A DESCRIPTIVE ANALYSIS OF THE RELATIONSHIP BETWEEN ENROLLMENT SIZE AND EDUCATIONAL EXPENDITURES OF KANSAS PUBLIC SCHOOLS ALLOWING FOR VARIABLES INFLUENCING COSTS

By

HARVEY JAYHUE WATSON

Bachelor of Science in Education
Pittsburg State University
Pittsburg, Kansas
1970

Master of Arts
Pittsburg State University
Pittsburg, Kansas
1973

Education Specialist
Pittsburg State University
Pittsburg, Kansas
1979

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
DOCTOR OF EDUCATION
May, 1982

A DESCRIPTIVE ANALYSIS OF THE RELATIONSHIP BETWEEN ENROLLMENT SIZE AND EDUCATIONAL EXPENDITURES OF KANSAS PUBLIC SCHOOLS ALLOWING FOR VARIABLES INFLUENCING COSTS

Thesis Approved:

Kenneth St. Clair
Thesis Advisor

Carl R. Anderson

Robert Fossett

Russell Olson

Norman N. Durham
Dean of the Graduate College

PREFACE

This study is concerned with presenting a descriptive analysis of the Kansas public school finance system. The primary objective is to determine the relationship between enrollment size and educational expenditures while allowing for variables that influence the cost of the educational programs. Part of the descriptive analysis is presented in the form of plotted means graphs to study the correlation between enrollment size and variables of educational costs. A second part of the analysis is a multiple regression technique to discover which of the selected variables have the most influence upon educational costs.

The author wishes to express his appreciation to his major adviser, Dr. Kenneth St. Clair, for his guidance and assistance throughout this study. Appreciation is also expressed to other committee members, Dr. Patrick Forsyth, Dr. Carl Anderson, and Dr. Russell Dobson, for their invaluable assistance in the preparation of the final manuscript.

Special gratitude is expressed to my wife, Linda Kay, for her understanding, encouragement, and many sacrifices.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure Page

CHAPTER I

THE PROBLEM AND ITS SETTING

The Background Information

In the United States, education is considered a state function. Article 6, Section 1, Constitution of the State of Kansas (1977) states:

> The legislature shall provide for intellectual, educational, vocational and scientific improvement by establishing and maintaining public schools, educational institutions, and related activities which may be organized and changed in such manner as may be provided by law (p. 15).

In keeping with this mandate, the Kansas legislature created a state system of public school districts and delegated substantial decision making authority and tax-levying powers to local school boards.

As the population of Kansas grew, thousands of school districts were formed. By 1945, approximately 8,243 school districts existed, a number too large for the population. Kansas school district reorganization legislation was enacted in 1945 creating county committees empowered to reorganize school districts without a vote of the people concerned. Between 1945 and 1947, over 2,600 school districts were eliminated (Hooker and Mueller, 1970). The 1963 new reorganization act provided the first unification act that was designed to encourage reorganization. The impact of the 1963 act can be fully appreciated by observing that between 1964 and 1968, 183 non-operating districts were eliminated; the number of districts maintaining only elementary schools was reduced by 1,079; and the number of districts

maintaining only secondary schools decreased by 296 (Hooker and Mueller, 1970).

The constitutional mandate for a uniform school system and the legislative establishment of local school districts assumed that local districts of Kansas have the resources necessary to operate adequate educational programs. Yet school districts differ widely in many characteristics which may contribute to the costs of educational programs. Included among these are variations in district wealth, enrollment size, geographic size, and enrollment fluctuations.

District wealth, as measured by the average adjusted valuation per pupil plus the average taxable income per pupil, varies widely among Kansas school districts. On a statewide level, the 1980-81 average adjusted valuation per pupil varied from a low of $11,549 to a high of $368,766. The median was $68,305. The average taxable income per pupil ranged from a low of $4,393 to a high of $27,540, with a median of $13,487 (Unified School District Wealth, 1981). The district wealth (average adjusted valuation plus average taxable income) per pupil ranged from $20,555 to $388,324 with a median of $80,603. Such wide differences in district wealth would cause unacceptable inequities in school district programs if the programs were totally funded by local property taxes.

A second factor influencing the cost and breadth of the educational program a school district can offer is the total number of pupils served. Generally, a district with few students cannot provide as many optional curricular offerings as can a large district. Kansas school district enrollment in 1980-81 ranged from a low of 82 pupils to a high of 42,350 with a median of 572.65 pupils (Unified

School District Report on Enrollments and General Fund Budget Per Pupil, 1981). The number of school districts with an enrollment under 500 student population was 133. Thirty-two of these districts did not receive any state aid. The 1980-81 Kansas educational statistics listed 95 districts with less than 400 student population, 164 districts with 400 to 1,600, and 47 districts with 1,600 and over. Kansas has a total of 307 unified school districts. Fort Leavenworth, Unified School District 207, was excluded from most of the statistics: because of the school's unique situation, the Kansas legislature makes an annual appropriation to this district from the state general fund.

School district area is a third factor which may affect program cost and breadth. A large difference in geographic sizes of Kansas school districts exists from the small sized district of a few square miles to the large geographical district encompassing an entire county. Some districts have combinations of characteristics which result in extra costs, but their needs may be difficult to meet through a general financing formula. For example, a district with small enrollment but serving a large geographical area may have high per pupil costs from transportation, if the student residences are widely distributed throughout the district. The district may also have high per pupil instructional costs due to a necessarily low pupil/teacher ratio. The problem may be further compounded by the relative attractiveness of the area; whether it is a sparsely populated area, whether it is near a large city, or whether it contains any cultural or recreational attractions. These problems occur in many of the Kansas districts, since Kansas, as the major wheat farming state, encompasses an area roughly containing 80,000 square miles.

A fourth factor, enrollment fluctuation, can in some instances intensify a district's financial problems. Statewide, enrollment declined from 502,730 total student population in 1970 to 396,644 in 1980, a decline of 106,085 or approximately 21 per cent. The enrollment declined from 404,598 to 396,644 in one year, from 1979 to 1980 (Unified School District Report on Enrollment and General Fund Budget Per Pupil, 1981).

These four factors and other variations cause differences in the quantity and quality of education available to the youth of Kansas. First, Kansas school districts vary greatly in property wealth, enrollment and geographical size, and enrollment fluctuations. Secondly, the State's constitutional mandate to establish and maintain public schools requires the legislature to compensate for these differences and assure that all students are offered an adequate educational program, and thirdly, the wide variation in the actual general fund property tax rates among the school districts produces inequity among taxpayers. The tax rate a Kansan pays is determined by the school district in which he resides. In 1980, such tax rates ranged from 9.17 mills to 68.73 mills, a difference of 59.56 mills. The median rate was 40.13 mills and the mean was 37.26 mills (total general fund levies of all districts divided by the state total assessed valuation). The current method of financing schools in Kansas is relatively uniform and equitable, yet great expenditure disparities are widely found among Kansas school districts. The state has a more equitable system of educational finance when compared to some other systems, yet current methods can be improved through research.

Statement of the Problem

A comprehensive approach to measuring equity in Kansas school finance was needed. Whether equality or inequity existed among the school districts needed to be determined and reported for taxpayer understanding. A study was needed that analyzed the finance system from more than just a cost-per-pupil basis; variables influencing educational costs needed to be assessed, analyzed, and evaluated.

Purpose of the Study

The primary purpose of this study was to assess and measure the differences in the cost of educational services and the differences in the distribution of funds to Kansas public schools and to report the results of the relationship between school enrollment size and the following selected variables which directly influenced the cost of education:

1. Tax rate of a school district (mill levy)
2. Adjusted valuation per pupil (four-year average)
3. Taxable income per pupil (four-year average)
4. Number of courses offered in high school
5. Pupil/teacher ratio
6. Instructional costs
7. Administrative costs
8. Energy costs (heat and electricity)
9. Special needs of a district (bilingual education, vocational education, and special education)
10. Transportation costs
11. Number of attendance centers in district
12. Local effort rate of district

13. Transportation aid per pupil

14. Pupils transported over 2.5 miles

15. Density of district (transported students divided by square miles of district)

16. Geographical size of district (square miles)

17. Equalization aid per pupil

18. Percentage of local and state money to total budget (ratio)

19. Non-public school enrollment in district

Scope and Limitations

This was a status study of the public elementary and secondary schools in the state of Kansas. The study included the following scope and linitations:

1. Only data for the 1980-81 school year were included.

2. All 306 Kansas public schools were studied regardless of classification or accreditation. (Fort Leavenworth, the 307th school district, was excluded from the study because of lack of sufficient data).

3. All data were obtained from the Kansas State Department of Education.

4. In investigating the influence of non-public schools in a district, only the enrollment of the non-public schools was used.

Definitions of Terms

Adjusted valuation is the sum of (1) the assessed valuation of rural and urban locally-assessed real property raised to an assessment level of 30 per cent based on the rural and urban assessment-sales ratios and (2) the actual assessed valuations of tangible personal property and state-assessed property, which are presumed to be

assessed at 30 per cent (Mill Levies of the 306 Unified School Districts of Kansas, 1980).

General Fund Tax Rate is the actual general operating levy reported by the county clerk.

Adjusted Rate is the millage rate that would be required, if locally-assessed property were assessed at 30 per cent, to raise the same dollars as produced by the actual rate.

Enrollment or Enrollment Size means a total of all students regularly enrolled in any of grades kindergarten through twelve of a district on September 15 of that year.

Full Time Equivalency Enrollment means a sum of all students attending school including any student who is not regularly enrolled full-time. Any student who is not regularly enrolled full-time is counted as that proportion of one pupil to the nearest one-tenth that his regular enrollment bears to full-time enrollment. A pupil enrolled in kindergarten is counted as a half-time student. The study used full-time equivalency enrollment as reported by the Kansas State Department of Education; however, the term used in the study was "enrollment size" to avoid confusion with geographical size or with the concept of full-time equivalency enrollment, abbreviated FTE.

Average Adjusted Valuation means the average of the last four year's assessed valuation adjusted to 30% assessment.

Average Taxable Income means the average of the last four year's residents' taxable income filed in each calendar year.

Total Wealth or Total District Wealth means average adjusted valuation plus average taxable income.

Density or Index of Density means the number of pupils who, on

September 15 of the current school year, are residing in the district and living 2.5 miles or more by usually traveled road from the school house they attend and for whom transportation is being made available on regular routes by the district, divided by the number of square miles of territory in the district.

Significance of the Study

The study presented a comprehensive method of assessing and measuring the adequacy and equity of the Kansas school finance system. The measures developed in this study were based on all the data obtained from the educational records of the Kansas State Department of Education. The study provided an analysis based on what actually occurred in the public schools utilizing actual expenditures and distributions of money among 306 Kansas school districts during the school year 1980-81.

CHAPTER II

REVIEW OF THE LITERATURE

The concept of economy of scale is one approach for assessing and measuring the differences in the cost of educational services. Economy of scale has been used by researchers to investigate the influence of size upon cost with the basic assumption that a small school costs more to operate than a larger one. The two variables are school size measured by the number of students enrolled and expenditures per pupil. An investigation into the size-cost relationship of public schools will theoretically produce a curvilinear relationship somewhat in the shape of a "U" formation. This U-shaped curve indicates that the small schools will have the greater cost per pupil, and as the enrollment size of the schools increases, a point is reached where the costs are minimized at an optimum size. But as the enrollment increases beyond the optimum size the cost per pupil again begins to increase producing a U-shaped curve. The economy of scale is based on the cost-per-pupil and does not consider the isolated and essential school located in a sparsely populated area, nor does the economy of scale consider the educational needs of a school district.

Economy of scale was part of an analysis in a study conducted by Webb (1979) of 385 school districts in Arkansas. His study revealed the expected U-shaped curve. Webb reported that the average cost per pupil declined as the size or enrollment of the school district

increased until at a point of optimum size the per pupil cost began to rise again. The cost per pupil in schools enrolling less than 100 students was $1,070 compared to $717 cost per pupil in schools of 1,000-1,499 enrollments. The large districts enrolling 10,000 or more students were spending an average of $202 more per pupil than the schools of the 1,000-1,499 enrollment range.

The enrollment of a school district is related to the economic efficiency with which it produces educational service. Johns, Alexander, and Jordan (1972) report that the enrollment size of a school district is a crucial factor because size can affect the economic efficiency with which it produces educational services even if the school is allocatively and technically efficient. One diseconomy associated with small school districts is primarily related to the fact that small school districts are forced, from economic and educational necessity, to operate with a lower pupil/teacher ratio than larger schools in order to provide even minimum educational programs and services. The lower pupil/teacher ratio increases the cost per pupil for instructional salaries.

This point is emphasized by the Arkansas study of 385 school districts conducted by Webb (1979). The average pupil/teacher ratio varied from 10.25 for the 0-99 enrollment schools to 21.35 for the 1,500-2,499 enrollment schools. The diseconomies of the large schools were revealed by a slight decrease to a 19.35 pupil/teacher ratio at the 10,000-49,999 enrollment districts. Hall (1968), in a similar study of 200 public high schools from districts in all 75 counties of Arkansas, found that an enrollment size of 450 to 1,000 students was needed to obtain a pupil/teacher ratio range of 20/1 to 26/1. Webb's

study revealed that the average instructional cost for districts of less than 100 students was almost twice that of districts in the optimum range of 1,000-1,499. The diseconomies of the larger districts were indicated by the fact that even though the pupil/teacher ratio was higher, the average instructional costs in the largest districts were over $100 more than that of the 1,000-1,499 sized districts.

Webb also investigated the U-shaped cost curve as it plotted the relationship between school district size and administrative costs. The administrative cost per pupil decreased as enrollment increased until the optimum range of 1,500-2,499 was reached. With some variance the trend of the administrative costs continued to increase. The average administrative cost per pupil in districts with less than 200 students was about twice the amount of districts in the optimum range. Johns, Alexander, and Jordan (1972) state that the reason for increased costs as a function of enrollment is that the existing organization and technology of schools cannot be administered efficiently at very low or very high enrollment levels. Difficulties of governing and administrating large units are the reasons cited for the increased per pupil cost of the large districts.

The size-cost relationship becomes increasingly difficult to observe as districts become larger and more complex. Hanson (1963), in his study of 577 districts located in nine states, utilized enrollments ranging from 1,500 to 846,616 pupils. He used school district enrollment and a unit cost residual. The unit cost residual was obtained by adjusting current expenditures per pupil for the influence of certain characteristics of the adult population upon expenditure levels. The findings of his study support the concept of

economy of scale among districts enrolling over 1,500 pupils. The unit cost residuals were found to decline with increasing district size up to an optimum whose median was about 50,000 pupils. In six of the nine states, unit costs were found to rise when district enrollment exceeded the optimum. Hanson concluded that the uniform decline in unit costs up to an optimum size, followed by an upswing in costs when the optimum size is exceeded, provided tentative empirical support for the concept of a curvilinear relationship between district size and unit costs.

Webb (1979) pointed out that the school district size is not an absolute, but that the optimum size of a school district will vary from state to state. He emphasized that enrollment size is but one of the many factors related to educational quality and operational efficiency. Both Hanson (1963) and Webb (1979) state that as school districts increase in enrollment size, the per pupil cost of instruction and administration decreases, first rapidly, then more slowly levels off, and finally begins a slow increase as the school enrollment increases.

Osburn (1970) recognized that other variables or factors often influenced expenditures per pupil. In his study of 433 Missouri high schools, he held constant any variables influencing expenditures per pupil in order to obtain a partial correlation between size and cost. Current expenditures per pupil were specified as the dependent variable, and the independent variables consisted of number of courses offered, tax levy, assessed valuation per pupil as an index of the community wealth, median educational level of residents, geographical categories, enrollment size, enrollment size squared, teacher salaries,

and per cent of students in high school. Using a regression equation to find the net relationship between size and cost, Osburn found that the change in cost from 200 to 500 students was $12.74, from 500 to 1,000 was $16.74, from 1,000 to 1,500 was $11.14, from 1,500 to 2,000 was $5.53, and from 2,000 to 2,244 was $.66 per pupil. Osburn stated that the total net effect of increasing school size from 200 to 2,244 students would result in a savings of approximately $47 per pupil.

In a similar study, Riew (1965) found the total savings would amount to well over $200 per pupil by increasing school size from 200 to 1,675 students. Riew used 109 Wisconsin schools in his study, with the enrollment size ranging from 143 pupils to 2,400 pupils. The study revealed that the average teacher's salary, the percentage of teachers holding Master degrees, average years taught, pupil/teacher ratio, and credit units offered tended to increase as the enrollment size of the school increased. Riew's method to approximate the net relationship between school size and costs was least-square multiple regression analysis. His regression equation included the following variables: cost per pupil, enrollment, teacher salary, number of credits offered, teacher course load, change in enrollment, and percentage of classrooms built after 1950. Transportation costs were excluded from Riew's study, a possible explanation for the large difference in per pupil expenditures.

As Osburn (1970) pointed out in his study, the cost of transportation influences the total cost per pupil, especially in the sparsely populated rural area. White and Tweeten (1973) investigated both transportation and size economies in their study. By surveying school children in Oklahoma, information on the relationship between

family background schooling factors and academic achievement was obtained. Production functions identifying the relationship between schooling inputs and schooling outputs were estimated. The unit cost curves were derived for instruction, administration, plant operation and maintenance, buildings, equipment, and transportation. Optimal school district size, derived by combining these unit cost curves, varied by educational program and student density. Transportation costs were separately calculated as a function of hypothetical levels of student density. Transportation costs and education costs were vertically summed to obtain the long-run average total cost curve. The minimum point on the curve identified optimal school size. Separate curves were constructed for different student densities. White and Tweeten found the flatness of the curve between 400-1,100 pupil enrollment. Within this range schools could operate without significant differences in per-unit costs, and schools operating outside this range faced substantially higher costs.

Holland and Baritelle (1975) criticized the White and Tweeten study because their hypothetical district was assumed to have a square road grid system, and students were assumed to be dispersed evenly throughout the district. Holland and Baritelle state that only the possibility of one central school was considered by White and Tweeten. These assumptions place undue limitations on the analysis because typical road systems are not square and students are not evenly dispersed. To account for these complexities, Holland and Baritelle developed a separable programming model to study reorganization using Lincoln county in Washington state. Lincoln county, 43 to 53 miles, has nine school districts. The population density

is 4.08 individuals per square mile. The nine towns range in size from 405 to 1,370. The desired solution was to find the least-cost pattern of transporting and educating students while meeting any constraints on student location and schooling capacity. The objectives of the Holland and Baritelle study were to investigate the relationship between internal schooling economies and transportation costs with regard to the question of rural school consolidation. They concluded that consolidation cannot be counted on to provide large cost savings in sparsely populated rural areas. Cost savings were equal to only approximately 1.3% of the annual schooling and transportation budget.

Kiesling (1967) attempted to isolate the influences of pupil intelligence and socio-economic background in his study of 97 school districts in New York state as he investigated the relationship of educational performance to pupil expenditure and to size of the administrative unit. His basic model attempted to explain average school district pupil achievement in basic subjects by measuring pupil intelligence with a widely used intelligence test. He included the following variables: socio-economic attributes of the community in which the school district finds itself, per pupil expenditures, school district size, and past rates of school district growth. He also placed the school districts into three geographical categories: urban, village, and rural. Kiesling discovered that size of school district is negatively related to performance, if at all, and expenditures are related strongly to performance only in larger school districts. Performance in small school districts, defined by Kiesling as schools under 2,000 pupils, was found to be highly unpredictable.

Variables chosen for empirical studies are sometimes selected

merely because previous studies have used the same variables. Denzau (1975) conducted an empirical survey of studies on public school spending, investigating 13 empirical papers all using regression analysis. He concluded that specifically modelling a theoretical explanation of school spending has been of little value as yet. Denzau stated that the three best variables are secondary school per cent of total students enrolled, the tax base per pupil, and density. He found income was insignificant only when the property tax base or equalized assessed value per pupil was used. He included a variable derived from the percentage of revenue from non-local sources and the amount of teachers' salaries. Three variables were considered irrelevant: race, parents' education, and any attempt to measure migration of school students. More confidence could be attached to the results of scale economies, but district size was generally insignificant as was the need factor, measured by the percentage of population age five to 17, sometimes called the load of a school district. Denzau stated that none of the 13 models could explain the variations in per capita spending. Per pupil spending was a much easier variable to fit. As between the two measures of per pupil spending, the current spending per pupil less busing costs could be explained much better. Since the difference between the two is the subtraction of busing expenditures, Denzau suggested that future studies treat the two items separately. He also found state aid as a consistent variable and the effect of the private school variable was always significantly positive:

> Our results imply that a school district with 11% of its children in private education will spend about $3 more per pupil in the public schools than a district with 10% of its children in private schools (p. 247).

Denzau concluded his study by stating that the study of public school spending has proceeded in a disjointed fashion, with no explanatory, theoretical paradigm being generally accepted. Denzau concluded that his study of the 13 empirical papers on school financing might provide guidance for future research.

To measure the differences in the costs of educational services associated with school input price variations that are beyond the control of the local decision-makers, Chambers (1981) studied the local public school districts in California. The product of his work was an index designed to adjust the distribution of state aid to local districts to reflect differences in prices of school inputs. Differences in the costs of education were defined in terms of the differences in expenditures necessary to provide any given number of students with the same combinations and kinds of school inputs. A cost index for educational services was calculated by pricing out the same kinds and combinations of school inputs across all school districts within the state. Rather than using a cost-of-living index in local school districts, Chambers used an alternative method of examining the sources of variations in the prices of school inputs, isolating that portion of the price variations due to factors outside local control, and using these indices of uncontrolled variations in input prices priced out a standard market basket of school inputs. His goal of the analysis of educational cost differences was to develop an index that reflected the differences in expenditure per pupil required for two districts facing differing prices of school inputs to provide equal levels of educational services. The categories of school inputs purchased by local school districts included all certificated

personnel, all classified personnel, and nonpersonnel school inputs including energy services and transportation. Multivariate regression equations were performed to explain the variations in the salaries of the various categories of certificated and classified personnel and the expenditures for transportation services. The factors included in the overall analysis of variations in salaries of school personnel included personal characteristics, job assignment characteristics, and the characteristics of classrooms, schools, districts, and regions. The transportation services included such factors as number of pupils transported, miles traveled for field trips, number of pupils per square mile in the district, the cost of bus drivers, per cent urban population in the county, and the population density in the county. These explanatory variables were divided into two categories: those within local control and those outside the control of local decision-making. Chambers concluded that the larger urban districts exhibited relatively higher costs than suburban districts which, on the average, exhibited relatively higher costs than rural districts. He also established that for the vast majority of districts, differences in educational costs were mainly determined by differences in school personnel costs.

Hirsch (1960) sought to identify the determinants of expenditures for public education and to explain their relative importance. His study attempted to design a framework within which the determinants could be identified, measured, and rated. Hirsch's working model included the following variables: total current expenditures plus debt service, number of pupils, per cent increase in public school pupils from 1951-56, average assessed valuation of real property per pupil,

and index of scope and quality of education. The scope and quality index was composed of six subindices: number of teachers per 100 pupils, number of college hours of average teacher, average teacher salary, per cent of teachers with more than ten years experience, number of high school credit units, and per cent of high school seniors entering college. Hirsch observed that the variables included information dealing with the population size, sociological characteristics, physical characteristics, economic characteristics, and a simplified scope and quality index. In order to test the hypothesis that economies of scale were present, he assumed that the net relationship between per pupil expenditures and the number of pupils was U-shaped. With the aid of multiple regression and correlation techniques, his working model was tested for the 27 school districts in the St. Louis County area. He included data for two different periods: 1951-52 and 1954-55. A district's financial ability to afford education, measured in terms of per pupil assessed valuation of real property, was by far the single most significant determinant. Hirsch stated that the most important finding was the absence of significant economies of scale: growth or consolidation alone are unlikely to have significant effects on per capita expenditures. Hirsch also divided the total budget into seven dependent variables: total current expenditures plus debt services, total current expenditures without debt service, per pupil expenditures for general control, per pupil expenditures for instruction, per pupil expenditures for auxiliary services, per pupil expenditures for plant operation and maintenance, and per pupil expenditures for fixed charges. His other variables included: enrollment, enrollment squared, per cent of high school students, per cent increase

in students, and average assessed valuation of real property per pupil. Hirsch stated that his study could not find significant economies of scale and he suggested that consolidation was unlikely to solve the fiscal problems of schools in urban America.

Size economies of school districts can have important policy implications in areas as consolidation, population and reorganization, and population age adjustments. Fox's (1981) article investigates key dimensions of more than thirty studies which have attempted to measure the importance of size economies for school districts. He emphasized their theoretical, methodological, and empirical basis. Fox found most of the studies were empirically oriented rather than theoretically oriented. Failure to develop a theoretical base to adequately describe the behavioral relationships within which the schools operate may lead to incorrect inferences regarding whether size economies do or do not exist. By examining the theoretical framework, Fox classified the size economies research into five groups: ad hoc expenditure functions, cost functions, production functions, derived expenditure equations, and identified models. Fox pointed out the lack of sufficient data on input measures such as student inputs, native intelligence and effort, the student's home environment, and the school inputs of labor and capital. Measures of capital such as square feet of building space and building value should be included in any study. Failure to include capital in the regression equation would cause a specification error in the estimated equation. Fox stated that the impact of school size on the quality of education was still questionable. Results have not been conclusive.

The review of literature revealed that further study was needed

in the field of school financing and that many variables should be carefully considered before beginning a study. The literature exposed such variables as transportation costs, which unless controlled, would bias the results of an expenditure analysis. As Denzau (1975) revealed in his study, the presence of a private school in a school district might raise the total per pupil cost of education for that district. A multiple regression method for investigating and identifying the net relationship between expenditures per pupil and the enrollment size of a school system could be revised and extended to include all variables or factors influencing expenditures per pupil. As many variables that can be identified must be held constant to obtain a correlation or net effect between enrollment size and expenditures.

In summary, the review of literature revealed many variables influencing educational costs that were used by the researchers of public school finance. All the variables used by the researchers can be placed into three categories: those variables that would describe an individual school, those variables that would describe an individual school district, and those that describe educational expenditures. The category of variables describing an individual school would include the number of courses offered, enrollment size, enrollment size squared, per cent of students in high school, teachers holding Master degrees, average years of teaching experience, pupil/teacher ratio, teacher course load, student achievement, miles traveled for field trips, number of college hours of teachers, percentage of high school seniors entering college, and building value and building space.

The category of variables describing an individual district would include the assessed valuation per pupil as one measure of community

wealth, parents' education and background, geographical location and area, the change or fluctuations in student enrollment, percentage of new construction, socio-economic attributes of the community, the past rate of school district growth or decline, tax base per pupil, race of parents, number of non-public students in district, cost-of-living index, the density of the district both student and total population, and the per cent of urban population.

The third category of variables describes educational expenditures and includes teachers' salaries, cost per pupil, instructional costs, administrative costs, plant operation and maintenance costs, amount of state aid, all classified personnel costs, total current expenditures without debt service, total current expenditures with debt service, energy costs, and bus driver and transportation costs.

In selecting variables from the review of the literature, the researcher hypothesized that no relationship existed between enrollment size and expenditures per student in the Kansas public schools when allowing for other variables influencing the educational costs. From the category of variables describing the individual school, the researcher selected enrollment size as one of the dependent variables for the study. The second dependent variable selected was expenditure per pupil: this dependent variable was used in the multiple regression equation to determine which independent variable or which combination of independent variables influenced the expenditure per pupil the most.

The variables selected from the individual school category were enrollment size, number of courses, pupil/teacher ratio, and the number of attendance centers in the district. The State sets the minimum number of courses offered in a district; therefore, the number of

courses in the small school must be maintained at a certain level. The researcher wanted to examine the effect of this mandate on the small schools. Closely related to the number of courses offered is the number of certified personnel to teach these courses. This variable can be expressed by the pupil/teacher ratio. The last variable selected from the category was the number of attendance centers in the district. The research assumed that the number of attendance centers would be directly related to energy costs and administrative costs and, therefore, directly increase educational costs. Also the number of attendance centers in a district would remain at a constant number thoughout the small districts, but would begin to increase as enrollment size increased.

From the category of variables that described the individual district, the following variables were selected to be used in the study: geographical size of the area, number of non-public students, the assessed valuation per pupil and the taxable income (district wealth is expressed as valuation plus taxable income), mill levy, density of district, and the number of students transported over 2.5 miles in the district. The assessed valuation and taxable income were selected as variables to measure the district's ability to pay for educational services. The tax rate or the mill levy would measure the amount the district had to tax itself to provide students an educational opportunity. Two other variables were added for the study to examine the local effort rate of the district and the effect of the local effort rate on the total amount of local and state aid money received by the district: therefore, the local effort rate and the ratio of local to state aid money were added as variables. The

density of the district was selected as a measure for urban or rural schools since the density of a district is determined by the number of bus students transported over 2.5 miles. A direct relationship existed among the three variables: density, geographical area, and number of students transported. The researcher selected the number of non-public students to analyze the influence, if any, on the district's total expenditures.

From the third category of variables that describe educational expenditures, the researcher selected the variables dealing directly with the cost of an educational program: instructional costs, energy costs, administrative costs, transportation costs, special needs costs (bilingual education, special education, and vocational education), transportation aid and state equalization aid. The budget per pupil and the expenditures per pupil were the first variables to be measured in relationship to enrollment size, and then each variable was analyzed for its relationship to enrollment size and to the total expenditure per pupil. Each of the variables describing educational expenditures make up a percentage of the total budget per pupil and total expenditure per pupil: each was measured in relationship to enrollment size to determine the economy of scale.

CHAPTER III

METHOD OF ANALYSIS

The concept of economy of scale, used by researchers in school finance literature, revealed one direct approach to assess and to measure the differences in the cost of educational services in the Kansas public school system. Selected variables, describing the individual school characteristics, the district, and the educational expenditures of the district, were measured to determine the economy of scale. Since the main focus of this Kansas public school finance study was to assess and measure the differences in the costs of the educational services and the differences in the distributions of educational funds and to report the results of the relationship between school enrollment size and expenditures allowing for certain variables that influence costs, an economy of scale was utilized as one technique and one method of analysis.

The assumption of the study was that after variables were identified for educational services, allowing for individual characteristics, and recognizing the same kinds and combinations of school expenditures across all school districts, the cost-size relationship would not be significant. The study attempted to identify some nominal variations in school spending during the 1980-81 school year that might be justified on the basis of differing needs of school districts and uncontrollable variations in the prices of school

resources. Therefore, the major hypothesis was that no significant relationship existed between school enrollment size and expenditure per pupil. However, each variable examined by itself and without control of the other variables would produce the expected U-shaped cost curve.

Hypotheses

The major hypothesis was that no significant relationship existed between enrollment size and expenditures for educational services. However, each variable examined by itself and without control of the other variables would produce the expected U-shaped cost curve found in an economy of scale.

In order to test and analyze the major hypothesis, 20 working hypotheses, based on economy of scale, were formulated to examine the problem of analyzing school enrollment size as a factor of school expenditures. The 20 research hypotheses were based on the concept of economy of scale: as school enrollment size increases, educational costs rise proportionally until an optimal range is reached, then as the school enrollment size exceeds the optimal range, costs again begin to rise producing a U-shaped cost-curve.

The 20 research hypotheses were as follows:

1. As school enrollment size increases from zero, the general fund budget of the district will rapidly increase and then slowly level out through the middle enrollment range, and again begin an increase after the enrollment range exceeds 15,000 students. The rationale for the hypothesis is that the budget of the school district ranges from a low of $300,000 to a high of $86,375,000. The combined budgets of the largest enrollment category will increase the curve

even though the four largest schools enroll roughly a third of the total state public school population.

2. As school enrollment size increases from zero, the tax rate per district rapidly decreases, and then slowly levels out to a flat minimum. The rationale for the hypothesis is that the 306 Kansas schools have maintained themselves over a long period of time, and if the tax rate were too high, earlier steps would have been taken to consolidate or reorganize. Plus many of the small schools are located in the larger geographical areas allowing them a greater assessed valuation and, therefore, a lower tax rate.

3. As school enrollment size increases from zero, the adjusted valuation per district rapidly decreases, and then slowly levels out with slight variations. The assumption is that the larger schools are located in denser populated areas with higher valuations. The smaller schools are found in the larger geographical areas, while the middle sized schools will vary in their assessed valuation.

4. As school enrollment increases from zero, the taxable income per district will rapidly increase, and then level off with an upswing in the larger districts. A relationship exists between the amount of taxable income and the population of a district: the larger districts, located in the denser populations of the state will maintain a higher average of taxable income.

5. As the school enrollment size increases, the number of courses offered in high school will first hold steady, then rapidly and steadily increase. The State has a minimum number of courses a district must offer: therefore, after the enrollment has increased beyond the size of schools financially able to exceed the minimum

standards, the number of courses will increase steadily.

6. As the enrollment size increases, the number of pupils per teacher will increase rapidly at first, and then level off with a slight decrease in the larger schools. The assumption is that as the enrollment increases a better balance can be achieved in the ratio of pupils to teachers and, as research has revealed, the larger sized schools experience a slight decline in the pupil/teacher ratio.

7. As the school enrollment size increases, the instructional costs will rapidly decrease at first, and then level off to a minimum and finally begin to increase again. The rationale follows the ratio of pupils to teachers in a district, and the instructional costs will be directly related to the number of teachers employed by the district.

8. As school enrollment size increases, the administrative costs will rapidly decrease at first, and then level off to a minimum, and finally will begin to increase again in the largest districts. The rationale for the hypothesis is that the small schools must expend a fair percentage of their general budget fund for administrative costs; however, as the enrollment size increases the percentage of the total budget spent for administrative costs will decrease. But as the size of the enrollment increases to include districts with many attendance centers, the administrative costs will again be to rise. As the school districts grow more complex with size, administrative costs will again begin to rise as more administrators are required for efficient operation of the school; however, while the total cost of administration, expressed in an amount of money, increases, the percentage of the budget expended for administrative costs will remain the same or slightly lower than the smaller schools.

9. As enrollment size increases, the number of attendance centers will at first hold stable and then increase. The number of attendance centers should be directly related to the number of pupils enrolled, except for those districts which have a large geographical area with many attendance centers, or schools that have consolidated and have maintained many attendance centers within the district.

10. As school enrollment size increases, energy costs will at first hold fairly steady and then rapidly increase. A direct relationship is seen between the number of attendance centers and energy costs. Most schools in Kansas have access to natural gas and utilize this source of energy for heating, and as the rate for heating should be fairly stable across the state, the relationship between enrollment size and energy costs will be directly dependent upon the square footage of the buildings and the number of attendance centers in the district.

11. As school enrollment size increases, the local effort rate will sharply decrease, and then remain fairly constant. The local effort rate is used to determine the principal deduction from the general fund in computing the district's state aid entitlement. The Kansas legislature sets the "norm" local effort rate and changes the local effort rate when necessary to reach agreed upon levels of state assistance to school districts. Basically the local effort rate is determined by dividing the budget per pupil "norm" for the district's enrollment category, after adjustments have been made, into the district's budget per pupil and multiplying by the constant 1.593 which was set by the Kansas legislature for 1980-81. The enrollment categories are: under 200, 200-399, 400-1,599, 1,600 and over, and the

four largest school districts. The "norm" budget per pupil varies from the small to the large enrollment categories: $2,718, $2,718, $2,267, $1,785, and $1,794 for the four largest school districts. Adjustments in the "norm" budget per pupil are made in the 200-399 enrollment category and in the 400-1,599 enrollment category to provide a linear transition for the differences in the enrollments. The adjustments are, for the 200-399 enrollment category, the enrollment of the district minus 200 multiplied by $2.2550 subtracted from the "norm" budget per pupil for that enrollment category; for the 400-1,599 enrollment category, the adjustment is enrollment minus 400 multiplied by $.4017 and subtracted from the "norm" budget per pupil. Since no adjustment is placed on the under 200 category, a decrease is expected after the enrollment passes 200 population.

12. As school enrollment size increases, the transportation costs will sharply decrease, and then level off to a minimum. The rationale is that the smaller schools in the larger geographical areas will incur a higher rate of transportation costs as measured by percentage of the total budget. The largest schools, located in densely populated areas, will have minimum transportation costs and will expend a lower percentage of their total budget for transportion. In amounts of money expended, the transportation costs, after the small schools in the large area, will be proportional to the school's enrollment size. The four largest school districts, located in cities, should have a proportionally lower transportation costs because of the number of pupils residing within 2.5 miles; however, the amount of money expended for transportation will exceed the other school districts.

13. As school enrollment size increases, the transportation aid to the district will decrease, and then level off to a minimum. The aid is directly related to the number of students transported over 2.5 miles, to the density of the district, and to the geographical size of the district. In general, the geographical size of the district will decrease as the enrollment size increases.

14. As school enrollment size increases, the density of the district will increase steadily. Since density is determined by the number of students transported over 2.5 miles divided by the square miles of the district, it would be logical to assume that as the enrollment increases, the density will increase in student population with the exception of those districts with extremely small boundaries and those districts located in cities with attendance centers located within a 2.5 mile radius.

15. As school enrollment size increases, the geographical size of the district will decrease steadily. The school districts with the largest areas are usually located in a sparsely populated region; therefore, the area should decrease as the enrollment increases, with some exceptions.

16. As school enrollment size increases, the amount of state aid will rapidly and steadily increase. The amount of state equalization aid a district needs is determined by the district's wealth; however, in general, the smaller schools receive a smaller amount of state aid due to a higher district wealth and, of course, fewer pupils. Approximately 13% of the smallest sized school districts receive little or no state aid.

17. As school enrollment size increases, the percentage of

pupils transported over 2.5 miles will increase at a constant rate. Most of the small schools depend upon the rural students to make up their enrollment, while the four largest schools have the greatest majority of their students within the 2.5 miles radius.

18. As school enrollment size increases, the per cent of local money received for the general fund budget will rapidly decrease, while the per cent of state equalization aid will at first be fairly insignificant, then a rapid increase in equalization aid will occur with increasing size. The variable is measured in terms of percentage of state equalization to the total general budget: therefore, the amount of equalization aid will increase as the enrollment size increases.

19. As school enrollment size increases, the special needs of a district (bilingual education, special education, and vocational education) will increase at a steady rate, with a slight increase in the largest schools. Many of the smallest schools do not offer any vocational education classes; however, because of their small budgets, a large per cent of their general fund budget must go to special education. Few schools reported any money transferred to the general fund for bilingual programs.

20. School districts having non-public schools located in their district will experience a slightly higher cost per pupil than schools of comparable size without non-public schools within their boundaries.

Design of the Study

Plotted means graphs using enrollment size as the dependent variable were selected as one method of analyzing the Kansas public school finance system. To examine the concept of economy of scale,

the first plotted means graph was to analyze the relationship between enrollment size and the total budget of the district to determine if a cost-curve pattern existed by analyzing the amount of funds that are available to the districts. Then each of the remaining 19 independent variables stated in the working hypotheses were plotted by means where applicable.

Dependent Variable for the Plotted Means Graphs

The dependent variable selected for the plotted means graphs was enrollment size of the school districts. The school districts were placed into the same enrollment categories the State used in determining the school budgets and the state equalization aid. These categories were: under 200 enrollment, 200-399, 400-1,599, 1,600-15,000, and 15,000 to 42,350.

Independent Variables for the Graphs

The independent variables include all of the 20 variables used with the dependent variable, enrollment size, to formulate the 20 working hypotheses. The 20 independent variables were: total general fund budget of the district, tax rate, adjusted valuation, taxable income, number of courses offered, energy costs, pupil/teacher ratio, instructional costs, administrative costs, number of attendance centers, local effort rate, transportation costs, transportation aid, density of district, geographical size of district, number of pupils transported over 2.5 miles, state equalization aid, percentage of state equalization aid to the total budget, special needs of the district (bilingual education, special education, and vocational education), and number of non-public students in district.

Pearson's r Analysis

While the plotted means graphs used the means of the enrollment categories plotted by the means of the independent variable to study the economy of scale, the Pearson's r analysis provided a method of correlating the actual enrollment of the 306 Kansas schools to the actual expenditures of each district. Therefore, the Pearson's r analysis provided a second method of examining the relationship between enrollment size and the selected independent variables of the 20 working hypotheses. The Pearson's r analysis revealed the amount of correlation between the dependent variable and each independent variable, verified the regression line, and allowed a comparison to be made between the regression line and the plotted means graphs' cost-curves of each appropriate research hypotheses. Lastly, the Pearson's r revealed the significance of the relationship between the enrollment size and each of the 20 independent variables.

Multiple Regression Analysis

Multiple regression was the third method chosen for the study. In analyzing the Kansas public school finance system, it seemed essential to introduce appropriate variables into the regression equation to measure the variables which had the greatest influence on the educational expenditures. The method provided an analysis based on the actual expenditures and distributions of money among Kansas school districts. The measures contained desirable technical qualities based on all of the educational data. Data of educational expenditures and distributions were analyzed without examining any individual differences in the average rate of expenditures or revenues among the districts. The variables were directly related to school

costs and educational goals, and the variables were potentially available in all states on a comparable basis.

Dependent Variable for the Multiple Regression

Current expenditures was specified as the dependent variable. Current expenditures was defined as total expenditures minus capital outlay, debt service, and recreational community services. Current expenditures was selected as the dependent variable because total expenditures would include expenditures that reflect past construction or past events on local school spending. Also current expenditures as the dependent variable would reveal from the multiple regression which independent variables had the greatest influence on educational costs. These variables could then be closely analyzed in their relationship to enrollment size.

Independent Variables of the Multiple Regression

1. Tax rate was used to represent a component of demand for educational services.

2. District wealth was used as an index of community wealth. Such a variable would indicate ability to pay for educational services and programs. District wealth was actually the sum of two variables: assessed valuation and taxable income.

3. Number of courses offered in high school represented the breadth of the curriculum and an index of quality. The number of courses should also relate directly to the pupil/teacher ratio.

4. The instructional costs, represented by teachers' salaries, were derived from educational data printed by the Kansas State Department of Education: Percentage of Line Items of General Fund Budgets for USD's: 1980-81 (1980). The data were a summary of the

districts' budgets, and line 213 of the budgets listed the total teachers' salaries of the district.

5. The cost for administration was hypothesized to be positively correlated with pupil expenditures. The total 100 series of the Kansas school budgets were used as data. These three line items included 110 (administrative salaries), 120 (contractual services), and 130 (other). The 100 series included some secretarial salaries, school board fees, board expenditures, legal fees, auditors, etc. No attempt was made to divide the 100 series into categories because all the items reflected the administrative expense of the district. Line 211 (principals' salaries) was added to complete the total of the administrative costs variable.

6. The number of attendance centers in the district was hypothesized to be positively correlated to administrative costs, pupil expenditures, and energy costs. The data were obtained from the Kansas School Directory (1981).

7. The cost for energy was taken from lines 630 (heat) and 640b (electricity) of the Kansas school budget reports.

8. Local effort rate reflected one component of demand for education and the ability to pay for service. Local effort rate was determined by dividing the budget per pupil "norm" for the district's enrollment category into the district's budget per pupil after adjustments were made and multiplying by a 1.593 constant. The "norm" budget per pupil, the adjustments, and the constant were determined by the State and can be changed annually if deemed necessary.

9. Transportation costs data were obtained from the Transportation Report for Unified School Districts (1981).

10. Transportation aid data were obtained from the same source as the transportation costs data. The number of pupils transported over 2.5 miles and the density of the area determined the amount of transportation aid.

11. Density was defined as the number of pupils transported over 2.5 miles divided by the number of square miles in the district to give a density index. Therefore, density, number of pupils transported over 2.5 miles, transportation aid, and geographical size of the area were all directly related.

12. Geographical size of the district contained the number of square miles of the school district.

13. Number of pupils transported over 2.5 miles was directly related to transportation aid and geographical size. The percentage of pupils transported over 2.5 miles could be used as a factor to determine rural or urban schools, transportation costs, and total expenditures.

14. Amount of state equalization aid was hypothesized to be positively correlated with geographical size of a district, with the enrollment size, and with the wealth of a district.

15. The per cent of state equalization money to the total budget was hypothesized as being directly related to school enrollment size: the larger the school district in enrollment, the larger the per cent of state equalization aid to the total budget.

16. The cost to provide special needs for the district was determined from the amount of money transferred to special education, bilingual education, and vocational education. These three reported amounts of transferred money were summed to provide the special needs

variable.

17. The pupil/teacher ratio contained an index of quality as did the number of courses offered to determine the breadth of the curriculum.

18. Non-public school enrollment data were obtained from the Kansas Educational Directory (1981).

Statistical Techniques

The selected data were collected from reports issued by the Kansas State Department of Education, and the selected data were coded and keypunched. Many of the variables dealing with educational costs were taken from the report Percentage of Line Items of General Fund Budgets for USD's: 1980-81 (1980); and these variables were coded as percentages. By printing the variables as percentages, the researcher was able to proof-read the data from an 80/80 print-out list, and the computer performed the mathematical process of converting the percentages into the correct amount of money. This procedure reduced the chances of typing errors and simple math material mistakes.

The researcher, in order to assure accuracy, recorded the ratio of pupils to teachers as the number of certified personnel reported by the districts and allowed the computer to convert the number of teachers into the pupil/teacher ratio. The assessed valuation and the taxable income of the district were combined by the computer to form a third variable: district wealth. A program was developed for the computer to use the available data to compute and print the local effort rate of the districts. Lastly, the researcher programmed the computer to print an 80/80 print-out list, a simple frequency distribution, Pearson's correlations, and the multiple regression

program.

Population Considered

The study used data from all 306 Kansas public schools. The population was the total Kansas public school system with the exception of Fort Leavenworth, Unified School District 207. The Kansas legislature makes an annual appropriation to this district from the state general fund. Because of Fort Leavenworth's unique situation, the district was excluded from the study. The data of 306 Kansas public school districts were used for the analysis.

Data Collection

Data were obtained from the Kansas State Department of Education. The data were 1980-81 reports on transportation, percentage of line items, selected school statistics, general fund property tax rates, unified school district wealth, general state aid, enrollments and general budget. The Kansas Educational Directory (1981) printed by the Kansas State Department of Education also provided data.

Data Analysis

The data were analyzed by three different methods: a series of plotted means graphs, Pearson's correlation, and a multiple regression equation. The first method, providing a visual aid to study the concept of economy of scale, used plotted means graphs, where applicable, for each independent variable to analyze the relationship between enrollment size and the independent variable and to plot the cost-curve of expenditures. The second method, Pearson's r analysis, allowed the researcher to compare the plotted means cost-curve of each research hypothesis to the Pearson's r analysis by verifying the regression line and observing the significance and the amount of

correlation between enrollment size an the independent variable. In the third method, the data were analyzed by using a multiple regression equation. The multiple regression equation results for all school districts were displayed in a table.

Significance of the Study

The analysis developed in this study was derived from the data collected from the educational records of the Kansas State Department of Education. The study provided an analysis based on what actually occurred in the public schools utilizing actual expenditures and distributions of money among 306 Kansas school districts during the year 1980-81. The study presented a comprehensive method of assessing and measuring the adequacy and equity of the Kansas school finance system.

CHAPTER IV

ANALYSIS OF THE DATA

Data used in this study were collected by the Kansas State Department of Education. All Kansas public schools were included in the study with the exception of Fort Leavenworth, Unified School District 207. Because of Fort Leavenworth's unique situation, the Kansas legislature makes an annual appropriation to this district from the state general fund. The data of 306 Kansas public school districts were used in this study.

The following sections reveal how these data were combined to develop cost relationships between the enrollment size and the total expenditures per pupil using the concept of economy of scale. Total expenditures per pupil was selected as the dependent variable in the multiple regression analysis to discover which independent variables had the greatest influence upon the cost of education. After the selection of the independent variables by the multiple regression equation, these independent variables were further analyzed by the plotted means method with enrollment size as the dependent variable.

Multiple Regression Method

Multiple regression was the statistical technique used to analyze the relationship between the dependent variable, expenditures per pupil, and a set of independent variables: number of attendance centers in the district, non-public enrollment, number of pupils transported

over 2.5 miles, density, administrative costs, special needs costs, pupil/teacher ratio, energy costs, instructional costs, transportation costs, transportation aid per pupil, geographical area of district, ratio of state equalization money to total budget, state aid per pupil, wealth per pupil, and local effort rate of district. The main focus of the analysis was the evaluation and measurement of overall dependence of the expenditures per pupil variable on the set of independent variables.

The independent variable that explained the greatest amount of variance in the dependent variable, expenditures per pupil, was the local effort rate of the district. The correlation coefficient was 0.85004 with r squared = 0.72257 and F = 791.78797.

Local Effort Rate

In determining each district's budget, the School District Equalization Act used a local effort rate to determine the principal deduction from its general fund budget in computing the district's general state aid entitlement. The "norm" local effort rate had been set by law, and changes in the local effort rate have been made in conjunction with other School District Equalization Act modifications in order to reach agreed upon levels of state assistance to school districts.

The basic general state aid formula for 1980-81 is shown in Table I. The relationship of the local effort rate can be understood when the overall state formula is examined. The local effort rate was determined by dividing the budget per pupil "norm" for the district's enrollment category after adjustments had been made into the district's budget per pupil and multiplying by the constant 1.593 which was set by the Kansas legislature for 1980-81 (Table II).

TABLE I

BASIC GENERAL STATE AID FORMULA

General Fund Budget	Minus [District Wealth	X	Local Effort Rate	+	85% of Income Tax Rebate	+	P.L. 874 Receipts]	Equals	General State Aid

The local effort rate was one factor in the basic general state aid formula that could be modified or adjusted by the Kansas legislature for the school year 1980-81. The local effort rate was multiplied by the district wealth which was a four-year average of adjusted property valuation and resident taxable income. Added to this product was 85% of income tax rebate which was defined as twenty per cent of resident individual income tax liability after credits, except credits for income taxes paid to another state, withholding and estimates. Added to this sum was any P.L. 874 receipts the district might have been entitled to receive. P.L. 874 receipts were defined as the applicable amount determined under federal rules and regulations based upon a ratio of school district operating revenues that are "equalized." The "norms" and enrollment categories are in Table III.

TABLE II

LOCAL EFFORT RATE

$\frac{\text{District's Budget per Pupil (B.P.P.)}}{\text{B.P.P. "Norm" for District's Enrollment}}$	X	1.593%	=	Local Effort Rate

TABLE III

1980-81 B.P.P. "NORMS" AND ENROLLMENT CATEGORIES

Enrollment (E)	"Norm" Budget Per Pupil	Adjustments
Under 200	$2,718	None
200 399	2,718	Minus $2.255(E-200)
400 1,599	2,267	Minus $.4017(E-400)
1,600 and over	1,785*	None

* $1,794 for the four largest enrollment districts.

The local effort rate of a district was the same as the "norm" local effort rate fixed by law if the district's budget per pupil was the same as the "norm" budget per pupil for all districts in its enrollment category, as revealed by Table III. Otherwise, the district's local effort rate was more or less than the "norm" local effort rate in the same proportion that the district's budget per pupil was more or less than the "norm" local effort rate. The adjustment of the "norm" allowed for a smooth linear transition rather than an abrupt change from one enrollment category to another.

Local effort rate explained the greatest amount of variance in the dependent variable because the local effort rate was one factor in determining the general budget of a district. District wealth multiplied by the local effort rate plus the income tax rebate and state aid determined the budget of the district. As the general fund budget was divided by the district enrollment to determine the budget per pupil and expenditures per pupil, so was the budget per pupil divided into by

the "norm" budget per pupil. Therefore, the relationship between per pupil expenditures and local effort rate emerged highly significant.

Table IV reveals that the variable that explained the greatest amount of variance unexplained by the local effort rate was district wealth; and the next variable in the regression equation was equalization aid per pupil. Three factors used to determine the general budget: local effort rate, district wealth, and equalization aid explained 88% of the variance in the dependent variable. The fourth independent variable in the multiple regression equation was the ratio of equalization aid to the total budget. The strength of the amount of variation in expenditures was explained by the linear dependence upon four independent variables operating jointly: r squared = 0.91215.

TABLE IV

SUMMARY OF MULTIPLE REGRESSION

Variable	Multiple r	r^2	r^2 Change	Simple r	Beta
Local effort rate	0.85004	0.72257	0.72257	0.85004	0.54060
Wealth	0.91340	0.83430	0.11173	0.80059	0.41573
Equalization aid	0.93605	0.87618	0.04188	-0.51998	0.79750
Ratio aid/budget	0.95506	0.91215	0.03597	-0.61489	-0.69294
Geographic area	0.96168	0.92483	0.01268	0.18249	-0.15031
Transportation a.	0.96498	0.93118	0.00636	0.57930	0.09408
Transportation c.	0.96741	0.93589	0.00470	-0.07329	-0.06938
Instruction costs	0.96895	0.93886	0.00298	-0.20580	-0.21462
Energy costs	0.97072	0.94231	0.00344	-0.14629	0.35831
Pupil/teacher r.	0.97185	0.94450	0.00219	-0.28932	-0.23685
Special needs c.	0.97313	0.94698	0.00249	-0.11694	0.41094
Administrative c.	0.97450	0.94964	0.00266	-0.20876	-0.49135
Density	0.97457	0.94978	0.00014	-0.23685	0.04061
Pupils Transported	0.97460	0.94985	0.00007	-0.23353	-0.02849
Non-public pupils	0.97465	0.94993	0.00008	-0.14691	0.03519
Attendance centers	0.97466	0.94997	0.00003	-0.23367	-0.03162

The multiple regression equation was made suspect analytically by the selection of the four independent variables. Three of the independent variables were also used to determine the general budget: local effort rate, district wealth, and equalization aid. The fourth independent variable, the percentage of equalization aid to the total budget, was in turn determined by the three factors used in producing the general budget: local effort rate, district wealth, and equalization aid. Also, the relationship between per pupil costs and local effort rate proved suspect because just as the general fund budget was divided by the district enrollment to determine the budget per pupil and the expenditures per pupil, so was the budget per pupil divided into the "norm" budget per pupil and multiplied by a constant after adjustments were made in the enrollment categories. Therefore, the relationship between the expenditures per pupil and the local effort rate emerged highly significant.

In essence, the four variables selected by the multiple regression equation were not independent variables but were closely related and, in fact, were the elements of the general fund budget formula. However, regardless of the multicollinearity of the variables, the multiple regression equation was analytically correct in that the four variables selected did explain expenditures per pupil despite their highly intercorrelated nature. The budget per pupil was treated as being equal to expenditures per pupil by the researcher because data were not available on the amount of carry-over each district maintained or the amount of interest earned on idle funds. The selection of the four independent variables which determined the amount of money available to a district, or the distribution of funds to a district,

also determined the amount of money spent.

The main analytical fact emphasized by the multiple regression analysis was that the State, through the School District Equalization Act, determined the general fund budget, or the distribution of funds, and, therefore, the expenditures of the district.

Plotted Means Graphs

Plotted means graphs were used to provide a visual aid to analyze the relationship between the dependent variable, enrollment size, and 20 independent variables. Visual graphs were drawn, where applicable, by dividing the school districts into five enrollment categories and plotting the means of the independent variable. The five enrollment categories were the same categories used by the State to determine the local effort rate. The categories were schools under 200 enrollment, 200 to 400 enrollment, 400 to 1,600 enrollment, 1,600 to 15,000 enrollment, and the four largest schools.

The y axis of the graphs, representing the dependent variable, enrollment size, was incremented in intervals of 800 pupils. Enrollment size ranged from a low of 82 students to a high of 42,350. However the graphs were plotted by means of the enrollment categories, which were: 154.98, 302.83, 748.25, 3,192.56, and 28,529.63. The number of school districts represented in each enrollment category were: 34 districts in the under 200 enrollment category ranging from a low of 82 to a high of 200; 61 districts in the 200-400 enrollment category ranging from 204 to 400; 163 districts in the 400-1,600 category ranging from 406 to 1,568; 44 districts in the 1,600-15,000 category ranging from 1,601 to 8,134; and four districts in the large school category ranging from 15,220 to 42,350.

Pearson's r Correlation

A Pearson's correlation for each independent variable was computed to analyze the relationship between enrollment size and the independent variable. The correlation, r squared, and the significance were listed with each plotted means graph in order to compare the hypothesized cost curve of each appropriate hypothesis and to analyze the relationship of the independent variable.

General Budget Analysis

Figure 1 revealed the relationship between enrollment size and the budget plotted by means. Enrollment size correlated positively to the general budget which represented the total expenditures with the regression line appearing linear as the budget entitlement increased proportionally with size. The graph, constructed in increments of 800 pupils on the y axis, was extended to encompass the 42,350 enrollment district. Including the 42,350 enrollment district allowed the graph to reveal the cost line of the plotted means and, also, the cost line when the actual budgets of the four largest schools were plotted. The graph revealed the relative difference in the large school category by plotting both the actual expenditures and the means of the expenditures.

An interesting note on the Figure 1 graph revealed that the fifth largest school district's budget fell exactly on the cost line. Legislation, at the current time, Spring 1982, is being discussed to include the fifth largest school into the largest school district category: by the plotted means graph, the fifth largest district is already receiving the proportional amount of funds, even though it is in the 1,600-15,000 enrollment category.

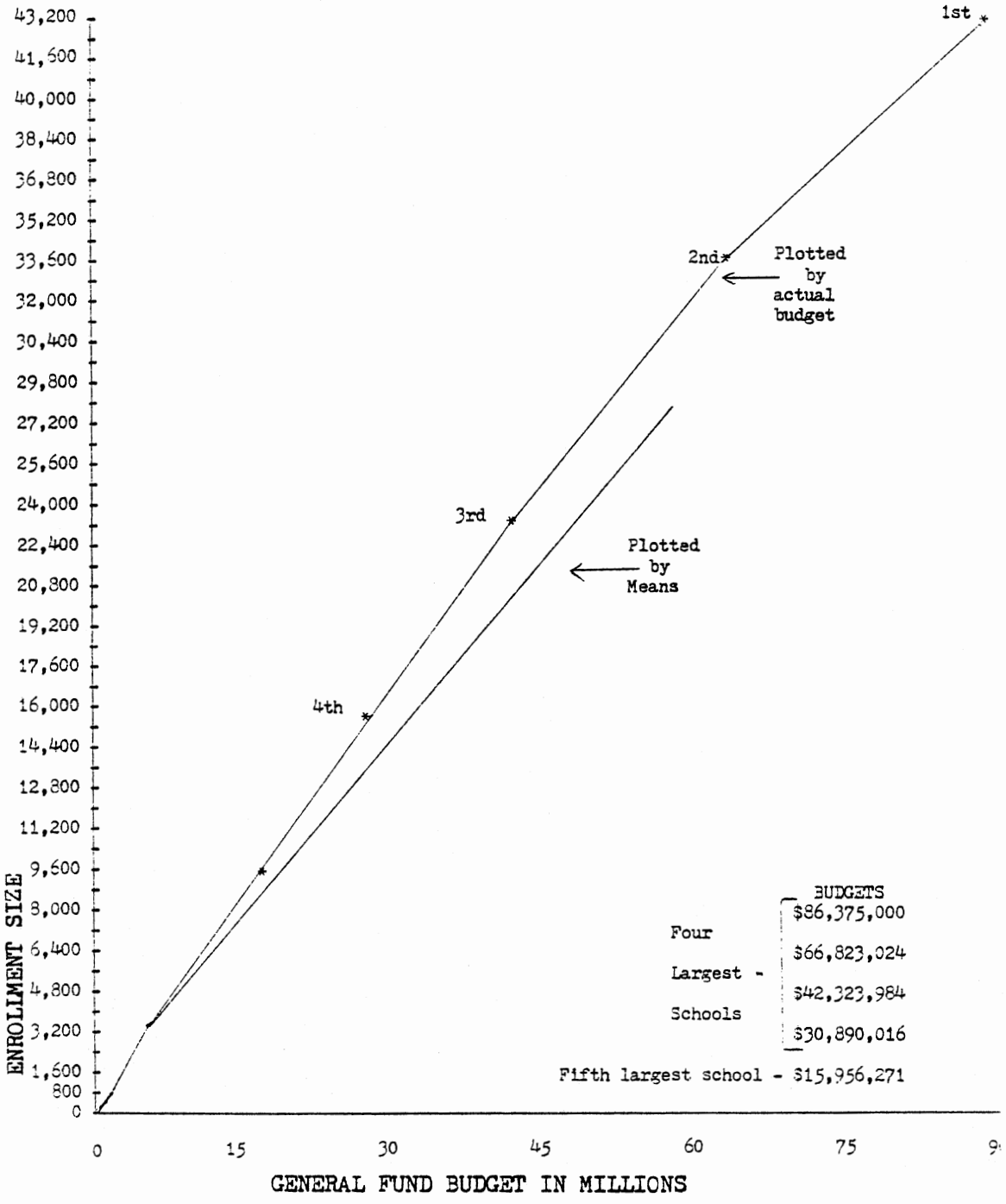

Figure 1. Relationship Between Enrollment Size and the General Fund Budget Plotted by Means of the Enrollment Categories, and The Relationship Between Enrollment Size and the General Fund Budget Plotting the Actual Budget Amount to Reveal the Location and Effect of the Five Largest Schools

In the plotted means graph, Figure 1, the expected cost-curve did not appear. The influence of the four largest schools, representing approximately one-third of the total student population, maintained a straight regression line. The general budgets ranged from a low of $300,216 to a high of $86,375,000. The budget means for each category were $527,763, $814,258, $1,642,811, $5,758,809, and $56,603,004. The Pearson's correlation revealed that the relationship between enrollment size and the general budget was 0.99691, with r squared at 0.99383; and it was significant beyond 0.001.

Figure 1 revealed a straight cost line or regression line that represented the budgets for the Kansas districts. The School District Equalization Act provided a formula to equalize the distributed funds to the districts. The effect of the formula can be readily seen in the cost line as the budget increased proportionally as the enrollment size increased.

Therefore, the first working hypothesis stating "as school enrollment size increases from zero, the general fund budget of the district will rapidly increase and then slowly level out through the middle enrollment range, and again begin an increase after the enrollment range exceeds 15,000 students" was rejected because no cost-curve was revealed by the plotted means graph. Even though the budgets of the districts range from a low of $300,216 to a high of 86,375,000, the amount of money a district received was proportional to the size of the district. Economy of scale was present; however, the expected cost-curve, as the districts became larger, did not materialize.

The amount of money distributed to a district can be expressed in a different term: budget per pupil. In educational finance language,

costs are usually expressed in terms of budget per pupil, rather than budget per district. The cost-curve of Figure 2 revealed a different perspective of the 306 Kansas districts' budgets when viewing the relationship between enrollment size and budget per pupil. The graph of Figure 2 revealed the expected U-shaped cost-curve described by researchers utilizing the economy of scale concept: the small districts' budget per pupil was the highest, and the middle enrollment category represented the lowest budget per pupil in the optimal range, with a slight increase in the budget per pupil as the enrollment increased beyond this optimal range. The means of the five categories were: $3405.32, $2688.86, $2195.54, $1803.82, and $1973.32.

The State legislature, recognizing that the four largest schools required more funds, set the "norm" budget per pupil at $1794 for the four largest schools. In essence, the increase from $1785 to $1794 increased the amount of state equalization aid to these four schools. However, the four largest schools enrolled a total of 114,119 students during the 1980-81 school year: their combined total enrollment represented roughly a third of the total Kansas public school enrollment. The four largest schools' budgets per pupil were: $2029.58, $1806.71, $2017.42, and $2039.55. The budget per pupil mean for the four largest schools was $1973.32. Therefore, the budget per pupil mean of the four largest schools, $1973.32, was lower than the state average budget per pupil of $2036.99 for 1980-81. Each of the four schools' budget per pupil was lower than the state average of $2036.99, except for the largest school which exceeded the state average by $2.56 per pupil. The slight increase in the budget per pupil for the largest enrollment category, shown in Figure 2, remained below average.

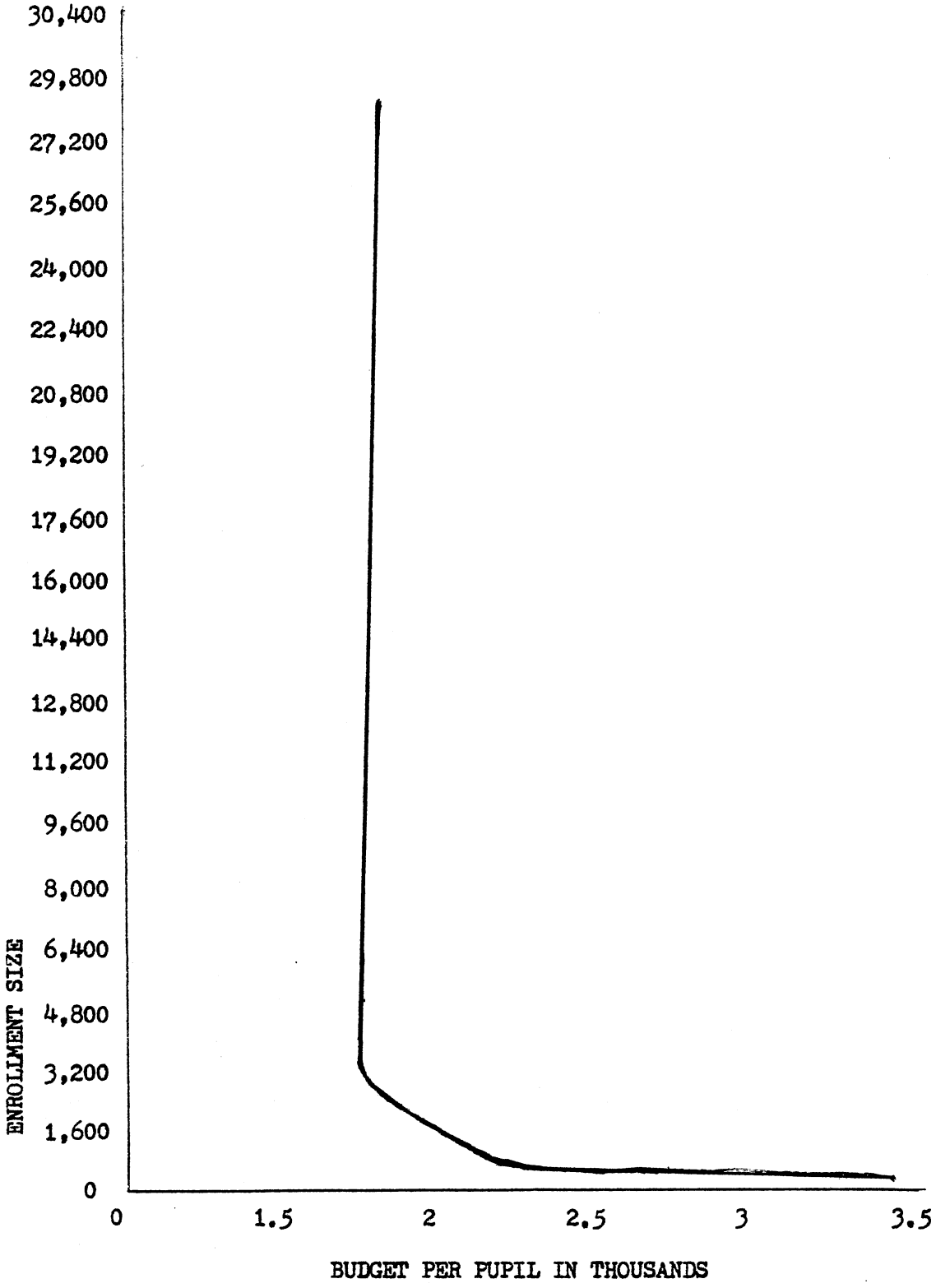

Figure 2. Relationship Between Enrollment Size and Budget Per Pupil Plotted by Means

Instructional Costs

A major percentage of educational costs was instruction. The study analyzed the costs reported for teacher salaries, line 213 of the general fund budget. Excluded from the analysis were the salaries of secretarial and clerical assistants and expenditures for classroom materials, textbooks, audio-visual materials, school libraries, and teaching supplies.

The total expenditure for teacher salaries from each district was dependent upon the number of teachers needed to meet the local board of education's goals and objectives. Enrollment size largely determined the number of units taught, the number of teachers employed, and the pupil/teacher ratio.

The relationship between enrollment size and instructional costs, as shown in Figure 3, appeared to follow a straight regression line as verified by the Pearson's correlation of 0.99477, with r squared at 0.98956; and it was significant beyond 0.001. The low expenditure for instructional costs was $145,995 and the high was $36,027,012. The instructional costs means for the plotted graph were $236,638, $368,688, $754,050, $2,724,550, and $24,141,181. The increase in the instructional costs from the small districts to the largest followed a straight line representing the economy of scale, as the size increased so did the costs.

The working hypothesis stating "as the school enrollment increases, the instructional costs will rapidly decrease at first, and then level off to a minimum, and finally begin to increase again" was rejected because no evidence of a cost-curve existed. The cost-line of Figure 3 revealed that instructional costs increased as the size increased.

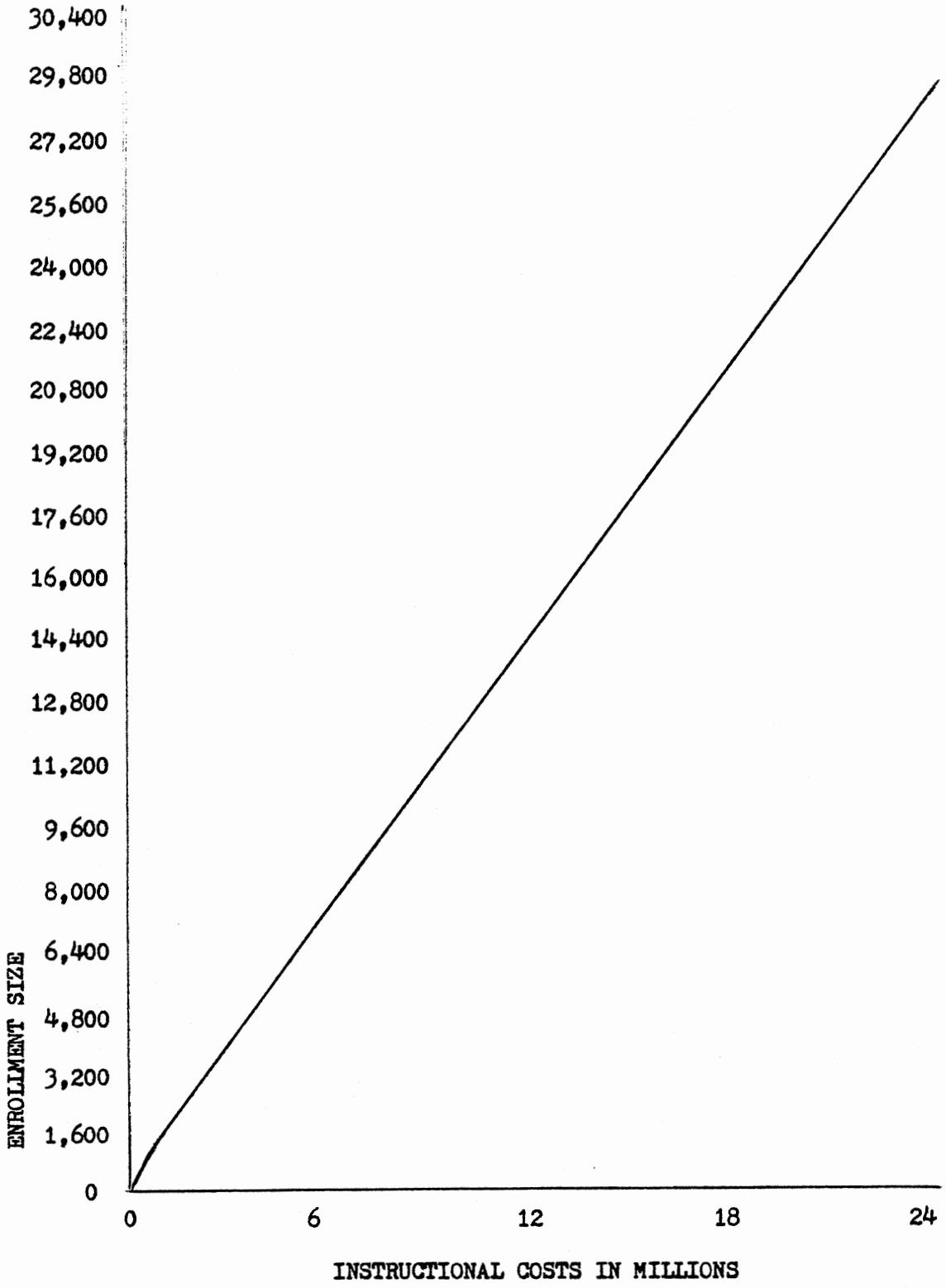

Figure 3. Relationship Between Enrollment Size and Instructional Costs Plotted by Means

Number of Teachers

The State sets a minimum standard of courses that must be offered in high schools. In general, the small schools barely exceed the minimum standards. They, therefore, have fewer teachers, but a high pupil/teacher ratio. In order to maintain the minimum standard, the small districts expend around 45% of their total budget on teacher salaries. The middle schools were able to offer more courses, with more teachers at a lower pupil/teacher ratio; however, the middle school districts expended around 47% of their total budget on teacher salaries. The four largest schools were able to offer the largest number of courses, had the largest number of teachers, had a slightly lower pupil/teacher ratio than the middle enrollment districts, and expended roughly 43% of their total budget for teacher salaries.

Enrollment size category means were plotted to observe the relationship between size and the means of the number of teachers. The means, plotted in Figure 4, were as follows, from small to large enrollment: 19.1, 29.26, 60.23, 222.75, and 1,987.89. The correlation was 0.99634 with r squared at 0.99265; and it was significant beyond 0.001.

While Figure 4 revealed the relationship between enrollment size and the number of teachers employed, Figure 5 revealed a different perspective by plotting the means of the percentage of the general fund budget reported as teacher salaries. The four largest schools reported the smallest percentage of the total general budget for teacher salaries: 42.65%. In descending enrollment scale the means were: 47.31%, 45.90%, 45.28%, and 44.84%. Figure 5 revealed a curved line as the percentage of budget used for teacher salaries was plotted.

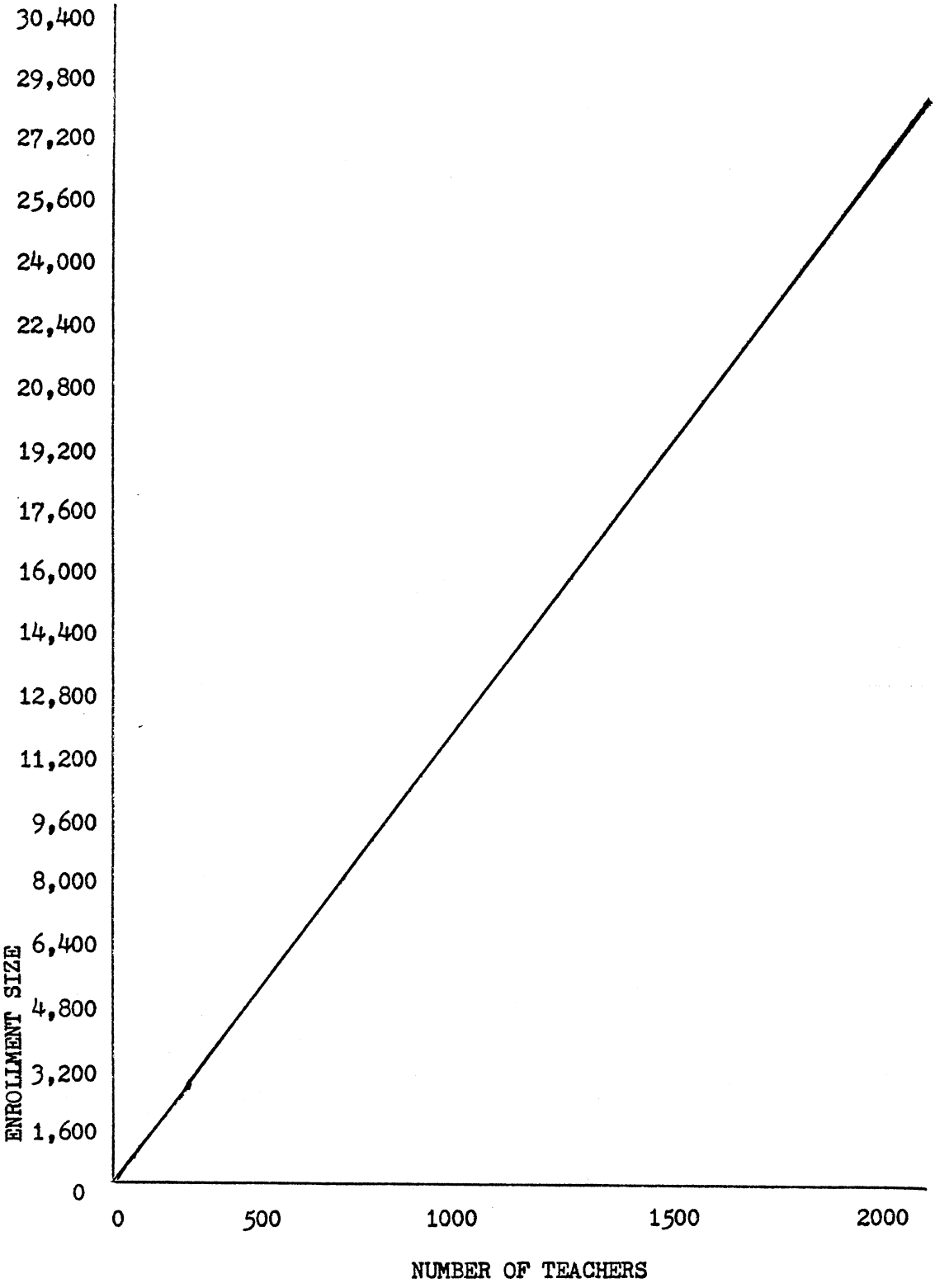

Figure 4. Relationship Between Enrollment Size and Number of Teachers Plotted by Means

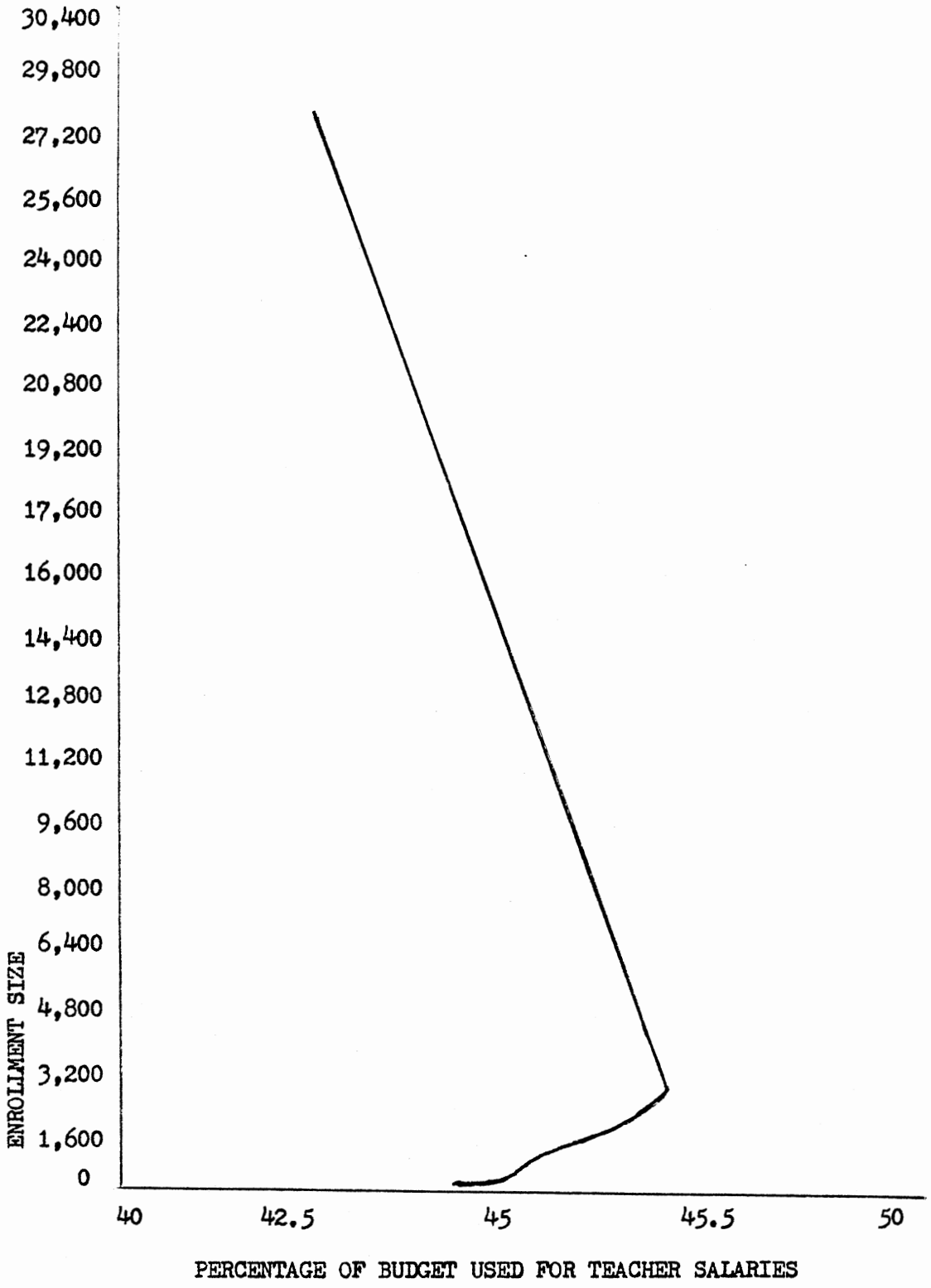

Figure 5. Relationship Between Enrollment Size and Percentage of Budget Used for Teacher Salaries Plotted by Means

Dividing the means of the number of teachers into the costs for teacher salaries means, the average mean cost per teacher was found. From small enrollment to large, the mean teacher salary was $12,389, $12,602, $12,519, $12,232, and $12,444. The figures revealed a ratio of the mean numbers of teachers and the means of the teacher salaries per enrollment category. The figures did not reflect the true teacher salary average of an estimated $15,250 reported in the Average Classroom Teachers' and Principals' Salaries of the 307 Unified School District of Kansas for 1979-80 and 1980-81. Line 213 did not include items as social security, workman's compensation, or fringe benefits.

Another relationship examined was that between enrollment size and pupil/teacher ratio (Figure 6) as plotted by the means derived from Table V. The mean number of teachers was divided into the mean of the enrollment per enrollment category.

TABLE V

TABLE OF MEANS FOR ENROLLMENT CATEGORIES

Variable	82 to 200 Enrollment	200 to 400 Enrollment	400-1,600 Enrollment	1,600-15,000 Enrollment	15,000-over Enrollment
Number of Teachers	19.1 (Mean)	29.257 (Mean)	60.234 (Mean)	222.75 (Mean)	1987.89 (Mean)
	13.5 (Minimum)	19.5 (Minimum)	33 (Minimum)	32.6 (Minimum)	1198.2 (Minimum)
	23.5 (Maximum)	44 (Maximum)	150.7 (Maximum)	660.4 (Maximum)	2860 (Maximum)
Enrollment	154.98 (Mean)	302.83 (Mean)	748.25 (Mean)	3192.56 (Mean)	28,529.63 (Mean)
	81.5 (Minimum)	204 (Minimum)	406 (Minimum)	1601 (Minimum)	15,220.3 (Minimum)
	200 (Maximum)	400 (Maximum)	1568 (Maximum)	8133.9 (Maximum)	42,350 (Maximum)

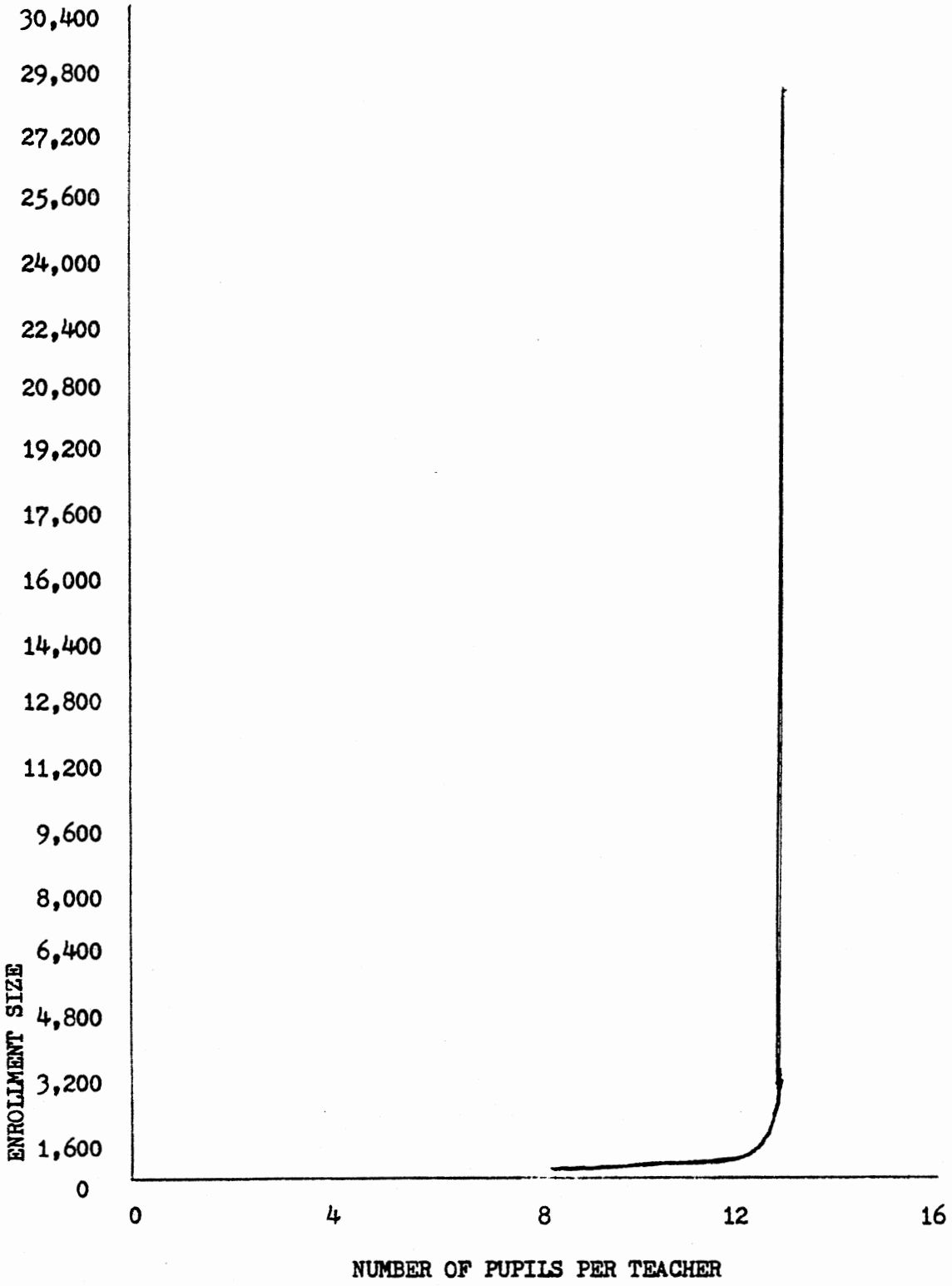

Figure 6. Relationship Between Enrollment Size and Pupil/Teacher Ratio Plotted by Means

The means of the pupil/teacher ratio revealed that the largest sized schools had the largest number of pupils per teacher. Figure 6 plotted the relationship between enrollment size and the pupil/teacher ratio and showed the most efficient and economical use of teachers in the various enrollment categories. The difference between the largest schools and the 1,600-15,000 enrollment category was only 0.02 pupils. The means, from small to large enrollment categories, were: 8.11, 10.35, 12.42, 14.33, and 14.35. The more efficient utilization of the pupil/teacher ratio leveled off as the enrollment reached the four largest schools. The expected U-shaped cost-curve did not materialize in the graph. However, one would expect a larger, more efficient, pupil/teacher ratio in the four largest schools than 14.35 pupils per teacher.

The plotted means line of Figure 6 revealed that as enrollment increased the pupil/teacher ratio improved. The largest two enrollment categories had the best utilization of teachers, reflecting a more efficient use of school finances, even though the increase in the ratio from the largest four schools over the 1,600-15,000 enrollment category was only 0.02. The number of teachers was highly related to enrollment size. The linear correlation ($r = .99634$) revealed that, as the enrollment size of the district increases, a more efficient utilization of teachers increased.

Therefore, the working hypothesis stating "as the school enrollment size increases, the pupil/teacher ratio will increase rapidly at first, and then level off with a slight decrease in the larger schools" was rejected. A cost-curve did not appear when the means were plotted; instead, Figure 6 revealed a steady improvement in the

pupil/teacher ratio with a slight increase of .02 pupils per teacher in the largest category.

Administrative Costs

The data for administrative costs were derived from lines 110, 120, and 130 of the 100 administrative lines of the districts' general fund budgets as reported by the Kansas State Department of Education. Line 211 (principals' salaries) was added to the sum of lines 110, 120, and 130 to compile the administrative costs. The administrative costs ranged from a low of $28,010 to a high of $6,409,025. The data for administrative costs were expressed in percentages of each of the district's total general budget. The means of the percentage of expenditure for administrative costs per enrollment category were, from large to small enrollment: 7.52%, 8.73%, 9.52%, 10.58%, and 11.45%.

The percentage of the budget expended for administrative costs grew smaller as the enrollment size increased: however, the total amount expended grew larger as the enrollment size increased, due to the monetary size of the budgets. Figure 7 revealed a line representing the mean administrative costs expressed in percentages of the total budget for the enrollment categories. The percentage of the total budget expended for administrative costs decreased as enrollment size increased. A smaller percentage of the budget in the larger schools, therefore, was expended for administrative costs; however, the percentages appeared misleading because the total amount spent grew larger as the enrollment size increased, since the larger schools have the larger budgets.

The actual amount of money expended for adminstrative costs was plotted by means of the enrollment categories in Figure 8.

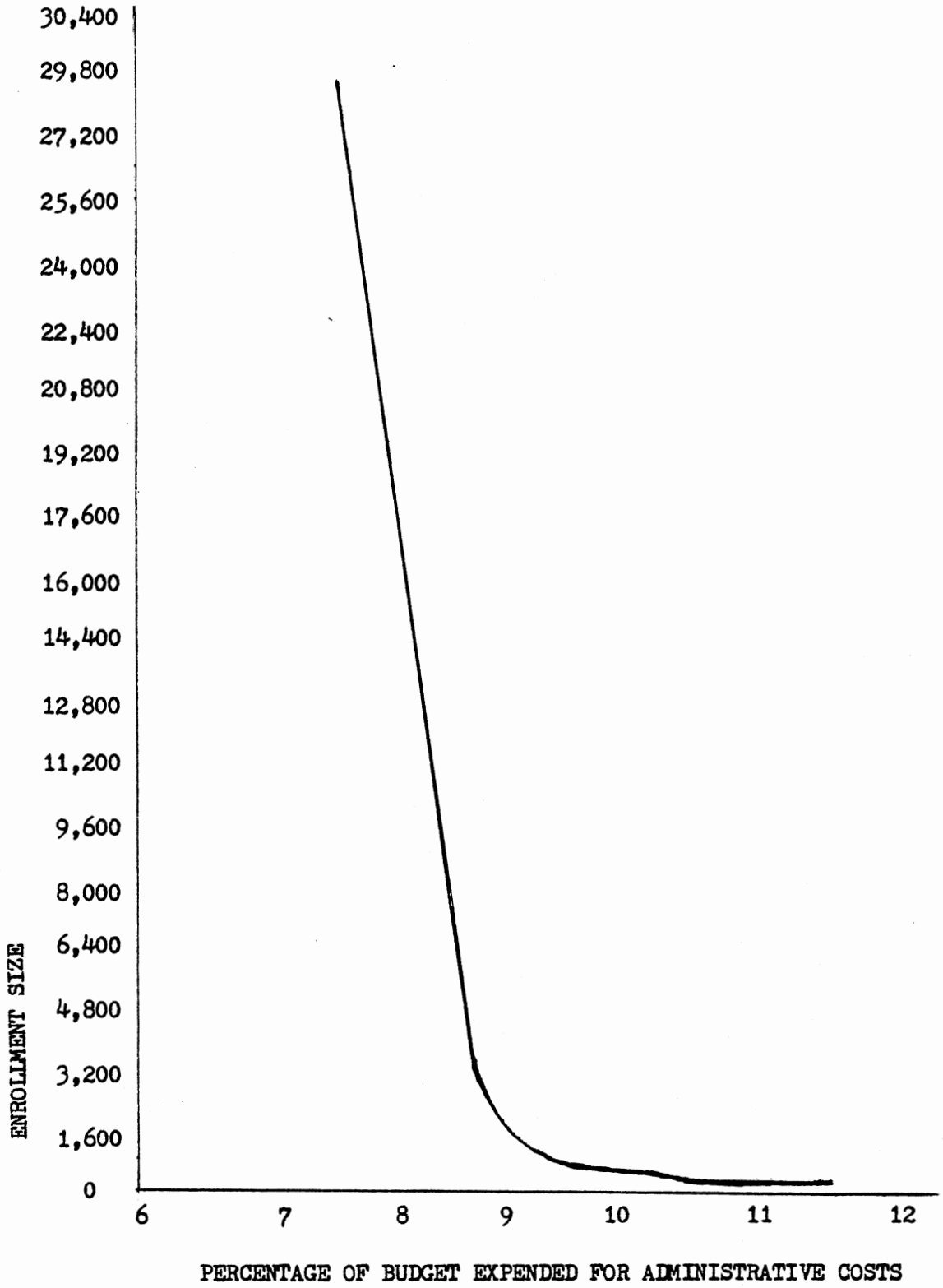

Figure 7. Relationship Between Enrollment Size and Percentage of Budget Expended for Administrative Costs Plotted by Means

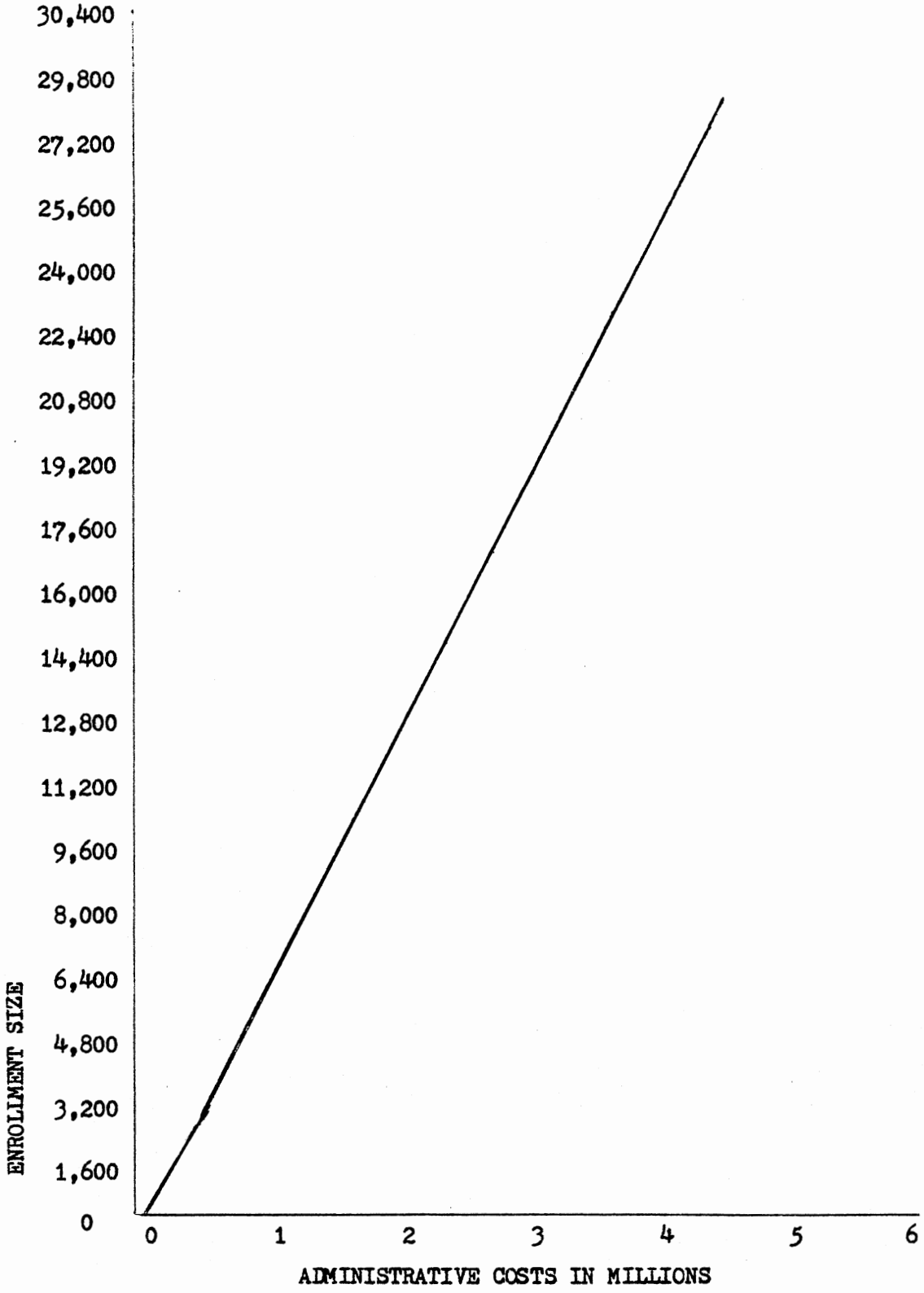

Figure 8. Relationship Between Enrollment Size and Administrative Costs Expenditure Plotted by Means

The mean percentage of administrative costs times the mean general budget of each enrollment category produced the following administrative costs, from large to small enrollment categories: $4,254,848, $502,514, $156,313, $86,148, and $60,439. The correlation between enrollment size and administrative costs was significantly high with r = .9928 and r squared = .98565; it was significant beyond 0.001.

The line representing administrative costs plotted in Figure 8 was similar to the cost-line found in Figure 1 plotting the general budget. The Figure 8 cost-line was also similar to Figure 3, plotting instructional costs, and Figure 4, number of teachers. A basic pattern represented by the cost-line of Figure 1 was determined when the relationship between enrollment size and the budget was plotted by means. The educational expenditures appeared to follow the same cost-line pattern.

This cost-line pattern represented verification of the economy of scale concept. Costs were directly related to size, and as the enrollment increased the educational costs increased proportionally. Therefore, the working hypothesis stating "as the enrollment size increases, the administrative costs will sharply decline at first, and then level off to a minimum, and then begin to increase again with the largest schools" was rejected. A curve in the cost-line did not appear, but rather the plotted cost-line of Figure 8 and the Pearson's r analysis revealed a straight regression line representing the administrative costs.

Number of Attendance Centers in the District

An obvious relationship existed between the number of attendance

centers reported in a district and the administrative costs of that district: as the number of attendance centers increased, so did the costs for supervision and management. The number of attendance centers in a district ranged from a low of two to a high of 99. Size was directly related to the number of attendance centers with a linear correlation of r = .97945; that is, as the enrollment size increased, the number of attendance centers increased. The relationship was highly significant beyond 0.001, with r^2 = 0.95931.

The means of the number of attendance centers for each enrollment category are listed in Table VI.

TABLE VI

TABLE OF MEANS FOR ENROLLMENT CATEGORIES

Variable	82 to 200 Enrollment	200 to 400 Enrollment	400-1,600 Enrollment	1,600-15,000 Enrollment	15,000-over Enrollment
Attendance Centers	2.147 (Mean) 2 (Minimum) 3 (Maximum)	2.869 (Mean) 2 (Minimum) 6 (Maximum)	3.902 (Mean) 2 (Minimum) 11 (Maximum)	9.795 (Mean) 4 (Minimum) 33 (Maximum)	61.75 (Mean) 36 (Minimum) 99 (Maximum)

The data did not attempt to explain differences in size of the buildings, age, square footage, or type of heating system. Figure 9 plotted the relationship between enrollment size and the number of attendance centers.

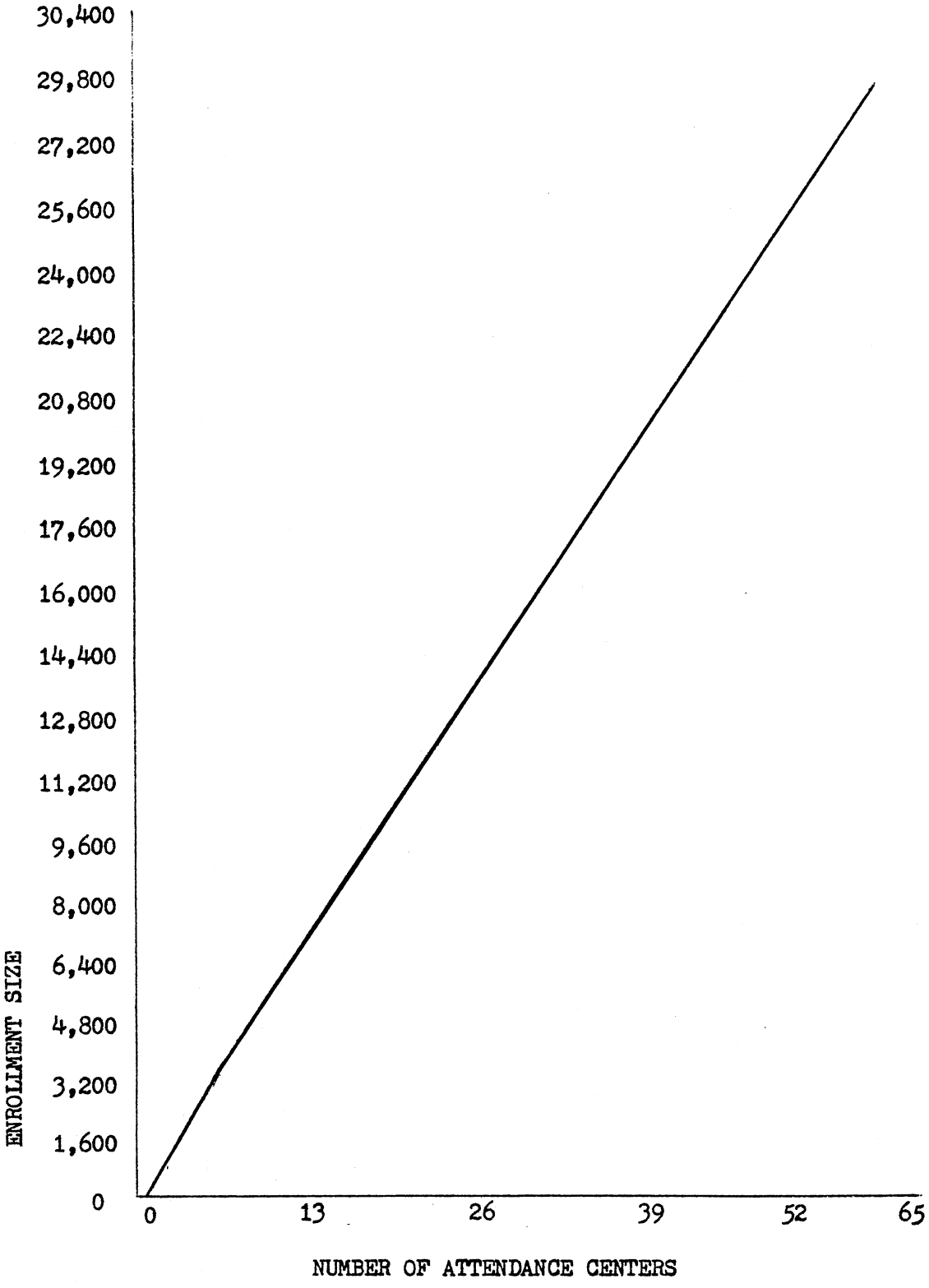

Figure 9. Relationship Between Enrollment Size and Number of Attendance Centers in District Plotted by Means

Because of the high correlation between enrollment size and the number of attendance centers, the working hypothesis stating "as the school enrollment size increases, the number of attendance centers will at first hold steady and then increase" was rejected. The graph of Figure 9 revealed the concept of economy of scale: as enrollment size increased, the amount of space needed for educational programs increased proportionally.

Energy Costs

The relationship between administrative costs and the number of attendance centers was similar to the relationship between energy costs and the number of attendance centers within a district. The obvious assumption was that as the number of buildings in a district increased, the energy costs to heat and light the buildings would increase.

Data for the energy costs were obtained from line 630 (heat) and line 640b (electricity) of the general fund budget reports. The energy costs were expressed in percentages of the general budget. The mean of the percentages expended for each enrollment category was multiplied by the mean general budget to obtain the mean energy costs for each enrollment category. From large to small enrollment category, the energy costs were: $2,739,585, $269,455, $72,793, $38,319, and $27,987. From large to small enrollment categories, the means of the percentages of energy costs to the general budget were: 4.84%, 4.679%, 4.431%, 4.706%, and 5.303%.

Figure 10 revealed the relationship between enrollment size and energy costs plotted by the means. Enrollment size correlated highly with energy costs ($r = .98546$); and the relationship was significant beyond 0.001 with r squared at 0.97113.

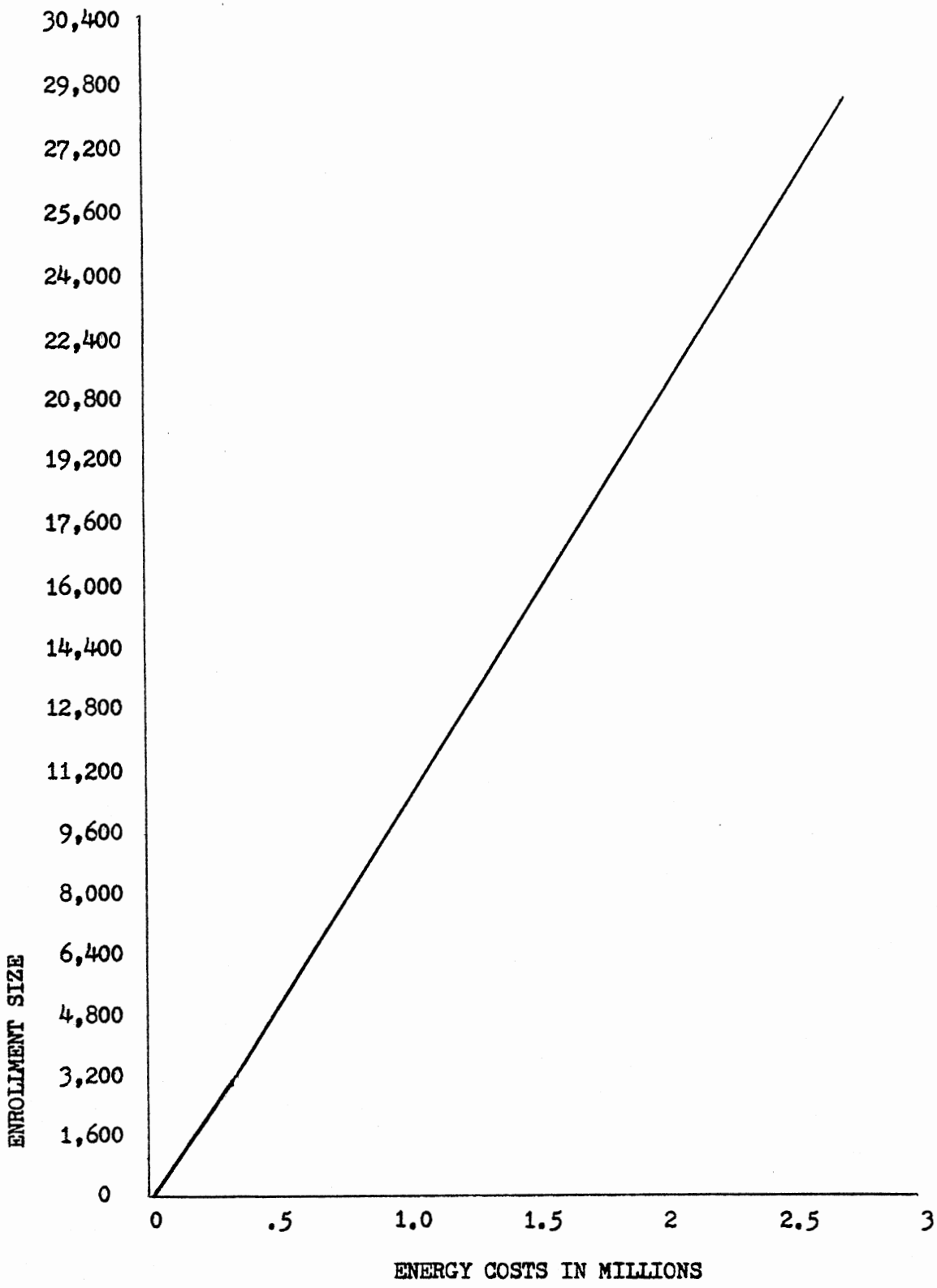

Figure 10. Relationship Between Enrollment Size and Energy Costs Plotted by Means

The assumption that as the number of attendance centers increased, so would the energy costs, was verified by Figure 10. The correlation between enrollment size and energy costs was highly significant: therefore, the working hypothesis stating "as school enrollment size increases, energy costs will at first hold fairly steady and then rapidly increase" was rejected for not adequately describing the line representing costs.

Special Needs

Data for the special needs of a school district were obtained from the percentage of money reported as transferred from the general fund budget to bilingual education, special education, and vocational education. The means of the percentages of money reported transferred were multiplied by the means of the general fund budget of each enrollment category. From large to small enrollment category, the means were: $4,598,994, $459,611, $86,248, $41,096, and $24,979. The percentage of money reported transferred for special needs increased as the enrollment size increased. From large to small enrollment category the means of the percentages were: 8.125%, 7.981%, 5.25%, 5.04%, and 4.733%. The smallest district enrollment category reported only 16 of the 34 districts transferred money to vocational education; none of the 34 transferred money to bilingual education.

Figure 11 revealed the relationship between enrollment size and special needs costs. The straight regression line, representing the special needs costs, was verified by the Pearson's correlation: $r = .96$, with $r^2 = 0.927$, and the relationship was significant beyond 0.001. The same apparent cost-pattern existed with the special needs costs increasing as the school enrollment size increased.

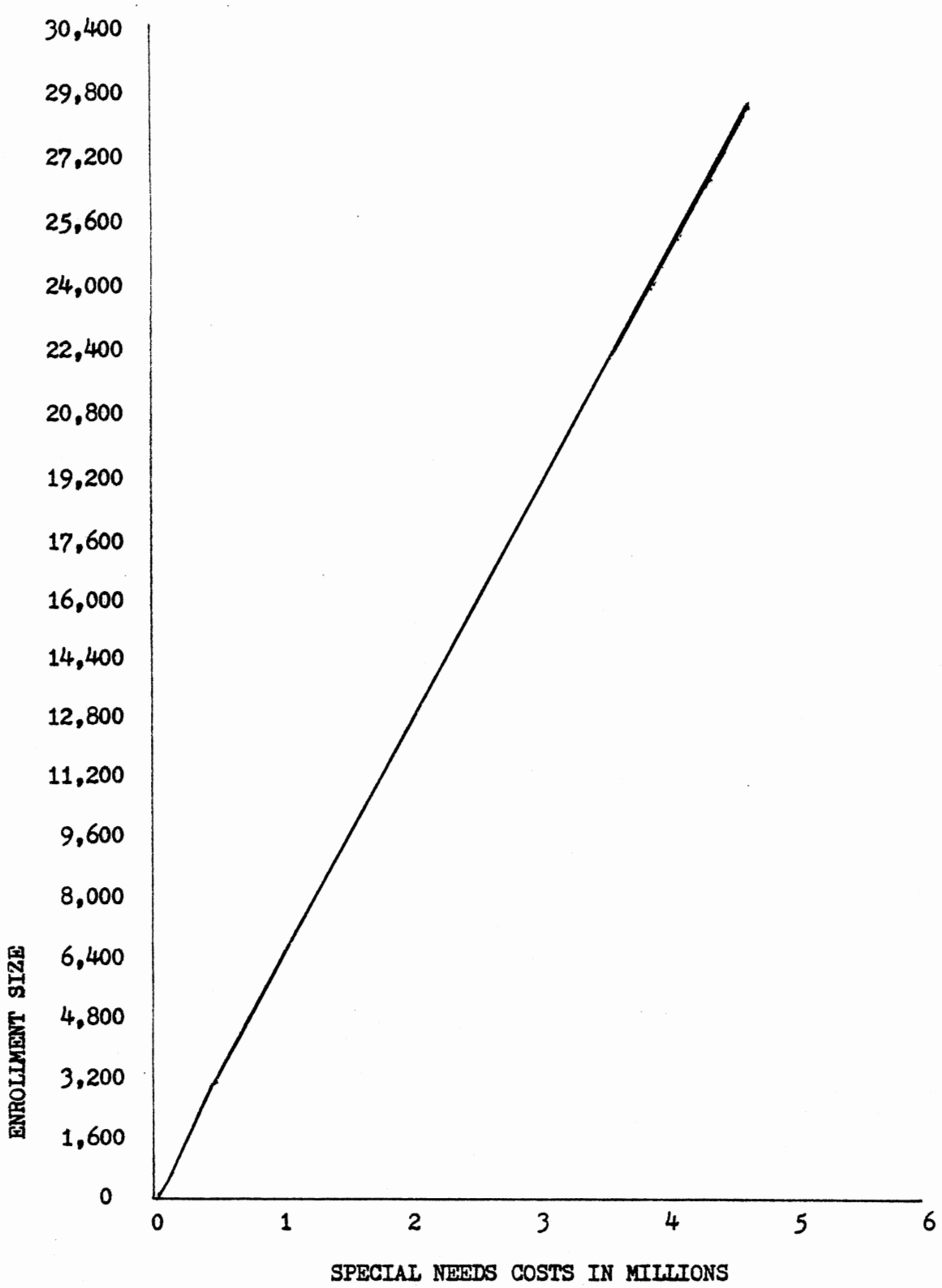

Figure 11. Relationship Between Enrollment Size and Special Needs Costs Plotted by Means

The working hypothesis stating "as school enrollment size increases, the special needs of the schools will increase at a steady rate, with a slight increase in the larger schools" was rejected for not adequately describing the rate of educational costs. The cost-line of Figure 11, representing the relationship between enrollment size and special needs, revealed the same economy of scale found in Figure 1 which plotted the general fund budget.

Transportation Aid

Data for the transportation aid were obtained from the Kansas State Department of Education. The means for the enrollment categories from large to small were: $889,116.75, $157,427.88, $93,502.31, $54,816.28, and $34,089.68. The plotted means of the transportation aid (Figure 12) revealed the same cost-pattern found in the graphs plotting budget, administration costs, instruction costs, energy costs, and number of teachers.

Figure 12 in plotting the relationship between enrollment size and transportation aid revealed a straight regression line representing costs. The Pearson's correlation revealed the following information: $r = .85757$, $r^2 = 0.73542$; and the relationship was significant beyond 0.001.

Since the State determined the amount of transportation aid each district was to receive by a formula based on the amount of students transported over 2.5 miles, the density of the district, and the area of the district, the researcher assumed that transportation aid would level off in the denser, larger districts. But because the working hypothesis dealing with enrollment size and transportation aid did not adequately describe the cost-line, the hypothesis was rejected.

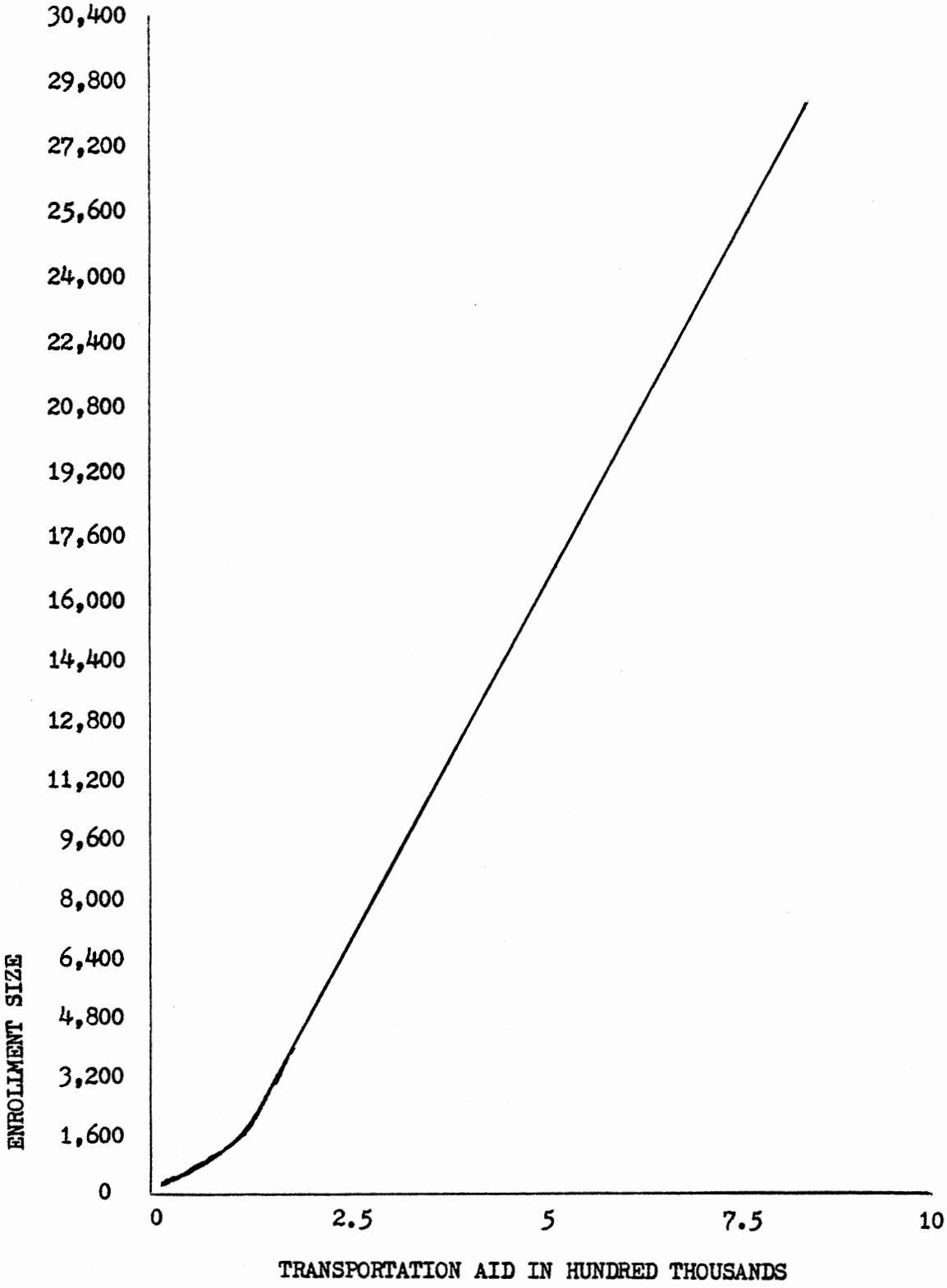

Figure 12. Relationship Between Enrollment Size and Transportation Aid Plotted by Means

Transportation Costs

Data for the transportation costs were obtained from the percentage of money reported transferred to the transportation fund from the general fund budget of each district. The means of the percentages of transferred money for transportation were: 0.037%, 1.75%, 2.37%, 2.28%, and 2.51%. The means of the transportation costs, from large to small enrollment categories, were: $209,431, $101,240, $38,902, $18,524, and $13,247.

Figure 13 revealed the plotted cost-line for transportation costs. The relationship between enrollment size and the amount of money reported transferred from the general fund to transportation correlated weakly at 0.16269, with $r^2 = 0.02647$; it was significant to 0.002.

The researcher considered the data as insufficient and highly unreliable: the money transferred to the transportation fund could have been used as labor for bus repair and as costs for bus parts; on the other hand, since the amount of carry-over was not reported in the data available to the researcher, it was unknown whether some of the money might have been transferred to "pad" the amount of available funds for transportation.

Since Figure 13 revealed that the cost-line for transportation costs increased steadily throughout the enrollment categories, and although the cost-line was not as linear as the prior cost-lines of previous graphs, the working hypothesis stating "as school enrollment size increases, the transportation costs will sharply decrease, and then level off to a minimum" was rejected by the researcher. The hypothesis did not describe the cost-line of the graph. The high expenditures of the 1,600-15,000 enrollment skewed the cost-line.

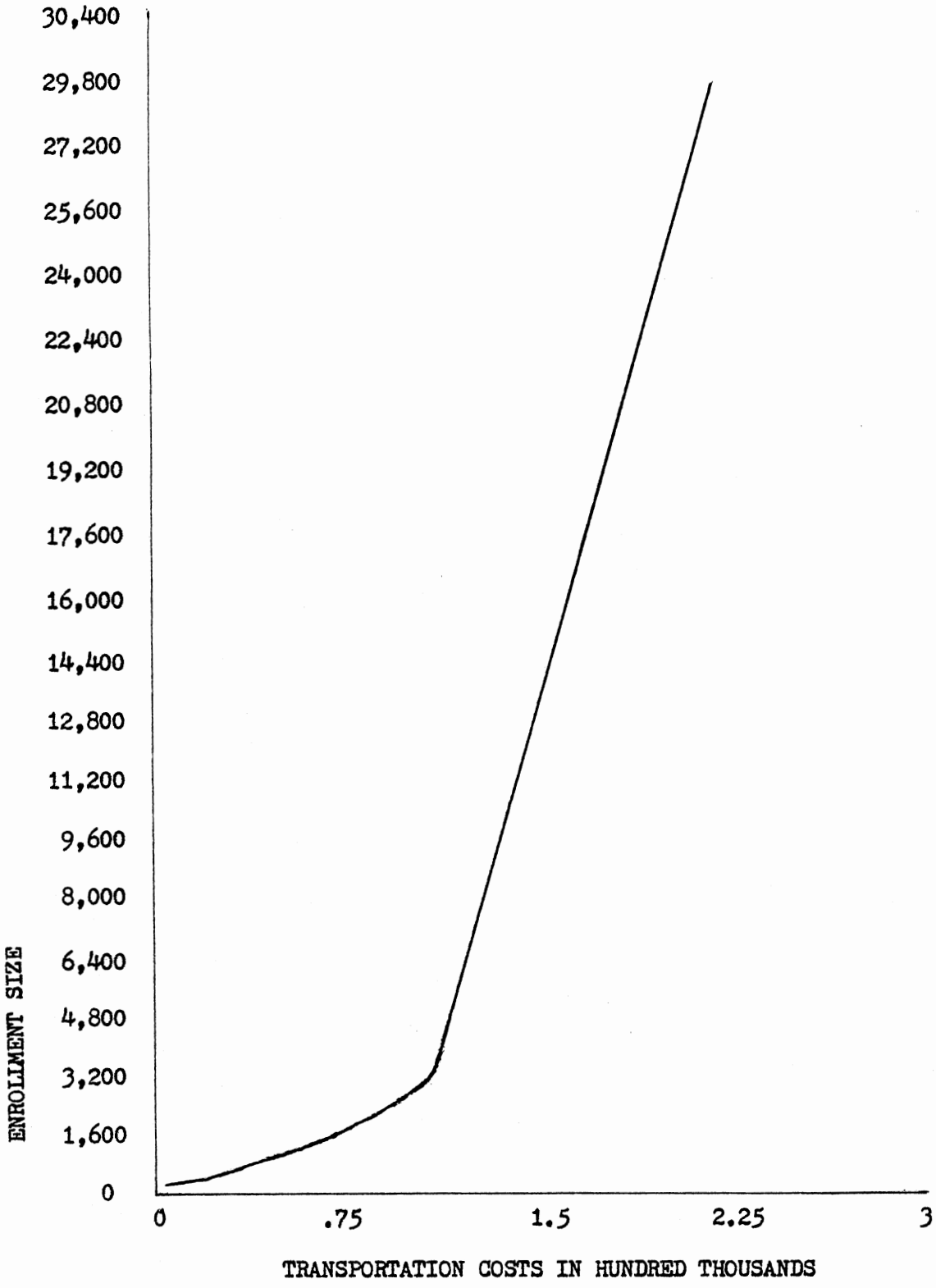

Figure 13. Relationship Between Enrollment Size and the Amount of Money Reported Transferred to Transportation

Number of Pupils Transported

The number of pupils transported over 2.5 miles determined the amount of transportation aid received by the districts. Since the number of pupils transported was directly related to the amount of transportation aid received by the districts, a plotted means graph was not deemed necessary for analysis. The working hypothesis, therefore, was not tested; however, by observing the means and the correlation, the researcher maintained that the working hypothesis was rejected for not adequate describing the cost-line.

The means of the number of pupils transported over 2.5 miles were: 5,314.75, 775.70, 315.78, 147.39, and 77.18. The correlation between enrollment size and the number of students transported over 2.5 miles was 0.887, with $r^2 = 0.787$; and the relationship was significant beyond 0.001.

Number of Non-public Students in District

The pupils attending a non-public school ranged from 0 as a low to 7,479 non-public students in an individual school district. The four largest districts accounted for the majority of non-public students within their district.

The means of the enrollment categories for the number of non-public students were, from small to large enrollment: 4.97, 20.49, 19.86, 247.9, and 4,147. The correlation between enrollment size and number of non-public students was 0.91275, with $r^2 = 0.8331$; and it was significant beyond 0.001.

Figure 14 revealed the relationship between enrollment size and the number of non-public students in a district. As the size of the cities increased in population, the non-public students increased.

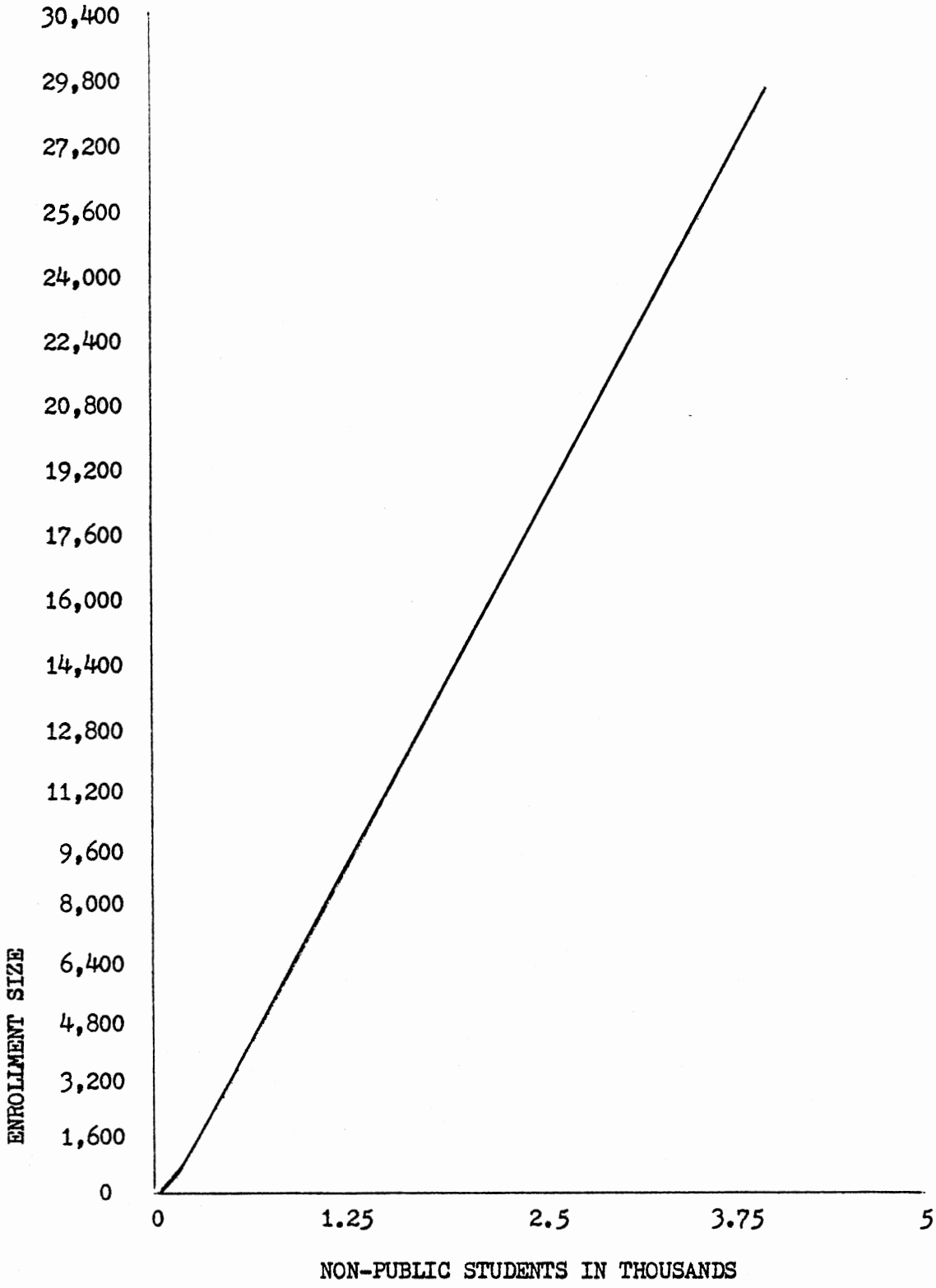

Figure 14. Relationship Between Enrollment Size and Number of Non-Public Students in District Plotted by Means

The additional costs of non-public students in school districts were seen in a 1974 amendment which excluded non-public pupils transported by a district in the computation of the index of density in order to be consistent with the calculation of per pupil cost of transportation. The effect of this amendment was to increase transportation aid to districts which transported a relatively significant number of non-public school pupils, thereby increasing the overall cost of education of the district. However, the money for the transportation aid originated from State funds and not directly from the local taxpayers of the affected districts.

Therefore, the working hypothesis stating "school districts having non-public schools located in their district will experience a slightly higher cost per pupil than schools of comparable size without non-public schools" was rejected as invalid. Further verification for the rejection of the hypothesis was presented by the multiple regression summary (Table IV) which revealed that the independent variable, the number of non-public students in a district, was the next to last variable to be selected in the equation, and the variable had only minute influence in explaining educational expenditures.

Number of Courses Offered in High School

The number of courses offered in high school was closely related to many of the other variables. As the number of courses offered in an educational program increased, so did the number of personnel to teach the programs and to supervise the process. The amount of money expended to pay the salaries of the teachers, administrators, and the support personnel had to increase as the number of course offerings increased. Space to provide housing for the number of courses had to

increase, and, with the increase in building space, a proportional increase in energy costs occurred.

Table VII, a table of means for the enrollment categories, lists the means of the following variables: number of courses, number of teachers, and instructional costs expressed in percentage of the total general fund budget. The number of courses offered in high school ranged from a low of 32.5 to a high of 138.4, a range of 106 courses.

TABLE VII

TABLE OF MEANS FOR ENROLLMENT CATEGORIES

Variable	82 to 200 Enrollment	200 to 400 Enrollment	400-1,600 Enrollment	1,600-15,000 Enrollment	15,000-over Enrollment
Number of Courses	39.5147 (Mean) 32.5 (Minimum) 54 (Maximum)	46.1721 (Mean) 36 (Minimum) 59 (Maximum)	58.93 (Mean) 36.1 (Minimum) 125.5 (Maximum)	105.2023 (Mean) 47.6 (Minimum) 178.8 (Maximum)	132.725 (Mean) 128.2 (Minimum) 138.4 (Maximum)
Number of Teachers	19.1 (Mean) 13.5 (Minimum) 23.5 (Maximum)	29.257 (Mean) 19.5 (Minimum) 44 (Maximum)	60.234 (Mean) 33 (Minimum) 150.7 (Maximum)	222.745 (Mean) 32.6 (Minimum) 660.4 (Maximum)	1987.89 (Mean) 1198.2 (Minimum) 2860 (Maximum)
Instruction (Per Cent)	44.838 (Mean) 33.8 (Minimum) 53.31 (Maximum)	45.279 (Mean) 33.58 (Minimum) 54.61 (Maximum)	45.90 (Mean) 16.67 (Minimum) 56.19 (Maximum)	47.311 (Mean) 39.2 (Minimum) 55.59 (Maximum)	42.652 (Mean) 38.69 (Minimum) 47.7 (Maximum)

Figure 15 revealed the relationship between enrollment size and

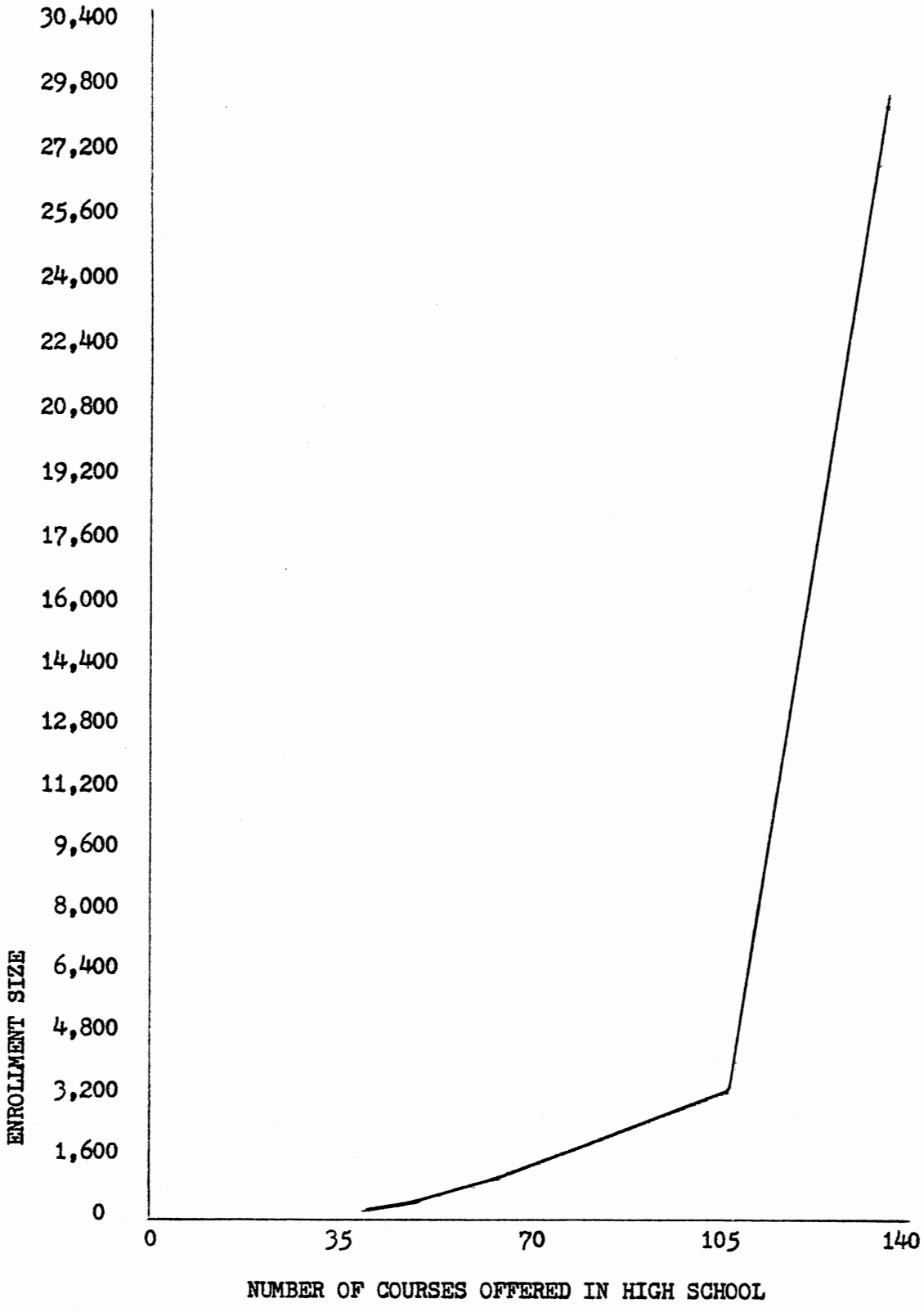

Figure 15. Relationship Between Enrollment Size and Number of Courses Offered in High School Plotted by Means

and the number of courses offered in high school. The means from small to large enrollment categories were: 39.5, 46.2, 58.9, 105.2, and 132.7. The correlation between enrollment size and the number of courses offered in high school was 0.52125, with $r^2 = 0.2717$. The relationship was significant beyond 0.001.

The working hypothesis stating "as the school enrollment size increases, the number of courses offered in high school will first rapidly increase, and then level out slightly" was rejected for not adequately describing the plotted line.

In educational finance studies, the researchers were often seeking an optimal range of enrollment where the most efficient use of expenditures was shown. The number of courses offered in high school correlated with enrollment size revealed an interesting scale of economy. The maximum number of courses offered in high school by a school district was 178.8. This maximum number was from a district in the 1,600-15,000 enrollment range. Nine schools in the 1,600 to 15,000 enrollment range exceeded the maximum course offerings of the four largest schools. The lower correlation of the number of courses variable, in comparison with the other independent variables, occurred as the districts in the 3,000-8,200 range of the 1,600-15,000 enrollment range were able to offer a greater number of courses. However, the mean of the 1,600-15,000 range was 105.2. While Figure 15 plotted by means revealed the economy of scale as the number of courses in high school moved fairly proportionally through the enrollment categories and appeared to increase in the four largest schools, the scattergram, using the actual figures of each district, revealed that many districts in the 3,000-8,200 enrollment size offered more courses

than the four largest schools and thereby skewed the distribution and lowered the correlation.

Mill Levy

The mill levy or tax rate of a district was determined by many variables: the number of students in the district, the budget per pupil, the local effort rate of the district, and the taxable income and adjusted valuation of the district. Taxable income and adjusted valuation were added together to form district wealth. District wealth multiplied by the local effort rate produced the amount of money needed for the general budget plus the state equalization aid. The mill levy or tax rate represented the amount of money the local taxpayers were charged for the educational costs in their district.

Table VII lists the tax rate means by enrollment categories and reveals the low and high tax rate of each enrollment category.

TABLE VII

TABLE OF MEANS FOR ENROLLMENT CATEGORIES

Variable	82 to 200 Enrollment	200 to 400 Enrollment	400-1,600 Enrollment	1,600-15,000 Enrollment	15,000-over Enrollment
Mill Levy or Tax Rate	38.657 (Mean)	37.648 (Mean)	39.457 (Mean)	40.24 (Mean)	47.737 (Mean)
	12.73 (Minimum)	14.55 (Minimum)	9.17 (Minimum)	26.27 (Minimum)	29.14 (Minimum)
	57.78 (Maximum)	68.73 (Maximum)	66.73 (Maximum)	49.24 (Maximum)	63.48 (Maximum)

Figure 16 plotted the relationship between enrollment size and

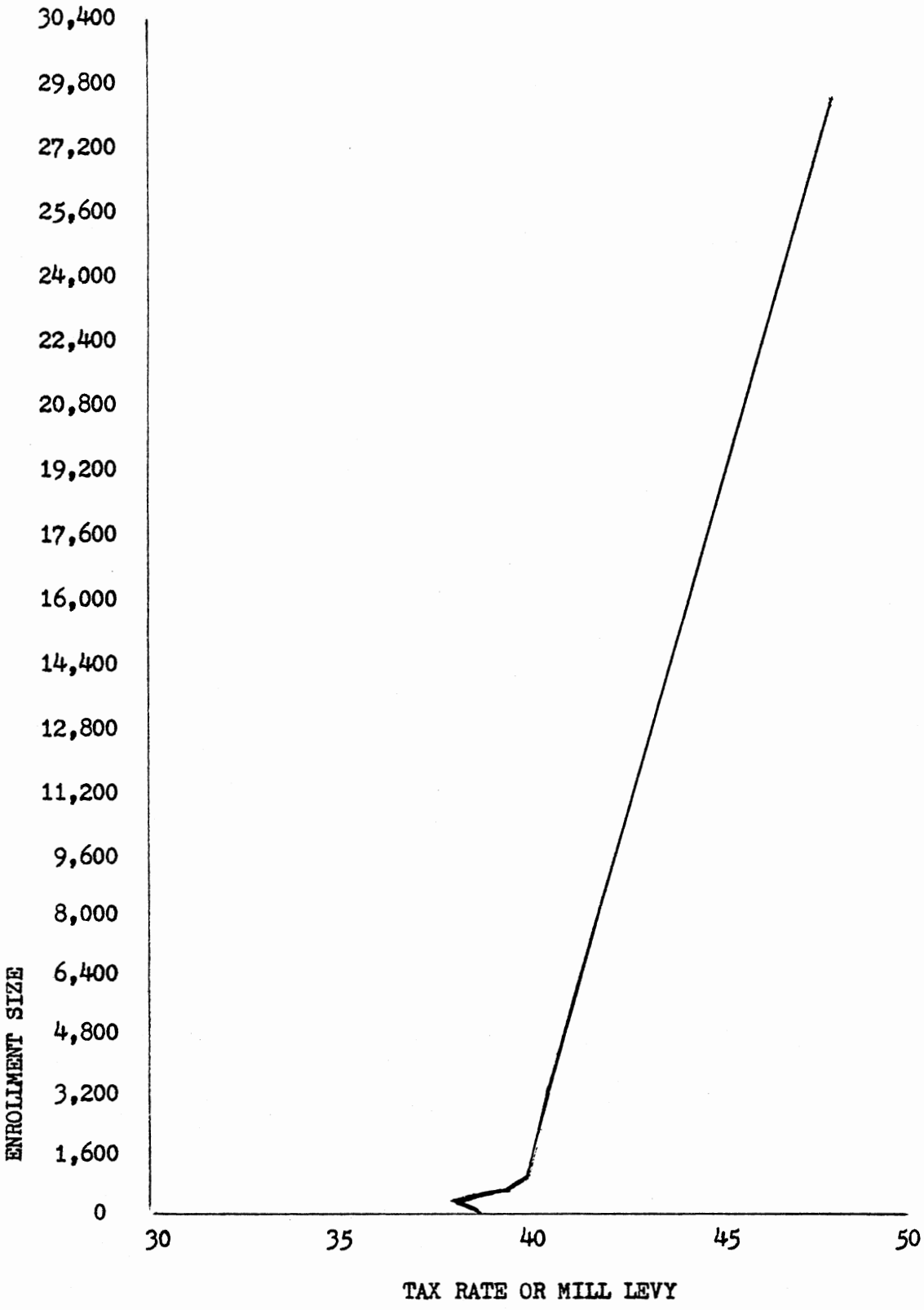

Figure 16. Relationship Between Enrollment Size and Tax Rate or Mill Levy Plotted by Means

and tax rate. The means, from small to large enrollment categories, were: 38.65, 37.65, 39.46, 40.24, and 47.74. The tax rate ranged from a low of 9.17 to a high of 68.75. An extremely weak correlation existed between enrollment size and the tax rate: $r = 0.10956$, with $r^2 = 0.01209$. The correlation was significant at 0.02734.

The working hypothesis stating "as school enrollment size increases, the tax rate per district rapidly decreases, and then slowly levels out to a flat minimum" was rejected. The weak correlation between enrollment size and the tax rate revealed that the line of the plotted means graph was misleading: too much variation existed among the tax rates of the 306 districts to accurate plot a line representing the tax rate.

District Wealth

District wealth was the sum of adjusted valuation and taxable income of a district. A 1976 amendment provided for an averaging of the district wealth over a four-year period to reduce the amount of change in wealth that could occur from one year to another due to annual variation in adjusted valuation and taxable income. District wealth was the average (mean) of the sum of the taxable income within a district for the four most recent years for which income figures were available and the adjusted valuation of the district for the same four-year period. Adjusted valuation was the sum of the assessed valuation of locally assessed real estate adjusted to a 30 per cent assessment level and the actual assessed valuation of tangible personal property and state-assessed public service companies. Table IX revealed that the average adjusted valuation per pupil ranged from a low of $11,549 to a high of $368,766, a difference of $357,217. The

median was $68,305. Average taxable income per pupil varied from a low of $4,393 to a high of $27,540 with a median of $13,487. District wealth per pupil, the sum of the average adjusted valuation and the average taxable income divided by the enrollment, revealed a low of $20,555 and a high of $388,324 with a median of $80,603.

TABLE IX

TABLE OF MEANS FOR ENROLLMENT CATEGORIES

Variable	82 to 200 Enrollment	200 to 400 Enrollment	400-1,600 Enrollment	1,600-15,000 Enrollment	15,000-over Enrollment
Valuation	25,444,059 (Mean)	31,775,772 (Mean)	48,611,660 (Mean)	108,140,725 (Mean)	1,104,209,024 (Mean)
	10,581,531 (Minimum)	8,003,867 (Minimum)	9,470,481 (Minimum)	8,378,704 (Minimum)	575,715,584 (Minimum)
	55,639,648	69,343,440	198,177,120	332,772,352	1,671,750,400
Taxable Income	2,274,531 (Mean)	4,139,074 (Mean)	9,583,873 (Mean)	42,906,973 (Mean)	633,475,584 (Mean)
	1,053,342 (Minimum)	1,344,282 (Minimum)	2,335,489 (Minimum)	4,784,873 (Minimum)	349,990,400 (Minimum)
	4,434,007 (Maximum)	7,814,758 (Maximum)	26,550,192 (Maximum)	122,672,480 (Maximum)	924,371,456 (Maximum)

Figure 17 revealed the relationship between the enrollment size and assessed valuation. A high correlation existed between enrollment size and assessed valuation: $r = 0.96274$, with $r^2 = 0.92686$. The relationship was significant beyond 0.001. The means of the assessed valuation, from small to large enrollment categories, were: 25,444,059, 31,775,772, 48,611,660, 108,140,725, and 1,104,209,024.

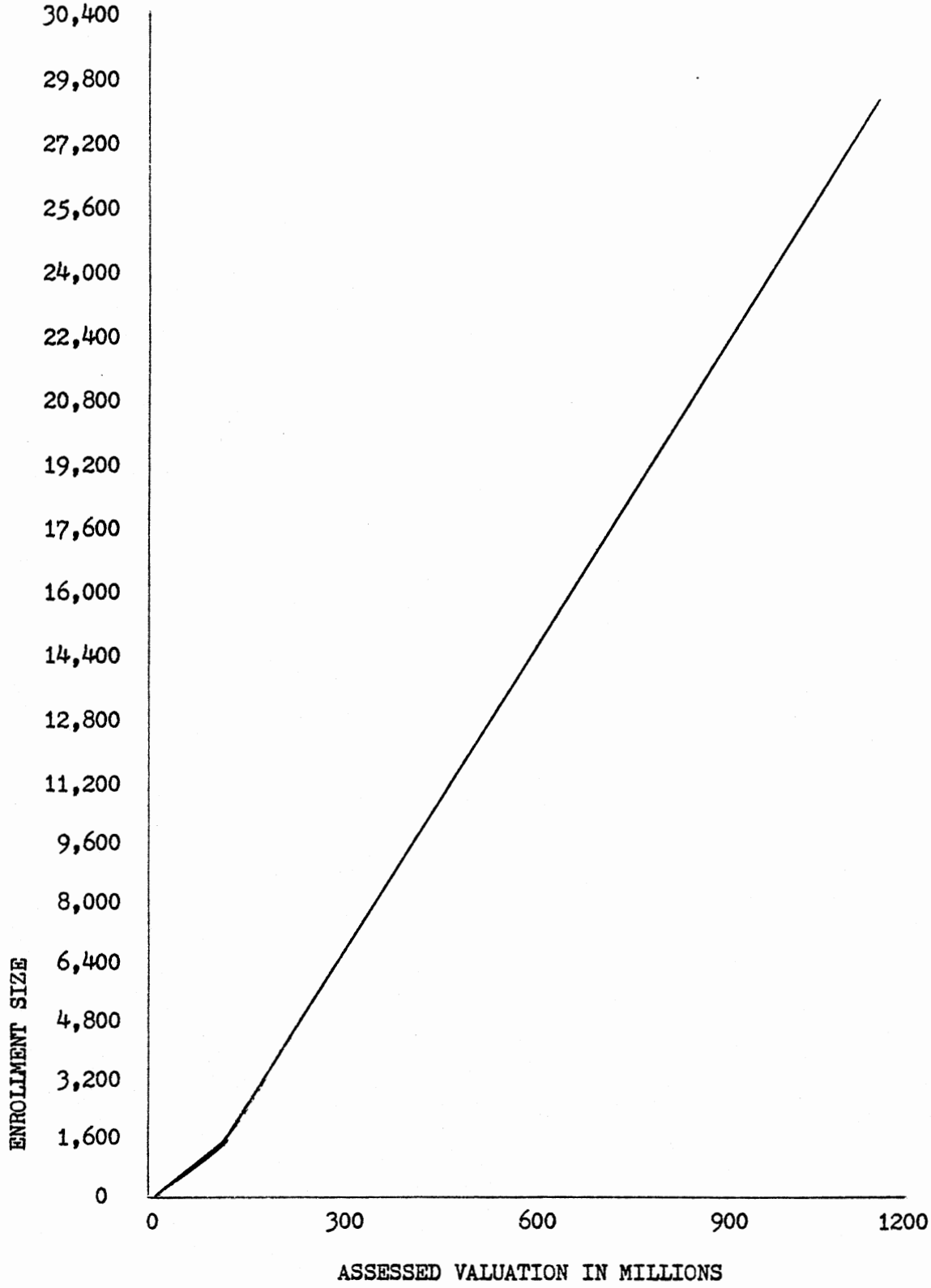

Figure 17. Relationship Between Enrollment Size and Assessed Valuation Plotted by Means

The working hypothesis stating "as school enrollment size increases from zero, the adjusted valuation per district rapidly decreases, and then slowly levels out with slight variations" was rejected for not adequately describing the plotted means line. A fairly straight plotted means line represented the correlation between enrollment size and valuation, rather than the hypothesized line.

The means line for assessed valuation plotted in Figure 17 followed the same pattern set when the budget of the districts was plotted by the means of the enrollment categories. Figure 18 revealed that the same basic pattern existed when enrollment size was plotted by the taxable income means. The correlation between enrollment size and taxable income was 0.97423, with $r^2 = 0.94911$. It was significant beyond 0.001. Therefore, district wealth, the sum of assessed valuation and taxable income, followed the same plotted-line pattern established by prior variables.

The means of the taxable income for the enrollment categories appear in Table IX, with the high and low taxable income of the districts in each enrollment category. Taxable income ranged from a low of $1,053,342 to a high of $924,371,456, a vast difference of $923,318,114.

The highly correlated regression line of Figure 18 verified that the working hypothesis stating "as school enrollment size increases from zero, the taxable income per district will rapidly increase, and then slowly level out" was rejected. The four largest school districts located in the major cities of Kansas had the most taxable income per district in the state. The mean of 42,906,973 for the 1,600-15,000 enrollment size jumped to 633,475,584 for the four largest districts.

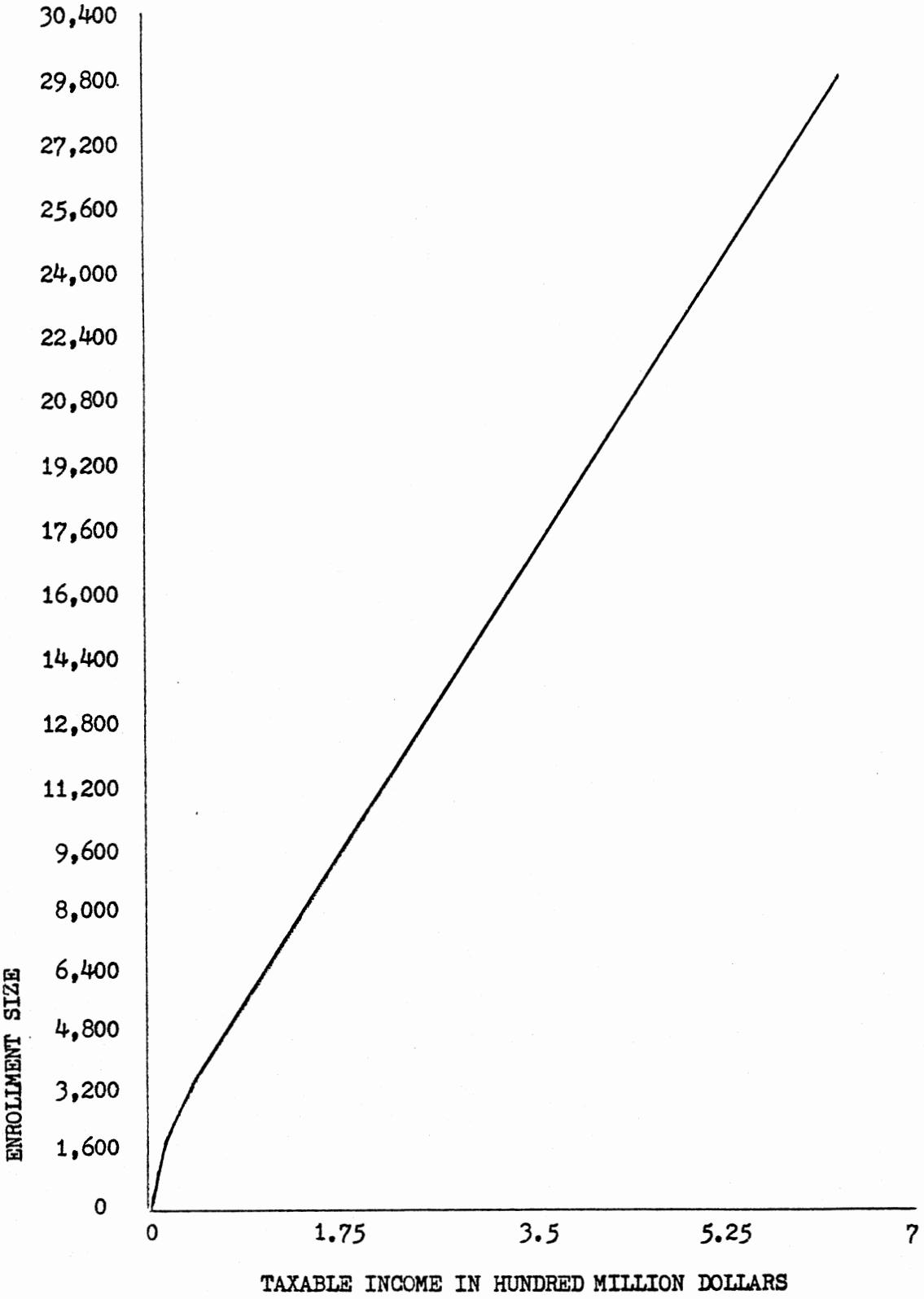

Figure 18. Relationship Between Enrollment Size and Taxable Income Plotted by Means

Equalization Aid

State equalization aid was determined by multiplying the district wealth by the local effort rate. To this product was added the 85% of income tax rebate and any P.L. 874 receipts. The 85% of the income tax rebate was defined as twenty per cent of resident individual income tax liability after credits, except for income taxes paid to another state, withholding and estimates, and P.L. 874 receipts were defined as any applicable amount determined under federal rules and regulations based upon a ratio of school district operating revenues that are "equalized." After multiplying the district wealth by the local effort rate and adding the 85% of income tax rebate and any P.L. 874 receipts, this total sum was subtracted from the general fund budget to determine the equalization aid entitlement for the district. The general equalization aid per pupil ranged from 0 to a high of $1,926.05, with a median of $742.33. Thirty nine of the 306 Kansas schools did not receive any equalization aid during the 1980-81 school year.

An extremely weak correlation between enrollment size and equalization aid was noted: $r = 0.06535$, with $r^2 = 0.00427$; and it was not significant at 0.12720. The means, from small enrollment size to large, were: $39,477.58, $181,015.75, $597,741.94, $2,799,713, and $19,771,210. The weak correlation was caused when the researcher entered the variable as equalization aid per pupil, rather than aid per district. The amount of aid received per pupil was dependent upon the district wealth; therefore, the aid per pupil appeared scattered throughout the plot, producing a low correlation. Figure 19, plotted by the means of the amount of equalization aid per district for the enrollment categories, revealed a plotted line that followed the established

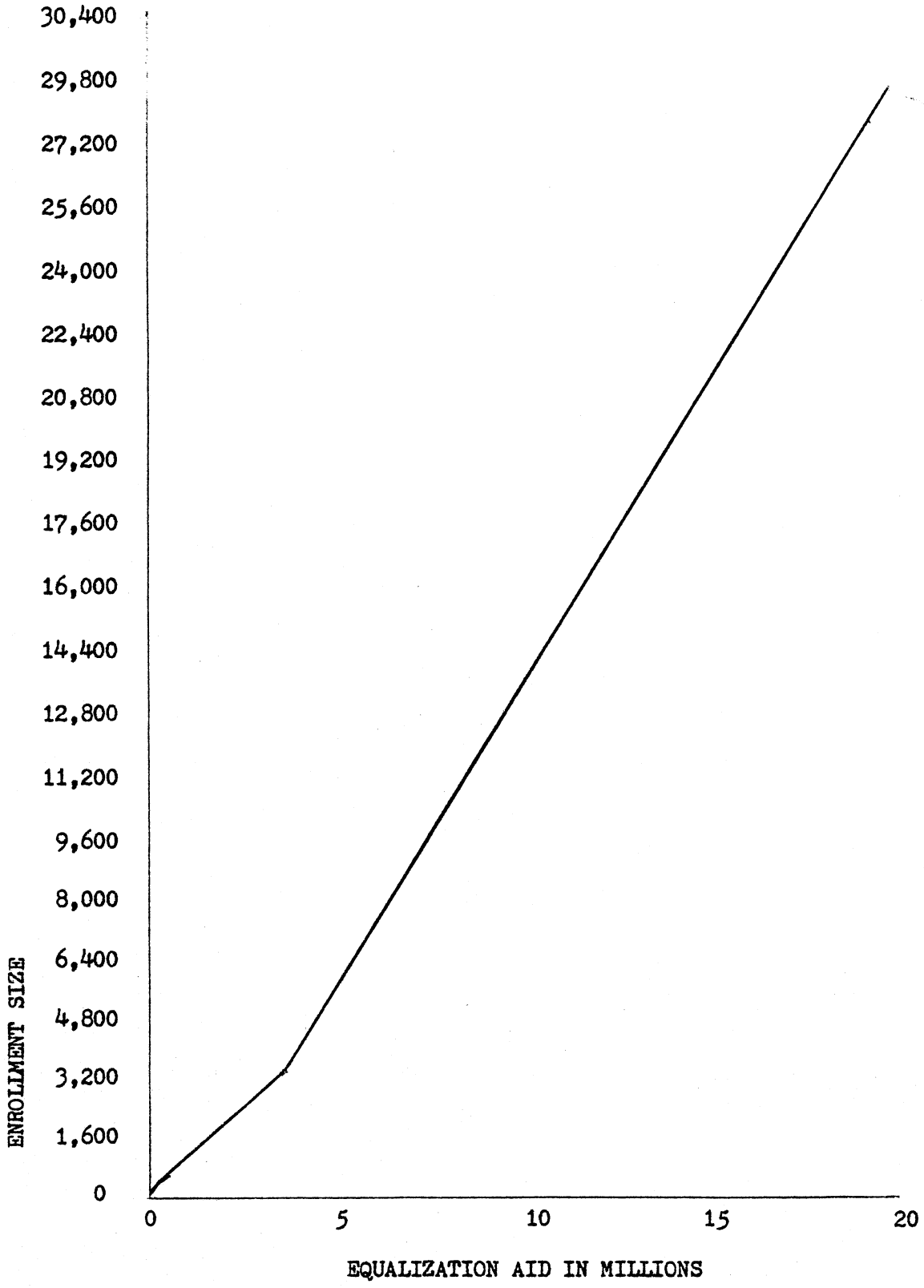

Figure 19. Relationship Between Enrollment Size and Equalization Aid Plotted by Means

pattern set by the other independent variable graphs.

The working hypothesis stating "as school enrollment size increases, the amount of state equalization aid will rapidly and steadily increase" was rejected for not adequately describing the plotted line.

The means of the equalization aid by enrollment categories appear in Table X, with the low and high amount of equalization aid for a school district.

TABLE X

TABLE OF MEANS FOR ENROLLMENT CATEGORIES

Variable	82 to 200 Enrollment	200 to 400 Enrollment	400-1,600 Enrollment	1,600-15,000 Enrollment	15,000-over Enrollment
Equal-ization Aid	39,477.59 (Mean) 0.00 (Minimum) 213,023 (Maximum)	181,015.75 (Mean) 0.00 (Minimum) 632,108 (Maximum)	597,741.94 (Mean) 0.00 (Minimum) 1,816,654 (Maximum)	2,799,713 (Mean) 301,881 (Minimum) 9,293,018 (Maximum)	19,771,210 (Mean) 10,829,091 (Minimum) 30,329,696 (Maximum)

Ratio of Equalization Aid to the General Budget

The amount of state equalization aid a district received in 1980-81 was also reported by the Kansas State Department of Education as a ratio of equalization aid to the general fund budget. The ratio, the percentage of state equalization money a district received, revealed the low ratio as 0 and the high as 82, with a median of 33.5. The high ratio showed that under the 1980-81 finance system one school district of the

state required equalization aid that amounted to 85% of its general budget.

A weak correlation existed between enrollment size and the ratio of equalization aid received by the districts: $r = 0.11947$, with $r^2 = 0.01427$; and it was significant at 0.01836. Since thirty nine schools did not receive any state equalization aid, a plotted graph of the ratio was not deemed necessary. The working hypothesis, therefore, was not tested.

Area and Density

The geographical area of a district revealed a negative relationship to enrollment size: $r = -0.14398$, with $r^2 = 0.02073$. Density, defined as the number of students transported over 2.5 miles divided by the number of square miles in the district, produced a positive correlation with enrollment size: $r = 0.84761$, with $r^2 = 0.71844$; and the relationship was significant beyond 0.001.

Since the geographical area or the number of square miles in a district was one of the factors in determining transportation aid, along with the factors of the number of students transported over 2.5 miles and, therefore, the density of the district, plotted graphs were not deemed necessary for the area or the density of the district. The working hypotheses involving area and density were not tested.

Local Effort Rate

As previously explained in the analysis of the multiple regression method, the local effort rate was determined by dividing the budget per pupil "norm" set by the State for the district's enrollment category into the district's budget per pupil and multiplying by the constant 1.593 which was set by the Kansas legislature for 1980-81. Because the

local effort rate was determined by the enrollment category and by the budget per pupil which again was determined by the enrollment category, a plotted means graph was not deemed necessary, and the working hypothesis, therefore, was not tested.

A negative correlation existed between enrollment size and the local effort rate: $r = -0.04310$, with $r^2 = 0.00186$; the relationship was not significant at 0.22624.

Summary of the Analysis

In the multiple regression equation, the independent variable that explained the greatest amount of variance in the dependent variable, expenditures per pupil, was the local effort rate of the district. The variable that explained the greatest amount of variance unexplained by the local effort rate was district wealth. District wealth was the sum of taxable income and assessed valuation. The next variable in the regression equation was equalization aid per pupil, and the fourth independent variable in the multiple regression equation was the ratio representing the percentage of equalization aid to the general budget. The strength of the amount of variation in expenditures per pupil was explained by the linear dependence upon the four independent variables operating jointly with $r^2 = 0.91215$.

The multiple regression equation, however, was made suspect analytically by the selection of the four independent variables. Three of the independent variables were also factors used to determine the general budget: local effort rate, district wealth, and equalization aid. The fourth independent variable, the percentage of equalization aid to the general budget, was in turn determined by the three factors used in producing the general budget: local effort rate, district

wealth, and equalization aid. Lastly, the relationship between per pupil costs and local effort rate proved suspect because just as the general fund budget was divided by the district enrollment to determine the budget per pupil and the expenditure per pupil, so was the budget per pupil divided into the "norm" budget per pupil and multiplied by a constant after adjustments were made in the enrollment categories. Therefore, the relationship between expenditures per pupil and the local effort rate emerged highly significant.

In essence, the four variables selected in the multiple regression equation were not independent variables but were closely related. However, the selection of the four variables, variables which were elements of the general fund budget formula, verified that the State determined the amount of money a district received, the distribution of the funds, the money available for a district, and indirectly the amount of the expenditures of a district. Any discrepancies that might exist in the budget per pupil or in the expenditures per pupil had been assessed, measured, and regulated by the State.

The State, then, directly controlled the funds available to the school districts through the School District Equalization Act, and the State justly set the economy of scale which was determined by the analysis of the plotted graphs with enrollment size as the dependent variable.

In the analysis of the plotted means graphs, the working research hypotheses were all rejected because the hypotheses did not adequately explain or describe the line representing the plotted means. The concept of economy of scale was verified when an overall pattern of expenditures was established by plotting enrollment size means with the

means of the general budget. The pattern consisted of a cost-line that increased steadily through the first four enrollment categories, and then increased slightly in the four largest schools enrollment category. This pattern set by the plotting of the general budget determined the following plotted means lines: instructional costs, number of teachers, energy costs, administrative costs, attendance centers, special needs, valuation, transportation costs, transportation aid, equalization aid, and taxable income. The line of the plotted means for the tax rate was irregular, however.

Lastly, graphs were not constructed for the independent variables: ratio of equalization aid to the general budget, geographical area, density of district, total number of pupils transported over 2.5 miles in a district, or the local effort rate of a district. These five variables were not considered applicable for plotted graphs: area was more closely related to district wealth which was plotted, and density was determined by the number of students transported over 2.5 miles and the geographical area of the district. Both density and number of students transported determine the amount of transportation aid and transportation costs. The percentage of equalization aid to the general budget was determined by the equalization aid entitlement of each district, plus thirty nine districts did not receive any state equalization aid, and the local effort rate was itself determined by the enrollment size and the enrollment size categories.

The analysis revealed an equitable method used by the Kansas State Department of Education to distribute educational funds. Of the three factors used to determine both state aid and the general budget: local effort rate, district wealth, and income tax rebate,

only the local effort rate was directly controlled by the Kansas legislature and can be modified each school year if deemed necessary.

Although the cost-line appeared to increase slightly in the four largest schools category and seemed to reveal a slight inequity of funding, the four largest school districts enroll roughly one-third of the total Kansas school population, and the cost per pupil in the largest schools were at the average expenditures per pupil for the state. The economy of scale was equitable, as the size increased so did the proportional costs. The U-shaped cost curve found by school finance researchers was not present in the expenditures of the Kansas public school system.

The greatest inequity was the vast difference in the tax rate among the districts. The tax rate ranged from 9.17 mills to 68.73 mills, a difference of 59.56 mills. The amount of tax a Kansan paid in 1980-81 was determined by where he resided in the state and in what specific school district.

CHAPTER V

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

The data of 306 of the 307 Kansas public schools, collected by the Kansas State Department of Education, were used in the study. The analysis of the data was divided into two parts: a multiple regression statistical technique used to analyze the relationship between the dependent variable, expenditures per pupil, and a set of independent variables that would directly or indirectly influence educational costs of a district; and the second part of the analysis used visual aids to analyze the results of the study: the results of Pearson's correlations were stated, and the means of the dependent variable, enrollment size divided into categories used by the state, were plotted with the means of the independent variables. The correlation coefficient, r squared, and significance of the Pearson's correlation were listed in order to provide comparison with the plotted means line of each visual graph and to verify the regression line.

Summary

The independent variable, in the multiple regression equation, that explained the greatest amount of variance in the dependent variable, expenditures per pupil, was the local effort rate of the district. The variable that explained the greatest amount of variance unexplained by the local effort rate was taxable income and assessed valuation. Taxable income and assessed valuation were combined as the district wealth

variable. The next variable in the regression equation was equalization aid per pupil, and the fourth independent variable in the multiple regression equation was the ratio of equalization aid to the general budget. The results of the multiple regression equation proved suspect analytically, even though the strength of the amount of variation in expenditures per pupil was explained by the linear dependence upon the four independent variables operating jointly with r squared at 0.91215.

Three of the four independent variables in the multiple regression equation were also factors used to determine the general budget: local effort rate, district wealth (taxable income and assessed valuation), and equalization aid. The fourth independent variable, the ratio of equalization aid, was determined by the three factors used to produce the general budget. Although the effects of multicollinearity were present since the four variables were closely interrelated, the main conclusion drawn from the multiple regression equation was that the Kansas legislature, with recommendations of the Kansas State Department of Education, had set the local effort rate, and by having a predetermined local effort rate, regulated the amount of monies available for the general fund and the amount of monies received as equalization aid. Therefore, the multiple regression equation did produce the variables having the greatest influence upon expenditures: the elements of the School District Equalization Aid formula.

The local effort rate allowed the wide range between the highest and lowest budget per pupil: $4,832.47 to $1,674.47. Originally, the budget per pupil specified for districts under 400 pupils was the median budget per pupil of all districts with 400-499 enrollment. In

order not to establish what was regarded as an excessive budget per pupil "norm" for such districts, the law was amended in 1978 to reduce the size of the smallest enrollment category from under 400 to under 200. The norm budget per pupil applicable to this enrollment category was the median of districts with 200-399 enrollment. Furthermore, in 1980, an amendment provided that for determining the local effort rate and, therefore, the general aid entitlement of the four largest enrollment districts, the median budget per pupil was set at 100.5 per cent of the median budget per pupil of all districts in the largest enrollment category, recognizing the existence of higher costs in these districts. The Kansas legislature determined the local effort rate and the amount of general state aid under the equalization formula. In general, districts with low wealth per pupil received a high percentage of general state aid, while districts with high wealth received relatively little or no general state aid.

The conclusion that the Kansas legislature determined the budget per pupil and, hence, the expenditures per pupil was further verified by the analysis of the plotted means graphs. The plotted means line representing the expenditures was determined by an overall pattern of cost established by plotting enrollment size means with the means of the general budget. The plotted line of the general budget emerged as the dominant pattern for the following plotted means lines of instructional costs, teachers, administrative costs, attendance centers, energy costs, special needs, transportation costs, valuation, taxable income, equalization aid, and transportation aid. Each of these independent variables followed the same cost-line pattern set by the plotted means line of the general budget.

The plotted graph analysis revealed an equitable economy of scale in the expenditures. As the enrollment size increased so did the educational needs and expenditures for the programs. The graph analysis verified that the State had determined the needs of the districts and had distributed the funds equitably. The U-shaped cost curve, discovered in many economy of scale studies, occurred when the optimal size was exceeded and expenditures increased sharply curving the line representing costs. This U-shaped cost curve, found by researchers of school finance studies, was not present in the Kansas public school finance system.

Conclusion

The study revealed that the Kansas State Department of Education and the Kansas legislature recognized the economy of scale concept and the educational needs of the school districts and regulated and determined the general budgets of the schools by the local effort rate. The smaller schools required a larger budget per pupil than the other enrollment categories, and the four largest school districts required more monies to meet their educational programs. Both the Kansas State Department of Education and the Kansas legislature study the educational costs of all districts each year and amend and modify the equalization formula as needed.

Recommendations

The Constitution of the state of Kansas charges the responsibility of the Kansas government for a uniform system of free public schools with equality of opportunity for all students. The Serrano vs. Priest decision of 1971 stated that the quality of a child's education could not depend solely on the wealth and resources of the district, but that

the child's education must be dependent upon the wealth of the state as a whole. Kansas maintains a system of school finance whereby the amount of money a school district receives is directly dependent upon the wealth and resources of the district; the state equalization aid insures that each district receives an amount of money, deemed adequate by the state, to operate the district's educational programs. However, the grave injustice is to the taxpayer, under the present system. The Kansan's tax rate is determined by where he resides in the state. The difference between 9.17 mills charged for education in one district and 68.73 mills levied in another is a gross discrepancy.

Therefore, the first recommendation is that the quality of a Kansas child's education be based on the total wealth and resources of the state, not an individual district. Other state operated facilities such as museums, libraries, and the State house are funded by a uniform tax levied against all Kansans. The benefits and obligations of these state operated facilities go to all Kansans: as so must the benefits and obligations of the Kansas public school system. The recommendation to meet this obligation would be to combine all districts' wealth and resources into one unit: State wealth and resources. From the state's wealth and resources, then, the educational needs of all the districts can be determined, and all Kansans can be taxed fairly and equally. The State needs to assume full-funding to the Kansas public schools.

The greatest inequity revealed by the study was in the variation of the tax rate among the 306 districts. The tax rate ranged from a low of 9.17 mills to 68.73 mills, a difference of 59.56 mills. The tax rate and, therefore, the amount of property tax a Kansan paid in 1980-81 school year was determined by where he resided in the state

and in what specific school district. Taxpayer equity is essential to a good state school finance system. When taxpayers are burdened by regressive taxes, the results will affect the quality of education in the state. The nature of the property tax with its difficulty of administration and its regressivity makes it objectionable to taxpayers. This problem, in addition to the need to equalize property valuations among and within counties, requires that the Kansas legislature be charged with the responsibility of performing sales-assessment ratio studies and annually certifying an appropriate valuation for all property within the state.

Furthermore, to insure a fair and equal tax rate to all Kansans, the recommendation is that Kansas property be assessed at 100% of its market value. Property valued with a fair market value of $100,000 should be assessed the same rate of tax regardless of location. A Governor's commission should be composed to study a state-wide valuation system and to investigate the feasibility of appraisal councils in each county which would be charged with the responsibility of adopting a program of appraising property and collecting taxes. The Governor's commission would also establish an equalization board for taxpayer protest and to provide a means for a check and balance. To insure taxpayer confidence in the system, the commission would establish a permanent study group to analyze annually the school district market value system.

Other sources of revenue to finance the school systems need to be investigated to ease the burden of the property taxpayer. At the current time (Spring 1982), the Kansas legislature is investigating the possibility of a severance tax on oil and Kansas minerals as well

as the possibility of a sales tax for school finance. A severance tax or a sales tax, or a combination of the two, would increase resources of the Kansas government for funding the educational system, ease the burden of the property taxpayer, and spread the responsibility of school financing to all Kansans. Other sources of revenue would insure that each Kansas public school was truly "free" to all students and erase the mockery of a free public school system by eliminating student fees, textbook fees, and any incidental fees. Other sources of revenue would enable the State to operate a system of public schools without fee charges to students, fee charges that discriminate against the poor in the state. With additional revenue the State could maintain a school system that goes beyond the idealistic concept and were truly free of costs to all students.

To insure accountability and creditability to the school finance system, uniform budget reporting forms should be mandated for all school districts. The reporting forms should reflect an account classification and the amount of receipts, expenditures, and transfers. The Governor's commission could investigate the feasibility of using computers based in Topeka to print monthly reports received from each school district and of using state auditors to audit each school district's finance budget. This method would reveal to the public a fair and equal system of school financing and insure a check and balance of the school money being wisely expended.

With full-state funding, the State assumes the financial responsibility for the construction of public school facilities and the financial responsibility for all existing building debts of the districts. The need to replace educationally obsolete and structually unsound and

unsafe buildings and to make major renovations of existing facilities will continue to place a financial strain on the school districts' financial plan. This obligation has been compounded by societal changes that have caused shifts in student population and federal and state educational mandates that have demanded more and better educational services. Under full-state funding the debts of individual districts would be paid by the State: however, with the assumption of full-state funding the State Department of Education would determine whether new school buildings are needed and where they are to be located. A school site could not be purchased until the State Department of Education approved the amount to be spent, the objective standards for the school physical plant, and the long-range building plans of the district. With the assumption of full-state funding, the Governor's commission could survey the existing school districts' facilities and report various needs to the State Department of Education. The survey would include any recommended replacement of temporary classrooms, replacement of unsafe or non-fire resistant structures, replacement or modification of energy inefficient buildings, additions to structurally sound buildings to make them educationally adequate, and modification of buildings for use by handicapped children and adults. The commission's report would include cost estimates to replace non-fire resistant and unsafe buildings, the dates of construction of all school buildings, the accessibility for the handicapped, the amount of space available for regular classroom programs and the amount of space available for special instruction of exceptional children. The commission should designate a study group to plan a twenty-year long-range building program, utilizing data on population

and enrollment studies and financial trends.

With full-state funding, the school districts' boundaries, as they now exist, would no longer be necessary except for the responsibility of transporting students to school. The Governor's commission could study and analyze the existing school district boundaries and redefine and redraw the boundaries to insure financial efficiency.

And lastly the commission should recommend that the State Department of Education adopt regulations specifying criteria for essential, isolated school districts. Upon approval of the State Department of Education, the designated schools that qualify would be allocated "add-on" funds in accordance with the adopted formulas.

Summary of Recommendations

The recommendations are as follows:

1. That the Kansas government accept the Constitutional responsibility for a uniform system of free public schools with equality of opportunity for all students.

2. That all school district wealth and resources be considered as State wealth and resources.

3. That the State assume full-state funding for educational services, and each property taxpayer be charged the same tax rate.

4. That all Kansas property be assessed at 100% of its market value.

5. That the Governor create a commission to study a state-wide valuation system, to investigate the feasibility of appraisal councils, to establish an equalization board for hearings, to establish a permanent study group to analyze the market value system annually, to recommend to the legislature other sources of revenue, to investigate

the possibility of using State computers and State audits to analyze monthly school reports, to survey school buildings and report various needs to the State Department of Education, to report cost estimates for replacement and modification of school buildings, to analyze school district boundaries for financial efficiency, and to adopt regulations governing essential,isolated school funding.

Recommendations for Further Research

A critique of this study by the writer would reveal that the data of the Kansas public schools were from the school year 1980-81; therefore, they were almost a year old when the study was printed. Fort Leavenworth school district was excluded from the study, and since the 1980-81 school year Powhattan, Unified School District 510, has been disbanded. However, the descriptive analysis of the 306 Kansas public school districts was objective and without bias. The research analyzed only the means of the enrollment categories and not individual schools.

The researcher would recommend three possible research studies. The first recommended research study would be an investigation of energy costs. Data on energy costs would be available from the Kansas State Department of Education. The recommended design of study would be to discover the most efficient school district on energy costs from the data and report a cost per building ratio. Once the researcher had found and analyzed the most efficient energy-cost school district, or the top three efficient schools, then, a descriptive analysis of the buildings could be documented: amount of wattage and cubic feet of gas (or the type fuel used), cost per watt and per cubic foot, number of square feet of the building, location in the state, age of the building, and the amount of insulation. The study could then investigate the

the worst or lowest school in energy cost. The analysis would reveal why a vast difference in energy costs exists across the state.

A second recommended inquiry would be an investigation of the effects of declining enrollment on a school district. The Wichita school district enrollment has declined from 63,492 in 1969-70 school year to 42,350 in the 1980-81 school year. The enrollment decline over the eleven year period is approximately 21,000 pupils. The study would investigate the effects of this decline and how the district adapted to the decline. The number of courses offered, number of teachers, number of administrators, and the number of buildings in the district could be analyzed to understand how the district responded to the enrollment decline. In conjunction with the enrollment decline in the Wichita schools, the remaining schools in Sedgwick county either remained at the same enrollment or have increased in size since 1969-70. A study of the factors influencing the growth of the surrounding schools while Wichita schools were experiencing an enrollment decline could be undertaken.

A third recommendation for research study would be student achievement. Since Kansas has implemented the state-mandated competency based testing to public school students, state-wide data would be available to the researcher to compare the results of the small, medium, and large schools to each other. One could hypothesize that the small sized schools would have the highest student achievement due to the smaller pupil/teacher ratio, and due to the smaller number of course offerings that tend to concentrate on math, English, and science. On the other hand, one might hypothesize that the larger schools would attract more efficient and highly trained teachers and offer a broader based course

offerings, therefore, students from the larger schools would attain higher scores. Or one could hypothesize no relationship exists between school enrollment size and student achievement on the competency based testing.

Further Considerations

Basic funding for the public schools of Kansas should come from tax revenues collected at the state level. This new format will show the people of the State that the public schools are a statewide responsibility and that a child's education is not dependent on local financial conditions. As the costs of education have risen and state tax resources have been spread over more public services, full assumption of educational funding at the state level for public schools needs to be implemented. A decrease in state responsibility would create inequities both to the student and to the taxpayer. Equality of educational opportunity is enhanced by reducing reliance on unequal local resources. Since the future economic well-being of the state is dependent on the production of human capital, Kansas should increase its fiscal effort for financing the public schools.

Available data indicate that school construction will continue to be a serious financial matter for school districts for years to come. State control on all school construction is essential to insure equal access to schools, energy conservation, renovation, and new program demands. Increased costs for building sites, materials, and labor are anticipated, and careful planning and utilization of school construction monies are an absolute economic necessity. Adequate facilities and healthy environments in which learning can occur demand that the State be responsive to the educational needs of the schools through system-

atic, on-going planning. The State must shoulder the responsibility for maintaining school facilities, along with implementing methods of assessing building needs, and developing long-range plans.

The State should provide educational programs and services with equal educational opportunity to all students. While mathematical uniformity is not possible, actions should be taken to assure that each child's educational opportunity will be maximized and that any inequities will be curtailed. The individual educational needs of children are the basic consideration of any system of school finance. However, a substantial educational and fiscal burden can conceivably occur in a school district which has an excessive ratio of children with unusual educational deficiencies. Since the incidence of educational needs from district to district is not uniform and the cost of providing services varies substantially, the State must be sensitive to both needs and costs. Therefore, educational equity requires that uniformity of educational offering should be maintained in all school districts except where differing incidences of educational needs require additional funding to meet excessive costs.

The educational curriculum of Kansas public schools is affected by sparsity of population and fiscal inadequacy of many school districts. Substantial differences among school districts exist in course offerings in the areas of cultural arts, foreign languages, and certain elementary and exceptional areas. Pupil sparsity greatly restricts the number of course offerings in many districts. The State is not fully responding to the legitimate educational program and course cost differentials which exist in many districts.

Education is a duty imposed upon the citizens of Kansas for the

good of the State, and the burden of finance should be equal to all taxpayers. All property owners in Kansas should be taxed equally to support the schools. A property owner should be taxed according to the assessed value of the property, and the tax base should not be determined by the geographical location within the state. Educational opportunity of every child should be the function of the total taxable wealth of the state and not limited to the taxing ability of a local school district. The happenstance of birth and home should not determine the education a child receives or the mill levy the parents pay. Schools are no longer merely a local service, a higher level of education is now necessary for every citizen of the state.

Financial support of public education in Kansas should be the sole responsibility of the state government. No one school district is educating only its own citizens; education is a legitimate charge against the total state revenue system because people migrate within the state and from state to state. Education is of such a universal nature that its legal control cannot be vested in any unit smaller than the state.

BIBLIOGRAPHY

Average Classroom Teachers' and Principals' Salaries of the 307 Unified School Districts of Kansas for 1979-80 and 1980-81. Topeka, Kansas: Kansas State Department of Education, January, 1981.

Chambers, Jay G. "The Development of a Cost of Educational Index: Some Empirical Estimates and Policy Issues." Journal of Education Finance, Vol. 5, 1980, pp. 262-281.

Constitution of the State of Kansas. Topeka, Kansas: Kansas State Printing Plant, January, 1977.

Denzau, Arthur. "An Empirical Survey of Studies on Public School Spending." National Tax Journal, Vol. 28, June 1975, pp. 173-289.

Educational Directory of Kansas Schools. Topeka, Kansas: Kansas State Department of Education, September 1980.

Fox, William F. "Reviewing Economies of Size in Education." Journal of Education Finance, Vol. 6, 1981, pp. 273-296.

General Fund Property Tax Rates of School Districts: 1980 Actual and Adjusted Rates. Topeka, Kansas: Kansas State Department of Education, February, 1981.

General State Equalization Aid for Kansas Unified School Districts: 1980-81. Topeka, Kansas: Kansas State Department of Education, March, 1981.

Hall, Walter Baxter. "The Relationship of Enrollment Size and Certain Factors of Cost and Effectiveness of Arkansas Public High Schools." (Unpublished Doctoral Dissertation, The University of Arkansas, 1968).

Hanson, Nels W. "Economy of Scale as a Cost Factor in Financing Public Schools." National Tax Journal, Vol. 17, January, 1964, pp. 93-96.

Hirsch, Werner Z. "Determinants in Public Education Expenditures." National Tax Journal, Vol. 13, June, 1960, pp. 29-40.

Holland, David W. and John L. Baritelle. "School Consolidation in Sparsely Populated Rural Areas: A Separate Programming Approach." American Journal of Agricultural Economics, Vol. 57, November, 1975, pp. 567-575.

Hooker, Clifford P. and Van P. Mueller. Relationship of School District Reorganization to State Aid Distribution Systems. Minneapolis, Minnesota: University of Minnesota, 1970.

Johns, Roe L., Kern Alexander, and Forbis Jordan. Financing Education: Fiscal and Legal Alternatives. Columbus, Ohio: Charles E. Merrill Publishing Company, 1972.

Kiesling, Herbert J. "Measuring a Local Government Service: A Study of School Districts in New York State." The Review of Economics and Statistics, Vol. 49, August, 1967, pp. 356-367.

Mill Levies of the 306 Unified School Districts of Kansas 1980. Topeka, Kansas: Kansas State Department of Education, December, 1980.

Osburn, Donald. "Economies of Size Associated with Public High Schools." The Review of Economics and Statistics, Vol. 52, February, 1970, pp. 113-115.

Percentage of Line Items of General Fund Budgets for Unified School Districts: 1980-81. Topeka, Kansas: Kansas State Department of Education, 1980.

Public School Report: Selected School Statistics: 1980-81. Topeka, Kansas: Kansas State Department of Education, January, 1981.

School Directory. Topeka, Kansas: Kansas State Department of Education, October, 1981.

Transportation Report for Unified School Districts: 1981. Topeka, Kansas: Kansas State Department of Education, 1981.

Riew, John. "Economies of Scale in High School Operations." The Review of Economics and Statistics, Vol. 48, August, 1966, pp. 280-287.

Unified School District Wealth: 1980-81. Topeka, Kansas: Kansas State Department of Education, March, 1981.

Unified School District Report on Enrollments and General Fund Budget Per Pupil: 1980-81. Topeka, Kansas: Kansas State Department of Education, January, 1981.

Webb, L. Dean. "Fiscal Implications of School District Reorganization." Journal of Education Finance, Vol. 4, 1979, pp. 342-357.

White, Fred and Luther Tweeten. "Optimal School District Size Emphasizing Rural Areas." American Journal of Agricultural Economics, Vol. 55, February, 1973, pp. 45-53.

VITA 2

Harvey Jayhue Watson

Candidate for the Degree of

Doctor of Education

Thesis: A DESCRIPTIVE ANALYSIS OF THE RELATIONSHIP BETWEEN ENROLLMENT SIZE AND EDUCATIONAL EXPENDITURES OF KANSAS PUBLIC SCHOOLS ALLOWING FOR VARIABLES INFLUENCING COSTS

Major Field: Educational Administration

Biographical:

Personal Data: Born in Galena, Kansas, February 23, 1936, the son of Harvey and Bess Watson.

Education: Graduated from Galena High School, Galena, Kansas, in May, 1953; received the Bachelor of Science in Education degree from Pittsburg State University, with a major in English, in January, 1970; received the Master of Arts degree in English from Pittsburg State University in August, 1973; received the Education Specialist degree in educational administration from Pittsburg State University in May, 1979; completed the requirements for the Doctor of Education degree at Oklahoma State University in May, 1982.

Professional Experience: Employed in Unified School District 488, Axtell, Kansas, as an English and chemistry teacher from January, 1970 to August, 1972; as an English instructor at Unified School District 461, Neodesha, Kansas from August, 1972 to August, 1975; as an English instructor and vice principal at Crest Unified School District 479, Colony, Kansas from August, 1975 to May, 1979; as superintendent of schools at Unified School District 468, Healy, Kansas from July, 1979 to July, 1981. Served in the Air Force from 1957 to 1967.

Professional Organizations: Kansas Association of School Administrators, United School Administrators of Kansas.