EQUALIZATION ASPECTS OF FEDERAL AID TO EDUCATION: THE DISTRICT PERSPECTIVE

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INTRODUCTION

The principle of equality of opportunity has raised serious legal questions about the revenue distribution associated with use of the property tax as the main school funding vehicle. Partially in response to the recognition of a maldistribution of funds at the local level there has been renewed interest in the degree to which the distribution of state revenue, via alternative foundation plans, does in fact provide compensating state revenue to low wealth districts. It is now widely recognized that many existing state foundation plans have performed inadequately in this regard and alternative plans are under study in many states. Relatively little public attention or research effort, however, has been devoted to examination of the distributional impact of the federal component of schooling revenues, particularly at the school district level.

Anderson evaluated the extent to which Title 1 funds of the Elementary and Secondary Education Act (ESEA) provided financial assistance to low-income areas of the United States [2]. He found that the Title 1 distribution plan functioned well at the state and regional level but not at the school district level. Bedenbaugh and Alexander studied the distribution of federal revenues between states from several federal aid programs [3]. Correlations were obtained between state personal income per child and the federal allocation per child. Of the ten federal programs examined, appropriations under six of the programs were found to be negatively and significantly correlated with income as was the combined allocation from all federal programs examined.[1]

This paper examines the distribution of federal aid to elementary and secondary education with regard to absolute revenue equalization and with regard to several alternative measures of financial and academic need. In view of the proliferation of federal funding programs and growth in relative importance of these programs, knowledge of their impact is critical to the future improvement of the distribution of funds.[2] Briefly summarized, the principle findings were that federal revenues increased rather than decreased the variability of total district revenues. Also, very little of the variability in federal revenues could be explained by variation in measures of academic need, financial need, district organization, or geographic location.

METHODOLOGY AND DATA

The principle of equality of opportunity has been subject to a very wide range of interpretation, especially with regard to its implications for public

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[1] A more general and extensive analysis of the distributive effect of a wide range of public programs is found in the work of Tweeten and Ray [10]. They present evidence that the benefits of most public programs accrue to those who need assistance least and to those in large urban areas. Also of interest is the Advisory Commission on Intergovernmental Relations comparison of 1961 state per capita income with the 1962 distribution of seven billion dollars of federal grants [1]. They concluded that there was an inverse relationship between per capita income and the distribution of grants, but that the relationship was not statistically significant. An earlier study by Muskin [9] found a positive correlation between per capita income and per capita federal grants.

[2] The importance of federal revenues to elementary and secondary education has increased from 0.3 percent of the total schooling budget in 1920 to 8.8 percent in 1968 [12]. In Kentucky, the study area for this report, federal revenues amounted to 17.0 percent of the total revenues in support of elementary and secondary education for fiscal year 1971 [8].

school finance. As a practical matter some officials feel that the notion of equality of opportunity implies that school inputs (revenue) should be equal.[3] Others have argued, however that equalization of opportunity implies even more, viz., that low wealth schools should receive greater total revenues than wealthier schools in order to compensate for inferior student background. While the research reported herein does not provide information about which, if either, view is correct it does provide information on the distributive effect of federal aid with regard to:

1. The degree that federal revenues compensate for district disparities in the sum of state and local revenues,
2. The degree to which federal revenues are related to district financial capacity as measured by adjusted gross income per student.[4]

The variance about the mean of district revenues per student was employed as the quantitative measure of equality in this study. If federal revenues are being distributed in a manner that provides greater federal aid to poor districts -- as defined by the sum of state and local revenues -- the distribution of total revenues should become more equal, and therefore variance of total revenues should become smaller.[5] If in fact federal revenues were distributed in such a manner, they would be said to have an "equalizing" effect. An alternative view is provided by the graphical presentation of the sum of state and local as well as federal revenues in standard normal form.

The data represent fiscal year 1971 for 189 school districts in Kentucky.[6] Choice of the school district as the observational unit was motivated by the desire to examine the impact of funds within state rather than between states and the desire to minimize data aggregation. Revenues associated with specific federal programs were not separately identified. Thus the subject of the examination was the combined effect of the federal aid program.[7] Although the data were specific to Kentucky they may be suggestive of possible relationships in other states.

EMPIRICAL RESULTS

According to the evidence in Table 1 the federal aid program results in a substantial increase in the variation of school district revenues. The variance of the sum of state and local revenues per student is 4147.36. With the addition of federal revenues the variance of total district revenues per student is increased to 8637.84.[8] Federal aid is distributed in a manner which increases rather than decreases disparities in district revenues.

The disequalizing effect of federal revenues is shown in Figure 1. The vertical axis shows school districts in descending order of federal revenues per student in average daily attendance. To conserve space only every fourth district is represented. The graph indicates that Paintsville received the greatest federal revenues per student while Augusta received the least.

The horizontal axis measures revenues per student received by the respective districts. Dollar amounts have all been converted to a standard normal variable to facilitate charting on a common scale. Both federal revenues per student and the sum of state and local revenues per student are charted. A district which is one standard deviation below the mean received, for example, $48.05 in federal revenues and $506.78 in state and local revenues.

The closer the state and local line comes to the federal line the less the equalization. That is, equalization occurs to the degree that the respective curves form an X pattern, indicating an inverse relationship between federal revenues and the sum of state and local revenues. The graph indicates that there is a slight tendency for poorer districts, as

[3] Both Jencks [6], and the Coleman Report [4] have shown that there is apparently little relationship between the conventional measures of schooling inputs and schooling output as measured by achievement test scores. In addition Jencks has seriously questioned the adequacy of the principle of equality of opportunity as a policy guide to schooling reform. He argues that equalization of opportunity will do very little to eliminate poverty.

[4] The measure of adjusted gross income was obtained from income tax returns. This is not a complete measure of income as it excludes corporate income and not all people complete income tax returns. The data are presented on a per student basis for 1967 [10].

[5] Because the sample variance consists of squared deviations, considerable emphasis is placed upon those observations which are furthest from the mean. An alternative and perhaps better measure would be the average absolute value of deviations.

[6] Three districts were eliminated from the study due to lack of necessary supportive data. Eliminated districts were South Gate, West Point, and Anchorage.

[7] Since there is considerable variation in the allocation criteria associated with the respective federal programs, knowledge of net effect of the combined program was viewed as the first priority. Ideally, the impact of each major program should be examined separately. The relative importance of the major federal aid programs in Kentucky for fiscal year 1971 may be obtained from Kentucky Department of Education [8] or the author.

[8] Since sample size is equal to population size the values in Table 1 represent population parameters.

Table 1. SAMPLE MEAN AND VARIANCE OF SCHOOLING REVENUES PER STUDENT IN AVERAGE DAILY ATTENDANCE, KENTUCKY, FISCAL YEAR 1971

Revenue Source	Mean	Variance
Local Revenues	173.79	8447.44
State Revenues	397.40	2353.22
Local and State Revenues	571.19	4147.36
Federal Revenues	128.50	6472.20
Local, State, and Federal Revenues	699.67	8637.84

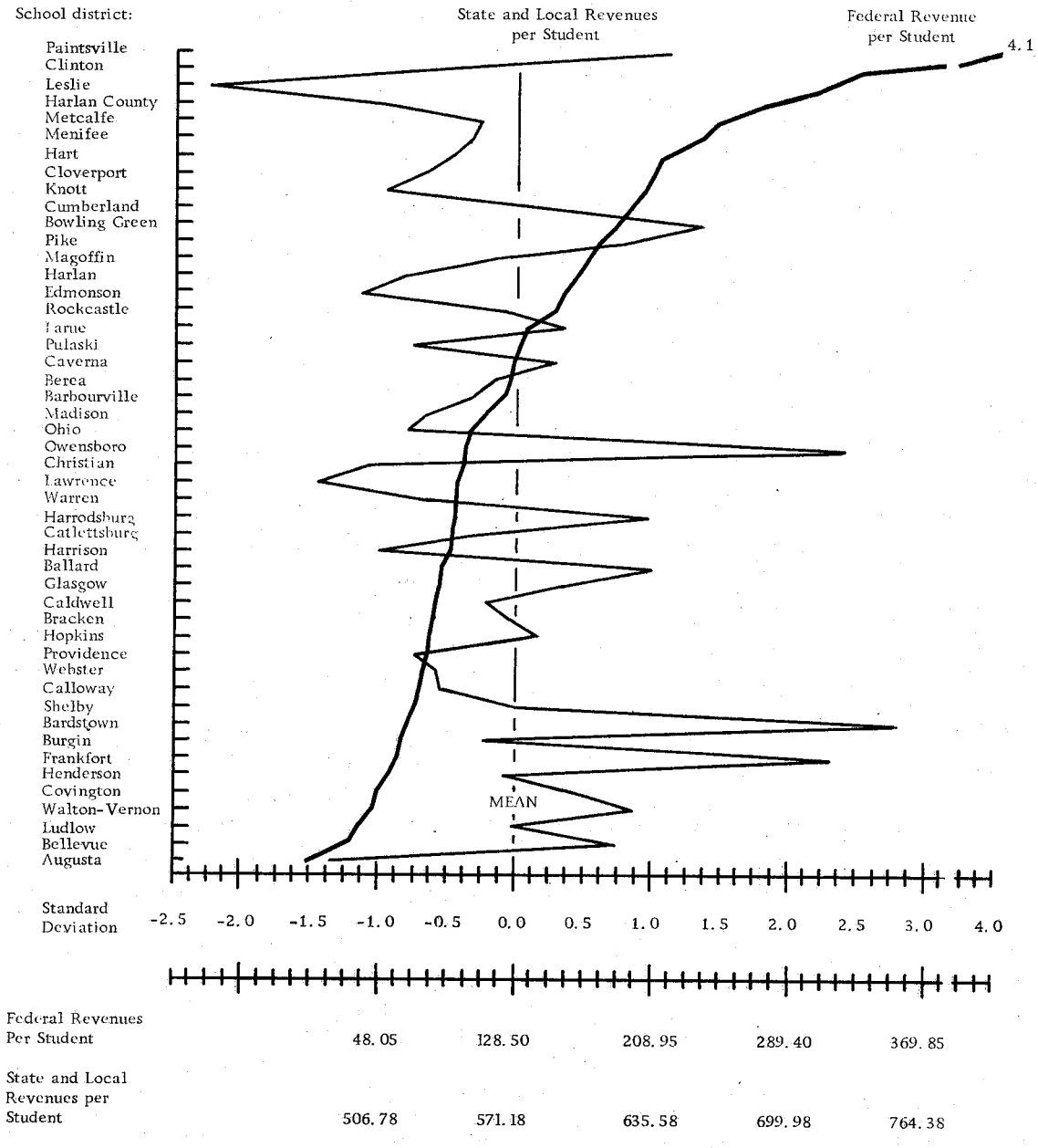
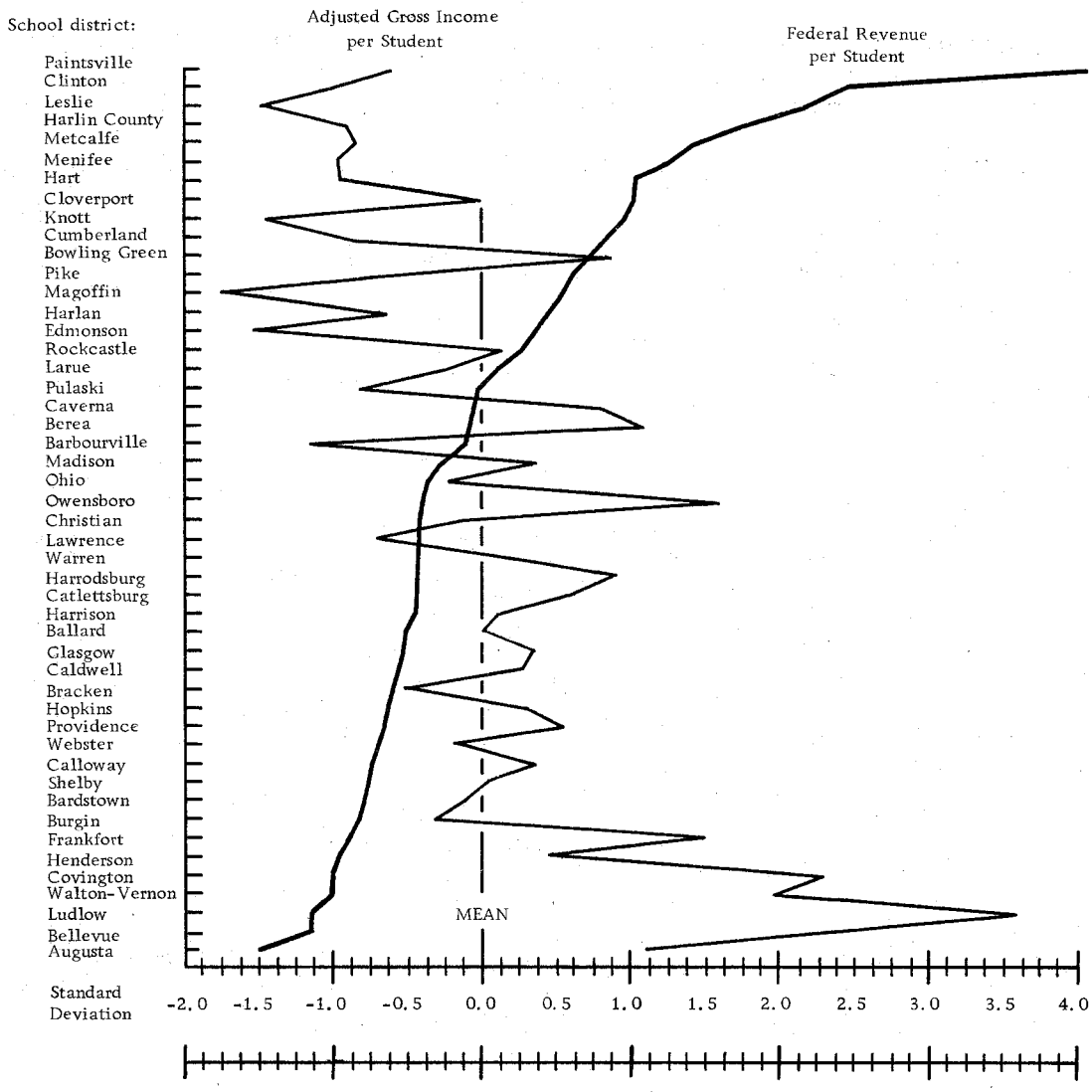


Figure 1. DISTRICT COMPARISON OF FEDERAL REVENUES AND THE SUM OF STATE AND LOCAL REVENUES PER STUDENT. (SCHOOL DISTRICTS IN DESCENDING ORDER OF FEDERAL REVENUES PER STUDENT.)



Federal Revenues Per Student	48.05	128.50	208.95	289.40	369.85
Adjusted Gross Income per Student	3287.13	6455.99	9624.85	12793.71	15962.57

Figure 2. DISTRICT COMPARISON OF FEDERAL REVENUES AND ADJUSTED GROSS INCOME PER STUDENT (SCHOOL DISTRICTS IN DESCENDING ORDER OF FEDERAL REVENUES PER STUDENT).

defined by the sum of state and local revenues, to receive more, and richer districts to receive less. However, the difference, or variation, in federal revenues among districts that have an approximately equal sum of state and local revenues is sufficiently large that the effect of federal aid is to increase district total revenue variation.[9]

Even though federal aid as a whole increases the variability of total district revenue, it does appear to provide some measure of relief to low income districts. When federal revenues per student (F) were regressed upon per student adjusted gross income (Y) the following equation was obtained:

[9] The Pearson coefficient of correlation between federal revenues and the sum of state and local revenues is -.191, and is significantly different from zero at the .01 level. The relationship between the two variables although negative and significant is apparently sufficiently close to zero to allow the variance of total revenues to increase with the addition of federal aid. The point which clearly emerges from this discussion is that conclusions about the distributive impact of any particular program are likely to be sensitive to the statistics employed.

(1) $\hat{F} = 213.76 - .013Y, \quad R^2 = .27$
(10.83)

t value in parenthesis

For each $1000.00 increase in district adjusted gross income per student federal revenues decreased by $13.00 per student.

The fact that only twenty-seven percent of the variation in per student federal revenues could be explained by variation in income invites comment. Many federal programs are supposedly directed specifically to meet the special needs of financially disadvantaged children. It is possible that district income data are not representative of, or correlated with, the distribution of disadvantaged children. If this is not the case, however, the results in equation (1) indicate that either most federal aid was never really intended to accrue to disadvantaged children or that the distribution plans of certain federal programs are in need of attention.

The distribution of the combined federal program is compared with income in Figure 2. The axis are constructed in the same manner as Figure 1. As before the degree that federal revenues provide compensation to low income districts is measured by the degree to which the respective curves form an X pattern. Although federal revenues are negatively correlated with district per student income the relationship is also characterized by considerable variation for approximately equal levels of income.

The relationship of federal aid and a combination of measures of financial ability, schooling quality, type of district, and population distribution was examined with multiple regression analysis. The included variables were as follows:

X_1 = School district size measured by students in average daily attendance. This variable was included as a proxy to measure the possibility that large districts through administrative specialization are better equipped to obtain federal grants.

X_2 = Adjusted gross income per student.

X_3 = Equalized assessed valuation per student in average daily attendance. This variable is an alternative measure of capacity to support education. It was positively although not highly correlated with income.

X_4 = School district quality ranking. This variable was created by obtaining armed forces qualification tests, college qualification tests, percent of ninth graders who graduate from secondary schools, percent of high school graduates who enter college, and percent of ninth graders who enter college in standard normal form. The normalized scores were averaged and the highest ranked district was accorded the number one [5].[10] It was expected that the distribution of federal revenues would be positively related to poorer quality school districts.

X_5 = Rural-County District.

X_6 = Rural-Independent District.

X_7 = Urban-County District.

X_8 = Urban-Independent District.

School districts were cross-classified according to district organization and population concentration. All school districts in an SMSA were classified as urban. The distinction by district organization was based on county consolidation. Many Kentucky districts have consolidated into single county units but some independent city and town districts remain. Although there was no strong expectation of sign on the location-organization variables there was some feeling that schools organized as independent districts located in non-urban areas might be less informed of the availability of federal funds and therefore would be characterized by less federal funding.

Y = Federal revenues per student.

The following equation was obtained from the regression analysis:

(2) $\hat{Y} = 135.437 + \underset{(1.70)}{0.00124X^*_1} - \underset{(3.32)}{0.00750X^*_2}$
$- \underset{(2.64)}{0.00145X^*_3} + \underset{(2.71)}{0.34797X^*_4} + \underset{(1.41)}{42.76257X_5}$
$+ \underset{(1.81)}{55.90149X^*_6} + \underset{(1.13)}{36.81653X_8}, \quad R^2 = .36,$

t values in parenthesis,

*Significantly different from zero at the .10 level.

Coefficients X_1 through X_4 had the expected signs and were significantly different from zero at the .10 level. The evidence indicates that on a per student basis the larger districts were more successful in obtaining federal revenues. However, the relative advantage was small. For a thousand student increase in district size the advantage in increased federal revenues per student was only $1.24.

All coefficients associated with financial ability indicated a negative relationship between district wealth and federal revenues. The size of the coefficients, however, was relatively small. Federal revenues decreased by $7.50 per student for each

[10] A more desirable measure of schooling output would have been mean achievement test scores. However, scores from only a limited number of districts were available from state sources.

$1000.00 increase in per student adjusted gross income, and for each $1000.00 increase in assessed valuation, per student federal revenues were smaller by $1.45 per student.

Federal revenues were inversely related to the quality ranking of school districts, i.e., lower quality schools received greater federal revenues. A ten point decrease in quality ranking resulted in an increase of $3.48 in federal revenues per student.

The effect of the variables representing district organization and geographic location was mixed. Contrary to expectations, the urban consolidated districts rather than the rural independent districts were disadvantaged in procurement of federal revenues. Only the coefficient representing rural-independent districts was significantly different from zero at the .10 level. Districts in this category were estimated to receive $55.90 more federal revenue per student than urban-county districts (the omitted dummy variable). Rural-county districts and urban-independent districts were also characterized by large positive coefficients.

The variation in federal revenues explained by variation in the independent variables included in equation (2) was 36 percent, most of which was accounted for by variation in income. In other words the majority of the variation in federal revenues cannot be accounted for by district size, X_1, financial need, X_2 and X_3, academic need, X_4, district type or location, X_5 - X_8.

It is possible that data in the form of district averages do not provide accurate measures of within district situations and that the study has simply used inadequate data. If this is not the case, then the objectives of federal aid to education and/or the functioning of the distribution plans at the district level may be in need of review.

CONCLUSIONS

The purpose of this study was to examine the distributional impact of federal aid to education. District data from Kentucky were employed and only the combined effect of the federal program was examined. Federal revenues were not found to be distributed in a manner which provided greater equalization of total per student district revenues. Precisely the opposite was the case, as the impact of federal revenues was to considerably increase district variance about the mean.

Federal revenues were negatively related to district adjusted gross income per student and the correlation between income and federal aid was higher than any of the other variables in this study. If adjusted gross income is an adequate measure of need, Tweeten's hypothesis about the perverse nature of the distribution of federal benefits does not seem to be true for federal aid to education in Kentucky. Also, rural-independent rather than urban-consolidated districts seem to have fared better in obtaining federal revenues.

Perhaps the most important finding was that very little of the variability in federal revenues could be explained by any of the measures of academic need, financial need, district organization, or geographic location developed for this study. Either the objectives of the federal aid program are not well related to these measures or there is a good deal of program slippage.

Quite clearly the objectives of federal aid to education need to be continuously evaluated in light of the best educational research. The distribution plan should then be designed to assure achievement of the objectives of the program. If the objective of the current program is to promote greater equalization with regard to the distribution of total revenues per student the current distribution plan is not achieving that objective.

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