the results of more recent school referenda.

IMPLICATIONS FOR THE RESEARCH PROBLEM

The research cited brings together a number of themes necessary for the formulation of a research problem posed in this dissertation and for its eventual solution. The general focus is the distribution of discretionary expenditures on elementary school education in the Columbus School System. The other issues noted help give substance to this focus, both conceptually and methodologically.

The work of Sexton is significant for the methodological innovations ultimately proposed in this research. The results from her study are used as a benchmark for comparisons with later descriptions of service and expenditure disparities. Her arbitrary grouping of schools is a weakness, however, and has characterized most later attempts at research on school expenditure distributions.
An underlying reason for interest in school expenditure disparities is their welfare effects (whether actual or perceived.) Both Harvey and Levy et. al stress the potential effects of any long standing SES biases in educational spending. Certain neighborhoods (the lower SES school attendance areas) consistently receive lower levels of spending from governmental agencies. As we indicated earlier, Becker has suggested the pattern of teacher transfers as a major source of discretionary expenditure disparities.

The behavior of voters in school referenda is interesting for what it tells us about resident preferences for educational services. Several arguments have been presented in the literature concerning the SES bias in these preferences. Wilson and Banfield have suggested a reasonable argument for explaining voting behavior on governmental expenditures.

METHODOLOGICAL SHORTCOMINGS

All the major research cited suffers from a number of methodological shortcomings. In this dissertation, the intent is to introduce some methodological innovations into research on intra-urban expenditure disparities.

Data requirements have tended to make micro-scale studies attempting validation of SES disparities difficult. The major problem has resulted from lack of spatial correspondence and numerical compatibility between censuses and various functional units or territories used by governmental agencies (e.g. voting precincts, school attendance areas, sewer districts, or other special benefit districts.)
Two procedures have been used in the literature to overcome this problem. The first requires arbitrary allocations of census-based socio-economic attributes to service provision units. A school attendance area is assumed to encompass certain census tracts and a composite social or economic condition for those tracts assigned to that school. This procedure requires only the subjective fitting of one geography to another and a simple averaging process.

A second approach requires reaggregation of both census and school attendance area geographies to some higher level at which spatial correspondence can be achieved. Whole municipalities have generally been the level chosen on the basis of this criterion; no perfect spatial correspondence has been found to exist between census tract geography and school attendance areas within municipalities.

Either strategy has made rigorous testing of hypotheses concerning the nature of expenditure disparities difficult. Of particular concern are the effects of reaggregation on the variation recorded in data sets and the procedures for subjecting this variation to statistical analysis. The reaggregation common in school expenditure studies has tended to filter out the local scale variation in expenditure measures and their SES correlates. By also reducing the number of observations, actual statistical tests for hypotheses have been severely constrained; correlation analysis cannot be legitimately used in these evaluations as a result of inadequate numbers of observations.

The problems of school reaggregation have been approached in a different manner in this dissertation. A technique is presented which
allows census data to be generalized to individual elementary schools: the use of continuous density surfaces. This allows much greater flexibility in data organization than enjoyed by earlier studies.

Aside from allowing spatial interpolations of census data to many forms of school information at the neighborhood level of aggregation, the compatible surface methodology has other benefits. It allows measures of dispersion from a measure of central tendency and correlation in expenditure research when neither had been possible previously. By permitting the use of smaller aggregations, it should also avoid some of the risks of ecological fallacy often encountered in expenditure studies. The use of compatible surfaces is a compromise between the grossness of data used in previous studies and the extremely costly data requirements involved for a sample survey focused on similar issues.

A PLAN OF ATTACK

This dissertation formulates a model for the allocation of discretionary expenditures across elementary schools in an urban school system. The second chapter reviews the literature on school expenditure disparities. Particular note is taken of changes in the nature of their distribution across schools over the years since compensatory funding in public schools increased in importance.

On the basis of suggestions made in that literature, a teacher transfer mobility model is proposed. This model suggests that senior teachers gain transfers to desirable schools. These transfers, and a salary schedule dependent on teacher qualifications and experience,
gain superior funding for staff in such schools. In addition, other activities of teachers, of parents of school age children, and of voters are identified relative to the effects each may have on school expenditure disparities. Concluding portions of the chapter state a series of propositions concerning the process by which school expenditure disparities based on SES may have come to exist.

Chapter Three describes the methodology employed. Columbus and the Columbus schools are justified as the context for a study of expenditure disparities. Interest then shifts to data use and presentation of the compatible surfaces (SYMAP) methodology. This procedure is meant to solve the longstanding problems of data compatibility and testing encountered in most studies of public expenditures. Actual data sources used in this research are noted. In conclusion, formal hypotheses are presented.

The next four chapters operationalize the testing of postulates previously noted. Chapter Four presents evidence related to the existence of SES-biased expenditure disparities across school attendance area populations. For Columbus, some weakly organized disparities in discretionary funding are noted. However, compensatory funding is found to dominate any overall expenditure disparities which may exist, even for the 1970 academic year. This effect is found at an earlier time than expected. Variations of expenditure measured on a school-by-school basis are found to have a large unexplained component. That discovery substantiates the need to organize data sets at a micro-scale.
In Chapter Five, the degrees of correlation between certain teaching conditions on the one hand and SES across schools on the other hand are reported. These correlations tend to conform with assumptions about teacher perceptions of the desirability of different school assignments. They also support an underlying premise of an SES-bias in teacher transfers.

Chapter Six presents results tending to both contradict and support a teacher mobility model of expenditure disparities. Because of data limitations, the tests in this chapter proceed along two tracks. In evaluating distributions of staffing characteristics across public schools, it is discovered that there is little evidence to substantiate the existence of expenditure effects consistent with an SES-bias in teacher transfers. However, it is then noted in a separate analysis that teachers have "intent" to transfer in the manner consistent with expectations, given the choice. Those results suggest a conscious effort by school authorities to circumvent the expenditure effects of teacher transfers.

Voter preferences for school expenditure levels in Columbus are presented in Chapter Seven. The Wilson and Banfield (1964) notions of three groupings of voters and their responses to these issues are not substantiated.

A concluding chapter is presented, noting some implications of this analysis. Suggestions for policy, consequences of results, and further research direction on these topics are discussed.
1. Those "welfare effects" can be the result of additions and subtractions of value from the place utility of a residential location within an urban system. There is a large, and recent, literature concerning the effects of location on place utility. This work is summarized in part by: Kevin R. Cox, Conflict, Power and Politics in the City, (New York: McCraw-Hill), 1973; Julian Wolpert, Anthony Mumphrey, and John Seley, Metropolitan Neighborhoods: Participation and Conflict over Change. (Washington: Association of American Geographers), 1972; and David Harvey, Society, the City and the Space Economy of Urbanism, (Washington: Association of American Geographers), 1972.


3. Costs and/or benefits accruing to a location in space are a result of a multitude of socio-economic forces. These are summarized in Harvey (1972) as a general model for measurement of the net effects of both private and public economic activities, and the social system in operation. Those effects can be ubiquitous over space (the same everywhere) or localized from point sources. In the latter case varying locations of land use relative to sources of positive or negative externality can have important consequences for the users of the land.

4. Discretionary funding is spent at the direction of local school authorities on programs as they see fit. Compensatory funding, usually from state or federal sources, is earmarked to be spent for specific educational programs and are normally targeted for the disadvantaged students of a district. Local authorities are not to mis-allocate these compensatory monies to programs which would not contribute to an extraordinary effort for those students.

5. Few school districts have formally established "battle pay" or other economic incentives for teaching in the less desirable schools. Therefore, teachers should not systematically receive differential pay in a school assignment when compared to other similar teachers within that district.

6. Within a school district, salary is determined by teacher qualifications (credit hours attained and/or degrees completed) and their teaching experience. A base salary, and all increments on the base, are established on a district-wide basis and are usually a product of collective bargaining for the large city school districts.

Chapter Two - The Distribution of Funding

Within School Systems: Description and Model

The introductory chapter has developed the theme of the distribution of school expenditures across elementary schools within school systems. Specifically, that theme concerns the nature of expenditure inequalities within school systems. This chapter develops a model to explain the existence of expenditure disparities and identifies certain propositions to be tested as hypotheses.

Disparities in expenditure distributions across schools within a school district are not as easily dismissed as those existing between states and between school districts within states. A listing of forces operating within school systems must go far beyond the economic determinism which has commonly been used to explain the existence of inter-state and inter-district variations in school spending.\(^1\) Discussion of possible causes contributing to intra-school district disparities must include a considerably more lengthy evaluation because of the complexity and subtlety of the forces operating there. Simplistic explanations to be viewed with extreme caution include (i) a purely racial, ethnic, religious, locational, or capricious bias on the part of a central school administration and (ii) an income determinism. Evidence concerning these alternative explanations has proved to be far from conclusive; this is particularly true in recent research. A variety of data problems, conceptual inconsistencies, and issues of a purely methodological nature have made it difficult to evaluate the origins and spatial distribution
of expenditure differentials across the schools of a district.

Policies of educational discrimination would seem too obvious and it is doubtful, therefore, that they could have survived the scrutiny of the numerous discrimination cases of the 1950s and 60s. If one assumes that expenditure inequalities between schools continue to exist, it would seem reasonable that there are alternative explanations for them. Those of concern here include the response of school authorities to the bargaining resources of middle-class parents, the various effects of teacher seniority and the district salary schedule, and the lobbying activities of middle-class parents. Each of these alternatives is shown to have similar effects upon school expenditure distributions within a school district. It is suggested that each is capable of creating an expenditure disparity favoring children from upper and middle-class families at the expense of those from lower-class families.

As context for a discussion of the forces influencing the creation of such expenditure disparities, we now proceed to review literature concerning their actual existence and specific spatial distributions. Having achieved this end, a series of alternative processes capable of creating such expenditure disparities will be postulated. Based on this conceptualization, a series of propositions are suggested; these in turn will be the source of working hypotheses. Each of these hypotheses will later be tested for validity across elementary schools of the Columbus (Ohio) City School System.
THE EVIDENCE FOR EXPENDITURE DISPARITIES

It has been a common assumption among social scientists and parents of school age children that school funds are allocated in an unequal pattern across the schools of an urban school system. Such an assumption would appear to result from an extension of the easily substantiated conclusion that there are disparities in expenditures between states and school districts within states. However, the existence of an intra-district disparity across schools has not been documented in a definitive manner. For this reason, a review of the literature concerning intra-district variations in educational expenditures is necessary. Hopefully, this will clarify the nature of whatever expenditure disparities exist and help one to evaluate alternative causes for them.

One of the significant issues which must be at least mentioned is the appropriateness of equating certain measures of expenditure to specific inputs for the production of school quality. Discussions of spending on school resources and its relationship to quality of education would suggest the existence of a reliable educational production function. Such is certainly not the case in fact, and this dissertation will not attempt to grapple with this elusive issue. However, concern remains focused upon differential school expenditures because of the insistence by parents that expenditure inequalities do indeed exist and that they influence outputs of the educational process.

This review of the disparities literature distinguishes between an "early" group of pre-1960 studies and a set of more recent studies. In general, the earlier studies are methodologically simplistic and indicate a strict class and income bias in the distribution of school
expenditures. Upper-class and wealthy neighborhood schools are seen as receiving the benefits of higher expenditures while poorer and lower-class neighborhood schools are regarded as receiving lower expenditures. More recent studies, however, tend to indicate a "U"-shaped functional relationship: expenditure disparities favor high-class and low-class neighborhood schools at the same time. More middle-class neighborhood schools become the losers. Methodological issues raised in this literature are reviewed in detail in a later chapter.

Early Studies of Intra-District Disparities

Fiscal ability and school expenditures appear to covary significantly between states and between school districts within states. There can be little doubt that there are significant variations in per student expenditures across school jurisdictions at both these scales. Such expenditure inequalities have been regarded as working to the disadvantage of children in poorer states and poorer school districts within states. The nature of expenditure distributions between schools within school districts has been less clearly documented. This has resulted primarily from an inability to obtain accurate and reliable data; expenditure information has not been readily available for individual schools. In addition, a variety of thorny methodological issues are raised when attempting to evaluate the relationship between school expenditure characteristics on one hand and neighborhood characteristics on the other.

A study by Dollard (1937) appears to be the first systematic attempt to document the existence of intra-district school inequalities in expenditures. In looking at a wide range of urban services provided within
his "ideal" Southern city, Dollard found that educational services were allocated in such a fashion as to favor the whites in general, and the white upper classes in particular. Results of this nature are not all that surprising given the time of the study and its Southern context.

Patricia Cayo Sexton (1964) used a very similar approach in the late 1950s for a "large northern city." While not specifically focusing upon expenditure levels, Sexton did discover significant variations in class size, percentages of uncertified teachers, ages of buildings, quality of facilities, and availability of free lunches across schools (see Table 1). By grouping elementary schools according to income levels of families assumed to be residing within respective attendance areas, Sexton was able to examine the social correlates of variation in the quality of services provided for 240 elementary schools in the city studied. These variations in service all tended to favor those schools serving neighborhoods with higher socio-economic status families. Consistently, lower status school neighborhoods received lower levels of school services. Similar results were also found across high schools for the same city.

Other studies in this "early" group include Stout and Inger (1966), Mayeske (1968), Katzman (1958), and Guthrie, et. al. (1969). Results of these studies reflect only slight variations upon a common theme using broadly similar methodologies. School services in lower-income city neighborhoods are consistently found to be inferior to those services provided for students in schools in upper and middle-income neighborhoods. More specifically, the results of these "early" studies show that levels
TABLE 1 Examples of Disparities in School Services from Sexton(1964).

<table>
<thead>
<tr>
<th>Income Group</th>
<th>Class Size</th>
<th>ESRP's</th>
<th>Building Age in Years</th>
<th>Facilities Score</th>
<th>No Free Meals or Milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>I ($3,000 -)</td>
<td>29.7</td>
<td>13.9%</td>
<td>45</td>
<td>573.5</td>
<td>42%</td>
</tr>
<tr>
<td>II ($5,000 -)</td>
<td>30.9</td>
<td>19.1%</td>
<td>46</td>
<td>578.3</td>
<td>22</td>
</tr>
<tr>
<td>III ($7,000 -)</td>
<td>28.6</td>
<td>5.4%</td>
<td>26</td>
<td>688.3</td>
<td>11</td>
</tr>
<tr>
<td>IV ($9,000 -)</td>
<td>29.5</td>
<td>4.5%</td>
<td>25</td>
<td>799.3</td>
<td>22</td>
</tr>
<tr>
<td>A (.LT. $7,000)</td>
<td>30.6</td>
<td>17.9%</td>
<td>**</td>
<td>577.0</td>
<td>**</td>
</tr>
<tr>
<td>B (.GE. $7,000)</td>
<td>28.8</td>
<td>5.5%</td>
<td>**</td>
<td>704.9</td>
<td>**</td>
</tr>
</tbody>
</table>


a. p. 114
b. p. 120, (this refers to teachers who are not certified but who teach in those schools)
c. p. 124
d. p. 127
e. p. 134

** information was not reported in the study.
of school service provision are positively correlated with social class, income levels, and the percentage of population which is white within a school's attendance area (see Figure 1A).

Recent Studies of Intra-District Disparities

The body of research to be cited here has produced some variations on these results. Rather than identifying nice, neat, and highly organized linear relationships between independent variables (neighborhood characteristics) and dependent variables (school services and expenditures), this "later" group of studies consistently indicates a "U"-shaped relationship as the prevalent one. A basis for this relationship is not entirely clear at this time, however, Levin, et. al. (1972) reviewed school expenditure data from a total of seven school districts in California and Michigan for the school year 1969-70. Their analysis focused upon differences in per student spending across city elementary schools. Urban school districts were chosen to include "two large industrial cities with sizeable black populations" (Detroit and Oakland, California); a large city that is the commercial center for a largely agricultural region and containing a sizeable Mexican-American population (San Jose); a medium-sized industrial city (Flint); a middle-income white residential suburb (Livonia, Michigan); and two predominantly blue collar suburbs (Warren and Beecher, Michigan) one of which is racially mixed (Beecher).

Although many differences exist between these communities, with respect to economic and tax base characteristics, neighborhood compositions, student populations, and state aid requirements, their school systems demonstrate very similar patterns of resource allocation with respect to
FIGURE 1 Expenditure Disparities Indicated by Studies.
neighborhood social class. This distribution has a "U"-shaped configuration.

This study suggests that by the late 1960s and early 70s, school systems were beginning to operate with dual sources of funding: discretionary and compensatory funding respectively. Each source of funds imposes very different constraints and the constraints strongly influence their use in an allocational sense.

**Discretionary** funding is generated from locally controlled property taxation. Once revenue from this source is raised, spending is largely at the "discretion" or even whim of school authorities. Few, if any, state or federal statutes exist to control the distribution of this money across schools. Consistent with the findings of the "early" studies, Levin, et. al. found that discretionary funding was allocated most heavily to schools with higher incomes and lower levels of minority population composition in their neighborhood attendance areas.

**Compensatory** funds have injected a very different component into the distribution of school expenditures. Moreover, this manner of funding has become increasingly important for financing school district operation during the past eight to ten years. In a majority of cases, compensatory funding redistributes income tax revenue from state or federal coffers to local school districts. In California, school districts may also impose special local taxes but only with permission from state authorities. However, the most important characteristic of compensatory funding concerns the requirement that it be spent for specifically defined and highly limited purposes. Generally, it has been tied
to use in low-income schools and those with programs in special education. Indeed, there have been instances where state and federal agencies have ordered local school districts to repay a funding agency for monies which were misused for other than stated purposes.

District control over discretionary funds and state-federal constraints on the spending of compensatory monies were found by Levin, et. al. to have created a situation where extremely poor and wealthy neighborhood schools both have relatively high per pupil expenditures. Schools through a range of middle-income neighborhoods, on the other hand, received less money, leading to a "U"-shaped relationship between household income in a school neighborhood and school spending there (see Figure 1B). In brief, middle-income schools failed to benefit from biases across schools in either discretionary or compensatory forms of funding.

The research by Levy, et. al. (1974) focuses upon the Oakland (California) School District. This study is also limited to an analysis of the distribution of teacher salary expenditures across elementary schools and does not attempt to measure directly the quality and quantity of school services. As in the previous studies cited, schools were grouped on the basis of race and socio-economic status. However, in this case, both the mean and standard deviation for a particular type or class of expenditure are reported with groups of individual schools used as observations.

The Levy, et. al. study presents data on the distributions of per pupil teacher salary dollars across schools, both with and without the
allocation of compensatory funds (see Table 2). If one constructs a graph with per pupil teacher salary dollars on the vertical axis and neighborhood income levels or minority compositions on the horizontal axis, the 1969-70 data reported would trace the form of a "U"-shaped distribution. This relationship indicates that as parental income in a school neighborhood increases, there is at first a decrease and then an increase in the teacher salary dollars expended per pupil. To have achieved this "U"-shaped distribution, the study suggests that schools with the wealthiest attendance areas have the more experienced teachers with higher levels of graduate education. These schools are, therefore, receiving higher teacher salaries as the discretionary component of total school expenditures. As the wealth of parents in the attendance area for a school increases, so do discretionary expenditures (see Figure 2A).

Schools in attendance areas with poorer parents have teachers with less experience and lower levels of graduate education and, therefore, they receive lower levels of discretionary spending. However, such schools do have disproportionate eligibility for compensatory funding. This extra spending is usually channeled into financing for extra staff positions which would not be supported elsewhere in a school system. As a result, compensatory funding decreases as income of school attendance area increases (see Figure 2B). With discretionary funding favoring the least affluent attendance areas, middle-income schools are seen as faring less well in terms of school expenditures overall. This results from the dual shortages of experienced teachers and of teachers hired with compensatory funds for the expressed purpose of lowering class sizes (see Figure 2C).
### TABLE 2 Examples of Disparities in Teacher Salaries from Levy, et. al.(1974) for the 1969-70 Academic Year

<table>
<thead>
<tr>
<th>With Compensatory</th>
<th>1969-70</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. % MINORITY GROUPS (Negro and Mexican-American)</td>
<td>0-10</td>
</tr>
<tr>
<td>2. NUMBER OF SCHOOLS IN GROUP</td>
<td>7</td>
</tr>
<tr>
<td>3. MEAN SALARY DOLLARS OF ALL TEACHERS PER STUDENT IN GROUP</td>
<td>370.73</td>
</tr>
<tr>
<td>4. STANDARD DEVIATION IN (3)</td>
<td>25.3</td>
</tr>
</tbody>
</table>

| 1. INCOME CLASS GROUPS (1960 census data) | $9,000 & above | $7,500-8,999 | $6,000-7,499 | $4,500-5,999 | $3,000-4,499 |
| 2. NUMBER OF SCHOOLS IN GROUP | 8 | 9 | 21 | 18 | 7 |
| 3. MEAN SALARY DOLLARS OF ALL TEACHERS PER STUDENT IN GROUP | 383.09 | 372.76 | 349.62 | 373.38 | 481.79 |
| 4. STANDARD DEVIATION IN (3) | 40.1 | 28.1 | 36.1 | 50.5 | 60.6 |

Table 2: Examples of Disparities in Teacher Salaries from Levy, et al. (1974) for the 1969-70 Academic Year. (continued)

Without Compensatory
1969-70

<table>
<thead>
<tr>
<th>% Minority Groups (Negro and Mexican-American)</th>
<th>1-10</th>
<th>11-50</th>
<th>51-90</th>
<th>91-100</th>
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</thead>
<tbody>
<tr>
<td>Number of Schools in Group</td>
<td>7</td>
<td>18</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Mean Salary Dollars of O. P. S. Teachers^a per Student in Group</td>
<td>370.73</td>
<td>370.14</td>
<td>348.98</td>
<td>351.53</td>
</tr>
<tr>
<td>Standard Deviation in (3)</td>
<td>25.5</td>
<td>36.4</td>
<td>29.6</td>
<td>36.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Income Class Groups (1960 census data)</th>
<th>$9,000 &amp; above</th>
<th>$7,600-</th>
<th>$6,000-</th>
<th>$4,500-</th>
<th>$3,000-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Schools in Group</td>
<td>8</td>
<td>9</td>
<td>21</td>
<td>18</td>
<td>7</td>
</tr>
<tr>
<td>Mean Salary Dollars of O. P. S. Teachers Per Student in Group</td>
<td>378.92</td>
<td>361.34</td>
<td>348.83</td>
<td>353.40</td>
<td>368.31</td>
</tr>
<tr>
<td>Standard Deviation in (3)</td>
<td>31.5</td>
<td>26.3</td>
<td>36.1</td>
<td>27.8</td>
<td>46.8</td>
</tr>
</tbody>
</table>

^a. these are the Oakland Public School teachers who are being paid strictly from local sources as a discretionary act by school authorities.

FIGURE 2 Combinations of Compensatory and Discretionary Fundings for a School.
By 1970-71, a new district superintendent sharply altered the distribution of discretionary funding across Oakland's elementary schools. This made discretionary funding per pupil almost equal across all elementary schools regardless of attendance area income levels or racial composition (see Table 3). When compensatory teaching personnel are now added to discretionary teaching personnel, the resulting distribution of per pupil expenditure by attendance area income and race has a reverse "J"-shape (see Figures 1C and 1D).

Expenditures reported in this study, however, are only those generated by teacher salaries. The authors suggest that schools receiving compensatory teaching personnel would appear even more favored if one included in the analysis all personnel required to operate a given school. This is because compensatory funding is also used to support non-teaching staff (e.g. library personnel, technicians, reading specialists, and counseling personnel). Expenditures on this supportive staff, while not included in the Levy analysis, should have tended to increase the degree of expenditure inequality (see Figure 3).

An issue raised by Levy, et. al. concerns the effect of pupil-teacher ratios upon per pupil expenditures as opposed to the effects of teacher experience and degree status. Independent budgetary effects of class size, experience, and education can be easily confused with each other. A situation may still exist, for instance, where more experienced and qualified teachers in schools for wealthier neighborhoods are forced to teach larger classes. This combination of high pupil-teacher ratio, experience, and qualifications may produce the same low
TABLE 3 Examples of Disparities in Teacher Salaries from Levy, et. al. (1974) for the 1970-71 Academic Year.

With Compensatory 1970-71

<table>
<thead>
<tr>
<th>1. % MINORITY GROUPS (Negro and Mexican-American)</th>
<th>1-10</th>
<th>11-50</th>
<th>51-90</th>
<th>91-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. NUMBER OF SCHOOLS IN GROUP</td>
<td>7</td>
<td>18</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>3. MEAN SALARY DOLLARS OF ALL TEACHERS PER STUDENT IN GROUP</td>
<td>421.02</td>
<td>425.53</td>
<td>429.12</td>
<td>617.66</td>
</tr>
<tr>
<td>4. STANDARD DEVIATION IN (3)</td>
<td>38.9</td>
<td>44.5</td>
<td>72.1</td>
<td>344.6*</td>
</tr>
</tbody>
</table>

| 1. INCOME CLASS GROUPS (1960 census data)          | $9,000 & above | $7,500-8,999 | $6,000-7,499 | $4,500-5,999 | $3,000-4,499 |
| 2. NUMBER OF SCHOOLS IN GROUP                       | 8    | 9     | 21    | 18    | 7     |
| 3. MEAN SALARY DOLLARS OF ALL TEACHERS PER STUDENT IN GROUP | 411.22 | 436.63 | 405.31 | 576.14 | 672.23 |
| 4. STANDARD DEVIATION IN (3)                         | 38.2 | 38.4  | 41.0  | 358.6* | 54.8  |

* indicates an extremely high skewness in the data to have this magnitude in deviations.

TABLE 3  Examples of Disparities in Teacher Salaries from Levy, et. al. (1974) for the 1970-71 Academic Year. (continued)

Without Compensatory
1970-71

1. % MINORITY GROUPS (Negro and Mexican-American)  
   0-10  11-50  51-90  91-100  
2. NUMBER OF SCHOOLS IN GROUP  
   7  18  19  19  
3. MEAN SALARY DOLLARS OF O. P. S. TEACHERS PER STUDENT IN GROUP  
   416.10  415.49  385.56  466.23  
4. STANDARD DEVIATION IN (3)  
   46.0  49.5  48.1  226.0*  

1. INCOME CLASS GROUPS (1960 census data)  
   $9,000 & above  $7,500- $8,999  $6,000- $7,499  $4,500- $5,999  $3,000- $4,499  
2. NUMBER OF SCHOOLS IN GROUP  
   8  9  21  18  7  
3. MEAN SALARY DOLLARS OF O. P. S. TEACHERS PER STUDENT IN GROUP  
   411.22  417.61  392.80  468.23  411.5  
4. STANDARD DEVIATION IN (3)  
   38.2  39.9  50.8  233.1*  52.3  

* indicates an extremely high skewness in the data to have this magnitude in deviations.

HIGH (h) expenditures for teachers and support staff.

FIGURE 3 The Effect of Compensatory Effort Used to Fund Both Teachers and other Support Staff.
levels of expenditure per pupil as small classes, inexperience, and lower qualifications. This matter of pupil-teacher ratios is pursued later in some detail because of its importance in establishing the nature of school expenditure inequalities within school districts. For now, the next step will be to create a model of the forces creating expenditure disparities.

A CONCEPTUAL MODEL OF THE DISTRIBUTION OF SCHOOL EXPENDITURES

The forces influencing school expenditure allocations across neighborhood schools may be explained in terms of an interaction between a series of self-interested individuals and their collective organizations. The particular parties involved may be referred to as actors in the traditional sense of role playing. The specific actors of interest include: school officials; district teachers and their organizations (i.e. the National Education Association (NEA), a variety of local, state, and national teacher's unions, special interest groups); and parents acting either as individuals or in groups. Organizations of parents could be as formal and permanent as a local PTA chapter; or, alternatively, as informal and temporary as a hastily formed ad hoc neighborhood committee on school playground safety after a particularly serious playground accident. Each of these actors in his own way is able to bring certain forms of pressure to bear upon the allocation of discretionary funding—but not compensatory funding—across the neighborhood schools within a school system. We now consider each actor in turn.

The School Boards and Central Administration

According to the utility-maximizing conceptual framework of institutional decision making (Downs, 1957), one would expect school boards
and central administrations, in their use of discretionary funding, to attempt to give priority treatment to the educational needs and wants of district residents having the most effective bargaining resources. Bargaining resources are defined for our purposes as the power of an individual or interest group to convincingly threaten, or to actually create, harm for the special interests of school authorities. The powerful pressure groups, therefore, are those which are not only most vociferous concerning their demands but who are also capable of imposing a specific disutility upon an offending school system. For example, teachers may threaten strikes, work slow downs, or loss of accreditation to gain attention for their interests. Middle and upper-class parents may also gain bargaining power over school authorities because of (i) their ability to threaten removal of fiscal resources from the school district; (ii) power to vote for or against individuals in elected offices or for or against money issues in school-related elections; or (iii) use of picketing or court actions as an interference with normal school operations.

As a consequence of their desire for utility maximization, one would expect elected school boards and their district superintendents to be susceptible to these bargaining resources. The political nature of being an elective representative requires board members to be responsive to their constituents. However, appointed school boards could be subjected to similar pressures to have themselves renewed.

School superintendents, moreover, have to be included among a list of school bureaucrats susceptible to public pressure, since their
appointments require them to serve "at the pleasure" of these same elected school boards. Superintendents who do not develop school policy, budgets, and expenditure distributions satisfactory to elective school boards, and which, in turn, are not satisfactory to actors with significant bargaining resources, will quickly find themselves looking for a position with another school system. Consider briefly the variety of bargaining resources used to bring pressure upon school authorities by the different interests concerned with school resource allocation.

The Parents

Certain groups of parents have generally been found to be very active in attempts to influence school decision making. It has also been assumed that the most active parents reside in upper and middle-class neighborhoods within a school district. They are willing to express their particular demands for educational services and are able to threaten damage to the school system through a variety of bargaining resources.

The aim of upper and middle-class parents is to influence the distribution of public expenditures on education so as to maximize their children's educational benefits. The results of lobbying could, however, conceivably include benefits other than a household's direct consumption of educational services. These activities, for example, could create increments on the value of residential property in a particularly favored school attendance area. Also, there may be anticipated increases in the lifetime earning power generated for children.
A conceptualization current among a large segment of parents is one in which superior expenditures, more effective school programming, stable classroom environments, and meaningful parent-teacher relationships will somehow create superior levels of student classroom performance. This view of the education production function has served as motivation for the development of middle-class parent goals. Such a view has persisted even when considerable educational research has indicated its weaknesses, and may be part of the basis for residential choice decisions.

Parental Lobbying

Over the short run, parents have a variety of tools at their command to influence decision making in school systems. As individuals, parents have the opportunity to personally discuss the day-to-day operation of a school, or the school system, with their children's teachers, school principal, district bureaucrats, school board members, other parents, or, as a last resort, the mass media. Using any number of personal lobbying or griping techniques, attention may be drawn to any of a variety of personal, local, or district-wide issues of immediate concern.

Lobbying for more long term changes in school policy concerns different types of issues and is usually communicated through a very different set of channels. Collectively, through school-based PTA activities, other parent organizations with concerns for district-wide school operations, and a variety of ad hoc neighborhood lobbies, parents make demands on school district decision makers at all levels in a school system.

Both individually and collectively, the upper and middle-classes are assumed to be most active in lobbying for changes in school policy. These
parents have gained significant advantages on behalf of their schools in the past. As a result, there have been considerable incentives for, and a motivation to, continue attempting to influence the operation of school systems. Upper and middle-class parents have found it easier, less personally expensive, and considerably more rewarding to keep track of the pulse of school affairs on a day-to-day basis. These parents have shown themselves able to react appropriately whenever they perceive threats to their children's schooling.

In addition, upper and middle-class parents have more of the significant individual characteristics necessary to facilitate effective intervention in school system affairs. Such characteristics may take the form of: (i) personal and professional skills (i.e. lawyers, economists, accountants, administrators, professionals, educators, politicians, public relations specialists); (ii) flexibility in hours facilitating free time to carry out lobbying and other related activities; this flexibility may result from occupational status or from being a non-working spouse; and (iii) financial status resulting from private income or an ability to make a considerable professional effort without pay. 

Parental Bargaining Power

Because a parent or parent group has made demands requiring discretionary funding to school officials does not necessarily mean that there will be any response. Demands in themselves are not sufficient to gain benefits unless they are backed up with bargaining resources which would be threatening to the position of school authorities. A variety of these bargaining resources will now be reviewed.
Socially Defined Bargaining Resources

Upper and middle-class parents derive advantages from the existence of a "class identification" or community of educational purpose between themselves and school authorities. It is suggested that class identity or affinity should exist because school boards and high level school management are being recruited from the upper and middle-classes. This identity of social background and purpose should carry with it a commitment to production of educational outputs appropriate to upper and middle-class values. Typically, these educational outputs have placed an overwhelming emphasis on programs for college entrance skills, special educational embellishments (i.e. language labs in elementary schools, accelerated math concepts, field trips for cultural enrichment, reading materials beyond mere texts), high levels of expenditure per pupil, and whatever student classroom segregation is necessary to insure a stable educational environment (i.e. performance tracking, academic-vocational student grouping, and racial-social class segregation). Whatever the specifics of a desired output may be, it will likely be transmitted into policy by school authorities because of their own "class identification" or sympathy with such goals. This could be postulated as a basis for the continuation of traditional school policies as opposed to the introduction of more radical formulations serving very different ends.

Fiscal Bargaining Resources

The educational needs and wants of lower-income parents are also expected to receive less attention from school authorities on fiscal grounds. School authorities must concern themselves with the retention
of the district tax base. It will, therefore, be to their advantage to administer school systems in such a way as to satisfy those parents, presumably of higher income, owning higher value residential properties. While residential land users usually will not pay completely for the school services they demand, upper and middle-income parents are paying more of the educational costs their children generate for the school district than do lower-income parents. In order to maintain school district tax base, school authorities will likely administer localized variations in school services through their control over discretionary funding. By permitting or consciously engineering such biases, a school board will attempt to retain in their district residents providing more positive fiscal externalities.

**Politically Defined Bargaining Resources**

Parents of school age children can also influence the decisions of school authorities as voters. This is feasible in two ways. First, the political process is the mechanism by which elected school boards become elected. Having school board membership elective rather than appointive makes school board members responsive to the people. If a school board member wishes to remain in office, there is an incentive to satisfy, or at least avoid displeasing, constituents.

School superintendents are also forced to recognize constituent demands since they normally serve at the pleasure of an electorally sensitive school board. Rather minor changes in a school board's composition could create a coalition leading to the removal of an offending school superintendent. Since upper and middle-class parents are more likely to
participate in the political process, their lobbying on school matters receives disproportionate attention from school authorities.\textsuperscript{23}

Less directly personally, school authorities are also vulnerable through votes upon permissive referenda. Unlike most government agencies, school boards do not have direct access to the property tax bases they depend upon for the burden of their revenue. School boards are commonly required by state law to gain district wide voter approval for increases in school tax rates, bond issues for capital improvements and investments, and even in some cases for approval of yearly operating budgets. Moreover, in recent years, a general voter revolt nationwide affecting many unrelated issues has made school boards especially vulnerable fiscally.\textsuperscript{24} This may be one reason why compensatory state and federal funding have become increasingly popular sources of revenue for school operation.

\textbf{Implications for Resource Allocation by School Authorities}

In summary, households in upper and middle-class neighborhoods are more active in voicing their preferences for school policies, and constantly use their bargaining resources to bring these preferences to the attention of school authorities. Having incentives created by previous successes, special abilities and characteristics which facilitate lobbying, and significant bargaining resources to make their presence felt at school and district levels of decision making, upper and middle-class parents are able to wield a disproportionate weight in influencing the normal operation of school affairs. Not having these advantages, lower-class parents have little or no power in school affairs. Because of this
relationship between school authorities and their clients, the upper and middle-class schools receive favored treatment in discretionary expenditure allocation from school authorities. As we will now see, other activities of teachers can aggravate this disparity.

The Teachers

Teachers contribute in at least two ways to the creation of unequal distributions of discretionary expenditures across elementary schools within large, urban school systems. Firstly, they do so through their systematic choices of school teaching assignments. This has tended to concentrate the more senior and higher salaried teaching staff in the more desirable schools. In addition, professional and labor organizations formed by teachers in recent years in most urban school systems have been instrumental in institutionalizing power and status for teachers over day-to-day school operations. We will now proceed to review the nature of teacher seniority and the effects it has upon teacher assignments, staff salary distributions, and special programming development. To conclude, these effects of seniority will be related to the allocation of discretionary funding across neighborhood elementary schools.

Teacher Assignments

Typically, district teacher assignment practices, teacher privileges as stated in union contracts, and salary schedules have been closely related to teacher seniority. Therefore, the use of seniority as a specific criterion according to which teachers are assigned to what they feel are the "desirable" schools will strongly influence the
distribution of school expenditures. Desirable schools would be those with newer buildings and facilities, student bodies with motivation to achieve and with intellectually stimulating home environments, fewer disciplinary problems both within and outside the classroom, and in close proximity to the middle-class teacher's home.

Competition among teachers for assignment to these choice teaching positions is usually resolved by a pecking order established on the basis of the seniority system. When two or more teachers, otherwise equally qualified, apply for a vacancy in a more desirable school, the more senior of the applicants will generally be offered the position. Teachers of lessor seniority are eligible for such a position only after the most senior applicants have refused it. As a consequence, the more desirable—and by implication, more upper and middle-class—schools will be consistently staffed with those teachers having greatest seniority. Conversely, the undesirable schools will tend to be staffed by new and junior teachers in the school system. This results in a systematic effect on salary requirements across schools.

Staff turnover rates across schools will also be related to the perceived desirability of a school as a work place and to seniority. Desirable schools will have low teacher turnover. Few teachers leave positions in desirable schools unless they retire, die, or are guaranteed a comparable position elsewhere within the school system without loss of tenure. Less desirable schools will have higher staff turnover rates due to transfers and teachers leaving the schools system rather than remain teaching there for any length of time. Replacements will, therefore, be needed
more often in undesirable schools, and these positions will be filled by teachers having less seniority than those teachers who are leaving. Levy, et. al. (1974) and Becker (1958) point out that transfers within a school system are consistently in the direction of more "desirable" schools (see Table 4).

**Effects of Staffing Upon School Expenditure Distribution**

Existing budgeting and accounting procedures have not generally allowed isolation of specific categories, or line items, of operating costs either per student in a given school or even per school. However, since it is common for in excess of 80 percent of the yearly operating costs to be a function of staffing requirements, discretionary expenditures on staffing are useful in evaluating overall spending disparities.

Since salary schedules are based primarily upon seniority, a particularly experienced teaching staff would bias a school's operating costs upward relative to other schools within the school district—indeed, independent of any overt actions by school authorities. In turn, the more "difficult" and less desirable schools, staffed by less experienced teachers with lower salary requirements, would not command high operating budgets. In sum, the staffing process should increase expenditures above district spending norms for schools regarded as more desirable by teachers; and, in turn, cause the operating costs of those schools regarded as less desirable to be below district norms.

**Distribution of Discretionary Special Program Funding**

Concentration of more experienced teachers in more middle-class schools likely has additional redistributional consequences of a perverse
Table 4  Reports of Transfers Requested and Granted from Levy, et. al. (1974) for the 1969-70 Academic Year.

<table>
<thead>
<tr>
<th>PERCENT OF MINORITY IN PRESENT SCHOOL</th>
<th>0-10</th>
<th>11-50</th>
<th>51-90</th>
<th>91-100</th>
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<td>0</td>
</tr>
<tr>
<td>11-50</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>51-90</td>
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<td>7</td>
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<td>3</td>
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<tr>
<td>91-100</td>
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<td>14</td>
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71 total requests

<table>
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<th>PERCENT OF MINORITY IN PRESENT SCHOOL</th>
<th>0-10</th>
<th>11-50</th>
<th>51-90</th>
<th>91-100</th>
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<tr>
<td>91-100</td>
<td>0</td>
<td>8</td>
<td>11</td>
<td>16</td>
</tr>
</tbody>
</table>

52 total granted

nature. The composition of a school's teaching staff may have some influence upon the distribution of monies for special educational programming across schools. Assuming, as we have, that more experienced teachers have tended to concentrate in upper and middle-class schools, then those senior staffers may have inadvertently created a considerable advantage for their schools in terms of grantsmanship and other negotiations with funding agencies. Senior teachers have power in these matters because of their seniority, tenure status, teaching experience and knowledge about the operations and bureaucratic structure of a school system. These factors make these teachers, and therefore, their schools, more competitive in the creation, financial support, and ultimate operationalization of special educational programming potentially funded from discretionary sources.

Consider the advantages of experienced teachers in greater detail. At least four have been suggested. Seniority creates bargaining power and prestige for a teacher within the confines of the district or with outside funding agencies. Teaching experience allows the formulation of new ideas to solve old problems which have previously been encountered by the educator. Job security for the senior teachers allows them to focus on long-range goals for new program development rather than such short-run goals as obtaining permanent certification or tenure. Lastly, having been certified and tenured, a teacher can focus any additional graduate studies, scholarly effort, or professional development upon the formulation of new programming for his or her school. Earlier in a teacher's career, there is only limited freedom
from arbitrary degree and certification requirements to pursue any new lines of a professional growth character. An additional consideration is that course preparation needs are likely to be less pressing in later years.

Junior staff may well be more progressive or innovative in their approaches to students and teaching, and also be more capable of coping with newer teaching strategies. However, junior staffers, for the reasons outlined above, lack the power to strongly influence the distribution of the necessary expenditures.

In sum, when school authorities have to allocate their limited discretionary funds for staffing and special programming, they have to choose from among many alternatives. The salary schedule and distribution of seniority heavily influence this allocation across schools. As a result of the power of senior staff in the development of new programs, schools with such staff, and therefore schools in upper and middle-class attendance areas, systematically receive more in terms of special educational programs funded with discretionary monies. However, in order to understand the on-going existence of these relationships, it is necessary to place them in an institutional context. Without the use of property taxes to support schools and neighborhood attendance areas for student assignments to schools, there would be little chance of creating or maintaining systematic expenditure disparities across the individual schools comprising a school system.
The Institutional Context of Expenditure Disparities

We have just reviewed a wide range of forces which could conceivably contribute to the creation of expenditure disparities among elementary schools within the same school system. The operation of these forces, however, is contingent upon two conditions which have traditionally been part of the institutional context of public education.

First, there is the neighborhood school concept. In the past, an elementary school has enrolled only children from an attendance area immediately contiguous to it. Parents, therefore, have had to gain residential entry into that immediate neighborhood in order for their children to attend the school in question. This context is changing. Busing of elementary school children for racial balance in a number of cities is opening up enrollment in hitherto closed neighborhood schools for all children, regardless of residential origin. However, the limited nature and extent of busing still means that the vast majority of elementary school students continue to attend schools in their immediate neighborhoods even where busing exists.

The second factor contributing to the production and maintenance of disparities has been the traditional and almost total dependence of school systems upon a local property tax—and hence upon the local property tax base—to raise operating revenues. Until compensatory funding, and the very recent use of equalizing formulae developed for re-distributive education grants of state and federal monies, increasing revenues for school districts could only be raised in two ways: from either voter approved increases in local property tax rates; or by natural growth increases in the per capita value of the tax base.
An alternative specifically limited to capital expenditures was voter approved bonding power which, in turn, had to be repaid from revenue derived from the same locally controlled property taxes. This dependence upon local property taxes has tended to make school districts, or the local governments with coincidental jurisdictions, in general, very competitive between themselves for new revenue producing land uses, e.g. industrial parks, shopping centers, and high-income residential developments, and for those which create fiscal surpluses in particular. Dependence on local property taxation, on the other hand, has also led to attempts to exclude those land uses and land users imposing negative fiscal externalities.

Both of these institutional features of school system operation have helped create an atmosphere facilitating creation and perpetuation of significant spatial variations in levels of educational services and expenditure. Neighborhood schools and tax base competition allow the formation of strong upper and middle-class lobbies around particular schools and the use of fiscally defined bargaining resources to threaten school authorities into heeding their demands. Consider each in turn, now, in greater detail.

**School Attendance Areas**

There has been some interest in the literature concerning the significance of local schools in residential choices.\(^{27}\) Traditionally, or at least before forced busing of elementary school students, the quantity and quality of educational services consumed by households could be manipulated through residential choice. Such has been the case both between and within school districts. However, within school districts,
residential manipulation of educational consumption is dependent upon perpetuation of the neighborhood school concept.

In the historical development of city school systems, the residential neighborhood was an early focus of power. In public education, community or neighborhood control of local school affairs is not a new phenomenon; it has persisted long after many other changes have come and gone. The use of contiguous neighborhoods as the criterion for school attendance, moreover, has been justified on the basis of certain "inherently logical arguments." These have included: (i) allowing children to walk or be walked short distances both to and from school; (ii) facilitating an easy trip home for lunch or if the child becomes ill; (iii) allowing schooling and play activity of the neighborhood child only with other neighborhood children; (iv) facilitating contacts between parents and school through direct visitations; (v) establishing the potential for creation of the "desirable" teaching environment attractive to the best teachers; and (vi) grouping parents with similar preferences for the education of their children by neighborhood attendance areas.

A set of underlying themes would appear to recur in these "logical arguments." They are those of physical distance from the school facility; the quality of formal and informal interaction between parents and school officials; the ability of parents to use their lobbying and bargaining resources as a means of obtaining concessions from school authorities; and a more subtle issue of social class and racial isolation to help create and protect the benefits gained by the upper and middle-class.
In terms of widely accepted canons of social justice, the first two of these themes may well be part of a reasonable justification for the neighborhood school concept. However, an acceptable rationale has been far less obvious in terms of class and racial segregation of student populations. Indeed, the neighborhood school concept has allowed economic residential segregation to be used as an excuse to socially segregate student populations across schools.

Residential segregation and neighborhood schools have contributed strongly to the processes which generate and maintain expenditure inequalities across elementary schools. The lobbying and bargaining resources of upper and middle-class parents are used on behalf of specific neighborhoods and are easily associated by district authorities with particular schools. Individually, neighborhood parents reinforce each others' demands before school authorities. Also, if group action seems warranted, locational clustering of similarly interested parents enhances the chances of forming collectivities concerned with common issues. From the point of view of supply, school authorities will find it more convenient and less expensive to provide specialized programs for a cluster of children in a single school rather than provision for the same number of children dispersed across several integrated schools.

In addition, teachers have indicated that they recognize the unique qualities of certain school neighborhoods as they pick and choose among teaching assignments. Neighborhood schools allow parents to create "desirable" schools for teachers and the teachers choose "desirable" schools.
Finally, neighborhood schools have allowed both parents and teachers to protect any benefits or concessions which can be gained for their school. If localized advantages cannot be effectively controlled on behalf of neighborhood residents alone, much of the incentive to create them will cease to exist.

Local Taxation for School Revenue

The revenue necessary to provide discretionary funding has traditionally been raised from taxes upon private property. All privately-owned property within the confines of a school district is taxed for school purposes and revenue is raised according to a tax rate per unit of assessed valuation of private property. The use of the property tax by school districts is commonly controlled by state law. Some school systems, therefore, are forced to go to permissive referendum to gain access to any additional taxing power. This requirement for school districts is unlike those for most local governments which are seldom limited by law from increasing tax rates and developing new sources of revenue. Because school districts are heavily dependent upon the taxation of private property and have severe limitations upon their ability to increase this in order to increase revenue, they have been forced to compete with each other to capture new additions to their respective tax bases.

Direct taxation of personal or corporate income is not within the power of school districts. However, since the distribution of this income influences the distribution of higher value property across school districts, those districts with higher per capita income will
also tend to have superior fiscal capacities. Differing fiscal capacities are commonly recognized in state school support formulae. In addition, they are an important component of the traditional explanation for the wide and distributionally perverse disparities in school expenditures across states and school districts within states.32

For school districts, fiscal advantages or surpluses are provided by these land users paying high property taxes per acre while creating minimal demands for school services. As such, industrial and commercial land users have generally been considered highly desirable revenue sources. While both are taxed heavily on the basis of their capital investments, neither is seen as directly requiring infusions of school services. For residential land users, in general, higher income residents occupying higher value housing are seen as paying more in property taxes toward the costs of public schooling than lower income residents. Also, their families will be smaller on average, which reduces the financial burden they place on the school system. Generally, residential land users, as a group, generate a demand for more educational services than they themselves pay for, and thus their presence in a school district usually needs to be counterbalanced by higher property values and less demanding tax rateables. For this reason, school systems have certain preferences for land users—non-residential and higher income residential, as noted—and they will be forced to compete with each other to attract them into their jurisdiction. School districts also compete to avoid fiscally undesirable land users.33
In competing with other school districts, school authorities may be forced to disburse educational favors to residents in such a way as to attract or retain those providing positive fiscal externalities. These may take the form of disproportionate educational expenditures to the neighborhood schools servicing them.

Again, we have identified a variety of ingredients contributing to the production and maintenance of variations in school services within a school district. In effect, school systems are forced to create and maintain expenditure disparities in order to sell themselves to customers providing positive fiscal externalities. This means that spatially and socially significant variations in expenditures will exist both between and within school districts. The neighborhood school concept and local property taxation are both part, therefore, of the institutional context facilitating the operation of the forces postulated in this chapter.

**SOME PROPOSITIONS**

In developing this conceptualization of the forces influencing the distribution of school expenditures across elementary schools, a series of propositions emerges, albeit sometimes implicitly. These propositions concern the activities of school authorities, teachers, and parents, and the ways in which they interact to influence the disparities in expenditures among schools. To the extent that it is possible, given the limitations of available data and of appropriate methodologies, these propositions will be tested in this dissertation. It remains to identify propositions of concern and to present a brief rationale for their role in the creation of expenditure disparities. The propositions involve:
(i) expenditure distributions; (ii) teacher preferences for working conditions; (iii) procedures for, and patterns of, teacher mobility within school systems; and (iv) parental militancy within school systems. Each will later be a point of departure for the identification of more specific hypotheses to be tested across elementary schools in Columbus, Ohio, for the late 60s and early 70s.

The distributions of school services and expenditures are assumed to be unequal across schools. These inequalities are also seen as systematic rather than random, and therefore, correlated with certain types of schools, parental characteristics, and neighborhood types within the confines of an urban school system. In most cases, inequalities in discretionary funding are expected to benefit upper and middle-class school neighborhoods at the expense of other residents in the school district. These inequalities result from the responses of school authorities to lobbying and the bargaining resources of the special interest groups concerned with education in a school system. Compensatory funding is expected to benefit lower-class school neighborhoods.

Teachers have also been given an important role in the creation of expenditure disparities. It has been assumed that they have consistent preferences as to which schools are more desirable working environments and that these desirable working environments are the upper and middle-class neighborhood schools. Also, due to patterns in teacher mobility, the more senior teachers should consistently be assigned to the more desirable schools. An abundance of teachers of high seniority inflates the operating costs for upper and middle-class neighborhoods above those
of others in the system.

The last proposition of concern here involves the nature of parental militancy. Demands for school services and superior expenditures have a specific social and spatial pattern. Upper and middle-class parents are again assumed to be the source of persistent requests for higher levels of school services when they are allowed to express their options on these matters. As individuals and in groups, these same parents have that variety of skills, and interests in using lobbying and the bargaining resources to effectively influence those making the decisions concerning school administration. The parents who benefit most from education and who are most active in influencing educational policy are again seen as those from upper and middle-class neighborhoods.

SUMMARY

This chapter has reviewed a variety of issues concerning school expenditure inequalities within school systems. Literature concerning the existence of disparities in expenditures and school services indicated that an earlier pattern of clear cut racial and class bias has become complicated by state and federal funding of compensatory programs. However, of more importance for present purposes, this literature indicates that inequalities in discretionary expenditures did commonly exist across elementary schools in the late 1960s and early 1970s, even though their exact form and effect may be in question.

The chapter then proceeded to develop some alternative explanations for expenditure disparities. Pressures operating upon school board members and superintendents were reviewed; it is assumed that each of these
actors attempts to protect his position from the threats of other special interest groups. The role of teachers was reviewed in an effort to establish the implications of seniority and salary schedules in combination with teacher mobility for the distribution of expenditures across schools. The specific role of parents was also placed in context both from the point of view of individual and group lobbying. A view that the upper and middle-class have superior bargaining resources and lobbying abilities was presented and justified. Finally, the institutional role of neighborhood school attendance areas and property taxation was examined as each operates to facilitate and enhance the emergence of inter-school disparities of discretionary funding within school districts.

As has been indicated, our interest is in establishing the validity of the propositions concerning factors influencing the distribution of school expenditures. The next chapter will focus upon the methodology necessary to test hypotheses based upon these propositions.
FOOTNOTES, Chapter Two


4. The fact that a population believes that these variations exist would seem to be sufficient grounds in itself to pursue such research. If an intra-urban migrant believes that significant variations do exist for school spending, and in their effects, residential relocations may be justified on that basis. This could occur whether or not those expectations are justified by the facts of the matter.


7. Levy, et. al. (1974), Op. cit., discusses this somewhat novel form of taxation allowed by the State of California. Special taxes may be created by a school districts for only designated purposes to remove a particular burden from the general school tax. These new
taxes are then not to be counted against the limit prescribed by the state for a district's taxing powers. In addition, the district would not be required to attain voter approval before such a special tax is to go into effect.

8. These funds are allocated for use to finance that extraordinary effort needed in the education of problem students, and those from socially and economically disadvantaged homes.

9. The recovery of these funds once supposedly misspent has been difficult. Levy, et. al. (1974) reports such a case in California.


11. "White flight", or movement of the white middle class from the central city to the suburbs, is assumed to create pressure on school authorities to take actions which would conserve the remaining tax base. Therefore, they should provide school services which would cater to the localized needs of the remaining upper and middle-class taxpayers. The preferential treatment resulting will hopefully keep higher income taxpayers residing in the central city school system rather than taking their taxability into an autonomous suburban school district.


Membership in a school's P. T. A. organization would be dependent on the parent's children in that school.

This could be a taxpayer's organization or some city-wide group to promote the betterment of public school education or some special program of art appreciation.


These are the ways that public schools are assumed to perpetuate the supposed middle-class educational advantages.


In reviewing salary schedules for school districts, one discovers that the major increments result from increased longevity in the school system. Teachers may well pursue graduate degrees and/or further credit hours to gain salary raises. However, since these education increments are only given with larger blocks of credit hours (usually 15 semester credit hours) and fully completed advanced degrees, the yearly longevity raises contribute more overall to the total paycheck of a teacher.


There has been a long argument concerning the rationale used to justify continuation of neighborhood based elementary school attendance. Whether neighborhood schools are implicitly or explicitly tied to the desires of white parents to maintain economic or socially segregated schools, such "logical" arguments have gained considerable acceptance. As a result, the elementary school has
remained a neighborhood school long after junior and senior high schools have become desegregated through their more heterogenous tributary areas.

30. The property tax used to support schools is probably the least regressive, most limited, and restricted tax bases in the country. The poor contribute a larger percentage of their income towards this tax. It is tied to property values rather than an expanding income base. School boards have also had very strict limits on the tax rates and the accessments they can impose across their tax base (forcing permissive referenda on most of their tax increases). In addition, their debt limit is also limited.

31. Only through state (in still in many cases not from income taxes) and federal redistribution of revenue do schools allow access to a tax base beyond a property tax by local schools.


33. The undesirable land uses would create more need for school services than they provide revenue to support. Low income housing would be a classic example of that kind of land use.

34. This is the justification for the maintenance of school by school disparities in spending when there should have been equality of spending within a school system.
Chapter Three - Questions of Methodology

We have now reviewed evidence concerning the nature of expenditure disparities within school systems and have speculated about a variety of causes for them. We must now turn, therefore, to the design of procedures which will allow the testing of hypotheses generated from those considerations.

This chapter proceeds to explain the choice of the Columbus (Ohio) City School System as the study context. Two major methodological concerns central to studies in this area of social science research are then introduced and discussed at some length. These involve: (i) the comparison of data sets across a variety of systems of geographic reporting units; and (ii) the effects of spatial data aggregation upon descriptive statistics and spatial distributions. The literature concerning both of these problems is reviewed, and strategies are recommended for alleviating them.

Underlying these concerns is an attempt to identify and measure the effects of a variety of variables—economic, social, and political—upon variation in school expenditures. Once the appropriate variables are isolated, the chapter proceeds to suggest a set of specific hypotheses.

THE COLUMBUS SCHOOL SYSTEM AS A STUDY CONTEXT

Columbus, Ohio is a city in the Middle West with a population of about 500,000 (1970) and with a metropolitan population of about 1,000,000 (SMSA, 1970). Table 5 presents a profile of pertinent
demographic variables for the central city of Columbus, its urbanized area, and for the Columbus SMSA. This profile also indicates the national norms for these conditions across all SMSA's in 1970.

The central city and SMSA of Columbus have grown rapidly in recent decades, both in terms of population size and spatial extent. However, the demographic characteristics of both the SMSA and the central city are very similar to the average SMSA in the U.S. as a whole, though not to the average central city. Because of a geographic expansion of its borders of over three hundred percent since 1950, accompanied by a population growth of almost one hundred fifty percent during the same time period, the central city of Columbus has been able to maintain a social and economic mix in its population not commonly achieved by central cities. In general, other central cities have become completely surrounded by their suburbs and, therefore, cut off from open, yet-to-be-developed lands. During the same time interval, for example, the central city of Cleveland grew by less than a square mile. This was due to the preempting of annexation by surrounding autonomous suburbs.¹

In Columbus, however, an active program of annexation has resulted in an unusual socio-economic diversity of population. Since there is general territorial coincidence between the central city and the school district, this diversity is reflected in the students of the Columbus schools. The Columbus school system, therefore, has been able to maintain its racial and income mix in recent years while growing in population. The student composition in many other central city school systems, on the other hand, has become increasingly black and
TABLE 5  Census Data for the Columbus Metropolitan Area: 1960 and 1970.

<table>
<thead>
<tr>
<th>AREA</th>
<th>square miles</th>
<th>1970 population</th>
<th>change 1960–70(%)</th>
<th>negro population</th>
<th>negro (%)</th>
<th>negro change 1960–70(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL SMSAs</td>
<td>*</td>
<td>139,418,047</td>
<td>16.6</td>
<td>16,749,356</td>
<td>12.0</td>
<td>511.2</td>
</tr>
<tr>
<td>Columbus SMSA</td>
<td>613</td>
<td>916,228</td>
<td>21.4</td>
<td>106,388</td>
<td>11.6</td>
<td>29.9</td>
</tr>
<tr>
<td>Columbus Urbanized Area</td>
<td>235</td>
<td>790,019</td>
<td>28.1</td>
<td>103,282</td>
<td>13.3</td>
<td>30.2</td>
</tr>
<tr>
<td>Columbus Central City</td>
<td>134.6</td>
<td>539,377</td>
<td>14.6</td>
<td>99,649</td>
<td>18.4</td>
<td>29.2</td>
</tr>
</tbody>
</table>
### TABLE 5  Census Data for the Columbus Metropolitan Area: 1960-1970.
(continued)

<table>
<thead>
<tr>
<th>1970 AGE COMPOSITION</th>
<th>1970 EDUCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>median less than 4 years of college or more</td>
</tr>
<tr>
<td></td>
<td>years 5 years H. S. or more</td>
</tr>
<tr>
<td>ALL SMSAs</td>
<td>12.2 4.8 55.3 12.0</td>
</tr>
<tr>
<td>8.5 65.8 9.3 28.3</td>
<td>12.3 2.7 60.7 14.0</td>
</tr>
<tr>
<td>Columbus SMSA</td>
<td>8.8 65.5 7.8 25.8</td>
</tr>
<tr>
<td>12.3 2.7 61.1 14.7</td>
<td></td>
</tr>
<tr>
<td>Columbus Urbanized Area</td>
<td>9.0 65.9 7.8 25.7</td>
</tr>
<tr>
<td>12.2 3.4 55.6 14.4</td>
<td></td>
</tr>
<tr>
<td>Columbus Central City</td>
<td>9.1 67.2 8.5 25.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5 years</th>
<th>and over</th>
<th>median age</th>
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<tbody>
<tr>
<td>under 18 years</td>
<td>65 years and over</td>
<td></td>
</tr>
<tr>
<td>8.5</td>
<td>65.8</td>
<td>9.3</td>
</tr>
</tbody>
</table>
TABLE 5  Census Date for the Columbus Metropolitan Area: 1960-1970.  
(continued)

<table>
<thead>
<tr>
<th>1970</th>
<th>INCOME</th>
<th></th>
<th></th>
<th>families, low income level(%)</th>
<th>families, 125% of low income level(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>median income</td>
<td>median income with $25,000 or more income(%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>10,469</td>
<td>6,828</td>
<td>5.6</td>
<td>8.5</td>
<td>12.0</td>
</tr>
<tr>
<td>SMSAs</td>
<td>10,458</td>
<td>7,663</td>
<td>4.7</td>
<td>7.7</td>
<td>10.9</td>
</tr>
<tr>
<td>Columbus SMSA</td>
<td>10,536</td>
<td>7,631</td>
<td>5.0</td>
<td>7.8</td>
<td>10.9</td>
</tr>
<tr>
<td>Columbus Urbanized Area</td>
<td>10,134</td>
<td>7,552</td>
<td>3.0</td>
<td>9.8</td>
<td>13.5</td>
</tr>
</tbody>
</table>

lower income. Heterogeneity of population makes Columbus an ideal case study for this dissertation.

In addition to the degree of socio-economic variation, other considerations influenced the choice of Columbus as the study context. These included: (i) the size of the school system in terms of the total number of elementary schools; (ii) the district's maintenance of substantial data on a school-by-school basis and its active pursuit of a program of collection, pre-processing, storage, and publication of school-related data; and (iii) the absence of busing of elementary school students out of their residential neighborhood schools for the purposes of racial balance during this time frame.

The size of the Columbus School District was of great importance. The 124 elementary schools included in the district constitute a large enough number of observations to allow the use of an array of powerful statistical procedures. Additional schools could well make the data requirements physically unmanageable without significantly enhancing inference.

In addition, the district's Office of Testing and Evaluation has been particularly active in the collection and management of a broad range of information relevant to the operation of a large urban school system. Commonly, even when data have been collected on a school-by-school basis, there has been considerable reluctance to release the data. The Columbus School District has, on the other hand, released an extraordinary range of data at this level of aggregation. This, in turn, facilitates rigorous comparison of school characteristics with neighborhood
socio-economic characteristics, the analysis of student and staff composition across individual elementary schools, and allows at least some evaluation of school performance. Again, we will review the nature of these data later in this chapter.

The last consideration taken into account here results from the emergence of local school busing policies during the late 1960s and early 1970s. The policy of the Columbus School District may be very simply stated. There was no forced or involuntary busing of elementary school students between residential neighborhoods in the time frame of this study. The school district allocated elementary school students to elementary schools in the city according to a neighborhood school concept. Typically, in a context of residential segregation, this leads to substantial segregation of pupil compositions between the different elementary schools. While not wishing to argue the educational and social merits of the neighborhood school concept, it is ideal for the analyses proposed here. The consequently strong intercorrelation of school neighborhood and school student socio-economic compositions during this time period allows study of bias in school district operation in a way which would otherwise be impossible.

METHODOLOGICAL ISSUES

In embarking on a study of expenditure variations across elementary schools, one quickly discovers that the data requirements are unusually demanding. Such is the case for this study, both in terms of the variety of geographic bases to be called upon for information and the range of variables associated with each of these bases. The data
requirements encountered in this dissertation raise a set of significant methodological issues.

**Aggregate Data, Data Collection Units, and Scale**

Aggregate data, as opposed to information collected and reported directly for individuals, are collected, pre-processed, and selectively published by a variety of governmental agencies involved in the day-to-day operation of our society. These data are collected for highly variable systems of areal units or jurisdictional entities. While wards or precincts are used to collect and report voting behavior, for example, a complex and otherwise unique geographic system of blocks, block groups, and census tracts is used to collect and report social, economic, and housing information for the same city. A totally different geographic data system of school attendance areas is used for educational information. For a social scientist wishing to utilize these aggregate data, this presents certain general problems of a methodological nature. In particular, a transformation procedure is necessary to modify this range of data sets in a way such that all information is referable to one geographic data system.

In addition, the **areal scale** of aggregation used for collection, reporting, or final comparison of a variable with others has been found to affect the properties of resultant data sets in a variety of ways.\(^2\) The scale of aggregation used exercises a pronounced filtering effect on the values ultimately reported.

It has been noted, for instance, that certain social, economic, and political processes appear to function or operate in a manner which
is scale specific. These effects may result, for example, in a situation where certain neighborhood level interactions are reflected in data values only when measured at the most local of scales. Comparable scale specific effects could occur for regions consisting of groups of census blocks, census tracts, counties, or states. In any of these cases, if the same variable were sampled and reported at an inappropriate scale of aggregation, evidence of such scale specific interaction would clearly go unrecorded. Obviously, different variables are influenced by differing sets of forces; it is therefore desirable to manage and manipulate such variables with considerable scale flexibility if they are to be brought into a common frame for analysis. This has not been possible in most cases in past research and, as a consequence, the least scale-flexible variable usually dictates the scale at which appropriate data can be statistically compared. As an example, this has commonly meant that whole cities have to be compared when social, economic, and political variables are combined in a research model. Whole cities may be the only common denominator at which comparisons could take place for those variables. Ultimately, as a result of this limitation, micro-scale neighborhood forces have either been studied improperly or have not been studied at all.

A second manifestation of the effect of aggregation has been clearly shown in the use of a variety of summary and inferential statistics. It has been noted that the total variation represented by a data set will decrease with increases in the size of data collection units for that variable. The local variation apparent at the block level in
rational composition for instance, is averaged out of the data as it becomes combined with other blocks for reports at successively higher levels of aggregation. As a result, correlation coefficients between race and other variables tend to increase with scale. A researcher, in picking a particular scale level for aggregation of data or correlation analysis, is setting an a priori bias for levels of explanation expected from subsequent analyses.

While we have seen that scale influences the nature of information in a general sense, a more specific interest of this dissertation concerns the effects of school grouping and regrouping. In examining school expenditures, researchers have commonly resorted to grouping together schools of like characteristics. These groupings have commonly been constituted on the bases of the socio-economic characteristics of a school's pupil composition. Once schools have been grouped however, it is not possible to compare on a school-by-school basis per student expenditures, class size, distributions of discretionary or compensatory funding, or other measures of school operating characteristics.

In such a case, the central tendency measure of expenditures for a given group may or may not be representative for individual schools within that group. Measures of central tendency for school groupings have been of interest in the past due to the expenditure disparities they seem to indicate. However, one must wonder how well such evidence would endure scrutiny if groupings were disaggregated, in steps, into a succession of larger numbers of groups, each group having progressively fewer schools. Ultimately, the ideal form for analysis would be a model
in which each school is represented as a separate observation. Figure 4 summarizes alternative interpretations of the analysis which might conceivably result from this strategy. Without evidence to the contrary, one is left with the feeling that any conclusions based on measures of central tendency for a group of schools would not be consistent enough across individual schools to warrant as much attention as they have received in the literature.

The study by Levy, et. al. (1974) addresses itself, at least partially, to this issue. This study was confined to evaluation of the distribution of teacher salary expenditures across elementary schools for Oakland, California. The authors grouped schools by minority population composition and socio-economic status. However, unlike previous school expenditure research, they reported both the mean and standard deviation for various types of expenditure for each group of schools (see Table 2 again). As suspected, a wide degree of variation was evidenced within each group of schools, and this would tend to limit the conclusiveness of inequities inferred from comparison of mean values; there was also evidence of skewedness in these distributions.

In response to concern for this problem, this dissertation will evaluate school-related variables differently. Rather than merely grouping schools, as has been common procedure, elementary schools will be used as individual observations throughout the analysis. This, along with a methodology to facilitate compatibility between a variety of geographic data systems should allow a representation of the full range of variation across schools to be considered. Such a methodology should
FIGURE 4 Some Alternative Forms of Interpretation for Grouped School Expenditure Disparity Patterns. (groups A to F used to aggregate individual schools rather than portray them as individual observations)
enhance the reliability of whatever conclusions may result from the analysis, even though disaggregation may lower the numerical value of the correlation coefficients reported. Groupings and reports of results by group, will be used only sparingly as secondary evidence, and then, only with qualification by measures of dispersion.

Solutions to the Compatible Data Problem

The issue of areal compatibility is of great consequence for this research. This results most specifically from the necessity of correlation analysis for purposes of a comparison across schools. In this kind of analysis, the researcher is quite often going to have to attempt comparison of variables collected from many different sources across the same total geographic space (e.g. a school district in-common with the city it serves). However, the requirement of observational compatibility has greatly limited the extent to which such research can be undertaken.

In very differing contexts, there have been attempts by social science researchers to develop methodologies whereby compatibility can be achieved between two differing geographic data systems. These rationales have been reviewed in some detail by Matson (1972). A summary of this review will now be presented. As a conclusion, a new procedure for creating spatial compatibility is described.

Several different methods for comparing density surfaces defined across different geographic data systems have been suggested in the literature. As Haggett (1965) has pointed out, it is possible to define a topographic-like surface, or continuous density function, for many
different spatial distributions—e.g. landforms, land rents, population densities, median income, racial compositions, etc. However, once this three-dimensional mapping has been accomplished for different variables across the same overall geographic entity, one requires some methodology for comparing these density functions for degrees of correspondence. When these different variables have also been evaluated for different geographic data systems, the evaluation of correspondence becomes more difficult since there is no coexistence of observational units short of the whole entity.

Court (1970) suggests a rather simple, though not necessarily straightforward, solution. In his procedure, the variable density functions are cartographically pre-processed in a way such that each phenomenon is represented by a system of equal interval isopleths. To facilitate this mapping, the data values for each variable could be transformed into Z-scores or percentiles, and deviation or variation ranges would be used to establish consistent isarithmic interval assignments to both ranges. Court then suggests a system of measurement allowing statistical comparison of the mapped surfaces: "When two maps drawn in this way, covering the same domain with the same number of equivalent isopleths are superimposed, the regions over which both distributions have their highest values can be delineated and measured. Similarly, regions of accordance for the next to highest values and so on can also be identified, as can regions having various degrees of discordance. Areas of each of these regions, obtained by planimetry, can be entered into a 'resemblance matrix' for which a
There are several problems with the Court method when one attempts to operationalize it in a research setting. Initially, there is a problem with the sheer mechanical complexity and tedium of attempting to identify, organize, and ultimately measure by hand these areas of accordance/discordance across the map domain. The difficulties would be disproportionately compounded as one increased the number of isopleths mapped in an attempt to gain precision in surface representation.

Secondly, the complexity of a "resemblance matrix" with a larger number of cell entries would limit the potential applications of the method. In attempts to increase the number of degrees of accordance/discordance to be evaluated, the computations required could easily render the method unusable unless it were computerized.

Finally, there is a lack of standardized statistical tests for measuring the significance of varying degrees of accordance/discordance. While the "quantile correlation" measure used by Court is expressed in a manner quite similar to the correlation coefficient, the two are not statistically related, and the sampling distribution for "quantile correlation" is, in fact, an unknown.

Haggett (1965) discussed a variation of this type of scheme. Of more concern here, however, he also identifies a number of other methods for creating compatible observations from differing data bases. Those of greatest interest would seem to include: (i) grid-type solutions: sampling the density functions for a specific rectangular grid, so as to allow comparison of values by observations created at regularly spaced
grid intersections; and (ii) grid-free solutions: the use of three-dimensional surfaces for variables so as to create the "best fit" polynomial representations of the data. This, in turn, allows predictions of values for an infinite number of coordinates across a map domain.

This latter form of procedure uses the technique known as trend surface analysis. Trend surface analysis however, is not a mapping procedure for density surfaces in the strictest sense. It only graphically and mathematically portrays the three-dimensional properties of predicted values calculated for that particular series of equations with appropriate coefficients. The actual cartographic product is not the data density function itself, therefore, but is an approximation to its characteristics.

A SYMAP Solution to Interpolation

The grid-free solution for surface creation, and eventual comparison, using SYMAP appears to be far superior to the other methods commonly suggested for spatial interpolation problems. In discussing this particular form of grid-free solution, Shepard (1968) suggests:

"In many fields using empirical areal data there arises a need for interpolating for irregularly spaced data to produce a continuous surface . . . in order to display these data in some type of contour or perspective view, to compare them with data for the same region based on other data, or to analyze them for extremes, gradients, or other purposes, it is extremely useful if not essential, to define a continuous function fitting the given points exactly. Interpolation values over a fine grid
may then be evaluated. In using such a function it is assumed that the original data are without error, or that compensation for error will be made after interpolation."\textsuperscript{11}

While Shepard discusses this interpolation problem in a general context, it must be kept in mind that he is largely responsible for the algorithm used in Harvard's SYMAP mapping program. Unlike trend surface analysis, SYMAP does not fit a single polynomial equation through a progression of powers to the whole map domain in order to create an image of overall trend. Instead, SYMAP has an interpolation routine which "fits" the resulting surface configuration to the individual points within the map domain, and for each region and subpart separately from one another.\textsuperscript{12}

The Interpolation Process

In SYMAP, data values and spatial coordinates are read into the program. The coordinates define the locational system across which a surface is to be created, and also set the dimensions for the map domain to be generated by computer line printer. Within the map domain, there are a total number of print character locations to be assigned data values and, later, print character symbolization.

For print character locations at regular intervals across the map domain, values are assigned through a procedure using: (i) a search radius: a distance in all directions away from a character location within which an area will be searched in an attempt to fill a quota of input coordinates with data; (ii) a neighborhood definition: the number of data points which is the quota to be filled before calculation of a value.
should proceed; and (iii) a distance decay function: this is designed to mathematically weight a value for the diminishing effects of more distant data points relative to those which are closer to that character's location in the map domain. Characters within this regular interval of characters for which actual interpolations are calculated are assigned values based on the linear trend along the vector between the major grid intersections. Also, the regular grid used for actual interpolations places no specific requirements on the input coordinates and data; the solution is grid-free relative to input data.

A printer overhit character symbolization, associated with a given data range category, is then assigned to this print character location and the particular character is printed in a matrix with all other symbols for that map to create an isopleth map imagery. This SYMAP method of interpolation is suggested by Shepard as having been "developed with particular consideration for variables such as population density, housing conditions, and others from the fields of planning and geography . . . Though the foregoing interpolation function contains arbitrary choices which can be modified, it has, at least, provided a workable tool assisting in the analysis of area data via computer mapping." Among the options which are in fact available as part of this algorithm are the facilities to modify search radii, neighborhood definitions, and the distance decay parameter, and an option to recover all data values which have been calculated for print character locations in the map domain before symbolism was assigned. This interpolation and mapping program, therefore, provides a plausible and flexible procedure
creating density function surfaces from an unlimited variety of geographic data systems within the same spatial entity. Of greater importance, SYMAP allows these surfaces to be resampled for sets of coordinate locations appropriate to any other geographic data system for that same domain. It also facilitates the use of SYMVU for this creation of three dimensional images of these surfaces.

A Compatible Surfaces Routine

The following procedure is presented as a method for resampling from density function surfaces generated by SYMAP. The purpose of such resampling is to generate geographically compatible data for any number of social, economic, or political variables which can be mapped across the same geographic entity. Having created a SYMAP output and a matrix of input variable data values for each print character location, this procedure could be operationalized either by hand or through computer programming. The steps suggested as part of this resampling procedure should include (these are summarized in Figure 5):

(i) Creation of a base map on which elementary school locations and census tracts are plotted. A location is then measured as the intersection of rectangular coordinates in that base map domain. It is these coordinate intersections, or centroids, which are used to locate respective census tracts.

(ii) Collection and coding of data and coordinate information for variables A and B. Variable A could be for schools of a city, and variable B could be a measure of median income for census tracts across the same city. There is no a priori rationale for which variable is
RAW DATA FOR THE APPROPRIATE DATA COLLECTION
WITHIN THE SAME OVERALL GEOGRAPHIC DOMAIN

DATA SET FOR VARIABLE A
1. Variable values
2. Centroid information

INPUT
SYMAP PROGRAM
(mapping routine)
[using option 21]

OUTPUT
ISOLINE MAP (fitting a surface to input data across points for centroids of data units. Interval of isolines have no effect on the nature of the "matrix")

DATA SET FOR VARIABLE B
1. Variable values
2. Different centroid information

"MATRIX" USE (pull off values from the "matrix" to fit any distribution of points for the same overall geographic domain. This makes the original surface for variable A compatible with the geography for variable B.)

"MATRIX" (values for all print character locations in this final output to a grid as fine as 1/10 inch on columns and 1/8 inch on rows)

REGRESSION (variable A and variable B defined for locationally equivalent observations now)

FIGURE 5 Flow Chart for the LOGIC used in Compatible Surfaces.
identified as A or B for the purposes of this procedure. Therefore, it is suggested that unless there are other conceptual or methodological considerations, the geographic base with the fewer number of variables to be made compatible will be converted to that base having more variables included in the final analysis. Such a decision would be based solely upon the savings and convenience of creating fewer computer runs. It is assumed in this example that the school locations and census tract centroids do not coincide, and the data and coordinates are prepared as if SYMAP were to be used on either variable and its concomitant geographic data system.

(iii) Run SYMAP on variable A, with its corresponding centroids, being sure to request that option of the program which saves the numerical "matrix" of values assigned to print character locations (so that they can be stored on disk or tape). The sizes of the map window and map domain for output can be manipulated to obtain the degree of resolution desired.

(iv) The "matrix" reports actual values of variable A calculated for a print character location, and indicates a density function surface configuration for that variable which is now made independent of its original input coordinates. Using printer row and column coordinates as appropriate for the Y,X coordinates of variable B, this "matrix" is resampled by hand or by computer to recover variable A values for the differing geographic data system of variable B.

(v) Correlation and regression of variable A and variable B values can proceed, utilizing the variable B geographic data system as
the common set of observational units. The two variables are now spatially compatible, and they may be treated as if they were observations collected on the same geographic base.

**DATA SOURCES**

A major justification for this methodology results from the present study's far-ranging data requirements. Elementary school information, including variables for wages, students, staff, and attendance areas, the 1970 Census for Housing and Population, and school issue voting behavior have, by necessity, been collected and reported by many different agencies. These agencies, in turn, have used different geographic systems for data collection. This has precluded their effective use in the same regression model. As has been discussed, this no longer needs to be the case. We will now review each of the data sources as they are utilized in this dissertation. The purposes of this effort are to identify their special characteristics, their geographic data systems, and the nature of the specific information required. With these inputs, hypothesis testing concerning the nature and causes of variations in school expenditures across the Columbus School District can proceed.

**The "Columbus School Profile"**

The "Columbus School Profile" publications were developed by the Columbus Board of Education to "provide a means of communicating information about schools to the public--parents, interested citizens, organizations, and other members of the educational community." They provide varied information on elementary school students and their teachers for each school in the Columbus School District. This is the first
instance where this type of information has been systematically organized for the Columbus schools and updated on a yearly basis. Also, this information has been made readily available to the public upon request.

While somewhat similar school information has been made available through the "Profile" for academic years 1968-69, 1969-70, 1972-73, 1974-75, and 1975-76, this research has confined itself to the reports for May 1969 and May 1970. This time frame has been selected for a variety of reasons, some of which have been expressed earlier; these reasons include the absence of school busing across neighborhoods and it being a period early in the use of compensatory funding.

Absence of busing is necessary in order to assume that children attending an elementary school reside in that school's vicinity. This assumption is the basis for the SYMAP interpolation of Census information from residential neighborhoods through attendance areas to specific schools.

Compensatory funding is of concern because the use of such funds would remove from the hands of local school authorities some control over school-by-school funding levels. Instead, it is the intent of this study to view school expenditures as distributed at the discretion of these authorities. Disparities in expenditure should be a function of their decisions and policies as much as possible, rather than deriving from an equalization or compensatory funding formula.

Specific data-related criteria used in selecting this time frame include: (i) the fact that more recent data releases were greatly abridged as a result of cost considerations; (ii) the availability of
data for the same time period from the 1970 Housing and Population Census; and (iii) the availability of comparable data for two academic years allowing computation of averages.

Later "Profiles" were found to be greatly abbreviated and reduced in scope. The 1968-69 and 1969-70 data files were very ambitious in terms of the quantity of information reported. However, after one year with no report released at all, later "Profiles" presented data for far fewer variables. As a result, their usefulness is rather limited for present purposes.

In selecting a time period, the availability of the 1970 Census was also an important consideration. It seems most desirable to measure school characteristics and neighborhood social characteristics with data collected for the same time period.

Lastly, as a result of variations in values for variables from one year to the next, it is desirable to use mean values. Because the variety of data desired was only available for 1968-69 and 1969-70, mean values were based on these two data sets.

In reviewing data requirements, other matters must be considered. "A school is a complex organization. Efforts to characterize schools by the use of quantitative data are never complete. The number of factors necessary to describe a school and what goes on within a school is quite large." The list of variables identified includes conditions commonly accepted as indicative of a school's teaching environment and of its student population, and those which are commonly of concern to traditionally-oriented decision makers in the educational community.
While more radical educators would certainly find these variables to be either incomplete or inappropriate for the task of judging the educational productivity of elementary schools, they are most useful for the present effort.

Information taken from the "School Profile" can be categorized into several groups of variables. These include: (i) student characteristics; (ii) school-environment characteristics; (iii) classroom-environment factors; and (iv) staff characteristics. All "Profile" variables are averaged for the two yearly reports, unless otherwise noted (see Table 6 for a listing of all variables).

**Wage Data and Teacher Attributes**

The basis of the expenditure measures used in this dissertation are the school-by-school wage, experience, and qualifications data for elementary school teachers in Columbus for 1970. As pointed out in the previous chapter, teacher wages consume the burden of a school's total operating budget. It has also been commonly accepted that teacher salaries are the major source of inter-school expenditure disparities. Even when more detailed evidence on operating expenses, maintenance personnel, busing, equipment, and material support in the form of supplies and books has been available, they have been seen as relatively insignificant in the emergence of inter-school disparities. Disparities that do exist in operating expenses probably result from forces having few direct racial or economic connotations. These forces might include building age, land costs, specialized busing requirements, or heating fuel requirements.
TABLE 6  List of Variables Used.

1. MEDIAN INCOME (1)
2. MEAN INCOME (1)
3. % FAMILIES .5 or LESS OF POVERTY LEVEL (1)
4. % FAMILIES 3.0 or MORE OF POVERTY LEVEL (1)
5. % FAMILIES BELOW POVERTY LEVEL (1)
6. % FAMILIES RECEIVING PUBLIC ASSISTANCE (1)
7. WEALTH (dimension)
8. POVERTY SEVERITY (dimension)
9. RACE white population as a proportion of total population in a block group (2)
10. WAGE average teacher wage (3)
11. SIZE average class size (3)(4)
12. GNFD funding from general fund for that EFFORT (4)
13. NTCH extra non-teaching staff employed (4)
14. WSTUD teacher wage expenditures per student (3)(4)
15. EFFORT degree of special programming effort expended (dimension)
16. % TEACHER OF TOTAL PROFESSIONAL STAFF (4)
17. % GENERAL FUND SPECIAL PROGRAMS (4)
18. % STATE-FEDERAL PROGRAMS (4)
19. % ADC CASES IN TOTAL ENROLLMENT (4)
20. ABSENCE RATE (4)
21. PUPIL MOBILITY RATE (4)
22. % OF PUPILS NEW TO THE COLUMBUS PUBLIC SCHOOLS (4)
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.</td>
<td>% OF PUPILS ABOVE AGE LEVEL FOR GRADE (4)</td>
</tr>
<tr>
<td>24.</td>
<td>% WHITE PUPILS (4)</td>
</tr>
<tr>
<td>25.</td>
<td>STUDENT SOCIAL-AND RACIAL COMPOSITION (dimension)</td>
</tr>
<tr>
<td>26.</td>
<td>STUDENT TURNOVER (dimension)</td>
</tr>
<tr>
<td>27.</td>
<td>1969 STAFF TURNOVER (4)</td>
</tr>
<tr>
<td>28.</td>
<td>1970 STAFF TURNOVER (4)</td>
</tr>
<tr>
<td>29.</td>
<td>EXP average experience levels for teachers (3)</td>
</tr>
<tr>
<td>30.</td>
<td>NT percent of teachers with three years or less teaching experience (3)</td>
</tr>
<tr>
<td>31.</td>
<td>%1 percent of teachers with one year or less teaching experience (3)</td>
</tr>
<tr>
<td>32.</td>
<td>HOURS average number of course credit hours attained by teachers (3)</td>
</tr>
<tr>
<td>33.</td>
<td>BCH percentage of teachers having bachelor's degrees (3)</td>
</tr>
<tr>
<td>34.</td>
<td>TEACHER TRANSFER REQUESTS (origins and destinatations) (5)</td>
</tr>
<tr>
<td>35.</td>
<td>RATES P. T. A. membership rates (6)</td>
</tr>
<tr>
<td>36.</td>
<td>Referenda votes from 1968 to 1972 (7)</td>
</tr>
<tr>
<td>37.</td>
<td>VOTE (dimension)</td>
</tr>
<tr>
<td>38.</td>
<td>OWNER home ownership rate (2)</td>
</tr>
<tr>
<td>39.</td>
<td>AGE 15 percentage of general population under age 15 (2)</td>
</tr>
<tr>
<td>40.</td>
<td>AGE 55 percentage of general population over age 55 (2)</td>
</tr>
<tr>
<td>41.</td>
<td>%HSG percentage of general population who are high school graduates (1)</td>
</tr>
</tbody>
</table>
TABLE 6  List of Variables Used  
(continued.)

42. MDYR median school years completed (1)

Sources:  
(1) 1970 tract for Columbus, U. S. Bureau of the Census.  
(2) 1970 block groups for Columbus, U. S. Bureau of the Census.  
(3) Individual level teacher wage data, 1970.  
(4) "Columbus School Profile", Columbus Public Schools.  
(5) Personnel Office, Columbus Public Schools.  
(6) Parent-Teachers Association, Columbus  
(7) Franklin County Board of Elections.
Wage related data are used in three forms.\(^{26}\) Firstly, information is available for the average salary paid to teachers assigned to a given school. In addition, the average teacher wage paid per student has been calculated for each school.

A second form of wage related information concerns the distribution of teacher experience levels. Experience is a major determinant of salaries. The teacher experience levels are represented by the mean years of experience, the percentage of first year teachers, and the percentage of teachers having four or less years of experience.\(^{27}\)

Finally, there is the issue of teacher qualifications. Educational levels are measured in two ways. The first focuses upon college credit hours attained, on average, by teachers in a school. Also, the percentage of teachers with just a bachelor's degree is noted.

**Other School Information**

Information from other sources includes: (i) P. T. A. membership enrollments and (ii) teacher transfer requests, each identifying the origins and requested destinations.

**P. T. A. Membership**

In an attempt to evaluate rates of parental activism concerning neighborhood school operations, it seems reasonable to measure parental participation in local school activities. Parent-Teacher Associations, or P. T. A.'s, are most commonly the outlet for this activity. P. T. A. membership rates for each elementary school were, therefore, obtained from the city-wide P. T. A. organization for the 1969-70, 1970-71, and 1971-72 academic years. Because of missing data and substantial
year-to-year variations in membership rates, average P. T. A. membership rates were then calculated across the three years. In addition, information on the number of parents who could have joined a school's P. T. A. in a given year was not available; a ratio of members to students was therefore used. Regardless, it is felt that these data, along with voting behavior data, should allow for testing of hypotheses concerning differences in parental activism across neighborhood schools.

Transfer Requests from Teachers

Of major concern in this dissertation are patterns of inter-school transfers of elementary school teachers. These data, however, have proven extremely difficult to obtain. For present purposes, inter-school mobility is measured on the basis of requests for transfer by origin and preferred destination. This is in contrast to more desirable data on actual transfers.28

Voting Behavior

Information concerning voting behavior on school-oriented issues is of considerable importance to this research. In Ohio, the general electorate has had the opportunity to express its preferences for levels of school services in almost yearly votes on local school district finances. While parents of school age children can express their preferences through avenues such as P. T. A. membership or individual contacts with the schools, there is a need to understand school expenditure preferences in the population at large. It is expected that neighborhood population differing in socio-economic status
react in a systematic manner to district-wide requests for school funding authorizations.

In an attempt to measure these preferences, results for four funding referenda held during the late 1960s and early 1970s have been collected across voting precincts for Columbus. The specific results of interest include: (i) a November 5, 1968 operating levy which passed; (ii) a September 16, 1969 bond issue for capital improvements which failed; (iii) a May 4, 1970 bond issue and operating levy, both of which failed; and (iv) a November 7, 1972 bond issue for capital improvements which passed.

Regardless of specific outcomes, however, these data give some indication of the long term educational preferences of neighborhood populations.

Census Information

To allow comparison of these previously noted data to school neighborhood characteristics, data are also collected from the 1970 Census of Population and Housing for Columbus. Note, however, that to fully describe the attendance areas for the elementary schools in this study, it was necessary to draw information from the block group and tract levels of aggregation.29

HYPOTHESES

On the basis of the propositions suggested in the previous chapter, a number of hypotheses have been formulated; these can be set forth as follows:

1. There are statistically significant variations in school
expenditure measures across the elementary schools of the Columbus School System.

2. Expenditure variations will be systematically related to variations in socio-economic status (SES) of school attendance area populations. As the SES of a school attendance area population increases:

   a. the average wage paid to a teacher will increase;
   b. all teacher wage expenditures per student will decrease and then increase;
   c. class sizes will decrease;
   d. special effort will decrease and then increase.

3. Teachers will have systematic perceptions of, and responses to, the working conditions they encounter. As the SES of a school attendance area population increases:

   a. the desirability of teaching in that school will increase;
   b. staff turnover rates will decrease.

4. Transfers of teachers between elementary schools have effects of a systematic character. In particular, as the SES of a school attendance area population increases:

   a. average teaching experience of professional staff will increase;
   b. the proportion of staff which is tenured will increase;
   c. the proportion of all staff which are first year teachers will decrease;
d. average course credit hours for staff will increase;

e. the proportion of all staff with bachelor's degrees will decrease;

f. teachers requesting transfers out of that school, as a proportion of all teachers, will decrease;

g. teachers requesting transfers into that school, as a proportion of all teachers, will increase.

5. The distribution of parental and citizen activism on school matters will be systematically distributed. With an increase in the SES of a school attendance area population:

a. positive voter response for school finance issues will decrease and then increase;

b. P. T. A. membership rates for parents with children assigned to that school will increase.

These hypotheses are justified in turn and then evaluated in the chapters to follow.

SUMMARY

The Columbus School District was chosen as a case study because of both its consistent and its unique qualities. Columbus has been called the "All-American City" and is taken to be the normal, ordinary, and consistent example of an average American city of its size. Census data seem to substantiate this claim. For this reason, the city has been of interest to pollsters and advertising agencies.

There are also three major uniquenesses which are of interest. The central city school system in Columbus has had significant
suburban land annexed to it as the city has grown spatially, this has made its residential mix more heterogeneous than it would otherwise have been. There was also an absence of busing, thus ensuring neighborhood elementary schools. In addition, the Columbus School District has been in the forefront of urban school systems in organizing and releasing school data for public consumption.

Major weaknesses in earlier studies of school expenditure distributions derive ultimately from their extensive data-base requirements. In attempts to operationalize school expenditure models, data from several agencies and geographic bases are required. These requirements have raised issues reviewed in this chapter.

In response to these issues, some methodological innovations are suggested. The use of grouping observations has been eliminated whenever possible. Dispersion measures are used when grouping is necessary. The compatible surfaces (SYMAP) procedure is used to generate individual observations for analysis when appropriate. All of these innovations are made possible by the use of the compatible surfaces (SYMAP) procedure. This allows any data to be mapped as a density surface and then have values resampled for any other set of coordinates within the same original map domain.

Concluding sections of this chapter identified the data and hypotheses seen as necessary for evaluating the general propositions suggested at the conclusion of Chapter Two. It now remains to apply the methodologies proposed to the variables collected and, therefore,
test for the appropriateness of these hypotheses concerning school expenditures.
FOOTNOTES, Chapter Three

1. Cleveland, Ohio, is found to have been surrounded by a ring of autonomous suburbs on three sides (and has Lake Erie on the fourth). There has been no significant change in territory for Cleveland because it cannot grow into unincorporated suburban land and therefore Cleveland is unable to maintain a balanced SES for its central city population. See: John Bollens, "Metropolitan and Fringe Area Developments in 1967" Municipal Year Book: 1968, (Washington: International City Management Associates), 1968, John Wenum, Annexation as a Technique for Metropolitan Growth: The Case of Phoenix, Arizona, (Tempe: Arizona State University Institute of Public Administration), 1970, and Raymond Wheeler, "Annexation Law and Annexation Successes", Land Economics, (November, 1965), pp. 354-360.


4. This would require the collection, reporting, and use of data at, or near, that specific scale as possible. Use at other scales of aggregation could mask important variations in a data set and/or result in inaccurate representations of "real world social, economic, and physical systems.

5. The actual measured values, once averaged, are lost with that averaging process. If all values average of similar, little information may be sacrificed. However, if values are very different (resulting from a high standard deviation), the extremes of that variation are removed; these cease to be represented by the data set when averaging takes place.

7. Various studies in the literature have made different attempts to group elementary schools along racial and economic continuoum. The numbers of groups used have ranged from four to seven which have commonly incorporate unequal ranges of the control variable. Such studies were discussed in Chapter Two. (Sexton (1964), Levin, et. al. (1972), and Levy, et. al. (1974))

8. Another issue results from the use of a mean rather than median as a summary statistic. If there was a positive or negative skew for a value distribution, the median could be a more accurate indicator of central tendency. The mean value would be influenced by extreme values if they are reported.

9. The strategy involves the use of Z-scores to standardize the data for the two variables in question and mapping using isolines representing the same Z-score ranges. This allows variables with differing metric systems to be compared for relative variations across a total territory.


12. Shepherd, Ibid.


14. Actual values are interpolated for a courser grid than each character location; the character locations are then filled in on the basis of a linear trend between course grid intersections. However, that precision can be changed as Option 37 in SYMAP. However, this could drastically increase computing time for the program without significant increases in accuracy in most cases. See Dongenik and Sheehan (1975), Ibid., Section III, pp. 35-36 for details on this option.
15. A given symbolization used at a character location can be created with a total of four hits and overhits on a print location in the output map. However, resolution on the output map can be no more than 1/10 inch and 1/8 inch for column and row respectively of output characters.


17. See Dongenik and Sheehan (1975), Op. cit., section III, pp. 30-36, for the defaults and options available which may be used to change any of the parameters controlling the interpolation process.

18. If there is a conceptual reason which requires use of another strategy that should take precedence. The saving of computer time would only be of interest when there is no other criteria to be considered in the determination of which geographic base is converted to the other.

19. Dongenik and Sheehen (1975), Op. cit., Section III, p. 23 describes option 21 which is used to save the matrix of values associated with the character locations.

20. By using options 1 and 2 of SYMAP in combination, it is possible to increase map printout size to a reasonable limit and then to focus on only a small portion of a map geography for actual data interpolation and map production. Resolution for a map can be increased by producing a larger map of a smaller area in this manner.


22. The Columbus School System was a pioneer in the collection, presentation, and public release of school by school educational data. Other school districts have been unwilling and/or unable to release this volume of data in this micro-scale format. However, the District found that the original "Profiles" were too ambitious in terms of staff resources, and reproduction costs; later versions are "Reports", and have been greatly abbreviated.


24. The variables are traditional in that they do not concern themselves with measures of non-traditional (radical) educational values. There is little concern with students coming in contact with alternative social environments and the independent inquiry of extreme interest to radical educators. For a discussion

25. Wages are seen as the major source of school expenditure disparities. This is because of: (i) their importance of expenditures of staff relative to overall school budgets and (ii) the tendency for senior teachers to systematically gain assignments in higher SES school of a district.

26. The wage data used here identified the salaries, education, and experience information for each teacher assigned to each elementary school in the Columbus School System. However, these data were only made available for the 1969-70 academic year.

27. No more than three years of experience can be credited for service outside the Columbus schools. Other experience is not counted for salary purposes even if a teacher has only recently been hired in Columbus after many years elsewhere.

28. As a result, we can only review an indication of desired destinations for transfer if they were approved. Application rates may be affected by the reality that no voluntary transfers are being allowed and even the nature of destinations indicated may be different than when transfers can be made.

29. The tract level of census aggregation is the most micro of scales at which income information is available. While the tract leads to more aggregation of that information than desirable for this dissertation, that data is not available for block groups or blocks.
Chapter Four - School Expenditure Distributions

A major assumption of this dissertation is that school expenditures, of several types, vary significantly across the elementary schools within a school district. This chapter statistically evaluates the significance of expenditure variations across elementary schools in the Columbus School System and places them in a spatial perspective. Having accomplished both these tasks, relationships between various school expenditure measures and a composite index of socio-economic status (SES) and race for school attendance area populations are reviewed. Emphasis is placed on teacher wage-related expenditure variations. Conclusions are then drawn.

VARIATION - A Statistical View

The initial question concerns the existence of variations in expenditures. If one finds no significant variation in these data to begin with, the resulting distributions across schools will be uniform; each school will have essentially the same expenditure level. In addition, even if significant variations in expenditure do exist across schools, there is no a priori reason to presume that these variations are significantly patterned either socially or spatially.

Table 7 presents the means and standard deviations for the expenditure variables under consideration. Statistically, variations clearly do exist across these schools. There is a variation of almost $1,200 within one standard deviation above and below the WAGE mean. Class SIZE varies a little over 10 students within the same
<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Across Schools</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAGE (paid to a teacher)</td>
<td>$7,953.70</td>
<td>$593.78</td>
</tr>
<tr>
<td>SIZE (of classes)</td>
<td>27.47 students</td>
<td>5.18</td>
</tr>
<tr>
<td>EFFORT (special programming)</td>
<td>0.0</td>
<td>.866 (factor scores as values)</td>
</tr>
<tr>
<td>GNFD (funding from general fund for that EFFORT)</td>
<td>9.71%</td>
<td>2.57%</td>
</tr>
<tr>
<td>NTCH (non-teaching professional help)</td>
<td>15.74%</td>
<td>6.95%</td>
</tr>
<tr>
<td>WSTUD (wages paid for staff per student)</td>
<td>$281.85</td>
<td>$73.51</td>
</tr>
</tbody>
</table>
number of standard deviations. The $140. variation indicated in WSTUD is also worthy of specific note. However, it now remains to account for the specific manner in which these variations are distributed.

**VARIATION - A Spatial View**

In an initial attempt to allocate portions of the total variation in expenditure to specific independent variables, certain measures of expenditure and SES have been mapped, using SYMAP and SYMVU. This mapping effort is meant to present the configuration of the density surfaces appropriate for WAGE, WSTUD, and the income dimensions (WEALTH and POVERTY) which are presented later in this chapter. Figures 7 and 8 indicate the WAGE and WSTUD distributions mapped with elementary schools (N = 120) as their individual data points; Figures 9 and 10 used censuses tracts (N = 143) for the income dimensions.

It is immediately apparent that there is little observable spatial pattern in the expenditure variables. Higher expenditures were expected to characterize higher SES schools; lower SES schools were expected to receive lower expenditures. However, in each case, these expenditure maps present an image of a more random pattern of variation across schools than WEALTH across census tracts for the same total territory (see Figure 6). Remember, that we will later compare these surfaces with each other statistically to verify such a conclusion and that density surface comparisons are central in the solution proposed for solving the data problems encountered in this dissertation. In this case, however, there is little visual evidence here to suggest that any specific areas of Columbus are receiving
The Direction of View is from the Southeast Toward the Northwest (from Canal Winchester toward Dublin)

FIGURE 6 The Locational Base Map for the SYMVU Output Maps that Follow—Columbus, Ohio.
FIGURE 7 The Distribution of the Wealth Dimension (I) - Columbus, Ohio.
FIGURE 8 The Distribution of the Poverty Dimension (II)—Columbus, Ohio.
FIGURE 9 The Distribution of the Average Wage—Columbus, Ohio.
FIGURE 10 The Distribution of Expenditures per Student—Columbus, Ohio.
systematically higher or lower expenditures for their schools. Some
initial evidence now suggests that variations in expenditure are more
spatially and socially random than would have been expected.

**SYSTEMATIC EXPENDITURE DISPARITIES ACROSS THE COLUMBUS SCHOOLS**

The preceding sections have reviewed variations in teacher wage
expenditures across the Columbia School System, and presented a view
of their spatial distribution. It now remains to establish the na­
ture of the relationship between these variations and the socio­
economic status of school attendance area populations. For this
analysis, the elementary schools in Columbus are treated as individ­
ual observations. They represent observations for which school ex­
penditures and associated measures can be identified and to which
certain SES and racial characteristics for attendance neighborhood
populations can be successfully interpolated.

Before actually proceeding with testing of hypotheses relating
expenditures to these neighborhood characteristics, the SES measures
used are explained.

**An SES Measure**

School expenditure studies, when examining the impact of socio­
economic status, have traditionally been very weak in their choice
of, and ultimate use of, surrogate measures for this variable. The
underlying reasons for this weakness have been discussed at some
length in Chapter Three of this dissertation. The interpolation
strategy adopted should overcome most of the shortcomings noted.
The 1970 U.S. Census provides a wide range of SES variables appropriate to evaluating the nature of school-by-school expenditure disparities. The SES index used through most of this dissertation contains two main elements: income and poverty intensity. Much of the literature concerning intra-district disparities in expenditure has focused on these characteristics for purposes of prediction and explanation.\(^1\) In that literature, recent attention has been focused on measures of both income and an indicator of poverty across schools as criteria for creation of disparities. The distribution of income is supposedly responsible for discretionary expenditure variations, while more specific measures of severity of poverty are important in the allocation of compensatory efforts. The income and poverty biases are noted in these studies and have been the basis for attempts to remedy resulting inequalities. When SES is mentioned in this discussion, a general connotation of socio-economic status is intended. Specific measures of more particular attributes which are part of a connotation of SES will be specifically identified and used when necessary. It will also be a common strategy to introduce race into an equation as a control variable to isolate the independent effects of income and poverty on a given dependent variable.

**Socio-Economic Status (SES)**

In attempting to establish an SES index, data must, out of necessity, be drawn from the tract level of census aggregation. Income and poverty measures are not available below the tract level,
since the tract is the minimum scale of disclosure for income related information.²

The income variables chosen as a basis for developing an SES index are not intended to measure only the overall distribution of wealth across school attendance areas. It is assumed that the severity of poverty is not easily measured by overall wealth; to a degree, for example, the intensity of poverty can vary independently of either the mean or median incomes reported for respective census tracts. The measures of central tendency for income do not give insight into the dispersion and/or distribution of that wealth relative to specific groups of residents in a tract. Therefore, more detailed information on the skewedness of that distribution is essential and this should be provided by the measures of poverty selected.

As a result of the high degree of intercorrelation expected and actually noted in income data, however, the data reduction technique of factor analysis is used. Factor analysis was performed before interpolation from census tracts to the geographic base for elementary schools. This minimizes the number of times the interpolation must be performed; only a few dimensions rather than a range of specific variables must be processed to attain data compatibility. The results of the factor analysis on all variables are presented here (see Table 8).

Some observations had to be eliminated from this analysis. A total of 143 tracts were used as input. This contrasts with the 160 tracts making up the central city of the Columbus SMSA. Elimination
<table>
<thead>
<tr>
<th>Variable</th>
<th>Dimension (factor loading values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDIAN INCOME</td>
<td>.836    - .407   .015</td>
</tr>
<tr>
<td>MEAN INCOME</td>
<td>.893    - .235   -.111</td>
</tr>
<tr>
<td>% FAMILIES .5 or LESS OF POVERTY LEVEL</td>
<td>-.332   .820       .074</td>
</tr>
<tr>
<td>% FAMILIES 3.0 or MORE OF POVERTY LEVEL</td>
<td>.619    -.557   -.215</td>
</tr>
<tr>
<td>% FAMILIES BELOW POVERTY LEVEL</td>
<td>-.273   .890       .034</td>
</tr>
<tr>
<td>% FAMILIES RECEIVING PUBLIC ASSISTANCE</td>
<td>-.477   .529       .260</td>
</tr>
<tr>
<td>% EXPLAINED VARIATION</td>
<td>67%     10%       1%</td>
</tr>
</tbody>
</table>
occurred for a variety of reasons. New tracts created by division of older suburban tracts have, in many cases, small population bases. In such circumstances, income variables are suppressed from public release for reasons of confidentiality. Data from other long-existing tracts which were either dissected by the Interstate and local highway system, occupied by other public works, or made undesirable by noxious facilities suffered a similar fate.

The dimensions identified in the factor analysis of income data include:

I. A WEALTH DIMENSION: as the factor scores for this dimension increase, there is an increase in the level of wealth across census tract populations. This dimension explains 67% of the variation of the input data.

II. A POVERTY SEVERITY DIMENSION: as the factor scores for this dimension increase, there is an increase in the poverty experienced across census tract populations. This dimension explains 10% of the variation of the input data.

The factor loadings presented in Table 8 allow a fairly clear cut empirical interpretation. Measures of wealth load on the first dimension and the more specific indicators of poverty load more prominently on the second. A third dimension did not explain sufficient variation to justify interpretation.

The factor scores for WEALTH and POVERTY dimensions can now be mapped, using SYMAP, to create their appropriate density surfaces. These density surfaces are then resampled for the 120 elementary
school centroid locations used in this study. These dimensions allow the identification of SES as appropriate to school attendance area populations for respective elementary schools.

**RACE as a Control Variable**

Since particular interest focuses on the independent effects of SES on dependent variables, a race variable, due to its intercorrelation with SES, is used as a control variable in each multiple regression equation. RACE is reported for 493 of the census block groups in the City of Columbus. Again, this number of observations is less than the total number in the city and this is again attributed to suppressions by the Bureau of the Census. This should have no systematic effect on the results, since the data missing tended to be distributed randomly over the total study area. The specific variable used in this context is: the white population, as a proportion of total population in a block group (RACE). RACE is mapped at the block group level of aggregation using SYMAP, and is then resampled for compatibility with school geography.

**The Relationship of SES and Expenditure Variables**

There has been general agreement in the literature that intra-district school expenditures in the United States are distributed unevenly. There has also been agreement that these inequalities have both spatial (inner city-suburban) and SES (WEALTH/POVERTY) biases. However, the specific nature of these disparities has varied significantly over the past 30 years. It remains now to evaluate the degree to which the distributions of expenditure-related variables
across the elementary schools of the Columbus system compare with these earlier findings.

The earliest studies in the literature indicate a positive relationship between SES for an elementary school attendance area population and overall school expenditures. This pattern of expenditures, as noted in Figure 11A, is commonly regarded firstly, as the result of discretionary funding allocations on the part of school authorities; and secondly, as an example of racial or class bias in funding decisions.

Later studies have suggested a tendency for both lower and higher SES elementary schools to receive higher overall school expenditures. Intermediate SES schools have received relatively lower allocations (see Figure 11B). In explanation, it is suggested that discretionary funding is having the same effect noted above in Figure 11A. However, as a result of fledgling state and federal school funding programs which specifically allocate compensatory funding to particular types of schools—those schools with a high incidence of poverty—lower SES schools are also receiving additional funds. The actual magnitude of this redistribution of funding is not clear. Because neither a discriminatory nor compensatory expenditure bias is expected to apply to more intermediate SES schools, expenditure levels there will be lower.

Still more recent studies of school expenditures indicate that there may be another shift toward a more equal inter-school distribution of discretionary funds (see Figure 11C). Pressures have been
FIGURE 11 Examples of Possible Graphings for Expenditure Distributions Across SES for School Attendance Areas.
brought to bear on school authorities to equalize their discretionary spending between schools. As a consequence, any additional compensatory funding leads to an expenditure inequality favoring lower SES schools (see Figure 11D).

It is hypothesized that the Columbus elementary schools will generally have an overall expenditure pattern which is transitional between the idealized representations presented in Figure 11A and 11B, respectively. During the time frame of this study—1968 to 1970—compensatory funding programs had not had their full effect on expenditure distributions in Columbus. The State of Ohio had not been as active as some other states, such as California, in identifying and remedying inequalities in school spending either between or within school districts. However, the strengths of relationships are now not expected to be high; a high dispersion may exist about any trend apparent.

**Predictive Equations for School Expenditure Disparities**

The analysis which follows uses multiple regression to test a series of hypotheses concerning the relationship between SES and specific school expenditure measures. Independent variables are provided by the SES measures described above. Dependent variables are all expenditure and expenditure-related variables evaluated across schools, and include: (i) the average teacher wage; (ii) average class size; (iii) degree of special programming effort expended; (iv) a measure of the extra non-teaching staff employed; and (v) teacher wage expenditures per student.
The literature, however, has suggested the existence of a U-shaped relationship between wealth and some expenditure variables. Our equation: (i) tests for the existence of a U-shaped relationship between WEALTH and a dependent variable when necessary; (ii) relates the same variable to the poverty measure; and (iii) also uses RACE as a control variable. This model is as follows:

\[ Y_i = a + b_1 x_{i1} + b_2 x_{i2} + b_3 x_{i3} + b_4 x_{i1}^2 + e_i \]

where:

- \( Y_i \) = a measure of school expenditures for the ith elementary school;
- \( x_{i1} \) = the WEALTH of the population of the ith school attendance area;
- \( x_{i2} \) = the POVERTY of the population of the ith school attendance area;
- \( x_{i3} \) = the RACE of the population of the ith school attendance area; and
- \( e_i \) = the error term for the ith school.

**Average Teacher Wage**

In the literature, it has generally been assumed that as the SES of an elementary school's attendance area population increases, there will be an increase in the average teacher wage paid (\textit{WAGE}). This results from a non-random allocation of teachers of differing experience and qualifications to different schools. As a result, teacher allocation contributes substantially to those socially perverse expenditure inequalities which result when there is no specific
administrative effort of a counteracting nature. As of 1968–69 and 1969–70, it is assumed that any such remedial measures had not been implemented by the Columbus School System; teacher wages should therefore be directly related to neighborhood SES.9

Given the results in Table 9A, this hypothesis cannot be rejected. In reviewing those results, moreover, it is readily apparent that WEALTH, and therefore discretionary expenditures, is the only significant one of the SES variables. Note that the effects of RACE are being held constant in the equation. This equation, however, accounts for less than 6 percent of the total variation of the WAGE variable. In fact, therefore, variations in WAGE are only slightly related to WEALTH across elementary schools in the Columbus School System.

Class Sizes

It is assumed here that class sizes (SIZE) are a major tool by which a school administration could deliver increased per pupil expenditures of a discriminatory character to specific elementary schools. This SIZE measure is based on total students in a school divided by only the actual classroom teachers assigned to that school. Additional teacher aides and specialists were not included in this denominator. Traditionally, it has been held that fiscal favoritism for higher SES schools has led to their smaller classes;10 this suggests that size is negatively related to WEALTH and directly related to POVERTY across elementary school attendance area populations, when controlling for RACE.
### TABLE 9  Results of Multiple Regressions for the Expenditure Disparity Models.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Wealth</th>
<th>Poverty</th>
<th>Race as control</th>
<th>Wealth²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. WAGE(^2 R^2 = .058)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>.220</td>
<td>-.006</td>
<td>-.012</td>
<td></td>
</tr>
<tr>
<td>BETA</td>
<td>.262</td>
<td>.067</td>
<td>-.045</td>
<td></td>
</tr>
<tr>
<td>F for inclusion</td>
<td>7.1</td>
<td>0.3</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td><strong>B. SIZE(^2 R^2 = .394)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>.244</td>
<td>-.596</td>
<td>.515</td>
<td></td>
</tr>
<tr>
<td>BETA</td>
<td>**</td>
<td>-.484</td>
<td>.245</td>
<td></td>
</tr>
<tr>
<td>F for inclusion</td>
<td>**</td>
<td>24.8</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td><em><em>C. EFFORT</em>(^2 R^2 = .574)</em>*</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>-.308</td>
<td>.709</td>
<td>-.633</td>
<td>-.293</td>
</tr>
<tr>
<td>BETA</td>
<td>-.761</td>
<td>.558</td>
<td>-.294</td>
<td>.772</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>1.0</td>
<td>35.6</td>
<td>13.2</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>D. GNFD(^2 R^2 = .117)</strong></td>
<td>+</td>
<td>-</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>.067</td>
<td>.244</td>
<td>-.267</td>
<td></td>
</tr>
<tr>
<td>BETA</td>
<td>.203</td>
<td>.201</td>
<td>-.204</td>
<td></td>
</tr>
<tr>
<td>F for inclusion</td>
<td>4.6</td>
<td>3.1</td>
<td>3.5</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 9  Results of Multiple Regressions for the Expenditure Disparity Models.
(continued)

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Wealth</th>
<th>Poverty</th>
<th>Race as Control</th>
<th>Wealth²</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. NTCH*</td>
<td><strong>R² = .405</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>-.224</td>
<td>.588</td>
<td>-.529</td>
<td>-.213</td>
</tr>
<tr>
<td>BETA</td>
<td>.876</td>
<td>.477</td>
<td>-.261</td>
<td>-.844</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>0.9</td>
<td>18.6</td>
<td>7.4</td>
<td>0.9</td>
</tr>
</tbody>
</table>

| F. WSTUD*          | **R² = .408** |        |                |         |
| Hypothesized Slope|        |        |                |         |
| Simple Correlation | -.185  | .607   | -.514          | -.167   |
| BETA               | .279   | .504   | -.239          | -.203   |
| F for inclusion    | 0.1    | 20.9   | 6.0            | 0.05    |

* was expected to have a non-linear relationship with the Wealth variable.

** did not enter the equation

F coefficient significance: 3.92 at the .05 level; 6.85 at the .01 level; or 11.38 at the .001 level. (df = 119)
The hypothesis, however, must be rejected (see Table 9B). WEALTH does not even enter the equation while the sign for POVERTY is incorrect for the hypothesis as stated. In fact, POVERTY is inversely and quite strongly related to class size.

**Special Effort in the Columbus Schools**

Special effort (EFFORT) expended across elementary schools in Columbus results from specific attempts by federal, state, and local school authorities to enrich or supplement a school's normal educational programming. This EFFORT might be achieved through required or voluntary reallocation of discretionary monies, specific compensatory monies, or other support in the form of supplemental staffing or materials. These commitments of resources facilitate educational efforts which would be over and above levels normal for the school or school district.

It is assumed that EFFORT will have a U-shaped relationship with WEALTH across school attendance area populations and will be positively related to POVERTY. As WEALTH increases, there will be a decrease and then an increase in the level of EFFORT being expended for a given school and its attendance area population. Special effort on education in lower WEALTH schools results from compensatory monies with federal and state sources earmarked specifically for these schools. This is why there is the positive relationship assumed between EFFORT and POVERTY. Usually, such monies are by design for improvement of programming in elementary level education, with emphasis placed on lower SES schools to help overcome whatever learning disadvantages these students may have as a result of their home environments.
Special effort in higher SES schools on the other hand, would result from a residual disparity funded by discretionary sources supporting their college entrance-oriented programs. More intermediate schools receive neither form of this funding.

To aid in the evaluation of these hypotheses, a multi-variate dimension to calibrate EFFORT has been created. This dimension is the outcome of a factor analysis of three variables, each of which is related to some aspect of special school programming. The variables included and results of this factor analysis are presented in Table 10. This factor loading matrix indicates that all three variables are represented by the EFFORT dimension. Also, the higher loading of federal and state funding for programs, as opposed to local funding, indicated a predominance of state-federal funding in whatever programming is taking place in the Columbus schools. The dimension explains 44 percent of the total variation of the input variables.

In relating EFFORT to SES across school attendance area populations, holding RACE constant, it is apparent that the hypothesis stated must be rejected for several reasons (see Table 9C). There is not a significant U-shaped relationship between WEALTH and EFFORT. Having controlled for the effects of RACE, it is noted that POVERTY is the only one of the SES variables which proved significant.

**General Fund Special Programming**

If there is special effort being expended which is specifically intended to benefit higher-SES schools, it must come from discretionary sources. Therefore, general fund expenditures on special effort would
TABLE 10  Dimension for Special Effort Across Elementary Schools with Factor Loadings.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dimension (factor loading values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% TEACHERS OF TOTAL PROFESSIONAL STAFF</td>
<td>1</td>
</tr>
<tr>
<td>% GENERAL FUND SPECIAL PROGRAMS</td>
<td>-.820</td>
</tr>
<tr>
<td>% STATE-FEDERAL FUND SPECIAL PROGRAMS</td>
<td>.175</td>
</tr>
<tr>
<td>% EXPLAINED VARIATION</td>
<td>.786</td>
</tr>
<tr>
<td></td>
<td>44%</td>
</tr>
</tbody>
</table>
be expected to be positively related to WEALTH and negatively related to POVERTY across schools.

In the results (see Table 9D), it is noted that general fund special programming (GNFD) is positively and just (.05 level) significantly related to WEALTH across schools. However, if anything, these funds are spent in a slightly random manner when compared with both SES variables and RACE.

**Non-Teaching Professional Staffing**

In a final attempt to clarify the nature of the distribution of EFFORT expenditures across elementary schools in Columbus, an additional hypothesis has been posed and tested. This one concerns the nature of a relationship between the percentage of non-teaching professionals (NTCH) assigned to a school and SES across school attendance area populations. Since lower and higher SES schools were assumed to be receiving EFFORT, both lower and higher SES schools should have higher levels of NTCH. This NTCH staffing would be an important mechanism through which EFFORT is expended. Values of NTCH should decrease and then increase with increases in WEALTH, while also increasing with POVERTY.

The results concerning this matter are not consistent with such a hypothesis (see Table 9E). While a relation is indicated between WEALTH and NTCH, the Beta's were not of the slope expected and the level of explanation was insignificant. WEALTH again had little importance in the final equation; POVERTY and RACE (as a control variable) account for about 40% ($R^2 = .400$) of the variation in NTCH.
Wages Paid Per Student

The last analysis considered in this chapter is designed to investigate wage payments to teachers per student (WSTUD). In a sense, WSTUD gives the accountant's bottom line or net fiscal result of the various forces suggested here as influencing the nature of school expenditure disparities. WAGE, EFFORT, and SIZE interact to create this value; WSTUD decreases and then should increase with an increase in WEALTH. Also this dependent variable should increase with increases in POVERTY if these school expenditures are to be consistent with our earlier assumptions.

The results indicate rejection of this hypothesis (see Table 9F). There is only a slight correlation (R = -.18) for WSTUD and WEALTH. Again, however, the importance of WEALTH in the overall model is only marginal. A null hypothesis of a negative relationship between WSTUD and SES, holding RACE constant cannot be rejected. As there is an increase in SES across these elementary schools, there is a decrease in WSTUD values reported; POVERTY is the significant force in that relationship, as seen in the Beta weights. A total of almost 41 percent of the variation in WSTUD is explained through a model implied by the equation.

DISCUSSION

These tests lead to a number of conclusions. In particular:
(i) the relationships for hypotheses not rejected are far weaker than expected, given the credence placed on them in the literature; (ii) a WEALTH bias in discretionary funding is not clearly evident; (iii)
compensatory funding appears to be influencing expenditures in the schools for which it was intended; (iv) some questions are raised concerning the mechanisms influencing class sizes across different schools during this time frame; and (v) there is a lack of evidence for the strong WAGE differentials that might result from an SES-bias in teacher transfers.

Levels of Explanation

Levels of explanation achieved in these tests are much lower than expected. Results contrast with those from reports in earlier school expenditure studies. The forms of analysis used in previous school expenditure studies, however, have not been particularly sensitive to variations in expenditures across individual schools. The emphasis in this study has been placed on the representation of that variation and on the use of correlation to establish the strengths of relationships.

Thus, a variety of methodological problems which have limited earlier studies have been surmounted in this analysis. The weak results presented here could therefore be an artifact of this enhanced degree of precision. In particular, the groupings of elementary schools used in previous analysis may have masked either consciously or unwittingly, large ranges in expenditure across individual schools which had otherwise comparable attendance area SES scores. This would have been the case for this study (see Table 11), with the data grouped as in earlier studies in a replication using those techniques.
TABLE 11  Variations in Wage Across Grouped Elementary Schools in Columbus.

A. as related to %WHITE

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Across Schools</th>
<th>Standard Deviation</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>$7953.70</td>
<td>$593.78</td>
<td>120</td>
</tr>
<tr>
<td>0-4.9%</td>
<td>8211.58</td>
<td>752.74</td>
<td>12</td>
</tr>
<tr>
<td>5.0-9.9%</td>
<td>7618.44</td>
<td>403.54</td>
<td>10</td>
</tr>
<tr>
<td>10.0-19.9%</td>
<td>7707.94</td>
<td>542.57</td>
<td>13</td>
</tr>
<tr>
<td>90.0-94.9%</td>
<td>7803.61</td>
<td>761.92</td>
<td>14</td>
</tr>
<tr>
<td>95.0-98.9%</td>
<td>8054.01</td>
<td>625.02</td>
<td>22</td>
</tr>
<tr>
<td>99.0-100.0%</td>
<td>8079.45</td>
<td>522.89</td>
<td>49</td>
</tr>
</tbody>
</table>

B. as related to %ADC

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Across Schools</th>
<th>Standard Deviation</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>$7953.70</td>
<td>$591.44</td>
<td>120</td>
</tr>
<tr>
<td>0%</td>
<td>8083.74</td>
<td>630.39</td>
<td>10</td>
</tr>
<tr>
<td>.1-.9%</td>
<td>8186.09</td>
<td>454.86</td>
<td>15</td>
</tr>
<tr>
<td>1.0-4.9%</td>
<td>8111.97</td>
<td>493.92</td>
<td>30</td>
</tr>
<tr>
<td>5.0-9.9%</td>
<td>7674.05</td>
<td>533.39</td>
<td>12</td>
</tr>
<tr>
<td>10.0-19.9%</td>
<td>7659.11</td>
<td>537.11</td>
<td>18</td>
</tr>
<tr>
<td>20.0-39.9%</td>
<td>7904.63</td>
<td>669.35</td>
<td>24</td>
</tr>
<tr>
<td>40.0% and up</td>
<td>7972.05</td>
<td>758.40</td>
<td>11</td>
</tr>
</tbody>
</table>
However, low level of explanation could raise at least two other issues of a non-methodological character. Firstly, could the Columbus schools be different from those of other districts studied? Secondly, could the larger range of SES noted within the Columbus city school system somehow account for these results?

A concrete set of answers to these questions is not possible at this time. There are at least some preliminary indications that methodological issues may be relevant. It is not possible to satisfactorily demonstrate this however, without replicating the earlier studies using the methodology employed in this dissertation.

Lack of Discretionary Funding Bias

There is little evidence to support the contention that there is a systematic discretionary funding bias on the part of school authorities aimed at benefitting higher WEALTH schools. The results from testing hypotheses concerning teacher wage, special programming effort, discretionary special programming funding, and class size variables are weak, at best. Discretionary funding, as evidenced by WAGE, SIZE, and discretionary special programming, was apparently not distributed in any systematic manner across schools; discretionary funding was important neither in determining overall special effort, nor was it related to SES in a systematic manner.

Existence of Compensatory Funding Bias

Quite clearly, compensatory funding is being expended in a manner consistent with legislative intent within the Columbus School System. Spending of these monies is obviously closely tied to poverty indicators;
as POVERTY increases across elementary school area populations, compensatory funding for schools increases. In addition, the special effort provided for elementary schools is primarily from compensatory funding.

Class Sizes

Contrary to hypothesis, lower SES schools consistently have smaller classes than higher SES schools. This could have resulted from a conscious effort on the part of school authorities to benefit pupils of lower SES schools or from special compensatory effort. However, an alternative explanation is also possible. This relates to suburbanization.

It seems reasonable to suggest that there has been overcrowding in the suburban schools of Columbus during the period under consideration. Population growth in suburban areas was very rapid during the late 1960s and early 1970s; suburbanization has tended to be a middle and upper class phenomenon. Resultant overcrowding of suburban schools—creating the need for larger classes and double sessions—was accompanied by a reluctance or inability to relieve this congestion by new construction and additional teachers. Also during this period, both operating levies and bond issues failed. Larger classes in middle and upper class schools may well have resulted from this cluster of events.

In any case, more teachers for double sessions and more classroom construction to relieve building pressures were not forthcoming between 1968 and 1972. This resulted from voter opposition to school
referenda. However, whether inter-school variations in class size result from a conscious effort to decrease class sizes for lower SES schools or from crowding of schools in suburban areas—with no funding to respond—cannot be determined at this time.

**Teacher Transfers**

The hypothesis regarding the relationship between WAGE and SES of school attendance area populations was critical for the burden of the analysis in the remainder of this dissertation. Bias in teacher transfers could be used as an explanation for the particular WAGE expenditure disparity which is apparent—albeit weakly—in Columbus. The idea of teacher transfer bias assumes that teachers with higher seniority are systematically transferred from lower SES schools to higher SES schools. Therefore, as a result of the wage effect created by this concentration of high cost teachers in high SES schools, a perverse WAGE distribution would be created.

While the nature of the disparity is consistent with the anticipated direction of teacher transfers, the level of explanation causes doubt about the effectivity of teacher transfers. One of the next tasks for this dissertation is to pursue this matter in greater detail.

**SUMMARY**

This chapter has reviewed evidence concerning the statistical significance and nature of school expenditure disparities across the elementary schools of the Columbus School System.
Statistically, the key school expenditure variables under consideration here varied significantly about their means or city-wide norms. Some spatial patterning was also noted. The characteristics of the SES index—combining measures of income and poverty severity—were also presented.

The relationship between variations in school expenditure and the SES of school attendance populations was examined. The results tended to be rather mixed and correlations were often weak. The idea of teacher transfer effects on expenditure variations was only weakly supported; class size was shown to greatly confuse the expenditure outcomes expected on the basis of teacher transfer patterns.

The distribution of other compensatory and discretionary funding for special effort programming across schools was evaluated. The results for compensatory funding held few surprises. The more random patterning of discretionary funds was not as expected. Evaluations of special effort overall indicated the heavy predominance of compensatory funds in these expenditures.
FOOTNOTES, Chapter Four - School Expenditure Distributions


3. In many cases the tracts had been created before the roadway construction and are therefore broken both geographically and functionally. The by-product of this for the user of census data are irreconcilable disturbances in tract boundaries from decade to decade; these changes are usually of such a nature as to require the deletion of an impacted census tracts as observations for time series analyses.

4. This literature was reviewed in Chapter Two and Three of this dissertation.


6. California and Michigan were among the first states noted in the literature for becoming active in this funding. The Levy, et. al. (1974) and Levin, et. al. (1972) studies, for those respective states, reported the efforts being made to resolve the problems of unequal abilities for school support across districts through substantial funding redistribution.

7. The non-linear relationship between expenditure and SES has become more important in reviewing school expenditure variations in recent studies. The assumption of a linear slope of change in overall expenditures across schools with varying SES cannot be made with recent changes in funding. As there is spending of both discretionary and compensatory funds, neither should benefit intermediate SES schools. This leads to the U-shaped distribution. However, there has not been a statistical test made for this property in past research.

stitute), 1972.

9. Levy, et. al. (1974) gives important evidence for a transition of Oaklands to increasing compensatory based funding and other specific efforts to eliminate other systematic discretionary fundings across schools.


11. The District may have been implementing to recommendations of the "Columbus Plan" which was recommended by community leaders in the late 1960s. The strategy was to limit growth of school services in suburban areas to slow the sprawl and/or white flight to which central cities have become accustomed in recent years.
Chapter Five - Teacher Working Conditions

The literature relating discretionary school expenditures to teacher transfers\(^1\) has given considerable attention to the nature of teaching conditions. Teaching conditions are an important component in the teacher transfer explanation of school expenditure disparities. When voluntary transfers of teachers are allowed within a school system, the resultant pattern acquires a systematic character. If non-voluntary transfers are made without regard for their potential expenditure effects, a similar, and perverse, redistribution of expenditure might be expected.\(^2\)

In an analysis of voluntary transfers by teachers, attention focuses upon the "push" and "pull" forces. They operate so as to create teacher demands for transfers from particular origin schools within a school system to specific destination schools.

"Push" forces would be those which create teacher dissatisfaction with particular school assignments, regardless of the specific properties perceived in alternative schools. "Pull" forces would be those attracting a teacher to specific school assignments, regardless of the properties perceived in the present assignment. In combination, the two forces should explain teacher desire to leave an assignment for one elsewhere in the school system. The precise identification of "push" and "pull" forces in a given situation would depend upon the teacher preference function for school environments and perceptions of working conditions at the different schools in the system.
In reviewing relationships between teaching conditions and attendance area population SES, we will be attempting to provide greater specification of the arguments in teacher preference functions. In the past, assumptions of the superiority of schools in higher SES neighborhoods, as teaching assignments, were accepted without critical review of their basis in reality. To the extent possible, we will now attempt a validation of these more specific arguments as "push" and "pull" forces. These forces, in turn, might be used in predicting origin and destination schools when teachers transfer.

This chapter proceeds to: (i) briefly postulate the "push" and "pull" conditions relating teaching environments to teacher transfers; (ii) outline and test specific hypotheses regarding the existence of the conditions postulated; (iii) evaluate the reactions of teachers in the Columbus School System to these conditions; and (iv) present conclusions concerning the appropriateness of push-pull forces and teacher perceptions of school-by-school desirability as they relate to teacher transfers.

TEACHING CONDITIONS AND TEACHER TRANSFERS

It has been assumed by Becker (1951) and Greenburg and McCall (1973) that, within a school system, elementary school teachers exhibit a certain social bias in their preferences for teaching assignments: given the choice, teachers consistently prefer teaching assignments in higher SES schools over those in lower SES schools. As the socio-economic status of a school's pupil composition increases, teachers perceive an increase in that school's desirability as a working
environment. Even when teachers are unable to select among alternative schools when first hired by a school system, they will attempt reassignment or transfer to a more desirable school within the system as soon as possible. Usually, this will be contingent upon gaining seniority.

MEASURES OF ASSIGNMENT DESIRABILITY AND THEIR RELATIONSHIP TO SES

In an attempt to evaluate the multi-dimensional characteristics of the contributions of classroom, school, and school attendance area population to the desirability of a teaching assignment, a number of variables must be considered. Teacher preferences for teaching assignments are based upon perceptions of the ideal teaching environment. According to the literature, for example, teachers prefer schools with: (i) higher SES pupil compositions; (ii) lower proportions of non-white students; (iii) higher levels of self-motivation for school work among the student body; (iv) scholastically able students; (v) a past history of scholastic achievement; (vi) a high degree of stability, or order, on a day-to-day basis; (vii) low student body turnover; (viii) small numbers of students per teacher with (ix) as many teacher's aides and other non-teaching professional specialists as possible; (x) cooperative parents sympathetic to teacher problems; (xi) parents capable of helping their children with academic work when absolutely necessary, and (xii) who have expressed preferences for high quality education for their children; (xiii) an administration sympathetic to teacher problems; (xiv) a workable system of discipline for students, both within and outside the classroom; and
(xv) a location in the city which is accessible to an appropriate range of housing opportunities.

**Some Data**

A series of operational variables have been identified as surrogates for school assignment desirability. The components to be evaluated and related to SES across attendance area populations include:

(i) student SES: this will be measured by the percentage of total enrollment which consists of ADC cases; (ii) student race: percent white pupils; (iii) classroom stability from day to day: using absence rate and pupils above age level for grade; and (iv) student turnover from year to year: as based on pupil mobility rate.

Factor analysis is again employed to summarize some of this data (i - iv) and the factor loading matrix for that analysis is presented in Table 12. The resultant dimensions can be given fairly clear empirical interpretations:

I. STUDENT SOCIAL AND RACIAL COMPOSITION: as factor scores for schools increase, the pupils on ADC decrease and percent white composition increases. (54% explained)

II. STUDENT TURNOVER: as factor scores for schools increase, student turnover rates increase. (13% explained)

The first of these dimensions is, in a sense, self-explanatory, and requires little additional comment. Student turnover, on the other hand, would appear to be most related to parental residential mobility. These migration patterns are responsible for the transfer of pupils in and out of schools over the short and long run. This condition
TABLE 12  Dimensions for Assignment Desirability with Factor Loadings.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dimension (factor Loading Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>%ADC CASES</td>
<td>I</td>
</tr>
<tr>
<td>IN TOTAL ENROLLMENT</td>
<td>-.709</td>
</tr>
<tr>
<td>ABSENCE RATE</td>
<td>-.326</td>
</tr>
<tr>
<td>PUPIL MOBILITY RATE</td>
<td>-.256</td>
</tr>
<tr>
<td>% OF PUPILS NEW TO THE COLUMBUS PUBLIC SCHOOLS</td>
<td>.036</td>
</tr>
<tr>
<td>% OF PUPILS ABOVE AGE LEVEL FOR GRADE</td>
<td>-.318</td>
</tr>
<tr>
<td>% WHITE PUPILS</td>
<td>.743</td>
</tr>
<tr>
<td>% EXPLAINED VARIATION</td>
<td>54%</td>
</tr>
</tbody>
</table>
confronts a teacher with discontinuities of class membership and disruptions of routine and discipline. The third dimension was not significant enough to be considered for further analysis.

**Hypotheses Relating School Desirabilities and SES in Columbus**

As suggested earlier, teachers are assumed to have preferences for combinations of teaching conditions. Using the dimensions just presented as indicators of teaching conditions, we may now state some hypotheses concerning their relationship to neighborhood SES across schools. It is assumed that school desirability will increase with an increase in STUDENT SOCIAL AND RACIAL COMPOSITION and a decrease in STUDENT TURNOVER.

As noted previously, it has commonly been assumed that teachers have considered each of these dimensions in their evaluation of potential teaching assignments. Exceptionally desirable teaching conditions have normally been associated with the autonomous suburban school systems of a metropolitan area. However, the conditions teachers feel they would find among the very limited job openings available in the suburbs may also be found in the suburban schools of some central city systems such as that in Columbus. Therefore, within a central city school system, these dimensions should be related to variations in SES across school attendance areas. We now proceed to test that assumption.

The general form of the statistical analysis carried out is again based on multiple regression. As previously stated:

$$Y_i = a + b_1x_{i1} + b_2x_{i2} + b_3x_{i3} + e_i$$
where: $Y_i =$ a measure of school desirability for the ith elementary school;

$x_{i1} =$ the WEALTH of the population of the ith school attendance area;

$x_{i2} =$ the severity of POVERTY among the population of the ith school attendance area;

$x_{i3} =$ the RACE of the population of the ith school attendance area; and

$e_i =$ the error term.

**Student Social and Racial Composition**

Correspondence between the SES and race of an elementary school's pupil composition and the SES and race of its attendance population is fundamental for most of the analysis in this dissertation. Lack of mandatory busing of elementary school students during this time frame allows us to assume that only with shifts in the SES and race of a school's attendance area population will there be changes in the SES and race characteristics of the student body.

Given the evidence presented in Table 13, the resultant hypothesis of a positive relationship between SES and race for an attendance area population and SES and race of that school's students cannot be rejected. The level of explanation is high (82%) and the Beta coefficients for the relationship were as expected. However, the failure of WEALTH to have a significant effect must be noted. The POVERTY variable as an indicator of SES, and RACE, have the most explanatory power.
TABLE 13  Results of Multiple Regressions for the Assignment Desirability Models.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Wealth</th>
<th>Poverty</th>
<th>Race as control</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. DIMENSION FOR $R^2 = .821$ SES AND RACE OF PUPILS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>.295</td>
<td>-.694</td>
<td>.883</td>
</tr>
<tr>
<td>BETA</td>
<td>.013</td>
<td>-.259</td>
<td>.730</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>0.087</td>
<td>25.7</td>
<td>220.7</td>
</tr>
<tr>
<td>B. DIMENSION FOR $R^2 = .258$ PUPIL TURNOVER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>-.330</td>
<td>.251</td>
<td>.096</td>
</tr>
<tr>
<td>BETA</td>
<td>-.308</td>
<td>.384</td>
<td>-.418</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>12.3</td>
<td>17.0</td>
<td>13.3</td>
</tr>
</tbody>
</table>

F coefficient significance: 3.92 at the .05 level; 6.85 at the .01 level; or 11.38 at the .001 level. (df = 119)
Pupil Turnover

It is assumed that with an increase in school attendance area population SES (holding RACE constant as a control variable), there will be corresponding decreases in pupil turnover. This is based on evidence of high rates of residential turnover for lower SES residential neighborhoods of central cities. The hypotheses, as stated cannot be rejected (see Table 13).

REACTIONS TO ELEMENTARY SCHOOL TEACHING CONDITIONS

Reactions of teachers to teaching conditions are measured here on the basis of individual behaviors. Teacher TURNOVER rates across elementary schools should reveal teacher reactions to the conditions encountered in their classrooms and schools. It is hypothesized that, with improvements in perceived teaching conditions across elementary schools, there will be a decrease in TURNOVER. TURNOVER should decrease as a result of satisfaction with the conditions encountered.

Table 14 presents relevant correlations. Hypotheses concerning the specific relations expected are also noted.

Staff TURNOVER

The observed relationships between staff TURNOVER and teaching conditions appear consistent with the hypothesis. With an increase in student TURNOVER and decrease in the factor, STUDENT SOCIAL AND RACIAL COMPOSITION, staff TURNOVER increases. All these slopes are consistent; however, and it needs to be stressed, the correlations are very weak. Other hypotheses concerning staff TURNOVER and aspects of school desirability are not confirmed.
TABLE 14  Some Hypotheses and Simple Correlations for Teacher Reactions to Teaching Conditions Across Elementary Schools in Columbus, Ohio.

<table>
<thead>
<tr>
<th></th>
<th>1969 Staff Turnover</th>
<th>1970 Staff Turnover</th>
<th>Average Turnover</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. HYPOTHESESIZED SLOPES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. SES AND RACE OF PUPILS</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. PUPIL TURNOVER</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3. WEALTH</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. POVERTY</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5. RACE</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>B. SIMPLE CORRELATIONS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. SES AND RACE OF PUPILS</td>
<td>-.014</td>
<td>-.301</td>
<td>-.210</td>
</tr>
<tr>
<td>2. PUPIL TURNOVER</td>
<td>.003</td>
<td>.210</td>
<td>.143</td>
</tr>
<tr>
<td>3. WEALTH</td>
<td>-.088</td>
<td>-.276</td>
<td>-.244</td>
</tr>
<tr>
<td>4. POVERTY</td>
<td>.111</td>
<td>.188</td>
<td>.198</td>
</tr>
<tr>
<td>5. RACE</td>
<td>-.113</td>
<td>-.283</td>
<td>-.265</td>
</tr>
</tbody>
</table>
DISCUSSION AND SUMMARY

A number of the traditional aspects of school desirability have been compared with school attendance area SES and RACE, and with teacher turnover as a measure of their reactions to elementary school desirability as a working environment. Very small percentages of total variation of the respective dependent variable have been predicted on the basis of the independent variables included. Also, there appears to be little evidence that these levels of explanation would improve significantly with the inclusion of additional independent variables.

A basic argument in this dissertation is the idea that biases in teacher transfers create school expenditure disparities. If higher cost teachers transfer systematically from lower SES schools to higher SES schools, school spending requirements are also redistributed.

Preference for higher SES schools result from perceptions of the different teaching environments within a central city school system. The literature has consistently noted a variety of attributes making for a desirable classroom environment. This chapter has been concerned with identifying a number of these attributes and has measured their variation across the Columbus schools.

The results of the analysis have supported, albeit weakly, our assumptions about preference functions. Some of the attributes of teaching environments were related to attendance area SES, and teachers react to them in some ways consistent with the idea of systematic preferences for teaching conditions. Pupil SES and TURNOVER (parental
mobility between schools and school districts) are, for example, related to SES across school attendance area populations.

The "reaction" variables which were identified, comprised measures of staff TURNOVER. These variables provided measures of one way in which teachers could respond to school teaching conditions. TURNOVER rates were distributed in a manner roughly consistent with the hypotheses stated; teachers are, in fact, leaving less desirable schools at higher rates than desirable schools.

Apparently, there is some basis for the assumptions made concerning school desirabilities and teacher reactions. However, the strengths of the relationships identified indicated that factors other than those considered were responsible for the vast majority of variation in teacher turnover. Whether this unexplained variation in turnover is to be allocated to random, as opposed to systematic variations across elementary schools, cannot be determined here.

It is now necessary to establish further analysis to test for the validity of the teacher transfer mobility model. This will test for the existence of the specific changes in staffing for schools which should result from normal operation of the teacher transfer model within the Columbus School System.

The next chapter will implement this suggestion. In Chapter Four, expenditure disparities, in the form of wage differentials, were found across schools and SES. These benefited higher SES schools. This chapter tentatively verified school desirabilities, consistent with that expenditure distribution. However, it has become obvious
in both chapters that the existing disparities in school expenditure and desirability in Columbus for 1968, 1969, and 1970 do not have the strong SES bias which had been assumed. Teacher transfers within the Columbus School System, therefore, may not have had the expenditure effects heretofore assumed in the literature and noted in other case studies.
FOOTNOTES, Chapter Five—Teacher Working Conditions


2. Levy, et. al. (1974), Op. cit.. Also, the Ohio Civil Rights Commission officially noted great concern for distributions of teacher education, experience, and, therefore, their expenditure effects when involuntary transfers were ordered for Columbus. These transfers were to bring about racial balance for teaching staffs without adversely redistributing teachers with higher levels of qualifications according to this 1974 ruling (Complain No. 342 as amended, p. 4). Becker (1951), Op. cit. and David Greenberg and John McCall (1973), Op. cit.

4. This data is measuring various aspects of turnover rates for students during the given academic years. However, there is an obvious translation of this student turnover pattern to mobility of their parents when they attend neighborhood schools. Such student turnover patterns should be a reflection of population census characteristics across residential neighborhoods.

Chapter Six - Distributions of Teacher Transfers
Within the Columbus School System

The previous chapter attempted to validate some assumptions underlying the notion that, when given the choice, elementary school teachers prefer assignments in higher SES schools. The results gave only weak support to those assumptions. Also, a number of questions have been raised concerning the degree of influence teacher transfers have on the operation of the Columbus School System. It remains now to review evidence concerning the actual nature of teacher transfers.

In this chapter, a rationale for evaluating the impact of teacher transfers upon elementary school staffing characteristics is presented. Based on this discussion, and upon further considerations of data limitations, a series of hypotheses are presented and then tested. Noting the shortcomings of these results, a second approach to the teacher transfer question is suggested. If teachers are not systematically transferring from less desirable to more desirable schools, as hypothesized, are they even requesting such transfers? Is there even an "intent" to transfer in the manner assumed?

Teacher seniority and qualification patterns across schools did not match patterns expected on the basis of postulated teacher transfers. If, in fact, transfer requests of this nature have not and still are not being made, this should not be surprising. However, if requests for transfers are being made, if these requests reflect
our earlier assumptions regarding school desirability and teacher preferences for assignments, and if these transfer patterns are not reflected in staffing, then one can only conclude that there must be a concerted effort on the part of school authorities to prevent such transfers.

The methodology used in this approach to teacher transfers is reviewed and results are presented. Appropriate conclusions are drawn. Results indicate rather clearly that teacher transfers have not had the significant influence on schools in Columbus found elsewhere. However, teachers seem to prefer assignments in the manner presumed. An exact reason for the discrepancy between actual and intended transfers cannot be established at this time.

DATA PROBLEMS

Transfer data have proven difficult to obtain. The district personnel office was steadfast in its unwillingness to release personnel-related information either by individual or by school; this, apparently, was for fear of compromising the confidentiality of individual teacher personnel files. In addition, the district's personnel director was either unwilling or unable to devote any staff manpower to conversion of these data into a less sensitive form.

Major data requirements focused on origins and destinations for those transfers both requested by teachers and approved by school authorities. In addition, the seniority of the teachers involved was of interest. These data were requested across individual
elementary schools for Columbus over a series of years (1968 to 1972) overlapping the 1969-70 academic year. This is the year for which teacher wage data were obtained. Transfer data across a number of years were thought necessary to minimize the risk of sampling error. These data requirements, however, were far from satisfied.

Consequently, in order to evaluate actual teacher transfers, however inadequately, we must depend upon measures of staffing characteristics. Inter-school distributions of staff experience and qualifications, as reported in the "School Profile," are used as indicative of the outcome of the transfer process. According to theory, teachers with higher qualifications and experience should concentrate themselves, through transfers, in higher SES schools. Staffing characteristics for these schools should reflect this.\(^3\)

In addition, the district personnel office did release very limited information for 1973-74 on elementary school teacher transfer requests. The information included only origins and destinations for the transfers requested by 144 teachers during that academic year. None of these requests were granted, for reasons discussed later. The relatively small sample of district teachers making transfer requests, the large number of elementary schools potentially involved as origins or destinations, and the tendency for teachers to request assignment to a high school region, rather than to a specific elementary school, have caused considerable difficulty in analysis. As a result, origin and destination schools must be regrouped, and analysis carried out at a higher level of aggregation than would
otherwise be preferred.

MEASUREMENT OF STAFFING EFFECTS

Due to lack of data on actual teacher transfers, the analysis which follows must examine the staffing characteristics of schools. To achieve this, five dependent variables are identified for each elementary school and for comparison with SES across elementary school attendance areas: (i) average experience levels for teachers (EXP); (ii) percentage of teachers with three years or less teaching experience (NT); (iii) percentage of teachers with one year or less teaching experience (%1); (iv) average number of course credit hours attained by teachers (HOURS); and (v) percentage of teachers having bachelor's degrees (BCH). Given the hypothesized structuring of teacher transfers, these variables should exhibit systematic patterns across elementary schools. Table 15 identifies these hypothesized relationships.

Hypotheses are based on the assumption that the destinations of voluntarily transferring teachers are the more desirable, higher SES schools. Origins are the less desirable, lower SES schools. This pattern of teacher mobility should lead to a certain bias in staffing characteristics across elementary schools. Teachers who have their transfer requests approved are assumed to be the more senior. The teacher characteristics associated with seniority—e.g. experience, higher qualifications, etc.—will then be distributed across elementary schools to give the more desirable school a number of advantages. These disparities, in turn, are assumed responsible for significant
<table>
<thead>
<tr>
<th>(i)</th>
<th>EXP</th>
<th>Relationship to SES of School Attendance Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii)</td>
<td>NT</td>
<td>-</td>
</tr>
<tr>
<td>(iii)</td>
<td>%1</td>
<td>-</td>
</tr>
<tr>
<td>(iv)</td>
<td>HOURS</td>
<td>+</td>
</tr>
<tr>
<td>(v)</td>
<td>BCH</td>
<td>-</td>
</tr>
</tbody>
</table>
variations in school expenditures. The equation to test for SES bias in staffing characteristics, with RACE held constant is:

\[ Y_i = a + b_1 x_{i1} + b_2 x_{i2} + b_3 x_{i3} + e_i \]

where: \( Y_i \) = a measure of staff characteristics for the teachers in the ith elementary school;

\( x_{i1} \) = the WEALTH of the population of the ith school attendance area;

\( x_{i2} \) = the severity of POVERTY among the population of the ith attendance area;

\( x_{i3} \) = the RACE of the population of the ith school attendance area; and

\( e_i \) = the error term.

Each of the staffing characteristics noted in Table 15 is now inserted, in turn, in this equation.

**Teacher Experience**

Teachers with sufficient experience, or seniority, within a school system, and who have transfers approved by the school authorities, will tend to leave less desirable school assignments for more desirable schools. Staff replacements for these teachers are those who have less opportunity for voluntary transfers to the more desirable elementary schools. This may be because they are new to the school system. In both cases, it is assumed that the net effect upon less desirable schools is a decrease in average levels of teacher experience.
On average, experience levels in more desirable schools will be exactly the converse. Those teachers who choose to leave the more desirable schools probably do so either for retirement, to teach in even more desirable schools in the district, or to begin careers in school administration. Given that the more experienced teachers receive higher salaries, the effects of transfer on staff compositions at origin and destination schools would ultimately be to create and maintain disparities in expenditure between lower SES and higher SES elementary schools.

This hypothesis concerning teacher experience must be rejected, given the results presented in Table 16A. No significant statistical relationship appears to exist between the distribution of EXP across elementary schools and the SES of school attendance area populations. On this basis, there is an indication that the distribution of teacher experience is not consistent with the idea of systematic bias in teacher transfers. Teachers with higher levels of experience have not been assigned systematically to higher SES elementary schools prior to 1970 as expected. For that matter, highly experienced teachers had not been systematically assigned to any particular type of elementary school in Columbus. This suggests that transfers will not have the expenditure effect suggested.

Tenurable Experience

On the basis of the same rationale, the percentage of teachers assigned to an elementary school, and who have three years or less experience in the school system, should remain high in the less
TABLE 16 Results of Multiple Regressions for the Staff Characteristics-Transfer Models.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Wealth</th>
<th>Poverty</th>
<th>Race as control</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. EXP $R^2 = .021$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>.127</td>
<td>.019</td>
<td>-.004</td>
</tr>
<tr>
<td>BETA</td>
<td>.159</td>
<td>.082</td>
<td>**</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>2.6</td>
<td>0.7</td>
<td>**</td>
</tr>
<tr>
<td>B. NT $R^2 = .131$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Simple Correlation</td>
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<td>-.056</td>
<td>-.012</td>
</tr>
<tr>
<td>BETA</td>
<td>-.388</td>
<td>-.099</td>
<td>.107</td>
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<td>1.0</td>
</tr>
<tr>
<td>C. %1 $R^2 = .093$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Simple Correlation</td>
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<td>-.080</td>
<td>.039</td>
</tr>
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<td>-.198</td>
<td>.011</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>11.1</td>
<td>2.9</td>
<td>0.01</td>
</tr>
<tr>
<td>D. HOURS $R^2 = .117$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>-.032</td>
<td>.258</td>
<td>-.320</td>
</tr>
<tr>
<td>BETA</td>
<td>.095</td>
<td>.136</td>
<td>-.265</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>1.02</td>
<td>1.4</td>
<td>5.8</td>
</tr>
<tr>
<td>Dependent Variable</td>
<td>Wealth</td>
<td>Poverty</td>
<td>Race as control</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------</td>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>E. BCH</td>
<td>$R^2 = .195$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>.200</td>
<td>-.357</td>
<td>.418</td>
</tr>
<tr>
<td>BETA</td>
<td>.054</td>
<td>-.146</td>
<td>.315</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>0.4</td>
<td>1.8</td>
<td>9.1</td>
</tr>
</tbody>
</table>

** variable did not enter this equation

F coefficient significance: 3.92 at the .05 level; 6.85 at the .01 level; or 11.38 at the .001 level. (df = 119)
desirable, lower SES schools. Continual teacher turnover—resulting from transfers or resignations—and the use of less experienced replacements is supposedly characteristic of those schools.

On the surface, this seems repetitious of the previous hypothesis. However, this second variable does have an additional connotation. Three years of service to the school system coincides with the tenure requirements for teachers in the Columbus School System. The percentage of staff with three years or less teaching experience (NT) indicates the proportion yet to receive tenure status, therefore. The more desirable, higher SES schools are assumed to have lower percentages of staff with three years or less teaching experience and, consequently, lower rates of untenured staff.

This hypothesis cannot be rejected. Table 16B indicates that there is a decrease in the untenured staff proportion as SES increases across elementary school attendance area populations. Only 13% of the variation is explained.

**First Year Teachers**

It also seems reasonable to hypothesize that the distribution of first year teachers in the district will assume a form comparable to the other experience-related variables noted. Inexperienced, non-tenured, and first year teachers should be concentrated in the less desirable schools. Opportunities for these teachers have been severely limited by school authorities. However, this particular dependent variable focuses specifically on the distribution of those teachers who have either just graduated from college or just entered
employment in the Columbus School System. In this dissertation, we have consistently assumed that these teachers would most likely replace teachers leaving the less desirable schools. Again, while SES explains only 9% of the total variation in the distribution of first year teachers, this hypothesis cannot be rejected (see Table 16C).

**College Credit Hours**

Educational attainment is a second general measure of teacher qualifications. It includes both the college credit hours attained by a teacher beyond basic requirements for graduation and initial hiring, and college degrees attained. Pay increments related to educational attainments are given on the basis of credit hours and/or advanced degrees. Teachers taking graduate level courses for credit without having these courses as part of an organized degree program receive pay increments on the basis of accumulated credit hours. However, if in addition to credit hours, an advanced degree is also received, an additional pay increment will be granted.

It has been assumed here that with an increase in the SES of the elementary school attendance area population and/or school desirability, there will be an increase in the average course credit hours attained by that school's teachers. Teachers in desirable schools have had more time to accumulate graduate level course credit in excess of basic bachelor's degree requirements.

This hypothesis is rejected on the basis of results indicated in Table 16D. In fact, credit hours accumulated (HOURS) appears to decrease with an increase in SES across school attendance area
populations. The relationship, however, is weak, and only 12% of the variation is explained.

**Teachers with Bachelor's Degrees**

This second aspect of teacher education levels is intended to reflect the skewed distribution of degree attainment for teachers across schools. For a variety of reasons, it has been assumed that, with an increase in school attendance area SES, there will also be a decrease in the percentage of teachers having only a bachelor's degree. Less desirable and/or lower SES schools have high teacher turnover rates. Teachers moving out are likely to be replaced by the most junior staff within the school district. In turn, these junior staff would usually have the minimum level of education needed to be hired. This assumption would be most appropriate when there is a buyers' labor market. This is the situation which elementary school teachers have had to face in Columbus since the middle 1960s. As a result, the less desirable schools should consistently have higher concentrations of teachers with lower education levels. As the desirability and/or SES of schools increases, there will be a decrease in the percentage of teachers with bachelor's degrees teaching in these schools. The more desirable schools should have teachers with the higher degree attainments.

Consistent with the results reported for the previous regression equation, this hypothesis must also be rejected. Also, as before, the null hypothesis cannot be rejected. The results suggest an increase in the incidence of teachers with only a bachelor's degree,
with an increase in SES across school attendance area populations (see Table 16E).

THE QUESTION OF INTENT

All this suggests that teacher transfers may not be so important as was originally thought in creating inter-school disparities of a perverse character in the Columbus School System. To this point, results relating to the impact of teacher transfers have indicated that:

1) A weak, and yet perverse, school expenditure disparity does exist across schools within the Columbus School System when teacher wages are used as the measure of school expenditure. All other forms of expenditure were largely compensatory in nature. This finding is consistent, albeit weakly, with the teacher mobility hypothesis proposed in this dissertation.

2) There was some indication that the conditions considered desirable by teachers are also positively related to SES across elementary schools in Columbus. Again, however, while the relationships indicated by these equations were statistically significant, their explanatory power was somewhat limited.

3) Contradictory results were found in attempting to measure teacher reactions to these varying conditions. Teacher turnover coincided with presumed patterns of school desirability, though explanatory power was limited.

4) Very weak, and, in fact, contradictory results indicated that measures of staff characteristics across elementary schools were not
consistent with an SES-bias in teacher transfers. Experience was not significantly related to SES; non-tenured teachers were distributed as hypothesized. First year teachers were found to have the SES bias expected. However, levels of education (HOURS and BCH) were found to decrease rather than increase with increases in SES across school attendance area populations. The determinants of wages for teachers—experience and education—were either not related to SES or were related in a manner contrary to that usually noted in the literature.

There appears ample evidence therefore, that actual teacher transfers have not been the significant force in changing school personnel characteristics and redistributing school expenditures as hypothesized. For these reasons, the remainder of this chapter will focus on the concept of transfer "intent."

In fact, the results have raised at least two questions concerning the appropriateness of teacher transfers as a force in school expenditure redistributions. These questions include: (i) are the weak or contradictory results a function of misunderstanding the motives of teachers requesting transfer? or (ii) is it possible that the Columbus School System has taken steps to thwart SES-biased teacher transfers? Measurements of transfer "intent"—in this case, the desire to transfer from an origin to a destination school—may eliminate one or more of these questions from further consideration.
**Intent Measured**

For the immediate purposes of this dissertation, and as a result of the severe data limitations noted earlier, transfer intent is measured by applications for transfer from teachers during the 1973-74 academic year. The initial data set consists of 198 transfer requests; each of these includes an origin school and the destination preferred by the teacher requesting transfer.

Destinations were indicated on a transfer request in either of two ways. First, a teacher might have actually specified a particular elementary school. This could be a response to the posted vacancy list prepared by the school system in the spring. A teacher could also respond to specific vacancies based on information informally transmitted through personal contacts. In addition, a teacher may have just listed a specific school out of personal choice, and without responding to a specific vacancy. In any case, these cases could not be used due to their small number.

Second, teachers could request assignment to an unspecified elementary school in a particular high school attendance area grouping. This option was chosen by 144 teachers in this data set. It should be noted that for personnel management purposes, the District has traditionally grouped elementary schools by high school attendance areas. The system of grouping used in the Columbus schools is presented in Appendix ONE.

In these cases, teachers express preferences for regional groupings of elementary schools, rather than for individual schools. We
will presume that high school attendance areas do provide meaningful aggregations of elementary schools.

Despite this level of aggregation, however, cell entries in the matrix of requests relating origin school regions to destination school regions are, in all cases, small. In some cases, they record no transfer requests at all. In Table 17, the thirteen groupings of elementary schools by high school attendance area are presented in alphabetical order. In the matrix, $x_{ij}$ is the number of transfers requested from the $i$th origin school grouping to the $j$th destination school grouping.

As noted, the basis for grouping elementary schools by high school attendance area was apparently one of administrative convenience. However, as a result of the tendency for spatial auto-correlation of attendance area SES and those other characteristics of schools related to their desirability as teaching assignments, schools may well have been inadvertently grouped on these properties. Therefore, it is not unreasonable to expect groupings to be substantially homogeneous in terms of criteria of school desirability. Operationally, the attributes of a high school grouping will be based upon the composite, or weighted averages, of respective attributes for all the elementary schools within it.

On the basis of these weighted means for different attributes, high school groupings were rank ordered in terms of presumed desirability as teaching assignments. The variables used in this ranking procedure include: (i) percent of students, white and (ii) percent of students, children from households receiving aid-to-dependent children
<table>
<thead>
<tr>
<th>ORIGIN</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Brookhaven</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Central</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 East</td>
<td>1</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
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<tr>
<td>4 Eastmoor</td>
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<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>5 L-M</td>
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<td></td>
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<td></td>
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<td></td>
<td>2</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6 M-F</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7 Mohawk</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8 North</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>(1)</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9 Northland</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>(2)</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td>1</td>
<td>(1)</td>
<td>5</td>
<td>1</td>
<td>4</td>
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<tr>
<td>11 W-Ridge</td>
<td></td>
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<td></td>
<td></td>
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<td>2</td>
<td></td>
<td>(3)</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12 West</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>(4)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>13 Whetstone</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>(0)</td>
</tr>
</tbody>
</table>
payments (ADC). Consequent rankings and weighted means are presented in Table 18. On the basis of these rankings, hypotheses that teachers request transfers from less desirable to more desirable schools can be tested.

Racially Biased Transfers

In the case of racial composition, it is assumed that teachers will attempt to leave schools with lower percentage white pupil compositions for those with higher percentage white pupil compositions (% WHITE). In the case of the transfer intention matrices presented here, more transfer requests should be made for destinations with equivalent or higher percentages of white students than that of the origin school groupings. Table 19 presents the origin-destination matrix with high school groupings ordered on the basis of racial composition. As was noted, a total of 144 teachers requested transfers to different school groupings within the district. A total of 106 (73.6%) teacher transfer requests were to groupings with higher percentage white pupil compositions. An additional 13 teachers requested transfers to any other school within the same high school grouping. Therefore, only 25 requests were to school groupings with lower percentage white pupil compositions. It would seem obvious on the basis of these results that the hypothesis has a good deal to be said for it; teachers making transfer requests have preferences for transfers to schools with racial compositions judged to be more desirable.
TABLE 18  The basis for Reordering of School Groupings: %WHITE AND ADC.

<table>
<thead>
<tr>
<th>School Grouping</th>
<th>%WHITE</th>
<th>Value(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northland</td>
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<td>99.2</td>
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<tr>
<td>Whetstone</td>
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<td>98.8</td>
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<tr>
<td>Brookhaven</td>
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<td>97.6</td>
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<tr>
<td>W-R</td>
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<td>97.4</td>
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<td>87.1</td>
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<td>77.7</td>
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<td>North</td>
<td></td>
<td>75.1</td>
</tr>
<tr>
<td>M-F</td>
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<td>74.0</td>
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<td>66.0</td>
</tr>
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<td>Mohawk</td>
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<td>37.0</td>
</tr>
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<td>L-M</td>
<td></td>
<td>18.6</td>
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<tr>
<td>East</td>
<td></td>
<td>5.9</td>
</tr>
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</table>

<table>
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<th>Value(%)</th>
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</tr>
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<tr>
<td>East</td>
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<tr>
<td>Mohawk</td>
<td>41.89</td>
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TABLE 19  Transfer Requests for High School Groupings Ordered by Pupil Composition, Percent White.

<table>
<thead>
<tr>
<th>RANKED ORIGIN</th>
<th>DESTINATION</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>%WHITE</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
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<td>.</td>
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<td>.</td>
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<tr>
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<td>4</td>
<td>3</td>
<td>2</td>
<td>.</td>
<td>4</td>
<td>.</td>
<td>1</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>(1)</td>
<td>.</td>
</tr>
<tr>
<td>13 East</td>
<td></td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>.</td>
<td>1</td>
<td>.</td>
<td>2</td>
<td>(3)</td>
<td>.</td>
</tr>
</tbody>
</table>

Transfer Direction:

to same group = 13 (9.0%)
to HIGHER group = 106 (73.6%)
to LOWER group = 25 (17.4%)

n = 144
Income Biased Transfers

A second test relates transfer requests to ADC rates (ADC) across school groupings. Here, the hypothesis is that teachers should express preferences for school groupings which have pupil compositions with either a lower or equal ADC burden.

As indicated in Table 20, the 144 teachers do seem to prefer lower ADC rate school groupings. A total of 104 (72.2%) of these teachers requested transfers to school groups with lower ADC rates. Of the remaining teachers, 16 requested transfers within the same school grouping. Again, the hypothesis seems to be a reasonable one.

A Regression Model Approach

Having reviewed these results in matrix form, it is now appropriate to identify more precisely the nature of the relationships involved. Request rates for transfers from origin to destination groupings of elementary schools can be formalized in the following equation:

\[
\frac{R_{ij}}{F_i F_j} = a + b_1x_i = b_2x_j + e_{ij}
\]

where: \( R_{ij} \) = the number of requests for transfer from the \( i \)th origin school group to the \( j \)th destination school group;

\( F_i \) = teachers employed in school group \( i \);

\( F_j \) = teachers employed in school group \( j \);

\( x_i \) = a measure of desirability for the \( i \)th school;

\( x_j \) = a measure of desirability for the \( j \)th school; and

\( e_{ij} \) = the error term.
TABLE 20 Transfer Requests for High School Groupings Ordered by Pupil Composition, Percent ADC.

<table>
<thead>
<tr>
<th>RANKED ORIGIN</th>
<th>DESTINATION</th>
<th>ADC</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
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<th>13</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Northland</td>
<td>(2)</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
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<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>1</td>
</tr>
<tr>
<td>2 Whetstone</td>
<td>(0)</td>
<td>.</td>
<td>.</td>
<td>1</td>
<td>.</td>
<td>.</td>
<td>1</td>
<td>.</td>
<td>.</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3 W-R</td>
<td>1</td>
<td>(3)</td>
<td>.</td>
<td>.</td>
<td>2</td>
<td>.</td>
<td>2</td>
<td>.</td>
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<td>.</td>
<td>.</td>
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<tr>
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<td>.</td>
<td>.</td>
<td>1</td>
<td>.</td>
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<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
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<td>1</td>
</tr>
<tr>
<td>5 M-F</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>(1)</td>
<td>1</td>
<td>2</td>
<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<td>1</td>
</tr>
<tr>
<td>6 West</td>
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<td>.</td>
<td>(4)</td>
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<td>2</td>
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<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7 Eastmoor</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>.</td>
<td>.</td>
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<td>(0)</td>
<td>1</td>
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<td>.</td>
<td>1</td>
<td>.</td>
<td>.</td>
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</tr>
<tr>
<td>8 North</td>
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<td>.</td>
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<td>.</td>
<td>(1)</td>
<td>1</td>
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<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>9 South</td>
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<td>2</td>
<td>1</td>
<td>(1)</td>
<td>.</td>
<td>.</td>
<td>1</td>
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</tr>
<tr>
<td>10 Central</td>
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<td>2</td>
<td>1</td>
<td>.</td>
<td>2</td>
<td>1</td>
<td>1</td>
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<td>(0)</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>11 L-M</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>3</td>
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<td>.</td>
<td>.</td>
<td>(0)</td>
<td>.</td>
<td>.</td>
<td>.</td>
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<td>.</td>
</tr>
<tr>
<td>12 East</td>
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<td>1</td>
<td>.</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>(3)</td>
<td>1</td>
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</tr>
<tr>
<td>13 Mohawk</td>
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<td>3</td>
<td>.</td>
<td>.</td>
<td>.</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>(1)</td>
</tr>
</tbody>
</table>

Transfer Direction:

to same group = 16 (11.1%)
to LOWER group = 104 (72.2%)
to HIGHER group = 24 (16.7%)

n = 144
In this equation, it has been assumed that teachers react to differences in desirability between school groupings. More specifically, request rates for transfers between school groupings increase with an increase in the difference between the desirability of the two groupings involved. The $F_i$ and $F_j$ terms are used to weight predicted transfers by the staff sizes of the groupings involved.

In evaluating this equation for the two measures of school desirability reviewed—% WHITE and ADC—it is necessary to further aggregate school groupings. As a consequence of the small number of observations and resulting zero entries in the transfer intention matrices, it was deemed necessary to recombine the thirteen high school groupings into seven. These re-combinations are presented in Table 21. For both independent variables—% WHITE and ADC, school groupings tended to naturally cluster along the continuum of variation. Therefore, regrouping could be accomplished in a relatively unarbitrary fashion. The seven groups of schools, for each of the two independent variables were then used to reaggregate the initial origin and destination frequency counts. These frequency counts for transfer requests to and from these groups of schools are presented as part of Table 22. The specific analysis for each equation is presented in turn.

**The Racial Bias**

The results presented in Table 23A again show that the hypothesis of a racial bias cannot be rejected. However, the multiple regression model provides a more objective criterion for making this judgment. The multiple correlation coefficient for the equation is .512, which
TABLE 21  Further Regroupings of Schools for Regression Analysis.

A.  % WHITE

<table>
<thead>
<tr>
<th>Level</th>
<th>Group Number</th>
<th>High School Areas</th>
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<tbody>
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<td></td>
<td></td>
<td>Whetstone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brookhaven</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Walnut Ridge</td>
</tr>
<tr>
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<td>Central</td>
</tr>
<tr>
<td></td>
<td></td>
<td>West</td>
</tr>
<tr>
<td></td>
<td>3.</td>
<td>Eastmoor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>North</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marion-Franklin</td>
</tr>
<tr>
<td></td>
<td>4.</td>
<td>South</td>
</tr>
<tr>
<td></td>
<td>5.</td>
<td>Mohawk</td>
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<td>Linden-McKinley</td>
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<tr>
<td>Low</td>
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B.  %ADC

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<th>High School Areas</th>
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<td>Walnut Ridge</td>
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<td>Marion-Franklin</td>
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<tr>
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<td>4.</td>
<td>West</td>
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<td></td>
<td>Eastmoor</td>
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<td></td>
<td>5.</td>
<td>North</td>
</tr>
<tr>
<td></td>
<td>6.</td>
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</tr>
<tr>
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<td>Central</td>
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<tr>
<td></td>
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<td>Linden-McKinley</td>
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</table>
TABLE 21  Further Regroupings of Schools for Regression Analysis.  
(continued)

B.  %ADC

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<td>RANKED ORIGIN %WHITE</td>
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</tr>
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</table>
TABLE 23  Multiple Regression Equations for the Transfer Flow Model.

<table>
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<tr>
<th>Independent Variable</th>
<th>As Origin</th>
<th>As Destination</th>
</tr>
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<tbody>
<tr>
<td>A. %WHITE</td>
<td>$R^2 = .262$</td>
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</tr>
<tr>
<td>Hypothesized Slope</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>-.348</td>
<td>.376</td>
</tr>
<tr>
<td>BETA</td>
<td>-.348</td>
<td>.376</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>7.5</td>
<td>8.8</td>
</tr>
<tr>
<td>B. %ADC*</td>
<td>$R^2 = .454$</td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>.304</td>
<td>-.601</td>
</tr>
<tr>
<td>BETA</td>
<td>.304</td>
<td>-.601</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>7.8</td>
<td>30.5</td>
</tr>
</tbody>
</table>

*this independent variable has had a log transform to maximize the percent explained variation. The relationship was not linear.

$F$ coefficient significance: 5.99 at the .05 level; 13.74 at the .01 level; or 35.51 at the .001 level. (df = 6)
provides a 26.2% level of explanation. The beta weights were significant at the .05 level; the destination desirability variable was slightly more important in the final equation. This suggests that transfer intentions are motivated, in part at least, by a racial bias.

**The Income Bias**

A similar result is achieved when testing the income bias hypothesis. According to Table 23B, this hypothesis cannot be rejected. The coefficient of multiple correlation was .674. The beta weight for the origin desirability variable is significant at the .05 level; that for the destination desirability variable is also significant at the .01 level. Both of these findings lend strength to the idea that transfer intentions are structured by teacher perceptions of income-related differences between school groupings.

**SUMMARY**

This chapter has clarified some of the underlying causes for the consistently weak, and at times, contradictory results noted earlier in the dissertation. In reviewing those results, there was little significant evidence to substantiate the idea of systematically biased teacher transfers in the Columbus School System.

Specifically, this chapter indicated that staffing characteristics were either unrelated to school desirabilities or contradictory to the hypotheses posed. On the basis of these results, hypotheses concerning "intent" to transfer had to be developed. At this stage, it was necessary to pose the most basic question; do teachers even consider school-by-school desirabilities in their choice of new school assignments?
School desirabilities were based on income and racial characteristics of students.

Teachers were found to be concerned with matters of desirability when making transfer requests. Racial and income biases were important in these decisions.

Accordingly, this suggests that there has been effort—either conscious or unconscious on the part of the school management in Columbus—to short-circuit the anticipated bias in teacher transfers. Apparently, teachers with experience or higher qualifications are not systematically transferred to the more desired elementary schools. Yet teachers do appear to prefer teaching assignments in those schools.

2. The attitude of the District Personnel Office in Columbus was to allow no outsiders to interact with their transfer data under any condition. However, it must be noted in all fairness that the District was under an Ohio Civil Rights Commission order at the time to desegregate teaching staffs on a school by school basis. This may have made them suspicious of the ultimate purpose for using such information.

3. A school staff desegregation order (approved on July 10, 1973) was very explicit concerning the monitoring of effects of needed involuntary transfers to achieve racial balance. "The assignment and transfer of professional staff members to and from schools where the average training and experience of professional staff members is significantly below the system average shall be made so that this differential is reduced or at a minimum, not significantly increased." Ohio Civil Rights Commission, Complaint No. 342 as amended, p. 4.

4. Actual tenure has other state certification requirements which cannot be measured here.


6. This practice is stipulated as part of the working agreement between CEA and the Columbus School District for the period September 1, 1973 to August 31, 1975.

7. A conscious attempt was made to regroup the 13 high school areas using natural break in race and income. In most cases, each of the seven groups resulting from the reorganization were comprised of schools with similar characteristics within that group; significant variation existed only between these new groups.
8. Transformations with logs were experimented with in these equations (as noted with the results in Table 23) in the attempt to maximize the levels of explained variations.
Chapter Seven - Resident Preferences
and Parental Activism

As an indirect consequence of the data compatibility technique used in this dissertation, a concluding set of hypotheses can be tested with a precision not previously possible without a sample survey of voter attitudes. These hypotheses relate to voter preferences for school services and to the activism of parents in school affairs.

Earlier, the nature of school expenditure disparities was reviewed. An obvious extension of the methodology used there allows the correlation of P. T. A. membership rates and voting behavior with SES for school attendance area populations.

The infinite flexibility of the SYMAP and resampling procedure allows interpolation of voting behavior data to the school base.\(^1\) Voting behavior data are collected and reported by precinct and then interpolated and resampled to the school data base. A similar process was followed in transforming census tract and block group data to that same data base.

This chapter proceeds to test hypotheses concerning an SES bias in both membership rates for P. T. A. organizations and voting behavior on a school-by-school basis. An SES bias in membership rates for P. T. A.s is hypothesized and tested. Attention then turns to a factor analysis of voting behavior for five school-related spending referenda. These data refer to the period between 1968 and 1972 and span the general time frame of the study. Factor scores from this analysis
are identified and then processed with SYMAP. After interpolation, factor scores for the dimension are resampled to the 120 elementary schools used throughout this study. Hypotheses concerning voter responses to these issues are postulated and tested. A discussion of all results concludes the chapter.

P. T. A. ACTIVISM

Quality of education in local schools is partially influenced by the constructive interest invested by parents of school age children in school affairs. The P. T. A. organization is a primary outlet for much of this activity. Therefore, P. T. A. membership rates (RATES) can serve as a surrogate measure of parental activism.

Parents with high interest levels in a local school will tend to join that school's P. T. A. In limiting our interest solely to matters of constructive participation, however, certain parental activities are eliminated from consideration. Parents with very short term and individualistic goals, and who may be labeled as obstructionist by teachers and administrators, are excluded. P. T. A. members believe they are more likely to succeed in changing school programming, in participating in policy decisions, or in influencing personnel decisions by working as a group, rather than as individuals. Ideally, P. T. A. membership should be a commitment to the betterment of educational services for the whole school attendance area.

The group attempts to achieve some goal which is common to the majority of the membership. However, the parent who is a P. T. A. member is still free to interact individually with teachers, principal,
or school board.

An SES bias in RATES is hypothesized. With an increase in SES for school attendance area populations, there should be an increase in P. T. A. membership. This assumption is based on a number of considerations. These include: (i) class-specific rates of participation in organizations in general; (ii) superior ability of the higher SES individual to contribute time, material, and money to furthering the group's goals; and (iii) this group's ties to more traditional educational goals (college preparation) and their outcomes. Parents with higher SES backgrounds can gain and contribute more as P. T. A. members. In addition, such parents are more likely to be homeowners, and thus, have longer term commitment to local school affairs.

The hypothesis based on these assumptions cannot be rejected, given the results indicated in Table 24. There is an increase in RATES with an increase in SES (holding RACE constant) across school attendance area populations.

VOTING BEHAVIOR PATTERNS REVIEWED

The final hypothesis tested in this dissertation concerns voter approval rates for various school referenda. As assumed earlier for Chapter Five, the desirable schools of the Columbus School System are, in part, those which are supported by parents and the general neighborhood population. Therefore, one might expect residents of higher SES neighborhoods to support improved provision of school resources for their children. Such a preference should be reflected in voting behavior on school expenditure referenda.
### Table 24: Results of Multiple Regression for the P. T. A. Membership Rate Model

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Wealth</th>
<th>Poverty</th>
<th>Race as control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rate</strong> $R^2 = .420$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesized Slope</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Simple Correlation</td>
<td>.420</td>
<td>-.553</td>
<td>.546</td>
</tr>
<tr>
<td>BETA</td>
<td>.223</td>
<td>-.275</td>
<td>.318</td>
</tr>
<tr>
<td>F for inclusion</td>
<td>8.4</td>
<td>8.9</td>
<td>12.8</td>
</tr>
</tbody>
</table>

*F coefficient significance: 3.92 at the .05 level; 6.85 at the .01 level; or 11.38 at the .001 level. (df = 119)*
A counter proposal can also be suggested. Parents and residents of lower SES neighborhoods, it might be argued, also want to have higher expenditures on school services. Their interest is in improving the quality of education in their lower income neighborhood school so that their children have an opportunity to achieve in the future what they themselves could not. Residents lacking educational backgrounds place a higher value on educational attainment and the upward social mobility it can create for the next generation. This would be reflected in an overall distribution of support which is linear and negatively sloped against SES.

A third, and more general economic model of voting behavior on public expenditure issues is also suggested in the literature. In this instance, the postulated relationship between support and SES is U-shaped in nature. An explanation for this pattern assumes partition of the electorate into three groups.

Lower SES voters are expected to approve any program of public expenditure, regardless of its immediate effect upon them. They benefit from a majority of the public programs decided by elections, and, additionally, envision themselves as making only minor contributions to financing them. Usually renters, they are less aware of the property tax burdens created by the public expenditures they approve. Lower SES voters are also only remotely aware of the actual mechanics of this form of taxation and its regressive character.

A second group consists of voters of intermediate SES. These voters consistently reject any public expenditure issue placed before
them. They vote in this manner regardless of the particular merits of the expenditure proposed. They regard themselves as carrying the burden of fiscal resources for the operation of local, state, and federal governmental spending programs. While they have little control over the operation of most taxation—income, excise, sales, or user charges—they are able to voice their direct disapproval of the use of property taxes by local government. Referenda, therefore, give these voters a release for their frustrations about increasing taxes of all kinds, excessive government spending, and governmental intrusions into the private sector of the economy. The "taxpayers' revolt," documented by rejection of numerous school referenda in the late 1960s and early 1970s, is largely a function of negative voting by this group on expenditure issues. These voters feel they are bearing the overall tax burden, while the poor go untaxed and receive most of the benefits from public expenditures. Likewise, the rich are able to hide behind tax loopholes.

Higher SES citizens have generally approved referenda for public expenditures. According to Wilson and Banfield (1964), this group of voters is "public regarding." They have little need for the governmental services which they can privately provide for themselves and their families—e.g. recreation, housing, transportation, and education. Therefore, they are unlikely to approve spending programs on the basis of any use they themselves might get out of these services. Instead, they favor such referenda out of concern for others less fortunate who need publicly provided services.
SOME HYPOTHESES

On the basis of this discussion, hypotheses concerning reactions of Columbus voters to school expenditure referenda are posed. Specific interest is focused on a series of four expenditure referenda which occurred during the time frame of this dissertation. It is assumed that with an increase in school attendance area SES, voter approval rates for a school issue will decrease and then increase. Because of the dangers of ecological fallacy, however, only statements about associations between dependent and independent variables are made; the behavior is that of ecologically defined populations which happen to have certain social characteristics. Actual motivations and voter rationales can be revealed only by individual data such as that collected with a sample survey.

MEASURES OF VOTING BEHAVIOR - DEPENDENT VARIABLES

For this concluding analysis, results for four school expenditure referenda, held between 1968 and 1972, were collected. This time interval spans the general temporal frame of all analysis in this dissertation. It also takes advantage of a flurry of referenda placed on ballots by the Columbus School System. The referenda of concern include: (i) the November 5, 1968 operating levy passed as part of the national election ballot; (ii) a September 16, 1969 bonding issue which failed in a special election; (iii) a May 4, 1971 operating levy and separate bonding issue, both of which failed in a special election; and (iv) the November 7, 1972 bonding issue which passed as part of the national election ballot.
For these referenda, results were collected by precinct, and report the percentage of voters favoring the issue. To identify overall patterns of voting behavior on these referenda, the data were subjected to factor analysis. Factor loadings for dimensions resulting from this analysis are presented in Table 25. The dimension identified was:

VOTE - as the values for factor scores on this dimension increase, there is an increase in the rate of voter approval of issues under consideration. (78% explained)

As has been general practice in this dissertation, factor scores were created for the original data collection units—in this case, the precincts. Scores were then mapped, using SYMAP as sampling points. The result may be interpreted as indicative of the voting behavior of school attendance area populations.

INDEPENDENT VARIABLES

For this analysis, an extended list of independent variables is considered. In addition to the WEALTH, severity of POVERTY, and RACE variables used previously, we will also consider certain variables of more specific interest in analyses of voting behavior. These include percentages of all housing units, owner occupied; age composition; educational attainment; and residential mobility rates. On the basis of suggestions noted in the literature, each is considered to be significantly related to voting behavior.

WEALTH is expected to have a U-shaped relationship with VOTE. This assumption is based on the Wilson and Banfield model for voting
TABLE 25 Dimensions for Voting Behavior with Factor Loadings

<table>
<thead>
<tr>
<th>Variable</th>
<th>I</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. PERCENT POSITIVE VOTE (%P)</td>
<td>.828</td>
<td>-.455</td>
</tr>
<tr>
<td>b. %P</td>
<td>.671</td>
<td>.287</td>
</tr>
<tr>
<td>c. %P</td>
<td>.960</td>
<td>.193</td>
</tr>
<tr>
<td>d. %P</td>
<td>.960</td>
<td>.037</td>
</tr>
<tr>
<td>e. %P</td>
<td>.855</td>
<td>-.045</td>
</tr>
</tbody>
</table>

% EXPLAINED = 77.7

---

a. November 5, 1968 Levy (8.2)
b. September 16, 1969 Bond (2.6)
c. May 4, 1971 Bond (3.0)
d. May 4, 1971 Levy (9.7)
e. November 7, 1972 Bond (3.3)
behavior which has been reviewed previously. Consistent with that assumption, POVERTY should have a positive relationship with VOTE. The higher the level of POVERTY, the more likely it is there will be support for any funding issue placed on a ballot. RACE should also have a similar U-shaped relationship as did WEALTH, since there is strong intercorrelation between those independent variables.

Holding income levels constant, whether or not a voter is a home owner (\% OWNER) is expected to be related to reluctance to increase the property taxes on which school revenue is primarily based. Renters are less negative toward public expenditure referenda than owners. This may be because they are not directly billed for payments of property tax on the housing they occupy. Rather, property taxes are included in their rent payment as part of a lump sum charge. In fact, most renters would have no concept of the magnitude of the tax burden they would face as a result of their voting behavior. Homeowners, on the other hand, see the burden of property taxation directly when their tax bill becomes due and with each tax increase.

Extremes in age structure for attendance area populations could be expected to have two somewhat dissimilar effects on voting behavior. Interest is focused on variables identifying percentages of the general population who are of school age (AGE 15) and those who are beyond the age normal for having school age children (AGE 55) at home. Each variable should be, in large part, independent of the other. In a neighborhood with a youthful age structure, need for public school services is both more obvious and more immediate.
Voters in such a neighborhood should react accordingly on school expenditure referenda.

It is also commonly held that neighborhoods containing more elderly voters, those being residents beyond the normal childbearing ages, will have less demand for school services. On the basis of lack of need alone, these voters will reject school expenditure referenda. In addition, however, these older voters would not wish to pay for higher school expenditure levels on an economic basis. They do not wish to face higher property taxation to pay for new school services, given their fixed retirement incomes. The elderly may also protest the higher costs of educating associated with today's more modern elementary schools.

The level of educational attainment for a school attendance area population also would seem to have a general effect on voting behavior, though one which is tied closely to SES. Because of intercorrelation between education and SES, there should be a decrease, and then an increase, in the approval rates across voters ordered by educational attainment. Education is measured in terms of percent high school graduates (% HSG) and median school years completed (MDYR).

In predicting voting behavior, residential mobility (MOBILITY) is also of interest. Conceivably, if voters are to have long term commitments to any community-scale cause, they must expect to be long term residents of that community. As residential mobility rates increase, therefore, a decrease in support for local schools might be expected. However, one might argue that, on the contrary,
short-stay voters will show increased rates of approval for school issues. In expecting to move, such a voter could vote in favor of an issue without worrying about paying the resulting increase in taxes. In addition, such short-stay voters may very well also be home renters rather than owners. This effect has already been discussed. The specific independent variable enumerating residential mobility is the student mobility dimension discussed in Chapter Five.

Except for the measure of residential mobility, these additional independent variables all come from census sources. Ownership rates and age structure data are collected at the block group level of census aggregation; variables for educational attainment are collected at the census tract level. In all cases, measures are interpolated to a surface using SYMAP and then resampled using elementary school locations as sampling points.

RESULTS

Analysis proceeds in two separate stages. To isolate the individual effects of SES and other social variables on voting behavior, we first examine simple correlations. This tactic allows each independent variable to be related in turn to VOTE. Only after the nature and degree of these simple correlations are reviewed does the analysis then turn to a multiple regression format.

VOTE: Simple Correlations

Table 26 presents a series of hypothesized relationships between voting behavior and various social indicators. Rationales for each of these hypotheses have already been presented. Since it was expected
TABLE 26  Hypothesized Relationships for Voting Behavior and Independent Variables.

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Relationship to VOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEALTH</td>
<td>U shaped</td>
</tr>
<tr>
<td>POVERTY</td>
<td>+</td>
</tr>
<tr>
<td>RACE</td>
<td>U-shaped</td>
</tr>
<tr>
<td>%OWNER</td>
<td>-</td>
</tr>
<tr>
<td>AGE 15</td>
<td>+</td>
</tr>
<tr>
<td>AGE 55</td>
<td>-</td>
</tr>
<tr>
<td>MDYR</td>
<td>U-shaped</td>
</tr>
<tr>
<td>%HSG</td>
<td>U-shaped</td>
</tr>
<tr>
<td>MOBILITY</td>
<td>+</td>
</tr>
</tbody>
</table>
that some of those relationships would be of a U-shaped nature, additional tests are made in those cases for that property. Therefore, in this analysis the following equations are utilized:

(i) \( VOTE = a + bx \)

(ii) \( VOTE = a + b_1x + b_2x^2 \)

The first equation tests for the linear effects of SES or a social variable while the second should indicate a U-shaped relationship if it exists. The results of these correlations are reported in Table 27.

In light of the model proposed by Wilson and Banfield (1964), the relationship between VOTE and WEALTH was tested for non-linearity. As noted in Table 27, in linear form, VOTE was negatively related to WEALTH. However, the U-shaped form of this relationship had a significantly greater explanatory power. This suggests that the three voter groups proposed by Wilson and Banfield are, in fact, represented in the Columbus results. Evidence is consistent with the assumption that lower and higher SES voters favor these expenditures for school services while intermediate SES voters oppose them. However, the level of correlation noted is weak \( (R = .238) \).

The POVERTY variable should have a linear relation to VOTE. The hypothesis that positive voting response increases with an increase in the severity of poverty is not rejected. This is consistent with the Wilson and Banfield notion that the lowest SES voters are more likely to vote in favor of public expenditure regardless of the particular
<table>
<thead>
<tr>
<th>Independent Variable (X)</th>
<th>Hypothesized Slope</th>
<th>Simple Correlation with X</th>
<th>Multiple Correlation with X and X²</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEALTH</td>
<td>U</td>
<td>-.119</td>
<td>.238*</td>
</tr>
<tr>
<td>POVERTY</td>
<td>+</td>
<td>.460</td>
<td></td>
</tr>
<tr>
<td>RACE</td>
<td>U</td>
<td>-.316</td>
<td>.380*</td>
</tr>
<tr>
<td>%OWNER</td>
<td>-</td>
<td>-.359</td>
<td></td>
</tr>
<tr>
<td>AGE 15</td>
<td>+</td>
<td>-.174</td>
<td></td>
</tr>
<tr>
<td>AGE 55</td>
<td>-</td>
<td>-.030</td>
<td></td>
</tr>
<tr>
<td>MDYR</td>
<td>U</td>
<td>-.024</td>
<td>.103</td>
</tr>
<tr>
<td>%HSG</td>
<td>U</td>
<td>-.029</td>
<td>.199*</td>
</tr>
<tr>
<td>MOBILITY</td>
<td>+</td>
<td>.303</td>
<td></td>
</tr>
</tbody>
</table>

* equation with squared component of the independent variable included was significant at the .05 level. (df = 119)
issue involved. Again, however, given the limitations of ecological data, further speculations as to actual individual voter behavior are risky. The associations of the age variables with VOTE were not found entirely as assumed. The AGE 15 variable was expected to be positively related to VOTE, while association with AGE 55 was expected to be negative. However, AGE 15 was found to have a slight negative relationship with VOTE. Therefore, as values for AGE 15 increase, there is a decrease in favorable votes on the school referenda. This suggests that voters in territories with smaller proportions of school age children consistently favor the higher school expenditures.

Populations with high proportions of population over age 55 (AGE 55), on the other hand, appear to vote no differently than those with other age compositions. There is little evidence that these older voter precincts are systematically either for or against school referenda.

Given the results for a U-shaped relationship between WEALTH and VOTE, it is not entirely surprising that VOTE has a similar relationship with racial composition (RACE). RACE and WEALTH have traditionally shown a strong and positive relationship with each other. Populations with the highest and lowest white fractions are more in favor of school expenditures than more racially mixed populations.

A range of rates of home ownership (% OWNER) across territories is associated with decreases in rates of voter approval for school referenda. Neighborhoods with extremes of rentership vote for these issues; those voters with the shortest term economic commitments to
their neighborhoods are more likely to vote in that manner, therefore.

Educational attainment (MDYR) has little effect on the probability of a population voting for or against school referenda. In these results, there is no significant U-shaped relationship between % HS attainment measures and vote. However, it explains only about 1% of the variation in VOTE.

The MOBILITY variable has a positive effect on voting. This is compatible with the second hypothesis earlier for the effects of MOBILITY on VOTE. Highly mobile populations are willing to approve public expenditures.

VOTE: Multiple Regressions

Because of the detailed analysis just completed, interest in these multiple regression models is limited. The primary purpose of this chapter was to explore the nature of relationships between characteristics of school attendance area populations and voting behavior on school referenda. Now, there is concern with overall levels of explanation and the predictability of voting behavior afforded by these independent variables; moreover, multiple regression is of interest so as to gauge the importance of each independent variable when holding others constant.

Levels of explanation, significance, and the order in which independent variables entered the equations predicting VOTE are noted in Table 28. Two forms of predictive equation are provided. Equation I presents all independent variables which entered into the equation, regardless of their individual contributions to the degree
TABLE 28  Results of Multiple Regressions for the Voting Behavior Model.

A. VOTE, Stepwise regression

Equation I

<table>
<thead>
<tr>
<th>Step</th>
<th>Independent Variable</th>
<th>Slope</th>
<th>Simple Correlation</th>
<th>Cum Multiple R</th>
<th>BETA</th>
<th>F for inclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>POVERTY</td>
<td>+</td>
<td>.460</td>
<td>.460</td>
<td>.55</td>
<td>11.8</td>
</tr>
<tr>
<td>2.</td>
<td>MDYR</td>
<td>+</td>
<td>-.024</td>
<td>.557</td>
<td>.19</td>
<td>.7</td>
</tr>
<tr>
<td>3.</td>
<td>MOBILITY</td>
<td>+</td>
<td>.303</td>
<td>.599</td>
<td>.31</td>
<td>9.3</td>
</tr>
<tr>
<td>4.</td>
<td>AGE 55</td>
<td>-</td>
<td>-.030</td>
<td>.633</td>
<td>-.41</td>
<td>13.9</td>
</tr>
<tr>
<td>5.</td>
<td>AGE 15</td>
<td>+</td>
<td>-.174</td>
<td>.634</td>
<td>-.29</td>
<td>4.9</td>
</tr>
<tr>
<td>6.</td>
<td>RACE U</td>
<td>U</td>
<td>-.316</td>
<td>.658</td>
<td>-1.34</td>
<td>8.5</td>
</tr>
<tr>
<td>7.</td>
<td>RACE²</td>
<td></td>
<td>-.274</td>
<td>.689</td>
<td>1.07</td>
<td>5.7</td>
</tr>
<tr>
<td>8.</td>
<td>%OWNER</td>
<td>-</td>
<td>-.359</td>
<td>.691</td>
<td>.173</td>
<td>1.2</td>
</tr>
<tr>
<td>9.</td>
<td>%HSG²</td>
<td>U</td>
<td>.001</td>
<td>.692</td>
<td>.84</td>
<td>1.3</td>
</tr>
<tr>
<td>10.</td>
<td>WEALTH²</td>
<td>U</td>
<td>-.099</td>
<td>.698</td>
<td>-1.09</td>
<td>1.3</td>
</tr>
<tr>
<td>11.</td>
<td>WEALTH</td>
<td></td>
<td>-.119</td>
<td>.701</td>
<td>.91</td>
<td>.9</td>
</tr>
<tr>
<td>12.</td>
<td>%HSG</td>
<td></td>
<td>-.029</td>
<td>.702</td>
<td>-.60</td>
<td>.5</td>
</tr>
</tbody>
</table>

Total variation in VOTE explained = 49.2%

* a non-linear relationship is expected for this independent variable (a squared component is included in the equation as a result of correlations shown in TABLE 27).
TABLE 28  Results of Multiple Regressions for the Voting Behavior Model. (continued)

B. VOTE, Stepwise regression
   Equation II

<table>
<thead>
<tr>
<th>Step</th>
<th>Independent Variable</th>
<th>Slope</th>
<th>Simple Correlation</th>
<th>Cum Multiple R</th>
<th>BETA</th>
<th>F for inclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>POVERTY</td>
<td>+</td>
<td>.460</td>
<td>.460</td>
<td>.52</td>
<td>19.9</td>
</tr>
<tr>
<td>2.</td>
<td>MDYR</td>
<td>+</td>
<td>-.024</td>
<td>.577</td>
<td>.29</td>
<td>9.7</td>
</tr>
<tr>
<td>3.</td>
<td>MOBILITY</td>
<td>+</td>
<td>.303</td>
<td>.599</td>
<td>.27</td>
<td>10.2</td>
</tr>
<tr>
<td>4.</td>
<td>Age 55</td>
<td>-</td>
<td>-.030</td>
<td>.633</td>
<td>-.37</td>
<td>12.7</td>
</tr>
<tr>
<td>5.</td>
<td>AGE 15</td>
<td>+</td>
<td>-.174</td>
<td>.634</td>
<td>-.10</td>
<td>3.2</td>
</tr>
<tr>
<td>6.</td>
<td>RACE</td>
<td>U*</td>
<td>-.316</td>
<td>.658</td>
<td>-1.46</td>
<td>10.9</td>
</tr>
<tr>
<td>7.</td>
<td>RACE(^2)</td>
<td></td>
<td>-.274</td>
<td>.689</td>
<td>1.27</td>
<td>8.8</td>
</tr>
</tbody>
</table>

Total variation in VOTE explained = 47.5%

* a non-linear relationship is expected for this independent variable (a squared component is included in the equation as a result of correlations shown in TABLE 27).
of overall explanation. Equation II presents only those independent variables which increased levels of explanation by at least one percentage point. It is assumed that all remaining variables were explaining increasingly insignificant amounts of the variation in VOTE.

In predicting actual voter preferences for school spending, the POVERTY and RACE variables were found significant. However, in this case, RACE appears to have a U-shaped relationship with VOTE. WEALTH was not significant in the final equation.

The education, age, and neighborhood turnover variables were of greater importance in that equation than their simple correlations would have indicated. The effects of MOBILITY increased the positive vote for school referenda as expected. The effects of age and education were not always in the predicted directions; the AGE 15 and MDYR variables both exercised a negative impact upon vote when they were expected to relate in a positive manner. In the end, equation II explained only slightly less than 50 percent of the total variation in VOTE; many of the statistically significant independent variables were contributing very little to that overall level of explanation.

DISCUSSION

This chapter has held few surprises. Hypotheses concerning the character of P. T. A. membership rates and voting behavior were supported by the data presented.

Rates of P. T. A. membership show the expected SES bias. Parents with children attending schools in higher SES attendance areas are more likely to join P. T. A. organizations. This relationship is
consistent with more general assumptions concerning participation of urban residents in various formal organizations.

The voting behavior model of Wilson and Banfield (1964) has been rigorously tested with the Columbus data and it was supported only by the results of simple correlation as presented in this chapter. A U-shaped relationship noted for simple correlations between VOTE and WEALTH, RACE, and one of the two educational variables indicated that voters can legitimately be grouped into the three types hypothesized by Wilson and Banfield. Lower and higher SES voters supported school referenda. The intermediate SES voter preferred to oppose those same issues. However, the Wilson and Banfield model is not supported by the multiple regression analysis which followed. In fact, only the U-shaped form of the RACE variable was significant in equation II. The WEALTH variable did not enter that final equation at all.

Consideration of the simple correlation between VOTE and WEALTH and the weak relationships between VOTE and the educational variables suggests some interesting conclusions. It lends credence to the idea that voting on school referenda is on the basis of economic considerations rather than educational. Preferences for education, based on educational background, apparently have little or no effect on the voting outcome. However, further research is necessary, probably using sample survey data, to more clearly address that issue.

The only hypothesis rejected was that concerning the impact of population age structure on voting behavior. The relationship between percentage of school age children in an attendance area and vote
was negative. The voters in attendance areas with lower percentages of this age group in the general population were more likely to support school referenda. It would seem, therefore, that populations with few children react in the "public regarding" manner which would be counter to their own needs.

Analysis presented in this chapter also demonstrates the superior characteristics of the data compatibility methodology. The methodology can be implemented using urban micro-scale (neighborhood) data for voting behavior and SES. Spatial compatibility is achieved by creating statistical surfaces and sampling these surfaces for common locations. Most of the earlier voting behavior studies have either been operationalized on an inter-urban basis or have used rather suspect methods to achieve compatibility within cities. The flexibility of the compatible surface technique, and of correlation analysis, can be very useful in public choice studies of public expenditure. These studies have been very difficult to operationalize in the past, and this dissertation demonstrates the feasibility and value of this methodological strategy.
1. This technique was discussed at length in Chapter Three, and this is its second application for this dissertation.


4. These benefits result from self-provision of free professional services when appropriate, or from the individual's availability for meetings during the traditional working hours of others.


9. These residents of the city have little if any contact with this form of tax if they are renters. Most long term owners of housing in such neighborhoods would as owners would also have their properties grossly under-accessed for tax purposes because they have not been on the market and resold in recent years to bring a reassessment.

11. This is the only direct way that voters can negatively respond to taxation by their government, and specific levels of spending authorized by their public officials. Votes on elected officials are oriented more to ideology, personality, and/or a broad range voting record across many issues (of economic and non-economic concerns).


13. Ibid.


15. This could result if a population's age structure were skewed toward either the very old or very young. Each extreme could create special interests for voters on educational referenda.

16. The social security and retirement plan benefit payments are not usually increasing at the rates experienced for property tax rates and assessments. A retiree might be forced to sell a property if taxes increased beyond his fixed means to pay these taxes.

17. This assumes that they desire to receive the benefits created by their special efforts and tax dollars.
Chapter Eight - Some Conclusions

As the introductory chapter indicated, the choice of this dissertation topic was influenced by several articles and books in the literature. Sexton (1964) aroused interest in matters of school expenditure disparities within large urban school systems. Harvey (1971) raised the issue of effects which might result from differing levels of public expenditure and how these differentials are reflected in real income redistributions across residential neighborhoods. Levy, et. al. (1974) reiterated that same theme of the spatio-economic effects of public policy; their income effects were discussed as "outcomes" rather than specific monetary consequences, however.

In addition to this discussion of more general "outcomes" of public policy, Levy, et. al. postulated consequences of road improvements and school expenditure on real income. These public expenditures were suggested as an important factor in the creation of localized costs or benefits for residents in different neighborhoods. It was also noted that discretionary and compensatory funding resources were having an increasingly varying effect on overall school expenditures across neighborhood elementary schools. Compensatory monies increasingly dominate the existing disparities; discretionary are of less importance.

Becker (1952) suggested that discretionary expenditure distributions are, in large part, a function of the pattern of teacher transfers rather than a mere racial or economic bias on the part of a
school board. A teacher would transfer schools as part of the life cycle of a professional career. Teachers commonly have their first assignments in the less desirable schools or school districts. However, in later years they will relocate to an assignment in the more desirable schools or school districts available. This pattern of transfer mobility would concentrate teachers with more experience and better qualifications, by definition the higher cost teachers, in higher SES schools and school districts. Senior teachers have traditionally been given the first choice or preference in transfer opportunities and they have preferred high SES school assignments over those in lower SES schools. The workings of this teacher transfer model for allocating discretionary expenditures has been the primary focus of much of this dissertation.

Wilson and Banfield (1965) postulated a comprehensive explanation for voter preferences in public expenditure referenda which was based on an economic decision model. Their research postulates a partition of the electorate into three groups—i.e. those voters in lower, intermediate, and higher SES residential neighborhoods respectively. Each group votes their self-interest; the voting pattern for expenditure referenda is U-shaped across SES.

On the basis of this literature, a series of specific hypotheses has been developed and tested. They are posed in order to allow evaluation of: (i) the existence of significant disparities in discretionary funding across elementary schools; (ii) an SES bias in the conditions a teacher might conceivably use to evaluate a school's
desirability relative to others within a district; (iii) the correlation of particular levels of SES across attendance area populations and teacher salary determinants; (iv) the nature of transfers requested by teachers within a district; (v) parental activism in school P. T. A. affairs; and (vi) the nature of voter reactions to school funding referenda. Now that these analyses have been concluded, a brief review of results and a summary discussion of their relevance to these hypotheses are presented. Finally, the implications of this research are noted and an attempt is made to place it in a broader social science perspective.

RESULTS REVIEWED

In general, hypotheses tested in these chapters have been based on a consensus gained from a review of a broad ranging literature. However, the specific statistical results encountered are not, in all cases, supportive of those ideas. A review of results for each major hypothesis posed is now presented.

School Expenditure Disparities

Expenditures on elementary education across the Columbus schools are shown to have SES biases in their distribution. However, this bias is not always of the form expected; other variables intervene to nullify the effects of that bias, and the correlations reported are not as strong as expected.

As noted in Chapter Four, teacher salaries, as a measure of discretionary expenditures, had only a weak positive relationship to SES; they did indeed favor higher WEALTH schools as commonly assumed. The
level of predictability of salaries on the basis of SES was very low within this school district as most of the variation in salaries must be explained by factors other than SES across attendance area populations.

A second reason for doubting the validity of an SES bias in expenditures based on teacher salary derives from quite another rationale. A strong negative relationship was noted between class size, based only on number of classroom teachers and SES across the same schools. Counter to expectations, it was found that larger classes were associated with higher SES schools. Thus, smaller classes in lower SES schools have easily counteracted any superior expenditure effects which result from only slightly higher salaries being paid elsewhere in the city.

Lastly, compensatory funding was much more significant than expected in determination of the magnitudes of spending differentials across elementary schools. The predominance of compensatory funding in special effort across schools and the unorganized nature of other discretionary spending differentials lead to such a conclusion. The welfare effect of the differential in teacher salaries would be minimal; class sizes and compensatory funding constitute that bias in school spending which, ultimately, favors lower SES elementary schools in Columbus.

**Motivations for Teacher Transfers**

The hypothesized teacher salary disparities were expected to be generated by a bias in teacher transfers. More costly teachers with
greater seniority were expected to be assigned predominantly to higher SES schools. However, the weakness of support for the basic assumption of patterned teacher salary disparities led to the testing of more specific hypotheses relating to the operation of mechanisms able to create such an expenditure disparity.

The analysis presented in Chapter Five presented a series of school desirability measures which teachers are assumed to consider in evaluating alternative teaching assignments. Measures were identified to indicate distributions of student SES, student turnover rates (as related to parental mobility), and the classroom atmosphere. Results indicated that such variables were more significantly related to POVERTY and RACE of school attendance areas. Those relationships generally support the underlying forces needed to generate the teacher transfer effect. District teachers therefore would have reason to prefer transfers which could create the discretionary expenditure disparities associated with them. Such disparities should ultimately favor the higher SES schools and their attendance area populations.

Teacher turnover rates were also consistent with the assumption that higher SES schools represented more desirable assignments.

Transfer Mobility Patterns

Chapter Six presented evidence for teacher desire or "intent" to transfer schools in the manner we have assumed. However, higher levels of teacher experience and qualification are not evident in the staffing of supposedly preferred destination schools. Teachers in higher SES schools were, in fact, not significantly different in their
characteristics from those of any other schools in the Columbus System.

Based on evidence for "intent" and lack of evidence for actual concentrations of higher cost teachers in preferred schools, other forces must be operating to counteract the expenditure effects expected from transfers. The perverse expenditure effects of transfers had been noted throughout the 1950s and 1960s for a broad cross-section of urban school systems in the U.S.; there is no precedent for the pattern noted here for Columbus. The precise reason for this discrepancy of outcome is not clear at this time. This is discussed in more detail below.

Parental Educational Preferences

Parental activism in school related affairs and voting behavior were the focus of Chapter Seven. Both were analyzed in an attempt to establish neighborhood preferences for varying levels of educational services. Activism and voting were assumed to be related to the SES of respective school attendance area populations.

Parental activism, as measured by varying rates of P. T. A. membership across elementary schools, exhibited the SES bias hypothesized. Parents of children in higher SES schools were more likely to participate in the activities of their school's P. T. A.

Voting behavior on school expenditure referenda was compared to the Wilson and Banfield (1964) findings concerning more general public expenditure issues. Specifically, it was expected to have a distribution in Columbus consistent with the behavior patterns postulated for
three distinct groupings of voters. Lower and higher SES voters should have favored school spending issues; intermediate SES voters should consistently reject those same issues.

The bulk of the results did not support that model. Some U-shaped relationships were noted in simple correlations of wealth, racial composition, and education. However, in a multiple regression, these variables were not found to be significant predictors of voting behavior, and the voters were not found to behave in accord with the concept of those groups.

**SOME CONCLUSIONS AND IMPLICATIONS**

A number of general, and in some cases, very specific conclusions and implications can be drawn from this review of results. The issues noted include: (i) an evaluation of the utility of the compatible surfaces (SYMAP) procedure; (ii) the effects of data disaggregation; (iii) the use of correlation analysis across individual schools as observations; (iv) the magnitudes of existing expenditure disparities; (v) the effects of teacher transfer mobility; (vi) the neighborhood patterns of parental and voter interest in school issues; and (vii) the welfare effects or "outcomes" to be expected, given the body of results just reviewed. Each of these issues is now discussed in turn.

**The Compatible Surfaces Procedure**

A preliminary obstacles confronting operationalization of intra-urban expenditure distribution research is data. The availability of micro-scale expenditure data for services within cities
and their ultimate compatibility with a reasonable range of measures of social, economic, and political conditions are central to these limitations.

The SYMAP interpolation and resampling procedure presented in this dissertation overcomes many of the compatibility constraints previously plaguing this type of research. It allows the generation of compatible expenditure and SES data observations for a range of micro-scale urban research. The flexibility inherent in the procedure is invaluable for such analysis. Initially, all data are collected and reported at the most advantageous scale for that data; this choice of scale can be based on particular data considerations rather than on the need for compatibility. As a result, all analysis for this dissertation could be carried out at the school base as a common denominator, regardless of whether one was intending to combine other social, economic, or political variables. No school data observations need be lost in a compromise to allow matching of block group, tract, or precinct level data to the school geography overlying those respective areal units for the same city. Previously, these losses would have been commonplace.

Secondly, all other measures pertinent to the research—census variables, voting behavior, age of subdivisions, annexations, air pollution levels, perceived residential desirabilities, zoning, accessed valuation, etc.—can be included as data in a single model. Each variable's individual distribution is interpolated to a density
function, or surface, for the whole territory and then resampled for common observational units. No matter what geographic base is used initially to organize spatial data, a surface can be generated for those distributions across that total geographic entity. As long as data can be obtained, and it is spatially continuous, it will be systematically and logically compatible with all data sampled or re-sampled to the common base.

Data Variance and Correlation

Past school expenditure studies identified disparities on the basis of school groupings. Results reported for groups of schools classified by various aspects of SES were consistent with an SES bias in expenditure disparities. However, mean expenditure levels for groups conceal a great deal of variation in expenditure across schools. At the very least, this raises doubt about the validity of inferences regarding expenditure disparities.

Without fully replicating analyses produced for all earlier expenditure disparity studies, it is difficult to generalize the effect of using individual school observations on the results obtained in this dissertation. However, there is evidence that some of the variations in expenditure levels noted in this dissertation have also existed in previous studies.

Expenditure Disparities

It now remains to review the conclusions concerning some of the major hypotheses posed in this dissertation. Evidence indicated that there are large variations in school spending (expenditures on staffing per student) across the Columbus schools. These were found to result
from systematic processes. First, discretionary expenditures created by staffing requirements for schools did slightly benefit higher SES schools in Columbus. Wages did increase by SES for elementary school attendance areas. However, the effects of class sizes and the heavier than expected use of compensatory funding resources greatly biased overall per student expenditures in favor of lower SES schools. About forty percent of the variation was explained for that expenditure variable.

Remaining variation in per student expenditures could not be explained by any of the conventional independent variables employed in similar research. These unexplained expenditures were apparent at all levels of SES; many school were receiving very differing per student expenditures even though they were similar in attendance area population SES. The residuals from the predictive model for this dependent variable would appear, therefore, to be random deviations from city-wide norms.

In sum, higher SES schools are not being funded in the manner expected. Clearly, therefore, the "outcome" of funding allocations for Columbus is not the perverse disparity which was consistent elsewhere during the 1950s, 1960s and early 1970s.

Teacher Transfers

The distribution of average teacher wages per school only very weakly supported notions of expenditure effects deriving from teacher transfers. Higher cost teachers were expected to be more concentrated in higher SES schools. However, as a result of significant changes
in methodology used in this dissertation, there is no real way to know how different the results are from those expenditure distributions noted in the earlier literature.

Consequently, in addition to measuring those expenditure effects, the validity of the transfer model was also tested. In that analysis, there was a high degree of complexity in the model assumed and significant data limitations encountered. It was necessary to partition this problem such that separate tests are made for distributions of conditions which teachers are thought to prefer in an assignment, staffing characteristics which should result from voluntary transfers, and "intent" to transfer by teachers.

The results indicated that the classroom, school, and attendance area conditions which in all likelihood teachers desire have distributions across schools as expected. The "easier" assignments--higher SES schools--are assumed preferred over those which have a combination of undesirable attributes. However, the SES bias in these conditions does not carry over to the effects they are assumed to have on staffing across schools; the greater degree of staff experience and qualification assumed for preferred schools did not exist. Also, class sizes were larger for the higher SES schools rather than smaller as hypothesized.

The apparent ineffectiveness of transfers on wage distributions is, therefore, not surprising. The higher SES schools were not receiving the benefits deriving from a bias in teacher transfer patterns. For this reason, variations in class size and the systematic use of compensatory funding are leading to greater spending disparities favoring lower SES schools than would otherwise exist.
Because data were never obtained for actual transfers by teachers, such conclusions must be based on inferences from distributions of teacher experience and educational qualifications across different schools. Precisely why teacher transfers were not as expected is not clear; apparently, however, school management was blocking those transfers that would have taken place if teachers had had the choice.

Voting Behavior and Parental Preferences

The hypotheses and analysis related to voting behavior are an interesting outgrowth of the methodology used in testing the expenditure disparity hypotheses. For that reason, this segment of the dissertation research has received a somewhat superficial treatment. In fact, the attempt has been to only open the door of what could easily have been a completely separate dissertation topic.

Results do not confirm the notions suggested by a reading of Wilson and Banfield, and they leave a number of unresolved issues. A strong SES bias proved to exist and some independent variables were found to have U-shaped relationships when correlated one at a time with voting preferences.

IMPLICATIONS AND NEW DIRECTIONS

A number of possible implications of these results have been suggested throughout the body of the dissertation. In summary, these include:

1. An important issue involved the amount of intra-school group variation not measured by early school expenditure studies. An increase in the number of observations used, and an improvement in the precision
with which variations is reported on a school-by-school basis, has shed light on this question. The large amount of variation across schools, as opposed to that across school groups, may not negate earlier findings suggesting income related disparities in expenditures. However, the assessment presented here has more accurately represented the true magnitude of these disparities. They were not very great. A replication of the earlier work using such a methodology would be necessary to ultimately clarify matters concerning differences between disparity patterns for the Columbus schools and those previously cited in the literature. Replication of the early methodology using Columbus data was used sparingly because of the weakness of that methodology.

2. The magnitude of expenditure disparities across the Columbus schools is far less than expected, and the nature of some of the specific components of these disparities is somewhat surprising. Again, because of profound differences in expenditure studies, a direct comparison of the magnitudes of disparities or their ultimate consequences is impossible. However, it appears that these distributions are not similar to those found in other school systems for the same time frame. One can understand that over time, since the Sexton study in the 1950s, there has been a significant move toward equity in provision of school services for both the inter and intra-district cases. However, this explanation does not adequately account for discrepancies between the results of the Michigan and Oakland, California studies on the one hand and those noted for Columbus on the other hand. All these studies use expenditure data
for 1969 and/or 1970, and compensatory funding was also a major force in modifying the expenditure disparities in all cases.

Teacher salary disparities, as a form for discretionary funding, were of little consequence in the Columbus schools. However, that salary distribution was of some importance. As a result, the effects of smaller classes noted for lower SES schools intensified the end effects of compensatory efforts already concentrated in those schools. It is difficult to assess the forces resulting in the distribution of class sizes since suburban schools in Columbus were overcrowed during this period. The school district had not been able to get a levy or bond issue passed in four years between 1968 and 1972 and was respecting some aspects of the Columbus Plan of the late 60's. This led to a classroom crunch for schools in the rapidly growing suburban neighborhoods when no additional classroom space could or would be generated. And in the end, class sizes have considerable power to determine the distributions and re-distributions of school expenditures across a school district. In this case, this process appears to have operated regardless of supposed teacher preferences for desirable school assignment in higher SES schools.

3. Teachers would choose their destinations for voluntary transfers on the basis of SES, if given the choice. The more desirable school groupings, and thus the most preferred of transfer destinations, are chosen by teachers when they are given the opportunity. However, in Columbus during the 1960s, this opportunity appears to have been missing; these preferences did not lead to transfers which systematically concentrated higher cost teachers in the preferred schools.
Limitations of data make it impossible to pursue this matter further at this time.

4. Voters for school referenda in Columbus are concerned with economic issues. The votes cast mirror those which might have been apparent in any number of local expenditure issues.

As noted previously, there is a further need to review results of previous literature concerning school expenditure disparities. It has been extremely difficult to place results noted here into a broader context, or for that matter, in historical perspective. There is a need for replications of earlier studies of disparities and voting behavior using the methodological innovations proposed and operationalized in this dissertation. If data were made available in a form consistent with needs for such replications, it would be possible to discriminate between the effects or a change in methodology on the one hand and a change in school policies on the other hand.
APPENDIX ONE

The following are the elementary school groupings used by the Columbus School District for various administrative purposes including advertisement of staffing vacancies.

1 - Brookhaven District

376 Como
487 Huy
525 Linden
542 McGuffey
563 North Linden
565 Northridge
571 Oakland Park
652 Walford

2 - Central District

312 Avondale
356 Chicago
388 Dana
440 Fifth
454 Franklington
485 Hubbard
508 Kingswood
549 Michigan
643 Thurber

3 - East District

316 Beatty Park
396 Douglas
424 Fair
462 Garfield
532 Main
541 Maryland Park
575 Ohio
583 Pilgrim

*the number refers to the school cost account I. D.
4 - Eastmoor District

304 Alumcrest
314 Barnett
332 Berwick
344 Broadleigh
408 East Columbus
414 Easthaven
428 Fairmoor
498 James Road
603 Scottwood
617 Shepard

5 - Linden-McKinley District

308 Arlington Park
340 Brentmeil
400 Duxbery
412 Eastgate
468 Gladstone
517 Lexington
674 Windsor

6 - Marion-Franklin District

354 Cedarwood
360 Clarfield
450 Fornof
476 Heimandale
510 Koebel
557 Moler
579 Parsons
599 Scioto Trail
628 Smith
640 Strockbridge
655 Watkins

7 - Mohawk District

328 Bellows
420 Eleventh
436 Felton
458 Fulton
528 Livingston
551 Milo
644 Sullivant
645 Trevitt
8 - North District

352 Calumet
368 Clinton
386 Crestview
473 Hamilton
491 Indianola
545 Medary
567 Northwood
607 Second
659 Winland Park

9 - Northland District

302 Alpine
320 Beaumont
394 Devonshire
448 Forest Park
483 Homedale
534 Maize
566 Northtowne
578 Parkmoor
595 Salem
646 Valley Forge

10 - South District

324 Beck
392 Dreshler
432 Fairwood
478 Heyl
502 Kent
519 Lincoln Park
591 Reeb
621 Siebert
632 Southwood
636 Stewart

11 - Walnut Ridge District

380 Courtright
512 Leawood
543 Maybury
573 Oakmont
576 Olde Orchard
587 Pinecrest
611 Shady Lane
672 Willis Park
678 Woodcrest
12 - West District

336 Binns
348 Burroughs
404 Eakin
466 Georgian Heights
481 Highland
523 Lindbergh
648 Valleyview
657 Wayne
665 Westgate
662 West Broad
668 West Mound

13 - Whetstone District

384 Cranbrook
470 Glenmont
494 Indian Springs
504 Kenwood
538 Marburn
614 Sharon
676 Winterset
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