DOCUMENT RESUME

ED 215 855 RC 013 362

AUTHOR Monk, David H.; And Others
TITLE Potential Effects of the Overburden Argument on the Funding of Rural Schools. Final Report to the New York State Special Task Force on Equity and Excellence in Education.
INSTITUTION New York State Special Task Force on Equity and Excellence in Education.
SPONS AGENCY New York State Executive Office, Albany.
PUB DATE Jun 81
NOTE 114p.; For related document, see RC 013 361.

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS Access to Education; Assessed Valuation; Change; *Delivery Systems; Differences; Educational Finance; Elementary Secondary Education; Enrollment Trends; Equalization Aid; *Financial Support; Fiscal Capacity; Income; Policy; *Resource Allocation; *Rural Schools; Rural Urban Differences; Small Schools; *State Aid; *State School District Relationship
IDENTIFIERS Economies of Scale; Isolation (School Districts); *New York; *Small School Districts; Sparsity (Population); Tax Bases

ABSTRACT

This report presents attempts to understand more about how six background characteristics (small scale, population sparsity, district isolation within a BOCES (Boards of Cooperative Educational Service), interaction between a change in enrollment and initial scale of the district, rapid changes in full value property wealth over time, and large discrepancies between income and property based measures of ability to pay) affect financing and delivery of educational services. Each characteristic is examined in turn and discussion includes a rationale for expecting each characteristic to make a difference either for taxpayers or students. Two distinct types of burdens are addressed: the first type involves hardships that stem from whatever extra costs certain districts are forced to incur in producing a given level and mix of educational outcomes, and the second type involves instances of the state's inaccurate determination of the school district's ability to pay for educational services. The report concludes with a discussion of policy alternatives considered in response to seven questions, e.g., should the state concern itself with the limited extent to which small districts cooperate for the purpose of providing educational services, and should the state make allowances for the current size of districts when it makes adjustments for declines in pupil enrollment? (BRR)

Potential Effects of the Overburden Argument on the Funding of Rural Schools

Final Report to the
New York State Special Task Force
on Equity and Excellence
in Education

David H. Monk
Kenneth A. Strike
Frederick H. Stutz

New York State College of Agriculture and Life Sciences at
Cornell University
Department of Education

June 1981

Table of Contents

Section I: Introduction

The research reported in this Final Report was performed on behalf of the New York State Special Task Force on Equity and Excellence in Education. In consultation with the Task Force's Rural School Study Group, we agreed to examine relationships between selected structural features of school districts and resource allocation practices of local school officials. Our goal was to identify instances where structural features over which local officials have little or no discretion are systematically related to burdens that affect either taxpayers or students.

More specifically, we were interested in exploring the consequences of district characteristics that met the following two criteria. First, the characteristic had to be commonly found in districts intuitively thought of as being rural. Second, we had to have some reason for believing that the characteristic could contribute either to taxpayer or student related burdens. Ultimately, we identified the following six district characteristics for further study: (1) small scale, (2) population sparsity, (3) district isolation within a BOCES, (4) the interaction between a change in enrollment and the initial scale of the district, (5) rapid changes in full value property wealth over time, and (6) large discrepancies between income and property based measures of ability to pay.

This report presents the results of our attempts to understand more about how these six background characteristics affect the financing and

delivery of educational services. Each characteristic is examined in turn and the discussion includes our rationale for expecting each of the characteristics to make a difference either for taxpayers or students. The report concludes with a discussion of policy alternatives that the research indicates are worthy of serious consideration. Readers who are interested in the historical as well as legal context of the issues we are addressing here are referred to our Interim Report.*

---

*We would like to acknowledge the assistance of the numerous individuals and organizations around the state that have contributed to this research. At the risk of overlooking some individual contributions, we wish to make special mention of the assistance provided by Robert Lamitie, Tom Malesky, and the staff of the Educational Finance Research Services division of the State Education Department. In addition, Leonard Powell and various staff members at the Information Center on Education helped us gain access to the state's comprehensive Basic Education Data System (BEDS). John Bishop, Chief of the Bureau of School District Organization, has endeavored on several occasions to explain the complexities of the BOCES system to us. Lois Wilson and Jim Shea of the Governor's office were kind enough to share their insights into the issues we address, and provided several important suggestions for types of analyses we ultimately carried out. Among the members and friends of the Rural Study Group, we wish to acknowledge the assistance offered by Richard McGuire, Corinne Stork, and Eris Thompson, and to make special mention of the contributions made by Ted Huntington, Donna Trautwein, and Bob Smith. At the Task Force, Nancy Gaeta, and earlier, Dale Hickam helped us build links between our work and the other research being conducted on behalf of the Task Force. At the Education Commission of the States, Robert Palaich was a dependable source of support and helped us in our attempts to develop a working definition of a rural school.

We have received assistance from many people at Cornell. Professor Joe P. Bail, Chairman of the Department of Education at Cornell, has been steadfast in his support for the project and has helped stimulate much of the interest at Cornell in rural school problems. It was Professor Bail that played a key role in organizing the Rural Schools Program at Cornell, and it was through the Rural Schools Program that we had the good fortune to work with Bill Deming, the program's director. Mr. Deming has helped us in countless ways to understand the issues from the practitioner's perspective, and we are grateful to him.

Our research assistants, Jim Bliss, Don Habibi, and Phil Harrington have made invaluable contributions and were willing on numerous occasions to give selflessly of themselves for the sake of the project. Finally, we are indebted to the support we received from a series of highly competent and dedicated secretaries, Sid Doan, Lura Marker, and Patti Farrell.

Section II: Empirical Results

Before turning to the major findings of the study, it is useful to be explicit about how we are using the term "burden" in our analysis. We have given attention to two distinct types of burdens. The first type involves hardships that stem from whatever "extra" costs certain districts are forced to incur in the course of producing a given level and mix of educational outcomes. In other words, if it costs more to do the same thing in one district compared to another, all else equal, a burden exists in the district that faces the higher costs, and this burden may be shouldered either by taxpayers in the form of higher taxes or by students in the form of lower levels of service which can have adverse effects on learning, or by both taxpayers and students. Of the six background characteristics we examine below, there is reason to believe that the first four of them (scale, sparsity, isolation, and changes in enrollment) have implications for the cost of producing a given mix and level of educational outcomes.

The second type of burden involves instances where the state makes an inaccurate determination of the school district's ability to pay for educational services. If the state overstates the true ability of the district to pay and provides state aid in accordance with this inaccurate determination, a burden exists in the affected district relative to an otherwise equivalent district. For example, consider the case of two districts that are equally able to pay for education. If the state overstates the wealth of one district and pays less state aid as a result,

the affected district must either raise additional revenue at the local taxpayer's expense or reduce services. In the first instance the burden falls on taxpayers; in the second instance, students are the most directly affected.[1] In the present context, the last two of the six background characteristics we are examining (changes in full value property wealth and the discrepancy between income and property based measures of wealth) have implications for the evaluation of the true ability of a school district to pay for education.

We have divided the presentation of our results into two parts. The first deals with those background characteristics that have implications for cost; the second examines the remaining two characteristics that have bearing on the determination of ability to pay.

Sources and Consequences of Cost Differentials

Scale of Operation

Research dealing with economies of scale in education provides some insight into how enrollment levels affect the opportunities of school districts to provide educational opportunities.[2] Briefly stated, economies of scale exist when larger organizations are able to produce the same outcomes as smaller organizations for less cost. These economies of scale are generally traced to two sources. The first involves the difficulties small organizations encounter when they seek to purchase small amounts of relatively indivisible inputs. One result may be a tendency for small organizations to purchase more of the indivisible inputs than is optimal in terms of efficiency. An example drawn from education would involve an instance where a school district is forced to operate with smaller class sizes than it would prefer to offer. To the extent that

student performance is not enhanced by the small class size, there is a sense in which the teacher resource, because of its indivisible nature, is being under-utilized. This under-utilization of certain inputs can erode the efficiency of the affected organization and the net result can be a situation where in small organizations it costs more than in larger organizations to achieve the same result.

The second source of scale economies involves the gain in specialization that can accompany increases in scale. Consider a situation where there are 30 students and one teacher in one school district and 240 students and 8 teachers in a second district. Assume further that in both districts the teachers are all paid the same salary. The pupil-teacher ratio is 30:1 in both cases, but in the latter case, each teacher will be able to specialize to a degree that is impossible (or difficult to achieve) in the first instance. To the degree that this specialization is associated with pupil gains, the second district will be producing more than the first for the same cost. Looked at in a different way, this result suggests that the smaller district can produce the same outcome as the larger district only if it incurs additional costs.

The absence of adequate measures of the outcomes of New York State K-12 school systems precludes an examination of the degree to which economies of scale exist in New York State school systems. Even so, we do have information about the levels of expenditure that exist in all regular K-12 school districts in New York and it is possible to speculate over how the existence of scale economies would influence resource allocating practices of local officials. By testing to see whether the patterns we observe are consistent with what the presence of scale economies would lead us to expect, we can gain some insight into differences in the treatment of taxpayers and students that are occasioned by

differences in school district scale.

Whether scale related differences in the treatment of taxpayers or students count as inequities that need to be remedied in order to satisfy standards that could be employed by the courts depends in part on the degree to which district scale is freely chosen. We will have more to say about this important question when we discuss policy options. For now our goal is to learn more about the nature of the independent relationships that exist between scale and expenditure levels and patterns.

Table 1 provides information about how small compared to large districts spend funds on education. All 670 regular K-12 districts were ranked in terms of their scale (as measured by the TAPU pupil count[3]) and were divided into ten equal groups (each involving roughly 67 districts). Means and standard deviations for a series of variables were calculated for each of the ten groups and these statistics are reported in Table 1. Unless otherwise stated, all data reflect operations in the 1978-79 school year.

Looking at Column 1 of the table, it appears that the smallest districts in the state spend at relatively high levels on a per pupil basis. However, further analysis has revealed how misleading this result can be. Specifically, notice the large standard deviation associated with the smallest districts in column 1. This figure reflects the amount of variation that exists among the smallest 67 districts in the state and is indicative of how dangerous it is to make generalizations about this decile. A case by case examination of these 67 districts revealed that the distribution of the districts within the decile is quite skewed and that two districts in particular (Fishers and Shelter Island) are responsible for whatever tendency there is for the average expenditure level for the districts to be relatively high. Indeed, when these two cases are excluded from the sample, the mean for the general fund per

Table 1

Relationships Between Expenditure Levels and Patterns and School District Scale (1978-1979)

	1		2		3		4		5		6	
Total Aidable Pupil Units	General Fund Expenditure Per Pupil		Local Levy Divided by Full Value (Tax Rate in Mills)		Local Levy Divided by Local Income		Expenditure per Pupil on Instruction		Expenditure per Pupil on Transportation		Expenditure per Pupil on Boces	
District Deciles*	Mean	S.D.**	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
<565	2527	1074	13.0	3.0	.08	.05	1359	549	158	66	162	82
566-933	2184	373	13.4	2.5	.06	.03	1192	239	144	35	145	46
934-1303	2285	500	14.4	3.4	.05	.02	1250	316	136	49	107	44
1304-1553	2274	553	14.8	4.4	.05	.02	1243	328	132	47	94	43
1554-1968	2347	598	15.1	5.3	.04	.02	1319	381	122	40	98	45
1969-2549	2314	650	15.5	4.2	.05	.03	1271	363	129	42	76	21
2550-3311	2464	664	17.5	4.7	.05	.02	1398	424	119	48	75	34
3312-4472	2592	666	19.9	5.5	.05	.02	1486	417	117	49	73	36
4473-6962	2633	479	21.3	5.4	.05	.02	1511	316	119	44	68	39
>6963	2607	513	22.3	6.3	.06	.03	1508	322	99	36	54	30
All Districts	2423	630	16.7	4.6	.05	.03	1354	373	127	46	95	44

n = 670

*Deciles are non-pupil weighted (each represents 10% of the districts and includes all regular K-12 districts with the exception of the "Big 5" districts).

**Standard deviation, a measure of variation within the decile.

Table 1 Continued

7		8		9		10		11		12	
Full Time Teachers Per 1,000 Pupils		Full Time Non-Teaching Professionals per 1,000 Pupils		Full Time Para. Prof. Staff per 1,000 Pupils		Beginning B.A. Teacher Salary ($)		Beginning M.A. Teacher Salary ($)		Percentage of Students Falling Below Minimum Competency as Measured by the PEP Test	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
63.0	16.5	5.8	3.7	4.8	4.3	9,566	936	10,575	1,373	.19	.06
52.1	5.7	5.6	2.2	4.9	3.3	9,896	749	10,809	863	.18	.05
52.8	6.2	5.8	2.3	3.9	2.9	10,042	997	11,091	357	.17	.05
51.5	4.7	5.6	1.6	3.9	3.6	10,087	1,226	11,136	1,590	.15	.05
51.2	4.4	6.2	2.2	3.6	3.6	10,514	1,193	11,662	1,639	.16	.05
51.5	5.3	5.9	2.2	4.1	3.5	10,179	1,104	11,382	1,356	.17	.06
51.6	4.8	6.8	1.9	4.1	3.0	10,690	1,267	11,956	1,690	.16	.06
49.9	4.6	7.3	2.8	2.9	3.3	11,100	1,209	12,457	1,706	.15	.06
49.8	4.9	7.1	2.2	2.4	3.1	11,220	1,141	12,647	1,453	.15	.07
50.5	5.1	7.3	2.0	2.3	2.8	11,171	1,061	12,744	1,422	.15	.06
52.3	7.0	6.3	2.4	3.7	3.3	10,481	1,222	11,699	1,632	.1	.06

pupil falls from $2,527 to $2,393.

Moreover, the bivariate relationship between scale and expenditure levels on the general fund may be confounded by the property wealth variable. Small districts are frequently alleged to be wealthy districts although the strength of the relationship is low (the zero-order correlation coefficient (r)= -.06) and wealthy districts tend to be high spending districts, r = +.74). Hence, we were interested in controlling for the effects of wealth as part of our effort to obtain an accurate measure of the relationship between spending and scale. When controls are in place for wealth, so that the comparison is being made between the expenditure levels of large compared to small districts that are equally wealthy, the partial correlation coefficient suggests that there is a positive relationship between scale and spending (r = .27).

However, we need to be mindful of the fact that the actual relationship between expenditure levels and scale may be curvilinear. If this is the case, the correlation coefficients reported above can be misleading and it is necessary to estimate a regression equation. When this analysis was carried out (see the Appendix for details), we found that there is an inverted U-shaped relationship between scale and spending levels such that both the very small as well as the very large districts spend at levels that are lower than is the case for medium size districts.

Although this is not a strong relationship (it explains only 3% of the variation in the general fund expenditure variable), it is important since it is somewhat inconsistent with what a strict economy of scale argument would predict. Recall that the economy of scale argument holds that it costs more to achieve the same results in a small relative to a large district. If a district chooses to impose the entire burden

associated with the cost differential onto its students, we would expect to find no relationship between scale and spending levels. And yet, what we are finding here is that small districts are spending less than larger scale districts. The question we need to address is whether this tendency to spend less in small districts constitutes evidence of a lack of interest in education on the part of taxpayers. This is a substantive question from a policy making perspective since it is related to the question of the degree to which districts are likely to use increases in state aid that result from school finance reform to reduce local taxes rather than to enrich the educational program. Columns 2 and 3 of Table 1 deal with this issue.

Column 2 of Table 1 reveals a direct relationship between the tax rate a school district imposes and the scale of the district. In other words, it appears that small districts tend to impose low tax rates while large districts tend to impose high tax rates. Moreover, this relationship holds even when we control for the effects of the property wealth of the district on the tax rate.

These results are largely consistent with what column 1 of the table reports. Small districts, in general, tend to be low spending districts that tax themselves at relatively low levels. However, when we look at column 3 where the level of local spending is compared with the ability to pay as measured by income rather than property wealth, we find evidence of a different type of relationship. Instead of finding that small districts spend a smaller fraction of their income than large districts on education, a finding that would be consistent with the thesis that small districts are "low effort" districts, we find that small districts tend to spend the same if not a slightly higher percentage of

their income on education relative to larger districts. Indeed the districts falling into the smallest decile tend to spend a higher fraction of their income on education than any of the other districts, and this result holds even when the two districts responsible for the large standard deviation are removed from the analysis.

As provocative as this result is, we recognize that it cannot by itself count as evidence in support of the claim that small districts are high effort districts relative to others. This is the case because the measure of local income systematically excludes sources of revenue for local school districts that are held by absentee property owners. School districts are able to tax the property of absentee owners but the income of these absentee owners need not be included in the income measure of the district's ability to pay. To the extent that absentee owners represent a higher proportion of the property tax base in the smallest districts, the income based measure of "effort" reported in column 3 for the smallest districts will be overstated. A more reasonable conclusion to draw from columns 2 and 3 is that the exclusive reliance on property tax rates to measure local effort is inappropriate and that it is premature to conclude that small districts are low effort districts.

Looking now at column 4 we find a relationship between expenditure levels on instruction and scale that is similar to what we found in column 1. Once again, the high figures for the smallest districts are accounted for by Fishers and Shelter Island; there is a need to control for the confounding effects of wealth; and the nature of the relationship is curvilinear. In other words, among equally wealthy districts, small districts tend to spend less on instruction than medium size districts and at roughly the same level as the largest districts.

A more interesting question we can ask is whether scale is related to spending on instruction when controls are in place for the level of spending on the general fund. In other words, the question becomes: Among districts that spend the same amount on education in general, do smaller districts tend to spend less than larger districts on instruction? When we carried out this analysis (see the Appendix for details) and found that while the strength of the relationship is modest, there is empirical support for the claim that small schools spend less on instruction than do other schools spending at the same level on education.

One explanation for this result is the tendency small districts have to spend more on transportation expenditures (see column 5). According to the table, small districts spend in excess of 1 1/2 times what large districts spend per pupil on transportation. But transportation is aided by the state at a high nominal rate, hence it is not clear that high transportation expenditures necessarily imply a reduction in spending for instruction. Moreover, it is not clear why scale per se should be related to expenditure per pupil on transportation services, except to the extent that economies of scale affect the production of transportation services. A more satisfying explanation for the relationship revealed in column 5 is that small districts tend to be sparsely settled districts ($r = +.43$) and that sparsity is positively related to transportation costs per pupil (+.33). We will have more to say about transportation when we examine sparsity.

Column 6 provides information about the relationship between scale and participation in BOCES programs. It is clear that small districts tend to spend more per pupil on BOCES services. While this result holds

in general, the high standard deviation reported in column 6 for the smallest districts suggests that considerable variation exists among small districts in the degree to which they subscribe to BOCES services. We found this variation to be potentially troubling, and in the section where we discuss isolation within a BOCES, we examine possible impediments that can limit the willingness or ability of small districts to make use of BOCES offerings.

Columns 7, 8, and 9 provide insight into some of the consequences of small scale for school district resource allocation practices. The table indicates that smaller districts tend to have higher teacher-pupil ratios than do larger districts. Indeed, we found that even among districts that spend the same level on education, the smaller districts hire more teachers per pupil than do larger districts (see the Appendix for details). The most straightforward explanation for this result involves economy of scale arguments about the relatively indivisible nature of the teacher input. It would appear that small districts have little choice but to operate with smaller classes than do larger districts that spend at the same overall level per pupil.

In light of this result, we can ask questions about how small districts finance their small class sizes. Four possibilities come to mind. First, they can hire fewer non-teacher inputs as a means of offsetting the costs of small class size. Column 8 suggests that small districts make do with fewer non-teaching professional staff members. These efforts to economize by hiring fewer administrators and other non-teaching professionals may underlie the complaints heard among small school administrators about the "excessive" paperwork required by the state.

In contrast to the tendency of small school districts to hire fewer

non-teaching professionals, we found evidence of a tendency to hire more para-professional aides per pupil than do larger districts. This result is surprising to us and the only explanation we can offer at this time is that small districts may see the hiring of para-professional aides as a relatively inexpensive means of promoting specialization in the instructional program. For example, in a small district grades may be combined as a way to reduce the teacher-pupil ratio, and an aide may be hired to help the teacher tailor the instruction so that it is appropriate for each of the various age and ability groups in the class. By having an aide supervise seat work and correct written work, the teacher can have the opportunity to provide more small group instruction to the class. In short, the hiring of aides may be viewed as a cost effective means of coping with the burdens small scale can entail.

A second means of financing the small class size that exists in small districts involves paying lower salaries to the teachers that are employed. Columns 10 and 11 address this issue and show that small districts tend to provide lower teacher salaries than do larger districts. A more complete analysis would include controls for differences in the cost of living as well as an examination of the possibility that teachers in small districts receive non-pecuniary types of compensation, such as the pleasure of living in pastoral surroundings. Even so, there is reason to believe that the lower salaries reported in Table 1 for the smaller districts reflect attempts on the part of small districts to finance the costs of their small class sizes. For example, we found that when we controlled for spending levels, scale continues to be positively related to starting teacher salaries (see the Appendix for details). Moreover, and more to the point, we found that the premium accorded starting teachers

with masters rather than bachelors degrees is positively related to scale (again, details appear in the Appendix). In other words, small districts appear to provide fewer incentives for teachers to acquire advanced training than do larger districts. In addition, we suspect but at this time cannot show that the premium associated with years of experience is more modest in the smaller relative to the larger districts.

These results all have implications for the recruitment of teachers and the level of teacher turnover that exists in small districts. Specifically, the prediction would be that recruitment is more difficult and turnover is greater in small rather than large districts. In New York, although we have no independent measure of teacher turnover,[4] we do have information about each district's expenditure level on instructional salaries per pupil and we find that this figure is positively related to scale ($r = +.24$). Hence the evidence is consistent with the claim that there is some tendency for small districts to finance their small class sizes by hiring teachers at lower starting salaries and by providing fewer incentives for the teachers they hire to remain within the system over time.

There is a third method for dealing with the costs associated with small class size that we suspect is important. This option involves the division of assignments among school personnel. If teachers in small districts perform the tasks ordinarily performed by administrators in larger districts and continue to perform their normal teaching duties, the teachers are in effect underwriting the costs of smaller class sizes by implicitly accepting a lower wage than the figures in Table 1 would suggest. If the teachers perform these administrative tasks and respond

by reducing their teaching efforts, the cost is shifted onto students in the form of reduced levels of instructional services. Unfortunately, aside from anecodotal evidence, we are not in a position to examine the extent to which this option is pursued.

Finally, districts have the option of reducing the diversity of their curricular offerings. If fewer courses are offered, classes will be larger in the area of the curriculum where the course combinations are made and taxpayers will benefit, but presumably at the expense of students who must contend with reduced opportunities to receive specialized instruction. While the reduction in the diversity of course offerings has been the subject of other studies (see Johns 1975 for an important example) we do not deal empirically with this phenomenon in this research.

Although it is hazardous to link the foregoing evidence regarding resource allocation practices with aggregate measures of pupil performance on standerdized examinations, it is potentially instructive to compare the performance of pupils in small districts with those in large districts. The one measure of pupil performance we have access to is the percentage of pupils in the district that fall below the state determined level of minimal competency as measured by the PEP test score. Contrary to what is commonly believed and what we were expecting to find, column 12 indicates that small schools tend to have higher percentages of their students fall below the criterion compared to larger schools. Indeed, even when we control for background characteristics such as district wealth,

scale continued to be a significant predictor of the percentage falling below the criterion (see the Appendix for details).

These results were surprising to us because we were of the opinion that small (rural) districts are successful in their attempts to provide a basic educational program, and that most of the difficulties in rural areas manifest themselves in the form of inadequate offerings in more specialized areas of the instructional program. For example, we suspect that handicapped students and those interested in studying advanced mathematics and foreign languages are the most affected by a small scale of operation. And yet it appears that disproportionate numbers of students in small districts are failing to achieve what the state considers to be minimum levels of competency.

To summarize:

- Small districts tend to spend at lower levels on education compared to medium size districts.
- It is not clear that small districts are low effort districts. When local wealth is measured in terms of income rather than property wealth, there appears to be little relationship between scale of operation and the fraction of local wealth that is spent on education.
- Among districts spending at the same level on education, small districts tend to spend less on instruction than do larger districts.
- Small districts tend to spend more on transportation per pupil than do larger districts.
- Small districts tend to spend more on BOCES services than do

larger districts, although considerable variation in the level of spending for BOCES exists among the smallest districts.

- Among districts spending at the same level, small districts have higher teacher pupil ratios, lower non-teaching professional pupil ratios, and higher para-professional aide pupil ratios than do larger districts.
- The percentage of pupils falling below the state established level of minimum competency is higher in small compared to large districts.

In the following section, we focus on the relationships between sparsity and the resource allocation practices of school officials.

Sparsity

We are reluctant to argue that sparsity has an independent effect on the allocation of educational resources other than through its effects on the cost of transportation services. Once students reach the school house door, the fact that they come from sparsely or densely settled regions should make little difference in terms of the average class size or the beginning teacher's salary.[5] Nevertheless, it is frequently asserted that not only is sparsity the defining characteristic of ruralness, but it is also a factor that can have independent effects on the allocation of resources aside from its effects on transportation costs. Despite our agnostic view of the conceptual rationale for expecting independent relationships between sparsity and resource allocation, we did carry out an analysis of sparsity that parallels the analysis we conducted of scale, and Table 2 reports the results.

The patterns that can be found in Table 2 are quite similar to those

Table 2

Relationships Between Expenditure Levels and Patterns and School District Sparsity (1978-1979)

	1		2		3		4		5	
Sparsity (Enrolled Pupils Per Square Mile)	General Fund Expenditure Per Pupil		Local Levy Divided by Full Value		Local Levy Divided by Local Income		Expenditure Per Pupil on Instruction		Expenditure Per Pupil on Transportation	
District Deciles*	Mean	S.D.**	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
<6.83	2337	441	.0130	.0031	.0837	.0446	1253	228	163	47
6.83-10.79	2123	313	.0139	.0026	.0524	.0190	1144	172	149	29
10.79-16.50	2122	396	.0134	.0021	.0447	.0142	1151	254	145	37
16.50-23.09	2109	301	.0139	.0022	.0413	.0189	1128	131	127	32
23.09-34.49	2057	233	.0142	.0030	.0399	.0175	1144	125	126	36
34.49-71.03	2226	378	.0161	.0030	.0444	.0183	1229	216	132	38
71.03-162.13	2549	587	.0185	.0049	.0507	.0209	1447	364	129	51
162.13-453.83	2746	722	.0197	.0057	.0584	.0370	1558	411	117	51
453.83-899.40	2927	712	.0213	.0060	.0553	.0268	1703	435	99	46
>7899.40	2923	499	.0237	.0070	.0581	.0250	1730	324	88	40
All Districts	2415	486	.0168	.0043	.0528	.0257	1351	287	127	41

n = 652

*Deciles are non-pupil weighted (each represent 10% of the districts and includes all regular K-12 districts with exception of the "Big 5" districts).

**Standard deviation, a measure of variation within the decile.

Table 2 Continued

6		7		8		9		10		11		12	
Expenditure Per Pupil On BOCES		Full Time Teachers Per 1,000 Pupils		Full Time Non-Teaching Professionals Per 1,000 Pupils		Full Time Para-Professional Staff Per 1,000 Pupils		Beginning B.A. Teacher Salary $		Beginning M.A. Teacher Salary $		Percentage of Students Falling Below Min. Competency as Meas. by the PEP Test	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
159	79	57.6	12.2	5.3	2.0	5.7	4.3	9,817	702	10,747	881	.20	.06
131	50	52.7	6.0	5.6	3.2	4.4	2.9	9,567	583	10,509	728	.19	.05
110	48	52.0	6.0	5.4	1.9	4.9	3.2	9,665	697	10,582	1065	.18	.05
99	34	50.5	5.2	5.5	1.8	3.9	3.0	9,749	601	10,692	691	.17	.05
82	33	50.0	4.0	6.0	2.3	3.0	2.6	9,895	753	10,887	902	.17	.05
78	37	50.0	5.4	6.0	1.7	4.2	3.6	10,355	804	11,425	991	.16	.04
88	50	50.5	5.6	7.0	1.7	3.3	3.5	10,944	1174	12,181	1554	.14	.04
75	46	51.7	4.9	6.9	2.4	2.6	3.8	11,055	1332	12,586	1710	.13	.06
69	50	53.5	6.7	7.5	2.4	2.6	3.5	11,698	1083	13,272	1482	.15	.06
64	34	53.2	6.3	8.0	2.5	2.4	2.9	11,683	1031	13,388	1443	.16	.07
95	48	52.2	6.6	6.4	2.2	3.7	3.4	10,480	1212	11,694	1622	.16	.05

found in Table 1. What is somewhat surprising about the two tables in comparison to one another is that the relationships we found for sparsity are almost uniformly stronger than those we found for scale. Indeed, attempts to disentangle the effects of sparsity from the effects of scale on resource allocation practices showed that the unique contribution of sparsity to the explanation of variation in general fund expenditure levels is larger than the unique contribution of scale. (See the Appendix for details.) It appears that the relationships we found between sparsity and resource allocation are something more than spurious relationships caused by the tendency for sparsely settled districts to operate small scale systems.

Rather than repeat here the findings we reported under the scale heading, we have chosen to consider sparsity in terms of its direct effect on transportation costs and to use this discussion as a point of departure for considering the degree to which spending local revenues on transportation draws resources away from the instructional program. Table 3 provides information about the relationship between sparsity and resource allocation practices for transportation services. Most of these results are well known and we will not dwell on them here (see our Interim Report for a more detailed discussion). The results can be summarized as follows:

- Sparsely settled districts spend more per pupil on transportation than do more densely settled districts.
- A curvilinear relationship exists between the fraction of total expenditures that are approved by the state and sparsity. The ratio of approved to total expenditures is relatively low for the most and the least sparsely settled districts in the state (see column 2).
- A similar curvilinear relationship exists between state aid for transportation as a fraction of total transportation expenditures and sparsity. Both densely settled and sparsely

Table 3

Relationships Between Selected Characteristics of Transportation Services and School District Sparsity (1978-1979)

Sparsity (Enrolled) Pupils Per Square Mile)	1 Expenditure Per Pupil on Transportation		2 Approved Transportation Expenditures Divided by Total Transportation Expenditures		3 State Aid For Transportation Divided by Total Transportation Expenditures		4 Expenditures on District Operated Transportation Services Divided by Total Transportation Expenditures		5 Percentage of Transported Pupils Considered Non-Allowed For Aid Purposes	
District Deciles*	Mean	S.D.**	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
6.83	163	47	.88	.08	.70	.13	.78	.21	.10	.08
6.83-10.79	149	29	.87	.11	.71	.12	.79	.17	.07	.05
10.79-16.50	145	37	.91	.08	.73	.11	.81	.24	.08	.06
16.50-23.09	127	32	.92	.05	.77	.12	.83	.23	.09	.09
23.09-34.49	126	36	.94	.07	.76	.09	.70	.35	.07	.06
34.49-71.03	132	38	.94	.08	.75	.09	.72	.35	.09	.07
71.03-162.13	129	51	.93	.09	.73	.08	.55	.42	.12	.08
162.13-453.83	117	51	.89	.12	.73	.12	.38	.36	.19	.16
453.83-899.40	99	46	.87	.14	.69	.15	.22	.30	.20	.15
7899.40	88	40	.85	.15	.66	.14	.15	.24	.24	.17
All Districts	127	41	.90	.11	.72	.12	.59	.38	.13	.12

N = 652

*Deciles are non-pupil weighted (each represent 10% of the districts and includes all regular K-12 districts with the exception of the "Big 5" districts).

**Standard deviation, a measure of variation with the decile.

settled districts face relatively low effective aid ratios (see column 3).

- Sparsely settled districts spend a larger fraction of their transportation budgets on district operated transportation services (see column 4).
- Sparsely settled districts tend to transport fewer non-allowed pupils as a fraction of the pupils they transport than do more densely settled districts.

The latter two findings have implications for the rate at which the state provides aid for transportation. The greater the tendency there is for a district to transport non-allowed pupils, the lower will be the rate at which aid is provided for transportation. Hence, it is not surprising to find that densely settled districts, given their tendency to transport relatively high numbers of non-allowed students, face relatively low levels of transportation aid as a fraction of their transportation expenditures.

The willingness to transport non-allowed pupils is not a reason for the low rate at which the state matches transportation expenditures in sparsely settled districts since these districts tend to transport non-allowed pupils at relatively low rates. An alternate explanation for the low rates in sparsely settled districts involves the so-called "parity" issue. The argument here is that during the period under study the state disallowed certain expenditures districts operating their own fleets incurred and at the same time approved the analogous expenditures made by districts relying on contracted services. If this argument has merit, we should be able to show that when controls are in place for the degree to which non-allowed pupils are transported, the reliance on district

operated expenditures is negatively related to the rate at which the state reimburses transportation expenditures. When this analysis was carried out (see the Appendix for details), we found a negative relationship that fell short of statistical significance. The change in transportation aid that will go into effect for the 1981-82 school year should eliminate whatever tendency there is for districts to be penalized for operating their own fleet of buses.

Thus far in this discussion we have been concerned with the transportation services school districts deliver as if they were independent of the many other services school districts provide. In the following paragraphs, we take a broader perspective and consider the transportation issue in terms of how districts finance the locally raised revenue they spend on transportation services. The discussion consists of three parts. First, we discuss our progress toward measuring the magnitude of the local revenues that are spent on transportation. Second, we calculate the tax rates each district would have to levy should it choose to impose the local share of transportation expenditures on taxpayers. Finally, we assess the degree to which districts reduce spending on instruction as an alternative means of financing the locally borne costs of the transportation services they offer.

New York State matches approved transportation expenses at a 90 percent rate. Hence, the local district is responsible for 10 percent of approved expenditures for transportation. Unapproved expenditures are handled differently. Some fraction (δ) of the unapproved expenditures qualify for equalized operating aid while the remainder ($1-\delta$) qualifies for no state aid. Moreover, there was a 7 percent cap on increases in transportation aid over the period we examined (1978-79). By calculating

the difference between 90 percent of approved current expenditures and the prior year's aid for transportation plus 7 percent, it is possible to obtain the amount of locally borne transportation expenditures that stems from the 7 percent cap.

It is difficult to specify δ with any degree of precision given the available data. Basically, δ represents fringe benefits for transportation personnel plus the salary and fringe benefits for the transportation supervisor for districts that operate their own fleet of buses. As a first approximation, if we accept the assumption that the fringe benefit package plus the supervisor's salary represents 30 percent of the local transportation related salaries paid by districts, then it becomes possible to calculate estimates of the Local Transportation Expenditure (LTE). In the appendix we discuss the methods we employed to construct the LTE variables in more detail.

Although all of the LTE variables analyzed below are based on the assumption that fringe benefits and the transportation supervisor's salary account for 30 percent of the total transportation salary expenditure, comparisons were made under alternate assumptions. Specifically, the results we report here are not sensitive to the addition of 10 percentage points to the 30 percent figure.

Table 4 provides descriptive statistics for alternate specifications of the local transportation expenditure (LTE) variables. Three versions of LTE are reported. LTE 1 represents the 10 percent the district pays on approved expenditures plus the difference between approved and total transportation expenditures. LTE 2 is identical to LTE 1 except that an adjustment is included for the equalized aid that is paid on fringe benefits and the supervisor's salary.[6] Not surprisingly, the mean for LTE 2

is lower than the mean for LTE 1 suggesting that the operating aid for transportation expenditures has a non-trivial effect on magnitude of locally borne costs. LTE 3 includes an adjustment for the 7 percent cap as well as the adjustment for the equalized aid. The fact that the mean for LTE 3 exceeds that of both alternate specifications of the variable reflects the importance of the cap on local costs, and can explain the widespread dissatisfaction with the cap.

The next step in the analysis calls for an attempt to determine how districts finance the local expenditures they make for transportation services. One option involves raising tax rates as a means of generating the revenue required to finance the local share of the transportation expenditures. It is possible to calculate the equalized tax rate each district would have to impose should it decide to pursue this option. Table 5 reports the average magnitude of this tax rate for the whole sample as well as for alternate categories of districts.

Table 4

Descriptive Statistics for Selected Local Transportation Expenditure Variables (1978-1979)

	Mean	Standard Deviation	n
LTE 1	$66,647	$73,310	647
LTE 2	$51,041	$67,175	647
LTE 3	$72,258	$90,165	647

Table 5 demonstrates several of the taxpayer inequities associated with the current program of transportation aid in New York State. According

Table 5

Local Revenues Spent Per Pupil On Transportation And the Associated Hypothetical Tax Rate (1978-1979)

	LTE1/PUP	LTE2/PUP	LTE3/PUP	PROP/PUP	TAX RATE 1 (in mills)	Tax Rate 2 (in mills)	Tax Rate 3 (in mills)
Whole Sample n = 647	$24.69	$17.60	$25.27	$68,929	.44	.29	.42
Small Districts Scale <1553 n = 256	29.45	20.15	28.73	69,088	.53	.33	.49
Sparsely Settled Districts Density < 23.0 n = 271	28.33	18.08	26.08	63,389	.59	.33	.49
Small & Sparsely Settled Districts Scale < 1553 Density <23.0 n = 207	30.06	19.86	28.24	67,590	.56	.34	.49
Large Districts Scale >2549 n = 257	20.64	16.33	23.27	71,211	.34	.25	.37
Densely Settled Districts Density >71.0 n = 250	22.72	19.99	26.83	81,125	.31	.26	.36
Large & Densely Settled Districts Scale >2549 Density >71.0 n = 194	21.30	18.14	25.07	76,681	.32	.26	.37
Poor Districts PROP/PUP <$68,929 n = 427	22.91	14.14	20.93	46,995	.53	.32	.47
Wealthy Districts PROP/PUP ≥ 68,929 n = 220	28.23	24.97	33.80	111,502	.27	.23	.32

to the table, small scale districts, sparsely settled districts, and low wealth districts must all impose high tax rates for the purpose of financing their current level of transportation services should they choose to impose the costs directly onto taxpayers. For the low wealth districts, this result can be attributed to their modest tax base. Property poor districts tend to have lower local expenditures on transportation than do property rich districts (the zero-order correlation coefficients between property wealth and the LTE per pupil variables range between +.26 and +.43). Wealthy districts, despite their higher levels of local expenses, can impose relatively low tax rates. For the sparsely settled and/or small districts, the higher tax rates can be attributed to the higher local costs they face. This is especially true when LTE 1 is used as the measure of local expenditures.

A second option available to districts as a means of financing local expenditures on transportation involves drawing resources away from non-transportation related services. To the extent that resources are withdrawn from instructional services for the purpose of financing transportation services, it can be argued that students rather than taxpayers are bearing the local costs of the transportation program.

Table 6 presents the results of some early attempts to assess relationships between spending on instruction and spending local funds on transportation. The table presents zero-order correlations between the three LTE variables as well as higher order correlations which include controls for the confounding effects of background variables. In addition, the table presents the results for several categories of school districts as well as results for the entire sample.

The simple correlations reported in Table 6 suggest that districts

Table 6

Relationships Between Alternate Specifications of Local Revenues Spent Per Pupil On Transportation and Expenditures Per Pupil On Instruction (Zero and Higher Order Correlation Coefficients) (1978-1979)

Expenditure per Pupil On Instruction

	Whole Sample n = 646	Small Districts Scale < 1553 n = 254	Sparsely Settled Districts Density <23.0 n = 269	Small and Sparsely Settled Districts Scale < 1553 Density < 23.0 n = 205	Large Districts Scale > 2549 n = 257	Densely Settled Districts Density > 71.0 n = 250	Large and Densely Settled Districts Scale > 2549 Density > 71.0 n = 194
Simple correlations							
LTE1/PUP	.18	.21	.27	.29	.35	.36	.37
LTE2/PUP	.41	.39	.41	.41	.52	.44	.47
LTE3/PUP	.35	.31	.39	.38	.47	.43	.44
Correlations Controlling for Property Wealth Per Pupil							
LTE1/PUP	.02	.03	.07	.08	.19	.23	.19
LTE2/PUP	.18	.15	.11	.10	.31	.30	.28
LTE3/PUP	.11	.06	.11	.10	.28	.24	.27
Correlations Controlling For Local Expenditure On Education							
LTE1/PUP	-.04	-.08	-.02	-.04	.10	.05	.09
LTE2/PUP	-.02	-.08	-.01	-.07	.11	.08	.10
LTE3/PUP	-.06	-.07	-.00	-.04	.06	.05	.08

with higher levels of local expenditure on transportation also spend at higher levels for instruction. However, all three of the LTE variables are correlated with the property wealth of the school districts (the zero-order correlation coefficients range between +.26 and +.43). In addition, higher wealth districts tend to spend at higher levels on instruction ($r = .67$). Hence it is necessary to control for the confounding effects of wealth before it is possible to assess the independent relationship between LTE and spending for instruction. The middle three rows of the table present these results and show that for the whole sample, the positive relationship between the two variables is largely eliminated once the controls for wealth are in place. Nevertheless, recall that we are looking for evidence of a negative relationship between LTE and spending on instruction. According to Table 6, in general, districts with equal wealth but unequal levels of LTE spend at similar levels on instruction.

When controls are in place for the level of local spending on education, the expected negative relationships appear, although they fall short of statistical significance at the 10 percent level. The negative direction of these results is not surprising since if the districts spend more local funds on transportation and spend the same level of local funds on education in general, the "extra" funds for the transportation program must come from somewhere.

Looking across the columns of Table 6 we can observe differences in the coefficients depending on such district characteristics as scale and density. In general, the results show that for the larger and more densely settled districts there is a stronger positive relationship between local expenditures on transportation and spending on instruction. Moreover, this positive relationship persists even when controls are in

place for the districts' wealth and level of local spending. The positive direction of the relationships found in the last three rows for the larger and more densely settled districts is consistent with a tendency in these districts to draw resources out of non-instructional services as a means of financing the local expenditure on transportation.

To summarize:

- The magnitude of the local outlay for transportation is sizeable despite the high nominal rate at which the state reimburses approved transportation expenditures.
- The 7 percent cap on aid that was in effect during the period dramatically increased the local outlay for transportation.
- The financing of the local outlay through the imposition of taxes violates standards of taxpayer equity.
- There is little evidence to suggest that districts are financing their local outlay on transportation by drawing resources away from instruction.

This completes our analysis of the implications of sparsity. Our attention turns next to an analysis of the impact district isolation within a BOCES can have on resource allocation practices.

Isolation

In the course of analyzing the relationships between scale of operation and spending patterns, we found a surprising amount of variation in the level at which small districts spend for BOCES services (see Table 1, column 6). We viewed this variation with some concern since we reasoned that the concept of shared services which the BOCES program

embodies constitutes a viable means of offsetting many of the costs small scale entails. To the extent that this is the case, the inability or unwillingness of small districts to participate in BOCES programs can have adverse implications for either students, taxpayers, or both.

In light of this, we became interested in identifying what might be called impediments that limit the ability of districts to participate in BOCES programs. We used the term isolation to refer to these impediments and we conceptualized two distinct types of isolation. First, we thought of an isolaced district as one that is different in some fundamental way from the other districts in the local BOCES. The example that is frequently given for this type of isolation involves a situation where a "rural" district with interests in shared teacher services is surrounded by "suburban" districts with interests in more esoteric services such as instruction in dance and the visual arts.

In order to explore this aspect of isolation, we selected three variables of interest: scale of operation, property wealth per pupil, and geographic size in square miles, and calculated means and standard deviations for each BOCES by aggregating the relevant district level data. This procedure yielded three means and standard deviations for each of the 44 BOCES in the state. It was then possible to assess the degree to which individual districts differ from the average calculated for the local BOCES. Standardized scores were calculated for each district and Table 7 reports the results.

According to the table, a sizeable number of districts (between 144 and 163), depending on the variable, find themselves more than one standard deviation away from the average for their respective BOCES. Moreover, the districts which find themselves most different from their neighbors

are the very wealthy, the districts with extraordinarily high pupil counts, and the districts which cover large geographic areas.

This last result is interesting since very wealthy districts as well as very large scale districts are almost by definition less dependent on BOCES as a means of delivering services than are their less well to do, smaller peers. In contrast, the districts that cover very large geographic areas are likely to face costs which make the concept of shared services attractive. And yet, there are roughly 32 districts in the state which are significantly larger geographically than their fellow cooperators in the local BOCES. This kind of isolation may have adverse effects on the ability of BOCES to meet these districts' special needs.

In order to test this proposition, we examined the relationship between this aspect of isolation and the level of participation in BOCES services. In our Interim Report we presented the results of this analysis and reached the conclusion that differences between a given district and its fellow cooperators in the local BOCES make little difference in terms of the level of spending on BOCES services. Although more refined analyses may reverse this conclusion, it is clear that this aspect of isolation does not explain the variation among small districts in their level of spending on BOCES services.

The second type of isolation we considered involves the distance in miles between the school district and the local BOCES regional service center. We reasoned that a district may be quite similar to its neighbors but be so distant from its local BOCES center that costs are incurred which preclude full participation. Consider the time students may be required to spend riding on buses to and from BOCES centers. The point here is that even if the state paid for all of the out-of-pocket costs

Table 7

District Characteristics in Relation to BOCES Characteristics

(figures represent the count of Districts falling into each category)

(1978-1979)

Number of Standard Deviations Below(-) or Above (+) the Mean for the District's BOCES

	-3	-2	-1	0	+1	+2	+3	+4	+5
Full Value Assessment Per Pupil	0	53	367	169	54	27	10	0	
Total Aidable Pupil Units	0	55	372	146	50	44	4	1	
Square Miles	1	63	324	184	67	28	5	0	

associated with lengthy bus rides, participation rates for the geographically isolated districts might still be low. An attractive explanation for this type of result would hold that the real costs associated with lengthy bus rides are imposed not on the districts, but on the students and their families. Short of outright coercion, the availability of a splendid vocational program 40 miles away is not likely to attract many students, regardless of how generous the state is in terms of transportation aid.

Table 8 presents information regarding the number of districts that are "isolated" in this geographic sense. According to the table, 47 school districts in New York State are more than 25 miles away from their nearest BOCES regional service center.* Although this need not cause a problem for those services that can be offered on a decentralized basis (for example, a BOCES special education class can be housed in a local school district rather than the regional service center), there are services which can only be offered at the regional center, and these are the services which isolated districts may be compelled to forego. In addition, it is worth noting that among the non K-12 districts that were excluded from this analysis, there are several instances where the one-way distance between the district and the BOCES center exceeds 60 miles.

Table 9 reports an analysis of relationships between the geographic isolation of school districts within their BOCES and resource allocation practices at the local level. Aside from noting that isolation appears to be related to the selected variables in ways that are similar to what we found for both small scale and sparsity (the most notable exception occurs in column 8 where the use of non-teaching professionals appears to be high rather than low in the most isolated districts), we will not discuss the results of Table 9 in detail. However, we do wish to draw

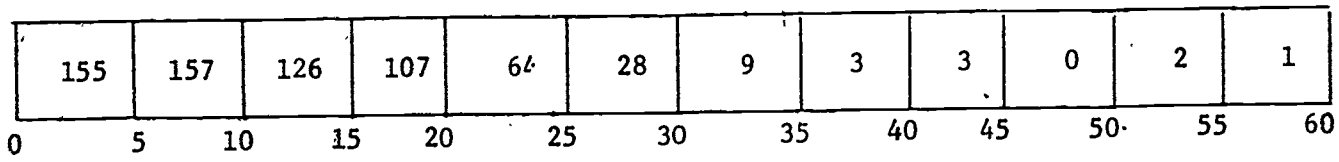
*These 47 districts enrolled a total of 52,006 students.

Table 8

Number of Miles (one-way) Between Regional BOCES
Service Centers and Local Districts
(numbers in cells refer to the number of districts)

(1978-1979)

Regular K-12 School Districts Only



Distance in Miles Between Regional BOCES
Service Center and the Local District

attention to column 6 of the table where, contrary to what we were expecting, a positive relationship appears to exist between geographic isolation and expenditures per pupil on BOCES services. Before we can interpret this result, we need to be aware of the fact that geographic isolation correlates with scale such that the more isolated districts tend to be small ($r = -.39$). This poses a problem for identifying the independent effects of isolation on participation since we know from Table 1, column 6, that small districts tend to rely more heavily on BOCES services than do large districts. It follows that we need to control for the confounding effects of scale and our question becomes: Among districts of the same size, do more geographically isolated districts spend less per pupil on BOCES than do more isolated districts? When controls are in place for the effects of scale, the correlation coefficient between geographic isolation and expenditure per pupil on BOCES equals an insignificant .01. Hence, it appears that among districts of the same size, isolation makes little difference in terms of expenditure levels on BOCES.

Table 9

Relationships Between Expenditure Levels and Patterns and School District Geographic Isolation

(1978-1979)

Geographic Isolation (one way distance in miles to the nearest BOCES Regional Center)	1		2		3		4		5	
	General Fund Expenditure Per Pupil		Local Levy Divided by Full Value (tax rate in mills)		Local Levy Divided by Local Income		Expenditure Per Pupil on Instruction		Expenditure Per Pupil on Transportation	
District Deciles*	Mean	S.D.**	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
< 3.0	2529	506	.0192	.0068	.0558	.0331	1451	322	108	49
3.0-5.0	2599	660	.0197	.0064	.0506	.0235	1489	406	112	47
5.0-6.7	2721	616	.0194	.0064	.0599	.0367	1571	413	119	52
6.7-8.8	2493	603	.0180	.0056	.0508	.0217	1405	392	116	43
8.8-11.0	2428	586	.0174	.0055	.0531	.0273	1349	367	128	45
11.0-14.0	2333	610	.0158	.0056	.0478	.0258	1311	373	125	39
14.0-16.0	2249	584	.0150	.0036	.0475	.0166	1246	363	137	38
16.0-19.0	2201	511	.0143	.0031	.0475	.0246	1225	305	145	67
19.0-24.0	2270	485	.0149	.0039	.0497	.0213	1232	307	140	46
> 24.1	2409	989	.0133	.0028	.0661	.0422	1280	474	153	40
All Districts	2422	633	.0167	.0052	.0529	.0282	1353	375	128	46

n = 656

*Deciles are non-pupil weighted (each represent 10% of the districts and includes all regular K-12 districts with exception of the "Big 5" districts).

**Standard deviation, a measure of variation within the decile.

Table 9 Continued

6 Expenditure Per Pupil On BOCES		7 Full Time Teachers Per 1,000 Pupils		8 Full Time Non-Teaching Professionals Per 1,000 Pupils		9 Full Time Para-Professional Staff Per 1,000 Pupils		10 Beginning B.A. Teacher Salary $		11 Beginning M.A. Teacher Salary $		12 Percentage of Stu. Falling Below Min. Competency as Meas. by the PEP Test	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
81	41	50.8	5.1	6.8	2.3	2.7	3.3	11,002	1,274	12,327	1,723	.15	.05
77	44	51.6	7.1	7.2	3.0	3.2	3.1	10,798	1,366	12,140	1,809	.16	.05
89	50	54.1	9.5	7.0	3.0	2.6	3.3	10,987	1,228	12,490	1,665	.15	.05
74	62	50.7	5.0	6.7	2.4	3.8	3.1	10,653	1,270	12,058	1,675	.16	.06
99	48	50.8	5.0	6.4	2.0	4.1	3.2	10,454	1,298	11,600	1,695	.16	.05
97	50	52.4	6.0	6.2	2.2	4.1	3.4	10,370	1,137	11,488	1,392	.16	.05
100	52	51.8	6.3	5.8	1.9	3.8	3.5	10,091	1,095	11,134	1,422	.16	.06
105	57	52.9	9.9	5.4	2.5	3.3	3.5	9,893	942	10,953	1,237	.18	.06
107	66	53.2	8.1	5.7	2.2	4.1	3.5	10,149	1,089	11,249	1,500	.17	.06
104	59	56.2	13.3	6.0	2.3	4.7	3.9	10,171	788	11,169	1,074	.18	.06
95	53	52.4	7.8	6.3	2.4	3.7	3.4	10,477	1,219	11,695	1,626	.16	.06

Although the isolated districts in New York State may complain about the BOCES services they receive, they do not appear to respond by systematically withdrawing from programs. However, before we become too complacent about the adequacy of the current BOCES offerings, we need to recognize that isolated districts may have little choice over their level of participation, especially if the services in question are mandated by the state. Moreover, the fact that geographic isolation is not associated with relatively low levels of participation in BOCES suggests that substantial numbers of students are travelling between 50 and 120 miles a day on a regular basis. This amount of travel is difficult to justify, and the state may be properly concerned about the adverse effects the associated amount of time in transit may have on student performance.

Although we are unable to explain why there is a large amount of variation in the level at which small districts spend on BOCES services, we continue to view this variation with some concern. Further research is needed. We suspect a case study type of methodology could prove to be especially useful in this context.

The following discussion focuses attention on relationships that exist between changes in enrollment and the resource allocation practices of local school officials.

Percentage Change in Enrollment

Our chief reason for expecting enrollment change, specifically enrollment decline, to make a difference in terms of the allocation of educational resources, stems from the idea that certain rigidities exist within school systems that make it difficult for officials to respond quickly to an abrupt or unanticipated change in enrollment. Examples would include provisions

in teachers' contracts which may either retard the speed at which teachers are "excessed" in districts experiencing decline, or affect the willingness of administrators to reduce staff. Suppose, for example, that seniority provisions require the administration to "excess" their most promising faculty or to accept a rapid increase in the degree to which teachers teach subjects that lie outside of their major field of preparation. In such situations administrators may respond by protecting their existing faculty through increased efforts to finance the resulting high teacher-pupil ratios by making cuts in other areas. The closing of buildings and a reduction in the use of para-professional aides are options that might be pursued. Table 10 examines the relationship between a percentage change in enrollment between 1977-78 and 1978-79 and selected aspects of resource allocation practices in 1978-79.

According to the table, districts experiencing the greatest decline in percentage terms tend to spend at high levels per pupil on the general fund (column 1), as well as on expenditures more directly related to instruction (column 4). In addition, these districts, as we might expect, tend to operate with relatively high teacher-pupil ratios. These relationships hold when we control for the effects of wealth (see the Appendix for details). Hence, the interpretation becomes: Among districts with the same wealth, those districts experiencing the greatest enrollment declines, in the short run, tend to spend higher levels and operate with higher teacher-pupil ratios than those experiencing smaller declines.

However, Table 10 also indicates that a great deal of variation characterizes the spending levels as well as the staffing ratios of the

Table 10

Relationships Between Expenditure Levels and Patterns
and School District's Percentage Decline in Student Enrollment

(1978-1979)

	1		2		3		4		5	
Percentage Decline in Enrollment 1977-78 to 1978-79	neral Fund Expenditure Per Pupil		Local Levy Divided by Full Value (tax rate in mills)		Local Levy Divided by Local Income		Expenditure Per Pupil on Instruction		Expenditure Per Pupil on Transportation	
District Deciles*	Mean	S.D.**	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
>6.3	2905	1069	.0169	.0070	.0620	.0385	1631	570	135	52
5.4-6.3	2465	510	.0183	.0064	.0556	.0289	1382	330	122	43
4.7-5.4	2437	578	.0174	.0065	.0501	.0226	1373	356	126	45
4.0-4.7	2433	567	.0168	.0051	.0462	.0192	1360	359	124	51
3.45-4.0	2380	507	.0169	.0051	.0441	.0190	1340	315	110	47
2.85-3.45	2318	512	.0159	.0047	.0511	.0221	1308	342	130	40
2.25-2.85	2355	554	.0166	.0048	.0537	.0331	1316	358	129	43
1.48-2.25	2304	518	.0163	.0051	.0515	.0303	1284	325	125	48
.48-1.48	2268	570	.0159	.0049	.0503	.0292	1260	357	131	63
<.48	2402	670	.0165	.0058	.0610	.0307	1313	406	138	43
All Districts	2423	627	.0167	.0056	.0527	.0281	1354	377	127	48

n = 670

*Deciles are non-pupil weighted (each represent 10% of the districts and includes all regular K-12 districts with exception of the "Big 5" districts).

**Standard deviation, a measure of variation within the decile.

Table 10 Continued

6 Expenditure Per Pupil On BOCES		7 Full Time Teachers Per 1,000 Pupils		8 Full Time Non-Teaching Professionals Per 1,000 Pupils		9 Full Time Para-Professional Staff Per 1,000 Pupils		10 Beginning B.A. Teacher Salary $		11 Beginning M.A. Teacher Salary $		12 Percentage of Stu. Falling Below Min. Competency as Meas. by the PEP Test	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
118	69	57.9	14.1	6.6	2.4	3.3	4.0	11,045	1,379	12,417	1,763	.15	.05
91	46	52.7	6.9	7.0	2.4	3.1	3.8	10,519	1,152	11,846	1,580	.16	.05
92	47	51.8	4.6	6.8	2.4	3.2	2.8	10,772	1,270	12,075	1,735	.15	.05
90	63	51.5	5.4	6.5	2.2	3.7	3.3	10,436	1,249	11,594	1,602	.16	.06
92	48	51.4	4.8	6.6	1.6	3.1	2.9	10,435	1,167	11,582	1,544	.16	.05
90	49	51.4	6.0	6.1	2.3	3.6	3.4	10,293	1,121	11,449	1,524	.16	.05
88	59	51.8	5.6	6.3	2.3	3.7	2.3	10,423	1,067	11,615	1,435	.16	.06
92	50	51.4	6.2	6.3	2.9	4.4	3.7	10,307	1,171	11,509	1,523	.18	.06
92	48	51.2	9.8	6.1	2.3	3.8	2.9	10,067	1,093	11,207	1,495	.17	.07
104	63	52.8	8.8	6.0	3.1	4.6	4.0	10,591	1,366	11,776	1,882	.18	.06
95	55	52.3	7.7	6.3	2.4	3.7	3.4	10,481	1,222	11,699	1,632	.16	.06

districts experiencing the greatest declines in enrollment. One explanation for this variation would hold that different types of districts experiencing a given percentage decline in enrollment respond in different ways. In other words, there may be an interaction between certain background characteristics of the districts and the percentage decline in enrollment that helps determine the nature of the response to the decline.

We examined this phenomenon by checking to see whether the impact of a given percentage decline in enrollment varies depending on the initial scale of the district. Scale is a plausible candidate for this type of analysis. It stands to reason that a 5% decline in a district with 300 students, one building, 12 teachers, and a part-time administrator has a different impact compared to a 5% decline in a district with 3,000 students, several buildings, 120 teachers, and 5 administrators. We found a stronger relationship between the percentage decline in enrollment and spending levels as well as teacher-pupil ratios in the smaller districts than we found in the larger districts. Specifically, the relevant correlation coefficients for the small districts ranged between .21 and .25 in the expected direction, while the analogous coefficients for the large districts ranged between .13 and .18. However, a portion of this difference can be attributed to the confounding effects of wealth. When controls were in place for differences in wealth, the coefficients ranged between .19 and .28 for the small districts and .14 and .27 for the large districts. Of all the relationships we examined, the nature of the relationship between the teacher pupil ratio and the percentage decline in enrollment was the most dependent on the scale of the district. (See the Appendix for additional discussion of this analysis.)

Summarizing, among equally wealthy districts, there is a stronger

tendency for a decline in enrollment to be associated with increases in the teacher-pupil ratio in small compared to large districts. The fact that the strength of the interaction between scale and declines in enrollment is weaker for the expenditure variables is consistent with our arguments about the tendency for small districts to finance their high teacher-pupil ratios by economizing in other areas of their program.

This completes our discussion of background characteristics that have implications for the cost of producing a given level of educational outcomes. In the following section we examine ways in which the state may be misrepresenting the ability of rural school districts to pay for education.

Sources and Consequences of Inaccuracies in the Measurement of School Districts' Ability to Pay

The previous discussion, where we examined the impact of scale, sparsity, isolation, and changes in enrollment, was focused on burdens that stem from the existence of higher costs in particular types of districts. Here we give attention to burdens that stem from an inaccurate determination by the state of school districts' ability to pay for educational services.

We divide the discussion into two sections, each corresponding to one of the remaining two background characteristics we agreed to examine on behalf of the Task Force. We begin with an analysis of the impact of changes in full value property wealth over time and conclude with a section devoted to the implications of a discrepancy between school districts' property and income measures of wealth.

Percentage Change in Full Value Property Wealth

We have two goals to achieve in this analysis. The first is to document the claim made by rural school administrators and residents regarding

the rapid increase in full value per pupil that has occurred in rural areas over the past five years. The second is to determine whether a disproportionate rise in full value over time is related to current resource allocation practices in school districts. In other words, we are interested in seeing whether a history of rapidly increasing property wealth has implications for the current treatment of both taxpayers and students.

For the purpose of measuring changes in full value over a recent five year period, we collected information about districts' full valuation for the 1973-74 school year as well as the analgous figures for the 1978-79 school year. With these two figures we were able to calculate the percentage change in full value and could then check to see if certain types of districts experienced, on the average, larger percentage gains than others. Since we were particularly interested in the degree to which "rural" districts experienced higher gains relative to others, we employed the working definition of a rural school that we developed for the Task Force as a means of identifying rural schools. Briefly stated, this definition defines a district as rural if it falls into one of the four bottom deciles of the scale distribution and falls into one of the four bottom deciles of the density distribution. Specifically, districts with fewer than 1553 students and who have fewer than 23 students in enrollment per square mile are considered rural. In addition, we looked separately at those districts that fall into the bottom two deciles of both the scale and density distributions. In order to be included in this group, a district had to have fewer than 933 pupils and fewer than 11 pupils per square mile. For purposes of contrast, we examined districts falling into the top four deciles of both

the scale and density distributions as well as those falling into the top two deciles of both distributions. Table 11 reports the results of this analysis.

It appears clear that over the 1974-1979 period property wealth has been rising at a higher rate in rural school districts than elsewhere. This result corroborates the findings of numerous efforts on the part of rural school officials to document differences in the growth rates of rural relative to other schools districts' (see for example, Davis, 1981). What is potentially important about the result we are reporting here is that it seems to hold in general for a collection of school districts that have in common only their small scale and sparsely settled population. In other words, this result cannot be attributed to unusual events occurring in a single county or region of the state. Instead, it is a result that applies to a substantial number of school districts located in over 41 counties in the state.

Having demonstrated that property wealth has been rising at a rapid rate in rural school districts, we need to ask whether or not this ought to be a concern of the state. We try to answer this question in two steps. First, we examine the relationship between changes in full value and the resource allocation practices of local officials to see if there are any consequences associated with changes in full value. Second, we examine alternate explanations of the results we find in step 1.

Table 12 presents the results of the first step in this analysis and in general indicates that districts experiencing the greatest increase in full value tend to a) spend at low levels on education in general as well as on instruction, b) spend at high levels on both BOCES and transportation services, c) have high teacher-pupil ratios, d) have low non-teaching

Table 11

Average Percentage Increases in Full Value Wealth Over Time for Selected Categories of School Districts

(1978-1979)

	Mean Percentage Increase in Full Value Property Wealth	S.D.	n
Whole Sample	104.2	62.5	635
Districts with fewer than 1553 students (TAPU) and with fewer than 23.09 students in enrollment per square mile.	140.8	44.6	205
Districts with fewer than 933 students (TAPU) and with fewer than 10.79 pupils per square mile.	160.8	50.6	91
Districts with more than 2550 students (TAPU) and with more than 71.03 pupils per square mile.	73.0	69.3	189
Districts with more than 4,473 students (TAPU) and with more than 453.83 pupils per square mile.	72.9	112.7	65

Table 12

Relationships Between Expenditure Levels and Patterns
and School District Percentage Increase in Full Value Property Wealth

(1978-1979)

Percentage Increase in Full Value Property Wealth (1974-1979)	1		2		3		4		5	
	General Fund Expenditure Per Pupil		Local Levy Divided by Full Value (tax rate in mills)		Local Levy Divided by Local Income		Expenditure Per Pupil on Instruction		Expenditure Per Pupil on Transportation	
District Deciles*	Mean	S.D.**	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
<48.6	2926	647	.0204	.0072	.0486	.0236	1708	402	84	40
48.6-60.4	3002	1034	.0216	.0052	.0579	.0274	1735	559	107	48
60.4-73.2	2532	571	.0200	.0054	.0480	.0216	1457	358	107	51
73.2-82.4	2330	459	.0174	.0050	.0496	.0296	1308	255	121	42
82.4-97.2	2402	582	.0166	.0058	.0519	.0306	1335	347	125	45
97.2-108.5	2292	524	.0167	.0148	.0504	.0232	1275	334	132	39
108.5-121.4	2191	373	.0147	.0037	.0477	.0241	1195	212	137	41
121.4-140.0	2169	341	.0139	.0032	.0531	.0303	1173	173	146	36
140.0-158.6	2206	466	.0134	.0029	.0594	.0360	1203	274	160	57
>158.6	2166	525	.0123	.0023	.0568	.0336	1168	272	145	39
All Districts	2418	582	.0167	.0047	.0524	.0284	1353	335	127	44

n = 635

*Deciles are non-pupil weighted (each represent 10% of the districts and includes all regulad K-12 districts with exception of the "Big 5" districts).

**Standard deviation, a measure of variation within the decile.

Table 12 Continued

6 Expenditure Per Pupil On BOCES		7 Full Time Teachers Per 1,000 Pupils		8 Full Time Non-Teaching Professionals Per 1,000 Pupils		9 Full Time Para-Professional Staff Per 1,000 Pupils		10 Beginning B.A. Teacher Salary S		11 Beginning M.A. Teacher Salary S		12 Percentage of Stu. Falling Below Min, Competency as Meas. by the PEP Test	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
63	40	55.6	6.6	7.9	2.2	2.5	3.0	11,460	1,214	13,032	1,706	.02	.01
73	44	53.7	12.2	8.2	2.8	3.2	3.8	11,371	1,346	12,974	1,718	.02	.01
82	43	50.1	5.2	6.6	2.0	2.4	2.9	10,864	1,272	12,164	1,635	.02	.01
77	36	51.8	5.9	6.3	1.8	3.6	3.1	10,443	1,068	11,591	1,378	.02	.00
83	34	50.5	5.7	6.4	3.1	2.6	2.7	10,644	1,060	11,845	1,466	.02	.01
96	58	50.8	6.2	6.0	2.0	3.7	3.4	10,304	1,014	11,464	1,439	.02	.00
102	46	50.7	4.8	6.0	2.4	3.7	2.6	10,261	1,048	11,333	1,327	.01	.00
109	52	52.4	7.4	5.3	2.3	4.3	3.3	9,841	1,021	10,891	1,212	.01	.00
121	58	54.3	11.8	5.4	2.1	5.1	3.9	9,701	728	10,656	996	.01	.00
143	76	54.0	8.8	5.3	2.0	5.3	4.2	9,746	803	10,657	1,055	.01	.00
95	50	52.4	7.9	6.3	2.3	3.7	3.3	10,485	1,220	11,705	1,628	.02	.00

professional-pupil ratios, e) have high para-professional aide-pupil ratios, f) offer low starting salaries for teachers, and g) experience relatively high levels of "failure" on PEP tests.

Several interpretations can be offered for these results. One fairly attractive explanation, on its face, is that there is no independent relationship between changes in full value and resource allocation practices and that what we observe in Table 12 is simply a consequence of the fact that the districts with high rates of increase in their property wealth tend to be small and sparsely settled. (Recall from previous sections that scale and sparsity are related to resource allocation practices in ways that are consistent with this interpretation.)

A second interpretation involves the assertion that there is an independent link between changes in full value and resource allocation, and that this link can be traced to the effect of the abrupt nature of the change the districts experienced. The argument here would be similar to the one we developed in the previous section where we talked about the rigidities that may exist within the educational system. If a district gains a great deal of property wealth from one period to the next (say, because of the arrival of a major business) and the state responds by reducing operating aid, the district may experience an abrupt loss in revenue from one year to the next. This loss in revenue may cause dislocations in the ability of the district to provide services. However, at least in principle, the loss of state revenue will be offset to some degree by the increase in revenue that stems from the enlarged local tax base. Hence, it is not altogether clear why abruptness per se need cause a loss in revenue for the school district.

A third and perhaps more important interpretation concerns the degree

to which the disproportionate rise in wealth is a permanent rather than a temporary phenomenon. If it is a temporary rise and if the state treats the change as if it were permanent, then the state will be in the position of overstating the affected district's ability to pay. The consequences for the district would involve a reduction in state aid that is not offset by any real enlargement of the tax base. The net result may very well involve reductions in spending levels that are consistent with the results reported in Table 12.

Notice that this third interpretation is similar to the "paper wealth" argument made in recent years by rural school officals and residents. According to this argument, the rise in full value in rural areas is due to speculation and is more accurately thought of as "paper" in contrast to real wealth. We are uncomfortable with the distinction between "paper" and "real" wealth since it suggests that the purchaser of land in rural areas is irrational and pays more for land than it is worth. While this may be the case in isolated instances, we find it to be a problematic premise upon which to build an argument that presupposes a particular theory of value. We prefer to think of paper wealth as the consequence of a series of instances where perfectly rational speculators gambled and lost. Moreover, we suspect that this sort of phenomenon has occurred in certain geographic regions around the state in recent years and that a number of school districts have been victims of temporary increases in wealth that the state has inadvertantly considered permanent.

One way to test whether or not the temporary wealth interpretation of Table 12 has any merit, given our data, involves stratifying the sample into rural and nonrural strata and examining whether or not the effects of a change in full value are the same for both groups of districts. If

it is true that the rise in wealth in what we are [illegible] districts is temporary and the rise in wealth in the "non-rural" di[illegible]s permanent, we should expect to see differences between the two types of districts in how an equivalent change in wealth affects spending levels and patterns. Specifically, we would expect to see a negative relationship between the percentage increase in full value and spending levels in rural districts and no relationship between these variables for the non-rural districts.

When we carried out this analysis we found some evidence of a significant tendency for rural districts to spend at lower levels than do non-rural districts following a large gain in full value. Table 13 indicates that the zero-order correlation between the percentage increase in full value and expenditure level on the general fund is -.16 for rural districts (scale $<$ 1553 and density $<$ 23.09) and -.13 for large, densely settled districts (scale $>$ 2550 and density $>$ 71.03). When we used more stringent criteria to identify the rural and non-rural districts, we found a larger difference in the magnitude of the relationship (-.26 compared to -.16).

Table 13 provides limited support for the claim that rural districts tend to spend at lower levels than do large scale, densely settled districts following an equivalent increase in property wealth. The difference is most pronounced between the "very rural" and others which is somewhat of a surprise since we expected that the districts most likely to have experienced "paper" increases in their wealth would be districts located on the outskirts of major metropolitan areas.

While the results reported in Table 13 are consistent with what a paper wealth type of argument suggests would be the case for the most rural districts, they fall short of establishing the validity of the paper wealth claims. Even so, there is good reason

for the state to distinguish in some way between temporary and permanent gains in wealth. Whether the State needs to be concerned about "abruptness" per se in the change is not clear at this time. We will have more to say about these issues when we discuss policy implications.

Table 13

Zero-Order Correlations Between the Percentage Increase in Full Value and Expenditure Levels Per Pupil on the General Fund (1978-1979)

Whole Sample	Rural Districts		"non-rural" Districts	
	Scale < 1553 and Sparsity < 23.9	Scale < 933 and Sparsity < 10.79	Scale > 2550 and Density > 71.03	Scale > 4,473 and Density > 457.83
n = 635	n = 205	n = 91	n = 189	n = 65
-.20	-.16	-.26	-.13	-.16

In the following section we explore the implications of the final background characteristics we considered, the discrepancy between income and property based measures of ability to pay.

Discrepancies Between Income and Property Based Measures of Wealth

In recent years, economists have argued that the composition of the tax base as well as its size can have independent effects on spending levels for education. For example, it has been argued that the percentage of the tax base that is devoted to residential rather than commercial uses can affect spending levels (See Ladd, 1975 and Adams, 1980). Moreover, increasing attention is being given to the effects of more subtle characteristics of tax bases such as the age distribution of the taxpayers (See Brown and Saks, 1979).

We view the discrepancy that can exist between alternative measures of wealth as a tax base characteristic that is analogous to those mentioned above. A measure of wealth discrepancy provides a means of assessing the degree to which a community can tax non-residents as a means of financing educational services. Districts that rank higher on the property wealth distribution than on the income wealth distribution will tend to be those districts in resort areas of the state as well as those districts with disproportionate amounts of commercial properties. In both instances, the districts are able to export taxes in the sense that non-residents help to support the local school system. The implication is that districts with high levels of property wealth relative to their income wealth can be expected to spend at higher levels than otherwise equivalent school districts. We examine this proposition later in this discussion.

There is a second aspect of the discrepancy issue that has received more attention from the Task Force. This involves the challenge of combining income and property based measures of wealth into an equitable index of school districts' true ability to pay. While the construction of this index lies outside the scope of this research, we provide some information regarding the magnitude of the discrepancies that exist in New York State.

In order to measure the discrepancy that can exist in a district between property and income based measures of ability to pay, we ranked the districts in terms of both income and property wealth and for each district compared the two rankings. For example, if a district ranked one standard deviation above the mean of the income wealth per pupil distribution and one standard deviation below the mean of the property wealth per pupil distribution, the measure of spread or discrepancy between

these two rankings would be two. (See the Appendix for more details about this methodology.)

Table 14 provides some insight into how much discrepancy exists in New York State between the property and income based measures of ability to pay. The further the cell is from the zero point on each scale, the more extreme is the discrepancy.

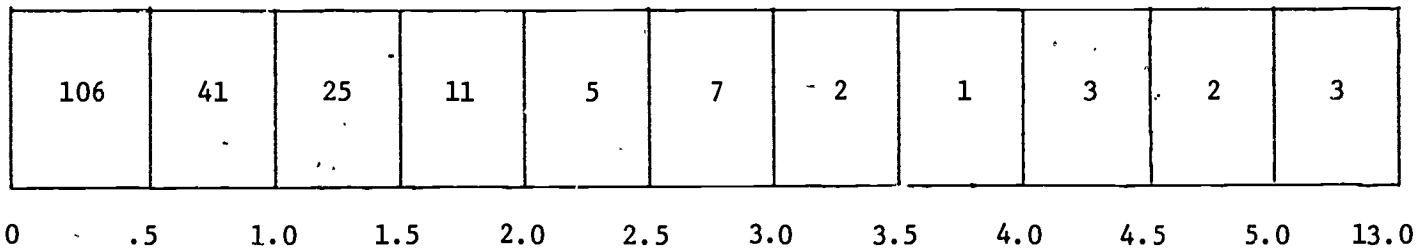
If we arbitrarily define a discrepancy to exist if the district's score is greater than .5, then we can claim that more districts in New York State have high property wealth relative to their income wealth than have high income wealth relative to their property wealth. There are 172 of the former type and 100 of the latter type. But it is also true that a small but significant number of districts have extraordinarily high levels of income relative to their property wealth. Specifically, if we accept a score in excess of 2.0 as an indicator of an extraordinary discrepancy, there are 23 districts in the state that can be categorized in this fashion. Since the state relies heavily on the property wealth measures of ability to pay for aid purposes, it follows that these 23 districts have been qualifying for considerably more aid than would be the case if income were included in the wealth measure.

Table 15 provides a more straightforward analysis of this phenomenon by controlling for absolute rankings along the two wealth dimensions. All districts falling into cells that are off the Northeast - Southwest diagonal of the table are, to one degree or another, faced with a discrepancy between their income and property based measures of wealth. Several interesting results can be found in this table. For example, it appears that expenditure levels are not sensitive to income levels for the low property wealth districts. For the middle and high property

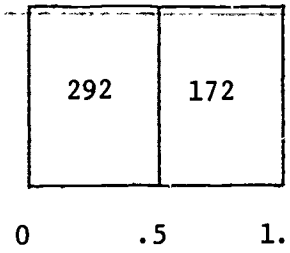
Table 14

Relative Ranking of Districts on Income and Full Value Property Wealth per Pupil Measures of Ability to Pay
(figures represent the count of districts falling into each category)*

(1978-1979)



Degree to which Income Wealth is High Relative to Property Wealth



Degree to which Property Wealth is High Relative to Income Wealth

*See the appendix for a discussion of the scale used to assess the magnitude of the discrepancy.

Table 15

New York State Regular K-12 School Districts

By Wealth Characteristics

Cell Frequencies
N = 670
Gross Income Per Pupil (TAPU)
(1978-1979)

Equalized Property Wealth Per Pupil (RAWADA)	Lowest Quartile < 14,427		Middle Two Quartiles 14,427-26,141		Highest Quartile > 26,141	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Highest Quartile > 80,359	General Fund Expenditure Per Pupil 2711	510	General Fund Expenditure Per Pupil 2726	633	General Fund Expenditure Per Pupil 3381	817
	State Operating Aid Per Pupil 565	197	State Operating Aid Per Pupil 533	143	State Operating Aid Per Pupil 505	109
	n = 16		n = 48		n = 106	
Middle Two Quartiles 43,463 - 80,538	General Fund Expenditure Per Pupil 2089	215	General Fund Expenditure Per Pupil 2214	330	General Fund Expenditure Per Pupil 2521	390
	State Operating Aid Per Pupil 927	95	State Operating Aid Per Pupil 887	112	State Operating Aid Per Pupil 811	119
	n = 65		n = 204		n = 63	
Lowest Quartile < 43,462	General Fund Expenditure Per Pupil 2059	235	General Fund Expenditure Per Pupil 2040	181	General Fund Expenditure Per Pupil 2155	198
	State Operating Aid Per Pupil 1109	63	State Operating Aid Per Pupil 1054	52	State Operating Aid Per Pupil 1019	34
	n = 84		n = 81		n = 3	

wealth districts, the expected positive relationship between expenditures and income is obtained. Moreover, for the low income wealth districts, higher levels of property wealth appear to have little influence on spending levels until the upper quartile of the property wealth distribution is reached. Finally, as might be expected, districts that have the same property wealth but different levels of income receive roughly the same amount of operating aid per pupil.

In the course of developing our definition of a rural school, we found that most of the districts categorized by high property wealth and low income are, by our standard, rural. Specifically, 65 percent of the districts falling to the left of the Northeast-Southwest diagonal have fewer than 1533 pupils and have fewer than 23.07 pupils per square mile. Of the 16 districts that fall into the extreme Northwest cell of the table, 13 or 81% of the districts are rural.

This tendency for small and sparsely settled districts to have high levels of property wealth relative to their income wealth can explain most of what we found when we attempted to assess the relationships between discrepancy in the wealth measures and expenditure patterns. Since we are aware of no theoretical arguments for expecting discrepancy to make a difference in terms of how educational funds are allocated, and since with one exception[7] we found no relationships that are different from what would be consistent with the claim that discrepancy is merely reflecting the effects of scale and sparsity, we will refrain from reporting the results of this analysis in detail.

Instead, since there are theoretical reasons for expecting discrepancy to make a difference in terms of the level of spending on education in general (recall the argument about imposing taxes on non-residents) we

did look more carefully at relationships between discrepancy in wealth measures and spending levels. When we examined decile breakdowns of the districts we found, contrary to what we were expecting, that districts with high levels of property wealth relative to income wealth tend to spend at low rather than high levels on education. However, a more legitimate test of our proposition requires a control for various potentially confounding background characteristics, most notably the absolute level of wealth and scale. When these controls were in place, we found a reduction in the strength of the negative relationship between spending levels and discrepancy but no evidence of the positive relationship we were expecting to find. (The correlation coefficient equals -.48 with no controls and -.38 when controls are in place for both the absolute level of property wealth as well as scale.)

To summarize this and the previous section:

- Between 1974 and 1979, rural school districts' property wealth per pupil increased, on the average, at twice the rate registered by large, densely settled school districts. This relatively rapid rise in rural property values has contributed to the tendency for discrepancies to exist in rural areas among alternate measures of ability to pay for education.
- Rapid rises in property wealth per pupil are associated with low spending levels, high teacher pupil ratios, low starting salaries for teachers, and high levels of "failure" on PEP tests.
- The tendency for a rise in property wealth per pupil to be associated with low spending levels is most pronounced for rural districts, a finding that is consistent with a paper wealth type of argument.

- Rural districts tend to rank higher on the property wealth distribution than on the income wealth distribution. It follows that an increased reliance on an income based measure of ability to pay would work to the advantage of most but not all rural districts.
- The relationship between a discrepancy in wealth measures and spending levels was not in the direction we expected. Even when controls were in place for the absolute level of wealth, a tendency for a district to be "property rich and income poor" was negatively related to spending levels.

Summary

This concludes our analysis of small scale, sparsity, isolation, declines in enrollment, increases in full value property wealth, and discrepancies between alternate measures of wealth. We argued that the first four characteristics are associated with costs that are borne either by local taxpayers or students and that the last two characteristics are sources of inaccuracy in the determination of school districts' ability to pay. Moreover, we argued that these characteristics either are common to what are intuitively thought of as rural areas or interact with one another in ways that generate burdens that are to some degree uniquely rural.

On the basis of these arguments, we examined relationships between each of the characteristics and resource allocation practices at the local level. Rather than provide a summary listing of our major findings. we prefer to turn directly to a discussion of policy issues that have special importance for rural districts. As we examine each issue we will make reference to the relevant findings.

Section III: Policy Issues

We have organized our discussion of policy issues around a series of questions that need to be answered in the course of reforming the financing of public elementary and secondary education in New York State. After posing each of the questions, we discuss the results of our research that have implications for the answers and then sketch some possible remedies that we believe are worthy of consideration.

Before we examine the questions, it is useful to reiterate two points we made in our Interim Report. First, policy makers need to keep in mind the fact that while numerous, the small and sparsely settled school districts account for a small percentage of the pupil population in the state. For example, our research showed that the smallest 10 percent of the districts account for fewer than 1.3 percent of the students in our sample. This point is relevant from a policy making perspective since it suggests that reforms for rural districts can be had at relatively modest cost to the state.

Second, we wish to stress the importance of the distinction between burdens that stem from background characteristics that are voluntarily accepted and those that stem from characteristics that are imposed in some fashion. For example, it is difficult to consider the appropriate response of the state for alleviating whatever burdens are associated with a small scale of operation without considering the degree to which a given small district is small out of necessity rather than choice. This is a difficult distinction to draw, but we hold that it is a necessary ingredient of a fiscially responsible set of proposals.

Question #1: Should the state concern itself with the limited extent to which small school districts cooperate for the purpose of providing educational services?

We found evidence of student related burdens in small scale, sparsely settled school districts. Recall that these districts tend to spend less on instruction than do otherwise similar districts that spend at the same level for education, operate with high teacher-pupil ratios, offer low starting salaries to their teachers, provide small incentives to their teachers to gain additional training, and rely heavily on para-professional teacher aides. Moreover, we suspect but cannot demonstrate that small and sparsely settled districts offer fewer specialized courses and expect their teachers to perform more non-instructional (quasi-administrative) tasks than do larger more densely settled districts. We note that the relatively high rate at which students in small, sparsely settled districts fail to attain minimally acceptable scores on the PEP test is consistent with our claim that student related burdens exist in New York State's rural schools.

The phrasing of Question #1 reflects our preference for the use of shared services as a means of reducing these student related burdens. In general, we view shared services as the most cost-effective method for upgrading the educational opportunities that are available to rural students. However, the point needs to be kept in mind that while a shared course can be offered more cheaply than the equivalent course offered by individual districts, the least costly option for the district is to avoid offering the course altogether. In light of this, if the goal is to induce districts to offer more courses on a shared basis, it may be necessary to offer financial incentives toward this end. What follows is a listing of steps the state might take to encourage inter-district cooperation:

- Passage of a statute that would give local boards of education explicit authority for entering into agreements with

neighboring districts. Current law is silent on this question. Local boards presumably have this authority at present, but in the absence of an explicit statement of their rights and liabilities when they enter into such agreements, boards are understandably reluctant to commit themselves to joint ventures.

- Small districts could receive additional financial incentives to offer shared services, especially shared academic services. For example, regular academic services provided through a BOCES could be aided. Currently such services receive no BOCES aid.
- The state could provide additional incentives for small school districts to reorganize. In addition to increasing the incentive provided for full scale consolidations, districts could be given incentives to consolidate selected portions of their programs. Incentives to consolidate grades 9-12, the regional high school concept, is an excellent example of this type of partial consolidation.

Despite the attractiveness of the shared service concept, we recognize that there are instances where it is not a viable remedy. School districts in isolated and sparsely settled regions of the state where either students or teachers would have to endure unreasonable amounts of travel in order to provide services on a shared basis[8] may resist attempts to consolidate offerings. Moreover, it is possible to imagine instances where a small district in a densely settled region is willing to share but finds few neighbors similarly inclined.

In situations where the sharing of services is not a viable option,

the state may have responsibility for intervening more directly by compensating districts for the costs associated with small scales of operation. In other words, in some districts it may not be feasible to operate without unusually small class sizes and the state may have the responsibility for seeing to it that such districts refrain from financing their small class sizes by paying less to teachers, offering fewer courses, and expecting teachers to perform non-instructional tasks. There are several ways in which the state could provide this compensation. We envision a two step process.

The first step would involve the determination of whether or not a given district is eligible for compensation. Several standards of eligibility can be imagined. For example, sparsity could be used to identify those districts where the consolidation of services is especiall difficult to achieve. As an alternative, consider geographic size in square miles. The standard could be established such that only those districts with fewer than some number of students per square mile or who encompass more than some number of square miles would le eligible.

The second step involves the calculation of the amount of compensation. In keeping with the work of Mort (1951) and Swanson (1961) we are most inclined to calculate the amount of compensation in terms of how much extra it costs the eligible districts to employ the necessarily high number of teachers relative to pupils. This approach has the advantage of tying the amount of compensation to a major source of the extra costs small scale generates.

By making the adjustment to the pupil count used for purpose of determining the fiscal capacity of districts, it is possible to defuse the argument that scale based adjustments are disequalizing. We pointed out in our Interim Report that some of the wealthiest districts in the state are small. It is also true that a small number of the small and

sparse districts (presumably those that would be eligible for the compensation) are in the upper quartiles of both the property and income distributions of wealth. If the compensation aid were provided on a categorical basis or if it were provided through an adjustment to the pupil count on which aid is paid, then there would be a disequalizing effect. However, by introducing the compensation through an adjustmer to the pupil count used to measure fiscal capacity, the wealthy districts, to the extent that they remain on the flat grant provision of the formula, would be unaffected.

I addition to an adjustment that could be made in the overall pupil count that is used for the determination of fiscal capacity, adjustments could be made on a program specific basis. The adjustment might be such that whenever enrollment falls below a critical level for a particular program, an additional weight is assigned to the student. For example, suppose the critical level for a handicapped program is 5. For districts with fewer than 5 such students, an additional weight could be applied to the students who are enrolled in the program. This proposal has the advantage of recognizing that economies of scale can exist on a program specific basis. In other words, this adjustment recognizes that two districts with the same total enrollment can, depending on the distribution of students among programs within the district, experience different levels of scale economies.

New York State has had experience with scale based modifications of pupil counts. In the past, these scale adjustments were seriously criticized on the grounds of a) their disequalizing effects and b) their tendency to discourage districts from consolidating. By employing a two step process where districts have to qualify for compensation before the scale adjustment is applied, we have sought to address the second criticism.

the state may have responsibility for intervening more directly by compensating districts for the costs associated with small scales of operation. In other words, in some districts it may not be feasible to operate without unusually small class sizes and the state may have the responsibility for seeing to it that such districts refrain from financing their small class sizes by paying less to teachers, offering fewer courses, and expecting teachers to perform non-instructional tasks. There are several ways in which the state could provide this compensation. We envision a two step process.

The first step would involve the determination of whether or not a given district is eligible for compensation. Several standards of eligibility can be imagined. For example, sparsity could be used to identify those districts where the consolidation of services is especially difficult to achieve. As an alternative, consider geographic size in square miles. The standard could be established such that only those districts with fewer than some number of students per square mile or who encompass more than some number of square miles would be eligible.

The second step involves the calculation of the amount of compensation. In keeping with the work of Mort (1951) and Swanson (1961) we are most inclined to calculate the amount of compensation in terms of how much extra it costs the eligible districts to employ the necessarily high number of teachers relative to pupils. This approach has the advantage of tying the amount of compensation to a major source of the extra costs small scale generates.

By making the adjustment to the pupil count used for purpose of determining the fiscal capacity of districts, it is possible to defuse the argument that scale based adjustments are disequalizing. We pointed out in our Interim Report that some of the wealthiest districts in the state are small. It is also true that a small number of the small and

the advantage of taxpayers. Our position is that tax rates are at best, a partial measure of effort and that current levels of effort, even if properly measured, may have little to do with changes in effort occasioned by an increase in state aid.

Second, the concern over the tendency to substitute state for local revenues could lead to the adoption of a maintenance of effort provisions that erroneously measure tax effort solely in terms of local revenues relative to property wealth. Our recommendation would be to include income as well as property wealth based measures of effort in any provision that is designed to penalize districts that reduce effort over time.

Question #3: Should the state provide extra assistance to districts that are unable to take full advantage of BOCES services?

We found a surprising amount of variation in the BOCES participation levels of the smallest districts in the state. We hypothesized that district isolation could be responsible for this variation, but were unable to show that isolation, as we conceptualized and measured it, is systematically related to participation levels. We suspect that a more refined analysis would show that isolation does make a difference, but we are unable to substantiate this claim.

Despite coming up empty handed with respect to the isolation arguments we have been making, the state may be well advised to give serious consideration to making BOCES services more accessible. Means toward this end could include efforts to:

- Increase the number of regional service centers so that the differences in the amount of time BOCES students must spend on buses are reduced.

- Provide increased incentives for the use of shared-teacher services. For example, BOCES aid could be provided for itinerant teachers of academic subjects. Currently such services receive no BOCES aid.
- Increase the availability of advanced instructional technologies in isolated areas. Computer assisted instruction, educational television, and radio all hold great promise for isolated rural areas and can help reduce the need for students as well as teachers to travel large distances on a regular basis.

Question #4: Should the state be concerned with the potential for transportation expenditures to drain resources away from the regular instructional program?

According to our results there is little evidence of a systematic relationship between locally borne transportation expenditures and spending on instruction. The financing of transportation appears to be more of a taxpayer than a student issue. Our results demonstrate the ability of high wealth districts to finance their locally borne expenditures through the imposition of relatively low tax rates. In light of these findings, we believe the development of an equalized system of providing aid for transportation should be given serious attention. However, while we are in sympathy with what an equalized program of aid for transportation could contribute, the tying of additional aid to a flawed measure of fiscal capacity may be counter productive. It may be prudent to delay basing transportation aid on fiscal capacity until the current debate over how to combine income and property based measures of wealth into an index of fiscal capacity is resolved.

We believe the inequities associated with the so-called parity issue

and the 7 percent cap are largely moot in light of the changes that will be made in the 1981-82 aid package, and we will not discuss them further here.

Question #5: Should the state make allowances for the current size of districts when it makes adjustments for declines in pupil enrollment?

Our research shows that a given percentage decline in enrollment is handled differently by districts depending, in part, on how large they are in the initial period. More specifically, among small districts, declines in enrollment are more strongly associated with high levels of spending and small class sizes than is the case for large districts. According to one interpretation of these results, small districts are more profligate than others and are less willing to lay-off teachers. An alternate interpretation would hold that staff reductions in small districts cut more deeply into the basic educational program than they do in large districts and are therefore more difficult to achieve. For example, in a large district a 5% reduction in staff can be spread out over a sufficiently large number of classes so that the net effect is little or no increase in class size. In a small district the same 5% reduction may necessitate the elimination of courses in addition to an increase in class size. Grades may be combined, specialized science courses offered in alternate years by the same instructor, and so on.

Presently, districts are held harmless from declines in state aid that stem from declines in enrollment. If it is true that the declines generate more serious problems for students and taxpayers in the already small compared to the large districts, the fact that the state is holding harmless all districts regardless of their scale means that

large districts are benefiting relative to small districts.

Although it is possible to reduce state aid to declining small districts more slowly than aid is reduced to declining large districts (for example, small districts could be allowed to use a four year moving average pupil count while large districts would be required to use a two or three year moving average pupil count), a preferable remedy would involve developing an operationalized definition of what counts as a "basic program" in small schools and then making sure that districts provide this program as a minimum. The development of such a definition is a major challenge that is receiving increasing amounts of attention within the school finance research community.[5] We view this as a promising area of research and plan to play an active role in the debate that ensues.

Question #6: Should the state distinguish between temporary and permanent changes in district wealth over time when it assesses districts' fiscal capacity?

Temporary increases in wealth, to the extent that they exist, wreck havoc with New York State's method for measuring fiscal capacity. The problem is that the state may inadvertantly treat a temporary rise in wealth as if it were a permanent rise. In New York, the potential for this to occur is exacerbated by the long lags that exist between the time the initial change in district wealth is recorded and the time the school aid allotment begins to reflect the change in status. If the rise is temporary, the state may be in the position of reducing the district's aid ratio at a time when the district's wealth is actually declining. What is needed is a more responsive measure of fiscal capacity, one that is up to date and sensitive to the difference between temporary and more permanent changes in wealth. One possibility involves making projections

of district wealth into the future and using the projected figures to build a profile of district wealth over time. Another possibility involves protecting districts from the effects of rises in wealth until it is clear they are permanent.

Question #7: Should the state give explicit attention to the discrepancy that exists in some districts between property and income measures of wealth?

Our research shows that the rural districts in New York tend to exhibit discrepancies between alternate measures of ability to pay. Moreover, the direction of the discrepancy is such that the rural districts rank higher on the property wealth distribution than they do on the income wealth distribution. It therefore follows that any movement toward increased use of an income based measure of wealth works to the advantage of most rural districts. Indeed, of the 202 districts we have classified as being rural, only 13 look substantially wealthier in terms of income than property wealth.

While we are not in a position to argue for or against the various proposals that have been made to introduce income into the state aid formula, with the help of the research staff at the Education Commission of the States, we did assess the implications of each of the major proposals for rural schools. While in general it is clear that multiplicative adjustments with a pupil count in the denominator are the most advan-

tageous for rural schools, it is interesting to see how hazardous it is to make generalizations about the impact of each proposed change on "rural" schools. The school district we are calling rural are a remarkably diverse group and it should not be surprising to find that some rural districts are made better off by one income factor and that others are made better off by a second factor.

One final point should be made about the discrepancy issue. While it may be true that most rural districts will benefit from the increased use of income factor in the state aid formula, it is not safe to conclude that the inclusion of an income factor puts to rest the rural districts' claim for fair treatment. On the one hand, not all rural districts show a high level of discrepancy between property and income measures of wealth. The zero-order correlation coefficient between discrepancy and the other indicators of ruralness we examined (small scale, sparsity, isolation, etc.) ranged between .13 and .34 in absolute value.

On the other hand, we are talking about two fundamentally different types of burdens that can exist in rural schools. The increased use of an income factor will presumably reduce the tendency for the state to overstate the wealth of rural school districts. But the same policy will not serve to reduce whatever extra costs stem from rural characteristics such as small scale, population sparsity, isolation, and enrollment declines in already small districts. The state cannot assume that by eliminating the source of one type of burden it is simultaneously offsetting the consequences of the remaining burdens that exist in rural as well as other types of school districts.

Section IV: Concluding Remarks

We have endeavored in this research to introduce members of the Task Force to some of the financially related inequities that exist in the rural school districts of New York State. Most of our efforts have been devoted to understanding more about the relationships between a set of characteristics we claim are commonly found in rural areas and the resource allocation practices of school officials. At this time, we wish to express our willingness to continue working to develop concrete policy options that are worthy of consideration. With the assistance of the research team at the Education Commission of the States, it should be possible to generate simulations of the alternative types of scale and sparsity adjustments that we are proposing. Once these results are in hand, the Task Force should be in a good position to judge the "rural issues" on their merits and in conjunction with the numerous other issues that need to be resolved. We look forward to the days ahead when the Task Force will be debating these issues.

Section V: Footnotes

[1]One of the interesting questions we can ask here is whether the nature of the distribution of whatever student burdens exist in a district varies among various categories of students. One question might be: Are handicapped students (or gifted students) more adversely affected by characteristics such as small scale than are other types of students? Although we do not report the results of this type of analysis in this report, we are examining these questions and preliminary results will be available shortly.

[2]See Fox (1981) for an excellent review of the economy of scale literature in education.

[3]We are sweeping aside here the conceptual difficulties associated with measuring the scale of school districts. We rely on a pupil count as our measure of scale. A more comprehensive analysis would involve alternate conceptions of scale. For example the number of buildings in conjunction with the number of pupils has implications for scale economies. See Johns (1975) for a discussion of some of these issues.

[4]The incidence of teacher turnover in rural areas has received some attention. See, for example, the second Special Edition of the National Rural Project Center for Innovation and Development, Murray State University, Murray, Kentucky for an article by Alan Zelter entitled "Population Sparsity and Geographic Isolation as it Relates to Staff Recruitment and Retention." (December 1980)

[5]This is not to deny the impact sparsity can have on the level of engagement of students and parents in the educational program offered by the school. Students who must travel long distances each day to and from school may find it difficult to engage in after-school activities and may even find engaging in classroom activities difficult. Similar arguments can be made about the effects of sparsity on the level of parental participation in school activities. As important as these effects of sparsity may be, we are not in a position to deal empirically with their impact.

[6]There is a problem of definition here. Since the State pays the same level of equalized aid regardless of the level at which the district spends, it is not entirely clear that equalized aid is being paid on transportation expenditures. However, since some fraction of the unapproved transportation expenditures are approved for general aid purposes, there is a sense in which some portion of operating aid is provided for transportation uses. LTE2 and LTE3 include an adjustment that takes account of this equalized aid.

[7]The relationship we found for the teacher-pupil ratio is different from what we would expect to find if scale and sparsity relationships are masquerading as discrepancy effects.

[8]It would be possible for the State to compensate itinerant teachers directly for whatever hardships they may be forced to endure as a consequence of travelling long distances. No such compensation is feasible for students who may be forced to spend excessive amount of time in transit.

Section VI: References

Adams, E. K., "Analysis of Nominal and Cost Adjusted Spending Variations Among New York School Districts." Journal of Education Finance Vol 6, No. 2 (Fall, 1980): 246-253.

Brown, B.W. and Saks, D.H., "Income Distribution and the Aggregation of Private Demands for Local Public Education." Department of Economics, Michigan State University, typescript, 1979.

Davis, C.E., "Truth or Consequences - Equalization and Assessment," typecript, 1981.

Fox, W.F., "Reviewing Economies of Size in Education." Journal of Education Finance Vol. 6, No. 3 (Winter, 1981): 273-296.

Johns, R.L., "An Index of Extra Costs of Education Due to Sparsity of Population," Journal of Education Finance 1 (Fall, 1975): 159-204.

Ladd, H.F., "Local Education Expenditures, Fiscal Capacity, and the Composition of the Property Tax Base," National Tax Journal Vol. XXVIII, No. 2, (June, 1979): 145-158.

Mort, P.R. and Reusser, W.C., Public School Finance (New York: McGraw Hill Book Company, Second Edition, 1951).

Swanson, A.D., "The Small School Correction" in Mort, P.R. (ed.), "A New Approach to School Finance." (New York State Educational Conference Board, 1961).

Section VII: Appendix

Appendix I

Curvilinear Relationship Between Expenditure and Scale (from p. 9)

(see Table A-1)

Appendix II

Relationship Between Scale and Selected School Variables, Controlling For the Effects of District Sending Levels (from pp. 13-17)

In many instances, when conducting research of the nature reported here, it is customary to report the relationship between two variables, say property wealth and beginning teacher salaries for a school district, by means of a bivariate correlation coefficient. However, simple bivariate correlation coefficients are of limited use since they can only express the relationship between two variables at a time. Usually social and economic behavior cannot be reduced completely to such simple two-way relations. Often when we determine the correlation between two variables, there are other variables that affect in various ways the apparent relationship between the two variables of interest. The statistical technique of partial correlation allows one to control for the influence of such variables.

The present research describes in several places the relationship between scale (TAPU) and specified dependent variables. Table A-2 shows the simple bivariate correlation coefficients for scale and : (1) expenditures per pupil on instruction; (2) full-time teachers per 1,000 pupils; (3) beginning BA salary; and (4) premium accorded to Master's degree holders for New York State's regular K-12 school districts.

(Table A-2 About Here)

It can be seen from Table A-2 that there is a statistically significant relationship between school district scale and each of the dependent variables.. Discussion of these relationships is included in the text. Of interest here is the change in the apparent relationships between scale and each dependent variable when we control for the influence of a school district's spending level on the general fund. Table A-3 presents these results.

(TAble A-3 About Here)

According to Table A-3, school district spending per pupil on the general fund acts as a suppressor variable, attenuating the observed relationship between scale and expenditure per pupil on instruction, the ratio of teachers to students, and the beginning BA salary for teachers. That is, for expenditures on instruction, teacher/student ratio, and the begining BA teacher salary, the observed correlation with scale increases in absolute magnitude when we control for the effect of school district spending on education in general.

In the case of the PEP score variable, we controlled for the effects of district property wealth per pupil and found a partial coefficient that was slightly larger in absolute magnitude than the zero order relationship (-0.15 compared to -0.13).

Appendix III

Disentangling the Effects of Scale and Sparsity (from p. 21)

Our methods involved an examination of scatter plots, commonality analysis, and analysis of variance. Salient features of each approach along with an interpretation are given below.

Scatter Plots

There is a high concentration of small-scale districts in each distribution. There are a few large-scale, moderate-spending to low-spending districts in the upper tails. Most importantly, the high concentration of small-scale, districts in the lower left corners of the distributions are low-spending districts. Moreover, it should be noted that the scatter plot comparing expenditure per pupil on the general fund (N1) with scale includes one district that spends in excess of $9,000 per pupil on the general fund. This district, however, does not apear in the distribution of N1 verses sparsity. Both plots include other possible outliers, districts that are respectively very large and quite dense.

We also plotted general fund expenditure levels per pupil (N1) verses standardized values (Z scores) of scale (zscale) and sparsity (zsparse). While it is difficult to disentangle the effects of scale and sparsity on the basis of plots alone, the standardized plots below (see Figures A-1 and A-2) show that scale and sparsity have non-identical, though similar distributions.

(Figures A-1 and A-2 About Here)

We attempted to trace a quadratic sort of relationship in the distribution of general fund expenditure per pupil (N1) verses zscale. Our method of tracing such a relationship involved: 1) omitting the district whose expenditure level exceeded $9,000 per pupil, 2) noting that while some of the smallest districts are high-spending ones, a greater concentration of the smallest districts are low-spending districts, 3) noting that the largest three districts in the distribution spend less than some others in the middle of the distribution. This method suggested a quadratic relationship (downward-opening) between scale and expenditures on the general fund.

Commonality Analysis

In order to isolate the unique and shared contributions of scale and sparsity to the variance of General Fund Expenditures Per Pupil, we performed a commonality analysis (as detailed in Kerlinger, F. N., and Pedhazur, E.J., Multiple Regression in Behavioral Research, (New York: Holt Rinehart and Winston, 1973). The results of this analysis appear in Table A-4.

(Table A-4 About Here)

Analysis of Variance

As the final part of our attempt to disentangle the effects of scale and sparsity we tested to see whether or not the nature of the impact of scale depended on the level of sparsity in the district. Districts were classified according to two levels of scale and two levels of sparsity based on the median values of both variables. We carried out a two-way analysis of variance procedure for this purpose and found that the hypothesized interaction effect is statistically insignificant. The results of this analysis are reported in Table A-5.

(Table A-5 About Here)

Appendix IV

Transportation of Non-allowed Pupils (from pp. 23-24)

(see Table A-6)

Appendix V

Construction of Local Transportation Expenditure Variables (from p. 25).

New York State matches approved transportation expenses at a 90 percent rate. Hence, the local district is responsible for 10 percent of approved transportation expenditures. Disapproved expenditures are handled differently. Some fraction (δ) of the disapproved expenditures qualify for equalized aid while the remainder ($1 - \delta$) qualifies for no state aid. Moreover, there was a 7 percent cap on increases in transportation aid over the period examined in this study. By calculating the difference between 90 percent of approved current expenditures and the prior year's aid for transportation plus 7 percent, it is possible to obtain the amount of locally borne transportaion expenditures that stem from the 7 percent cap.

In light of this, local transportation expenditures (LTE) can be expressed as follows:

$$\begin{aligned} LTE = .1 &\left(\begin{matrix}\text{Approved}\\ \text{Transportation}\\ \text{Expenditures}\end{matrix}\right) + \left(\begin{matrix}\text{Total}\\ \text{Transportation}\\ \text{Expenditures}\end{matrix} - \begin{matrix}\text{Approved}\\ \text{Transportation}\\ \text{Expenditures}\end{matrix}\right) \\ - \delta &\left[\begin{matrix}\text{Operating}\\ \text{Aid}\\ \text{Ratio}\end{matrix} \times \left(\begin{matrix}\text{Total}\\ \text{Transportation}\\ \text{Expenditures}\end{matrix} - \begin{matrix}\text{Approved}\\ \text{Transportation}\\ \text{Expenditures}\end{matrix}\right)\right] \\ + &\left[.9 \begin{matrix}\text{Approved}\\ \text{Current}\\ \text{Year}\\ \text{Expenditures}\end{matrix} - \left(\begin{matrix}\text{Payable}\\ \text{Transp.}\\ \text{Aid for}\\ \text{Prior}\\ \text{Year}\end{matrix} + .07 \times \begin{matrix}\text{Payable}\\ \text{Transp.}\\ \text{Aid for}\\ \text{Prior Year}\end{matrix}\right)\right] \end{aligned} \quad (1)$$

It is difficult to specify (δ) with any degree of precision given the available data. Basically, (δ) represents fringe benefits for transportation personnel plus the salary and fringe benefits for the transportation supervisor for districts that operate their own fleet buses. As a first approximation, if we accept the assumption that the fringe benefit package plus the supervisor's salary represent 30 percent of the local transportation salaries paid by districts, then:

$$\delta = \frac{.3 \text{ (local transportation salaries)}}{\text{Total Transportation Expenditures -- Approved Trans. Expend.}}$$

and it becomes possible to calculate estimates of LTE.

Appendix VI

Effect of Changing Enrollments on District Staffing Ratios, Expenditures Per Pupil on the General Fund, and Expenditures Per Pupil on Instruction, Controlling for the Effect of District Wealth (from p. 40)

On pages 39-43 of the text, the effect of changing enrollments in a school district is discussed. It is reported that our analyses found a significant relationship between the percentage decline in enrollment and per pupil expenditures -- on the general fund, on instruction, and on teacher/student ratios. These results are presented in Table A-7.

(Table A-7 About Here)

However, we had reason to believe that district wealth had a possible significant influence on these relationships. For this reason we computed partial correlation coefficients, controlling for the effects of district wealth. The correlations controlling for wealth are presented in Table A-8.

(Table A-8 About Here)

As can be seen from Figure A-8, the relationship between change in enrollment and expenditures per pupil on the general fund and on instruction when controlling for the effects of wealth increases in absolute magnitude over the zero-order correlations. The partial correlation for change in enrollment and full-time teachers/ 1,000 pupils retains its significance. These findings suggest that the effects of changing enrollments on select school district resource allocation practices are independent of the effects of school district wealth.

Appendix VII

Interaction of Scale and Change in Enrollment (from p. 43)

In order to test the hypothesis that for some dependent variables of interest there is an interaction effect of scale and growth in enrollment, we regressed N8 (full time teachers per 1,000 pupils) on the following variables: full value property wealth per pupil (f217), growth in enrollment (cgenroll), and an interaction term (intrct2) that was defined as scale multiplied by growth in enrollment. Table A-9 reports the results of this analysis.

(Table A-9 About Here)

Consistent with what we hypothesized, the interaction term was statistically significant and the interpretation is that the effects of decline in enrollment are more pronounced in the smaller scale districts.

Appendix VIII

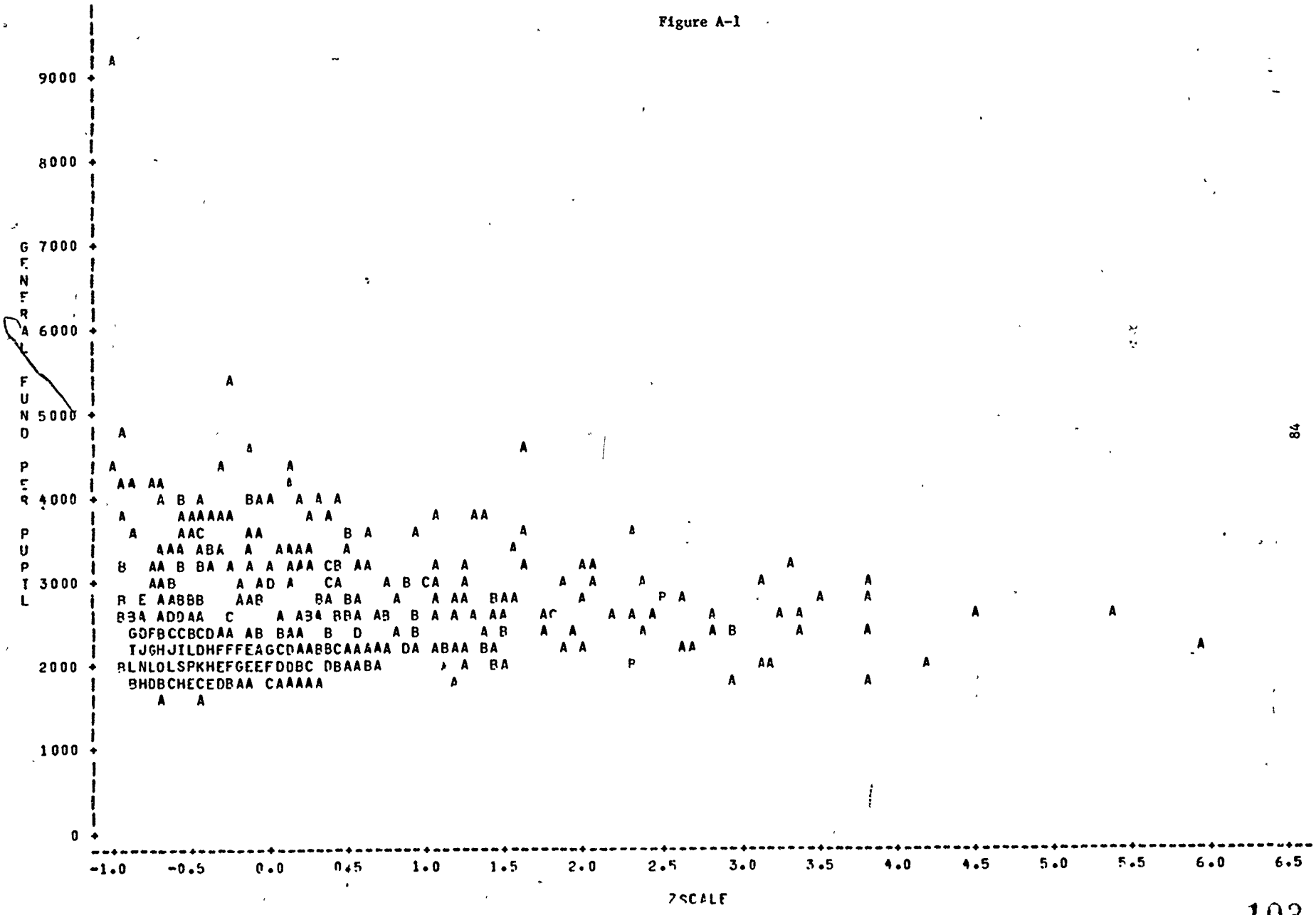
Discrepancy Between Property Wealth and Income Wealth (from p. 55)

Rural school administrators argue that high property wealth is often accompanied by by low income wealth in their school districts. In order to examine this argument, we computed standard scores (Z scores) for both property wealth per pupil (Z1) and income wealth per pupil (Z2). Then, we constructed a discrepancy variable consisting of Z1 minus Z2. Suppose, for example, that a district is quite rich in property wealth. This district would then have a high score (i.e., large, positive score) on Z1. Suppose further that its income is very low. The district would then have a low score (i.e., large, negative score) on Z2. It follows that our constructed discrepancy variable (Z1 minus Z2) would amount to a large, positive number. The chief advantages of the discrepancy variable are that 1) the distributions of property wealth and income wealth need not be even similar to each other, and 2) the sign as well as the magnitude of the discrpancy variable are directly interpretable.

EFFECT OF STANDARDIZED BACKGROUND VARIABLE 0:40 THURSDAY, AUGUST 6, 1981

PLOT OF N1*7SCALE LEGEND: A = 1 OBS, B = 2 OBS, ETC.

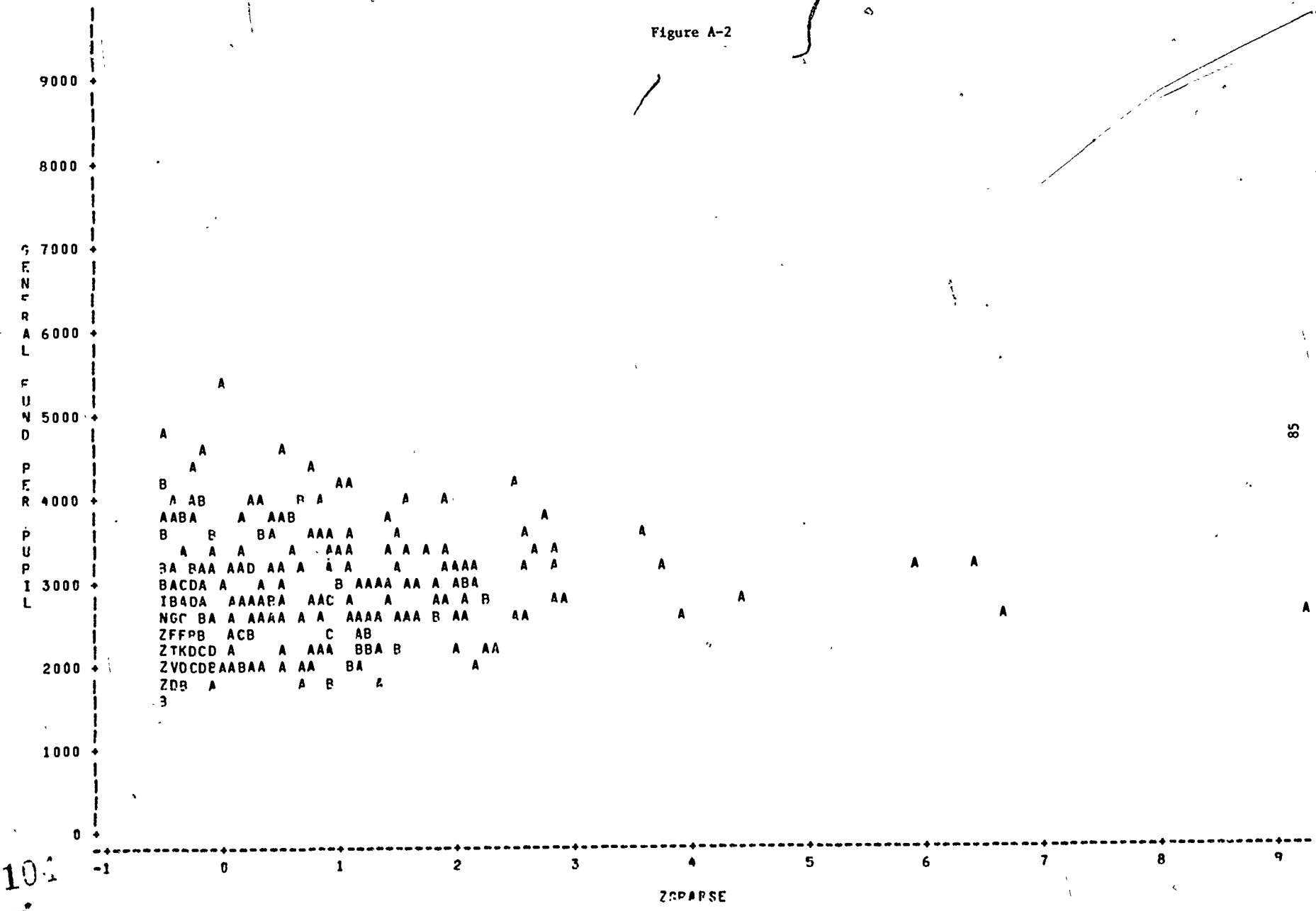
Figure A-1



EFFECT OF STANDARDIZED BACKGROUND VARIABLE 9:40 THURSDAY, AUGUST 6, 1981

PLOT OF N1*ZSPARSE LEGEND: A = 1 OBS, B = 2 OBS, ETC.

Figure A-2



NOTE: 18 OBS HAD MISSING VALUES 197 OBS HIDDEN

EFFECT OF SCALE (F017-LINEAR AND SQSCALE-QUADRATIC) ON GEN FUND EXP P/P CONTROLLING FOR PROPERTY WEALTH PER PUPIL (F217)
10:00 THURSDAY, AUGUST 6, 1981

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: N1 GENERAL FUND PER PUPIL

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	3	165820827.84777093	55273609.28259031	329.61	0.0001	0.597540	16.8994
ERROR	666	111685162.68513505	167695.43946717		STD DEV		N1 MEAN
CORRECTED TOTAL	669	277505990.53290599			409.50633630		2423.20406075

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
F217	1	152725293.06129819	910.73	0.0001	1	157980906.65257377	942.07	0.0001
F017	1	9038789.59146566	53.90	0.0001	1	9072432.63118361	54.10	0.0001
SQSCALE	1	4056745.19500709	24.19	0.0001	1	4056745.19500709	24.19	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1556.32228017	41.26	0.0001	37.72346450
F217	0.00911735	30.69	0.0001	0.00029705
F017	0.09940563	7.36	0.0001	0.01351480
SQSCALE	-4.8004133E-06	-4.92	0.0001	0.00000098

Table A-1

Table A-2

Scale with Selected Dependent Variables
Zero-Order Correlations

	N6 Inst/Pupil	N8 Tchrs/Pupil	FC01 BA Salary	PremA Premium MA	F492 PEP Avg
Scale (F017)	0.19 668 p=0.0	-0.20 668 p=0.0	0.33 488 p=0.0	0.30 470 p=0.0	-0.13 668 p=0.0

Table A-3

Scale with Selectd Dependent Variables
Partial Correlations
Controlling for N1 (General Fund Exp P/P)

	N6	N8	FCO1	PremA
Scale	0.25 667 p=0.0	-0.35 667 p=0.0	0.34 487 p=0.0	0.27 469 p=0.0

Table A-4
Commonality Analysis

Correlation Matrix:

	(1) Scale	(2) Sqscale	(3) Sparse2	(N1) N1 (Exp Per Pupil)
(1)	1.00000	0.92488	0.43172	0.16573
(2)	0.8546633	1.00000	0.34841	0.09989
(3)	0.1863822	0.1213895	1.00000	0.40864
(N1)	0.0274664	0.009978	0.1669866	1.00000

Squared Multiple Correlations:
Dependent Variable is N1

R2(N1.123)=0.17447 R2(N1.12)=0.04703
R2(N1.13) =0.16713 R2(N1.23)=0.16904

nalysis:

	(1) Scale	(2) Sqscale	(3) Sparse2
Unique to Scale	0.00543		
Unique to Sqscale		0.00734	
Unique to Sparse2			0.12744
Common to 1,2	-0.0052866	-0.0052866	
Common to 1,3	0.031622		0.031622
Common to 2,3		0.0122236	0.0122236
Common to 1;2,3	-0.004299	-0.004299	-0.004299
Sum	0.0274664	0.009978	0.1669866

Table A-5

Interation Effect of Scale and Sparsity
Analysis of Variance Table

Sources of Variation	Df	Mean Square	F	Sig of F
Sparsity	1	39416000.000	113.510	0.000
Scale	1	3184943.000	9.175	0.003
Sparsity x Scale	1	513917.313	1.480	0.224
Residual	666	397247.375		
Total	669	414797.625		

The dependent variable in this analysis is General Fund Expenditure Per Pupil (N1).

EFFECTS OF PROPORTION NON-ALLOWED (TRAN3) AND PROPORTION TRANS EXP DISTRICT OPERATED (TRAN2) ON PROPORTION TRANS EXP AIDED
8:40 THURSDAY, AUGUST 6, 1981

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: TRAN5

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	1.57390967	0.78695484	62.03	0.0001	0.157022	15.5416
ERROR	666	8.44955938	0.01268703		STD DEV		TRAN5 MEAN
CORRECTED TOTAL	668	10.02346906			0.11263670		0.72474204

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE IV SS	F VALUE	PR > F
TRAN2	1	0.11016447	8.68	0.0033	1	0.00736122	0.58	0.4465
TRAN3	1	1.46374521	115.37	0.0001	1	1.46374521	115.37	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	0.78124457	72.72	0.0001	0.01074268
TRAN2	-0.00921061	-0.76	0.4465	0.01209186
TRAN3	-0.41027733	-10.74	0.0001	0.03819660

91

112

113

Table A-6

Table A-7

Growth in Enrollment with Selected Dependent Variables
Zero-Order Correlations

	N1 Gen Fund/ Pupil	N7 Inst/ Pupil	N8 Tchrs/ 1000 Pupils
Change in Enrollment	-0.21 668 p=0.0	-0.20 668 p=0.0	-0.18 668 p=0.0

114