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Assessing Technical Economic Efficency in Selected Suburban Cook County Elementary School Districts

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ASSESSING TECHNICAL ECONOMIC EFFICIENCY IN SELECTED SUBURBAN COOK COUNTY ELEMENTARY SCHOOL DISTRICTS

This study used a multiple regression procedure known as the quadriform of educational production to categorize 115 suburban Cook County public elementary school districts into one of the following four categories: (1) technically economically efficient; (2) high service; (3) low service, and (4) technically economically inefficient. Data for this study were obtained from the Illinois Board of Education, School District Report Card, and annual financial report. As a result of this analysis, 16 school districts, or 13.9%, were categorized as technically economically efficient; 28, or 24.4% were categorized as high service; 27, or 23.4%, were categorized as low service; and 3, or 2.6%, were categorized as technically economically inefficient. Since quadriform analysis was based on "ideal cases", the remaining 41 school districts, or 35.7% were eliminated from further

analysis because they were judged to not be "ideal cases."

Once the districts were categorized, analysis of variance and Tukey-B procedures were used to determine if significant differences existed among the four types of school districts for 24 financial variables, 8 personnel variables, 6 socio-economic variables and 14 wealth variables. Of the 53 variables examined, 35, or 66%, were judged to be significant between at least two of the group means.

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ASSESSING TECHNICAL ECONOMIC EFFICIENCY IN SELECTED SUBURBAN COOK COUNTY ELEMENTARY SCHOOL DISTRICTS

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

On October 6, 1991, an article written in the CHICAGO TRIBUNE editorial section stated "Taxes aren't simply the most important political issue in Chicago and the suburbs and the rest of Illinois. Often, they are the only issue." ("Illinois Must Invest," 1991).

Across the state, local voters were voicing their opinions by electing officials who pledged to hold the line on taxes or reduce taxes. Disputes concerning who would get new revenue produced by the state income tax surcharge, new methods of taxation, and property tax caps dominated discussions in the state legislature.

In the same editorial section of the CHICAGO TRIBUNE the following appeared:

> Governor Jim Edgar has shown he's a strong believer in creating statewide committees to study serious problems. One of these task forces delivered a stern warning about Illinois' economic future. Unless he acts quickly, the state faces a serious shortage of qualified workers by the end of the decade that will cripple its ability to compete internationally and lower the standard of

living for most (state) citizens ("Illinois Must Invest," 1991).

The editorial further discussed the need for Illinois' citizens to develop a school system which provides comprehensive education from early childhood through adulthood, which stressed the importance of high performance and saleable skills. These articles illustrated the dilemmas faced by educators in Illinois. That is, there was a strong public outcry for improving schools with an accompanying outcry for lower or more stable taxes. If Illinois educators were to meet the demands of the public, they had to provide better education and graduates at the same or lower costs. Another way of stating this concept is to say that Illinois educators must provide greater educational outputs with equal or decreased resource inputs.

A definition of technical efficiency that was consistent with this concept is provided by Hickrod (1990). He stated that technical efficiency "maximizes the inputs in such a fashion so that the greatest output is achieved relative to a given level of input" (p. 2). It was this concept of technical efficiency that served as the primary framework for the current study.[1]

In summary, citizens in Illinois were asking educators to meet two primary goals: (1) increased quality and (2) lower taxes. One potential method of addressing these goals simultaneously was to operate schools in a more "technically efficient" manner.

Conceptual Framework

The establishment of efficient models for the operation of schools has been difficult to achieve. It has been difficult to isolate specific variables and determine their effect upon outcomes. Socio-economic factors have distorted the data and are difficult to control when attempting to determine the effect of specific input variables. Cost-effectiveness approaches have not answered global questions about school accountability and are much more useful at the local level to evaluate teaching alternatives (Hickrod, 1989, p. 2).

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[1]For purposes of this study, technical efficiency was interpreted as those selected school districts which fell into the first quadrant of a quadriform and who had a lower than expected average expenditure per pupil and a higher than expected average IGAP reading and math composite score for school years 1988-89, 1989-90, 1990-91.

Hanushek (1986) stated "although the educational production process has been extensively researched, clear policy prescriptions flowing from the research have been difficult to derive" (p. 1141). Economic studies of elementary and secondary schooling have concentrated on production processes, public finance questions about government support, and to lesser extent, labor markets for teachers, cost-benefit analyses of specific programs and public-private choices.

Hickrod (1989), distinguished finance professor at Illinois State University, has developed a useful tool called the quadriform which categorized school districts based on the impact of low-income children, district test scores access to wealth and expenditure levels. The quadriform method has been used to divide school districts into one of the following four categories: technically economically efficient, high service, low service, or technically economically inefficient.

The concept of technically efficient school districts served as the conceptual framework for this study. In addition, the body of research concerned with educational production functions and input-output analyses were included to help explain the essential framework of this study.

Studies of efficiency relating outputs to inputs traced their beginnings to a report titled "Equality of Educational Opportunity" (Coleman, 1966). Most recently, Swanson and King (1991) defined the concept of production function as a set of relations among possible inputs and a corresponding set of outputs for a firm or industry. They stated "with respect to schooling, outputs included behavioral and attitudinal changes in pupils induced through school activities" (p. 267).

The Problem

This study identified the common characteristics that existed among technically efficient suburban Cook County elementary schools for the school years 1988-89, 1989-90, and 1990-91. Specifically, what common characteristics existed within public schools in suburban Cook County that had lower than expected state operating expenditures per pupil and a higher than expected IGAP composite test score?

Research Questions

1. The quadriform of educational production was used to determine which suburban Cook County public elementary districts were classified as technically economically efficient, high service, low service, or technically economically inefficient?
2. What were the common financial attributes that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which financial attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low service districts, and technically economically inefficient districts?
3. What were the common personnel attributes that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which personnel attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts,

low service districts and technically economically inefficient districts?

4. What were the common socio-economic attributes that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which socio-economic attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low service districts, and technically economically inefficient districts?
5. What were the common wealth factors that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which wealth factors were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low service districts, and technically economically inefficient districts.

Need for the Study

In his study Liu (1989) recommended "the same research designs and stages of data analysis should be used but with different achievement scores such as the state student assessment results" (p. 136).

Liu's statement served to point out the need to study economic efficiency within Illinois elementary schools and the need to use alternative forms of output measurements such as the Illinois State Student Assessment (IGAP).

Hickrod et al. (1990) made a similar recommendation for further research by stating "the overall homogeneity of the population might also have some impact on the results of the quadriform. The less diverse the population, the more focused the population on increasing student achievement" (p. 21).

Hickrod indicated the need to study school districts in a relatively homogeneous geographic location. Taken together Liu and Hickrod pointed out three topics for further research: (1) the identification of technically efficient elementary school districts; (2) the use of alternative forms of output measurement; and (3) the need to study a relatively homogeneous geographic area. This study attempted to meet these needs and provide information an important addition to the research related to the financing of schooling in Illinois.

Definitions

<u>Economically Inefficient School District</u>: Those school districts that exhibited a lower than expected IGAP composite score and a higher than expected expenditure level.

<u>Expected Expenditure Level</u>: Expected expenditure level was the district operating expenditure per pupil predicted from the district equalized assessed valuation per pupil and percent of low income families.

<u>Expected IGAP Composite Score</u>: That level of IGAP composite score as predicted from district percent of low income, district percent of mobility, and district percent of attendance.

<u>High Service District</u>: Those school districts that exhibited a higher than expected IGAP composite score while exhibiting a higher than expected expenditure level.

<u>IGAP Composite Score</u>: Three year district combined average of district reading and math score for grades 3, 6, and 8 weighted by the number of test takers.

Illinois School Report Card: A result of Public Act 84-126 passed in 1985 mandating that school districts report required information to the State Board of Education. The required information included student and district characteristics, instructional characteristics, standardized achievement scores, and district financial information.

Low Service Districts: Those school districts which exhibited a lower than expected IGAP composite score while exhibiting a lower than expected expenditure level.

Technically Economically Efficient School District: The operational definition of an economically efficient school was a district that exhibited higher than expected IGAP composite scores while exhibiting a lower than expected expenditure level.

Limits of the Study

1. Illinois state IGAP assessment scores were used as the only measure of educational outputs. These scores did not include a measurement of affective educational outcomes and were narrow in scope.

2. The Illinois state IGAP assessment test was a group test and as such used group testing procedures and group reporting mechanisms.
3. The selected expenditure variables were limited to those included in the Illinois Annual Financial Report and the State Report Card.
4. The selected personnel variables were limited to the Illinois Certification Report and the Illinois State Report Card.
5. Because state IGAP goal assessment data was used and limited to elementary schools, high school and unit districts were excluded from this study.
6. Because the economic variables changed from county to county, only suburban Cook County elementary schools were used in this study.

Assumptions

This study was based on the following assumptions:

1. The annual financial reports as submitted to the state by local districts and audited by certified public accountants were correct.
2. Local school districts uniformly used the procedures contained in the Illinois State Budgeting Handbook.

3. The State Report Card data reported by the Illinois State Board of Education to the public was technically accurate.
4. The state certification reports as submitted by local school districts to the Illinois State Board of Education were technically accurate.
5. The pattern of relative internal allocations, as well as the total amount of money spent in the district on education, had an effect on economic efficiency.

CHAPTER II

REVIEW OF RELATED LITERATURE

This study was concerned with the common input variables which existed within technically efficient schools. The review of the literature concentrated on statewide testing in Illinois as a means to increase accountability, production function research, the impact of socio-economic status on student outcomes, and input-output research.

Overview of Statewide Testing

In 1985 the Illinois legislature enacted Illinois Public Act 84-126 "An Act In Relation to Education Reform and Financing Thereof." The Act established the school report card for public schools in the state of Illinois. The purpose for establishing the school report card was to "better school accountability" (p. 351). This purpose was to be accomplished by creating a uniform format for reporting both student achievement and financial data for each Illinois school district to the taxpaying general public.

The 1985 Illinois school reform legislation also established a definition of schooling and set a requirement that goals for learning in six fundamental learning areas be identified and assessed. As part of this legislation, all public schools were required to participate in a statewide assessment. A statewide assessment of reading was initiated during the 1987-88 school year at grades 3, 6, and 8, (Illinois Reading Assessment: Classroom Connections, 1991) and a statewide assessment of math was initiated in the 1988-89 school year at the same grades (Illinois Goal Assessment Program Assessing Mathematics in Illinois 1990).

Illinois was neither the first nor the only state to engage in statewide testing. One of the earliest statewide testing programs was initiated in Oregon in 1849. According to Casteen (1984) the Oregon territory, not yet a state, began certifying school teachers based on the results of written tests, a novel approach inspired by the lack of formally qualified teachers. The New York State Regents Examinations date back to 1865 and may be the country's oldest program of large-scale achievement testing (Hawes, 1964). The Regents, now a high school examination program, originally tested elementary school students, was elevated to the secondary level in 1887 (Fish, 1944).

The 1920's have been viewed as the period when the beginning enthusiasm for standardized testing reached its zenith. The testing programs of that era were voluntary. Usually, state governments did not initiate testing programs as a means for evaluating educational systems. The Iowa Test of Basic Skills traces its origin to this time period when it originated as a high school academic contest (Petersen, 1983).

New motivation for statewide testing resurfaced during the 1960's because of growing concerns by taxpayers that schools were spending tax revenues without being required to show what was accomplished (Ebel, 1979). Kirst (1979) pointed out that accountability statutes were passed by 35 states between 1966 and 1976. These statutes often included new state tests and assessment devices. As of 1988, 45 states and the District of Columbia had statewide programs for collecting data on student achievement. The majority, 25 of the 45 states, used a commercially normed test. Of the remaining states, some used a criterion-referenced test, some used both normed referenced and criterion referenced tests, and some collected data from a number of state required local tests.

Illinois' reliance on statewide testing data as a method of assessing schools is rooted in educational practice which dates back to the mid-19th century. However, Hanushek (1986) pointed out:

> A majority of studies into educational production relationships measure output by standardized achievement test scores. The measures used, however, are generally proxies for more fundamental outcomes. Some practitioners, simply reject this line of research entirely because they believe that educational outcomes are not or cannot be adequately quantified (p. 1150).

While this point of view has merit, today's practicing administrator is faced with the fact that the majority of states have school accountability statutes which have included some form of testing as a measure of output. In Illinois one measure of educational output has been performance on the IGAP tests.

Production Function (Input-Output) Research

Swanson and King (1991) defined "the concept of 'production function' as a set of relations among possible inputs and a corresponding set of outputs for a firm or industry" (p. 266). Hanushek's (1986) definition is consistent with Swanson and King's and stated studies of educational production functions examined relationships among the different inputs and outcomes of the educational process. These studies have been systematic, quantitative, investigations relying on econometric, as opposed to experimental methods for separating the various factors which influenced students' performance.

Sociologists have been using the educational production function since the late 1950's. In his paper titled "The Existentialist Reality of the Educational Production Functions" Michelson (1970) attempted to describe what an educational production function is and how to estimate one. He stated:

> In general, a functional relationship between inputs and outputs in a product is expressed as:
>
> $$Y = f\ (X_1, X_2, \ldots X_{11}).$$

Y is a measurable output or index of outputs; the X_1 are inputs into the process. Since production adds value to raw materials, the inputs are the factors of production (labor and capital, in quantity and quality) and the output is the value added by these inputs. No account is taken of the initial value of the materials in this formulation. The initial value is expressed in the same units as the output value, and if the initial value is the same for all observed production units, then it makes no difference if one thinks of Y as $Y_t - Y_o$ (output value at the end of the process less output value at the beginning) or as Y_t (output value at the end of the process). The difference is a constant term in the expression $f(. . . X_1 . . .)$ (p. 3).

Since the raw materials in education are pupils whose initial values (in output terms) differ, some account must be taken of these differences in educational functions. However, this is an estimation problem, which poses no difficulty in the conceptualization of the value added function. The educational production function, then, though in estimation requires adjustment for critical values, in presentation should appear as value added being a function of production inputs only (p. 3).

The X_1 are elements of the production process during the time period being considered. As an example, consider the output Y to be the increment to vocabulary between the ninth and twelfth grades. The conceptually correct educational production function would adjust inputs for differences among pupils in vocabulary at the ninth grade, and consider items outside the school--say literacy of parents--as an input to the production process during the high school years. Thus variables describing the "social class" of pupils serve two conceptually separate functions. They might correct for differences on entry to the production period, or for output production during the production period, but not at school. This distinction is crucial. To the extent that output differences are due to differences in production during the period under consideration, the programs which attempt to get

> more resources to children who have few outside-school resources, preferably during the times the other children are getting the outside-school resources, would have an obviously good chance of success. To the extent that differences in final output are due to differences in initial value of the output measure, a different production process entirely may be called for; and we know little about this process (p. 4).

The next step in specifying the production function is to indicate the signs of its first partial derivatives, $\frac{\partial Y:}{\partial X_1}$

$$Y = f\ (\overset{+}{X_1},\ \overset{+}{X_2},\ \overset{-}{X_3}\ .\ .\ .).$$

A partial derivative indicates the rate of change of Y when X_1 is incremented by a small amount, other variables staying the same. A negative sign indicates that an increase in only X_1 produces a <u>loss</u> in Y. If many outputs are to be investigated, then it would not be surprising to find negative derivatives for some variables with respect to some outputs. Thus increasing the average verbal facility of teachers might produce a reduction in manual skills; increasing the brawn of assistant principals might reduces some kinds of creative expression, etc. Yet, of course, such losses might be an acceptable "price" to pay for gains in other outputs (p. 5).

The last important feature of the production function is actual estimates of the partial derivatives. Thus, we have to know the functional form of input-output relationships. For example, a linear function

$$Y = a + b_1X_1 + b_2X_2 + \ldots$$

has partial derivatives b_1, b_2, etc. But a linear function with multiplicative interaction terms:

$$Y = a + b_1'X_1 + b_1'X_2 + c_1X_1X_2 \ldots$$

has partial derivatives

$$(b_1' + c_1X_2)$$

$$(b_1' + c_1X_1) \quad .$$

Here the response of Y to increments of X_1 depends on how much X_2 is present (p. 6).

Other complications arise when other forms are tested. Non-linear relationships can be approximated with higher order polynomials, such as

$$Y = a + b_1X_1 + c_1X^2{}_1 + b_2X_2...$$

In this case, $\frac{\partial Y}{\partial X_1} = b_1 + c_1X$; i.e., the response of Y to X_1 depends on how much X_1 there is to begin with. Typically, the exponent c_1 in such estimates is negative but small. The result is that for small values of X_1, b_1 dominates, and Y responds positively to increases in X_1. As X_1 increases, the effect of added X_1 diminishes (p. 6).

The mathematical form of the production equation, then, is crucial for determining its partial derivatives. These, in turn, give the information we are seeking: an estimate of the change in output given a specific input change (p. 6).

Input-Output Research: Socio-economic Status (SES)

Educational production studies were born out of the Coleman Report of 1966 which was concerned with the distribution of educational resources in the United States (Hanushek, 1986). This report demonstrated that differences in schools had little to do with differences in student performance. The Coleman Report (1966) stated once socio-economic factors are taken into consideration, expenditure level is not the most powerful predictor of quality. Further, it is social setting or environment that is the most important factor in a child's learning experience. Family background and the characteristics of other students in the school seemed to be the input variables which most effected student achievement.

In response to the results of the Coleman Report, Bowles and Levin (1969) wrote:

> When one considers that children possess a wide range of inherited abilities and are products of different preschool environments and other social influences, these findings are not as surprising as they might appear at first glance. But while one would certainly expect student background to be a powerful determinant of pupil achievement, it might also be anticipated that school characteristics have a significant influence on performance levels, yet the evaluation apparatus that was constructed in the report was not neutral with regard to which possible influences might account for variations in achievement (p. 8).

Bowles and Levin (1969) also believed that family background characteristics and school resources were highly correlated. They stated:

> The family background characteristics of a set of students determine not only the advantages with which they come to school; they also are associated closely with the amount and quality of resources which are invested in the schools. As a result, higher status children have two distinct advantages, strong educational interests provided by their parents and their parents' relatively high incomes which leads to stronger financial support for education. This reinforcing effect of family background on student achievement both directly through the child and indirectly through the school, leads to a high statistical correlation between family background and school resources. (p. 15)

Winkler (1972) concluded that Coleman's research design was flawed by the basic assumption that whatever variation there was in achievement that was explained by either home or the school environment was attributed to the home. While Coleman's conclusions caused much discussion, they also motivated many others to conduct additional research about the measurement of school quality using input-output measures and the influence of socio-economic status on output. A reanalysis of Coleman's data was carried out by Bowles (1970). Contrary to Coleman's findings, Bowles found statistically significant relationships between three measures of school variables: teacher verbal scores, financial expenditures, and race of students and verbal achievement.

The findings of the Coleman Report were reinforced by Talmadge (1972) when he stated it had been found repeatedly that learning ability is related to the socio-economic status (SES) of students. Many attempts have been made to hold various home and community effects constant so that a determination can be made as to how school input variables effect school outcomes.

A study conducted by Wold (1979) determined that the following five measures of socio-economic status (SES) were useful measures of SES: (1) assessed valuation of property per pupil; (2) sparsity of school age population; (3) per capita income; (4) per pupil Title I allotment; and (5) median level of schooling completed by adult population. Murname (1980) stated that elementary school children of low SES families who attend school with a high proportion of high SES students make more progress than children who attended schools in which most of the children come from low SES families.

White (1982) summarized 101 studies concerned with SES and achievement. His results demonstrated that the best estimate of the correlation between SES and academic achievement was .251 or weaker. He also indicated that "correlations computed from aggregated data would be much higher than correlations computed using individuals as the unit of analysis" (p. 461). As a research tool, White indicated that "with aggregated groups being the unit of analysis, SES was useful as a covariate, predicting or stratifying variables. He also warned that SES is a collective term. The indicators of SES such as income of family, education of parents, home atmosphere, etc. should be well defined and specified in a study" (p. 475).

In 1984, Walberg reviewed more than 3,000 investigations into production factors which influenced education and described nine factors requiring optimization to increase affective, behavioral and cognitive learning. These factors were divided into three categories: (1) student aptitude; (2) quality of instruction; and (3) environmental factors. Walberg further stated:

> Other factors influence learning in school but are less directly linked to academic learning. Class size, financial expenditures per student and private governance independent or sectarian in contrast to public control correlate only weakly with learning, especially if the initial abilities of students are considered (p. 21).

In 1986, Hanushek reviewed the educational literature relative to production function studies and found that schools and teachers differ dramatically in their effectiveness. One of the reasons for these differences was family background. Further, he found more educated wealthy parents have children who perform better on standardized tests.

In their review of major resource allocation studies MacPhail-Wilcox and King (1986) determined that the results of the studies which were reviewed indicated that school resources vary with community attributes, particularly student socio-economic status, race and educational need. It appeared that expenditure levels were higher and district discretionary funds are concentrated in high income and low minority enrollment schools. School expenditure levels correlated positively with student socio-economic status and negatively with educational need when school size and grade level are controlled statistically.

Socio-economic status was positively related to proportionate fiscal allocations for teachers and administrators and negatively related to allocations for specialists and material resources. (MacPhail-Wilcox & King, 1986).

Brempong and Gyapong (1991) concluded that socio-economic characteristics of communities were significant determinants of educational output. Failure to include these variables as inputs in the production of education results is misspecification of the educational production function.

Hickrod et al. (1990) reported that the percentage of children from low income families was a powerful predictor of the test scores of a district. This variable was curvilinear, that was when the percentage of children in low income families exceeded 50 percent, test scores fell dramatically.

It is evident that socio-economic status played an important role in the measurement of educational outputs. Consistently since the Coleman report pointed out the importance of socio-economic influences, researchers have observed this phenomenon and have attempted to delineate the effect of this input variable.

Input-Output Studies: Other Related Variables

Researchers have attempted to define the best method to isolate input and output variables so that a more accurate measurement of technical efficiency can be obtained. In order to gain an understanding of the history and scope of recent production function studies in education, the researcher has completed a historical review of the literature. The next several pages will be devoted to reviewing production function studies and the findings of these studies.

One of the first production function studies completed following the Coleman Report was authored by Samuel Bowles. The study which was completed in 1969 focused on among other things, the following topics: (a) the meaning of the education production function; (b) the measurement of the output of schools; (c) the problem of measuring what students come to school with and (d) the measurable dimensions of the learning environment. Bowles reported that (a) the estimated relationships are consistent with the conceptual model developed in his study; (b) teacher quality appears to be an important determinant of scholastic success and (c) the production functions explain a very small percentage of the variance of scholastic achievement, even using the full range of social class and school input variables.

Michelson (1970) also completed a reanalysis of the data obtained in the Coleman Report. He developed a correlation between school resources and variations in students' raw test scores for two populations, African American students and Caucasian students. Single linear analysis, simultaneous estimation and regression analysis were applied to the data from sixth grade student questionnaires, teacher questionnaires and principal questionnaires. Based on the finding of his study, Michelson developed the concept of teacher specificity which stated that teacher influence on a child differs by the type of child.

In 1970 Kiesling conducted a study of the relationship of school and community characteristics to achievement performance levels of fifth and eight grade pupils in a 1965 sample of 99 school districts in New York state. Kiesling reported that the school input, consistently related to pupil achievement levels, was resources devoted to central administration and supervision. Further, he stated a second school attribute often related to pupil performance especially in grade 5 was the level of teacher certification. Teacher experience was related to performance but only for pupils from good socio-economic backgrounds. He also concluded that teacher degree level, teacher salary level, value of school district plant and equipment, and principals and supervisors to pupil ratio were not related to achievement levels. The number of students per classroom was found to be positively related to pupil performance. Differences in performance outcomes were found to be much more significant between school districts rather than within school districts.

Martin Katzman (1971) conducted a production function study of 56 Boston elementary school districts. Katzman used six outcome measures: (1) rate of average daily attendance; (2) the rate of continuation of elementary school graduates through high school; (3) the difference in median reading scores between a district's second and sixth grade students; (4) the median level of mathematical competence scores for fifth grade students; (5) the percentage of sixth grade students who voluntarily took a placement exam for a prestigious public high school and (6) the percentage of sixth grade students who passed that exam.

Input variables were divided into two categories: school resources and social characteristics. School resources were measured in terms of (a) expenditures per pupil (b) percentage of accredited teachers (c) percentage of teachers with or above master's degrees (d) percentages of teachers with 10 or more years of experience (e) percentage of students in uncrowded classrooms (f) pupil to teacher ratio (g) annual rate of teacher turnover and (h) number of students per district (Katzman, 1971). Using the technique known as stepwise regression and district level data, Katzman (1971) found that when school resources were held constant, the two input variables which accounted for the greatest variance in achievement were social class and teacher turnover rate. As a result of his study, Katzman emphasized two fundamental economic principles: (1) there may be many tradeoffs between different outputs and (2) efficient resource allocation depended on the relative costs of resources as well as their effects on outputs.

In his 1972 reanalysis of the Coleman Report data, Hanushek compared African American children and Caucasian children for 471 schools with at least four Caucasian sixth graders and 242 schools containing at least four African American sixth graders. The results obtained by Hanushek's research demonstrated that after controlling for the effects of family background and student attitude, teacher characteristics were important in explaining achievement scores of both African American and Caucasian students.

In a review of Hanushek's study, Murname (1975) stated:

> More important than Hanushek's emperical results are his methodological contributions. The emphasis on starting with a model estimating separate production functions for African American and Caucasian children and investigating nonlinear effects systematically all constitute valuable lessons for future researchers (p. 13).

Jencks (1972) completed a three year study of urban elementary schools. Jencks investigated the relationship between verbal achievement of African-American and Caucasian sixth grade students, socio-economic background and school resource utilization. Jencks found that after controlling for the effects of race and socio-economic status, his results supported the findings of the Coleman Report. In addition, Jencks concluded that greater verbal ability of a teacher was associated with higher student achievement scores.

Heim and Perl (1974) undertook and completed an extensive study using data from production function studies, New York state school districts and a large national sample of high school students. Multiple regression analysis was used to measure the cost effectiveness of input characteristics such as teacher length of service, graduate training, teacher verbal ability, class size, quality and quantity of school administrators and use of educational technology. The findings of Heim and Perl indicated that not all inputs are equally productive for all grade levels or all subject matter. Specifically, neither teacher experience nor degree affected student achievement at grades kindergarten through third grade, however, these two inputs did affect student achievement in grades 4 through 6.

Richard Murname's (1975) production function study of 875 inner city black children was based on pupil specific data. In addition, Murnane attempted to compare the explanatory power of alternative models of educational productivity. In one model he used multiple regression techniques to estimate relationships between a student's end of the year test scores and (a) pretest (b) background characteristics and (c) attendance. The explanatory power of the model was compared to that of otherwise identical models which included dummy variables for classroom or schools. Murname observed statistically significant differences in the explanatory power of all three models and showed important differences in productivity existed among classrooms as well as among schools. Differences in the quality of classroom environments had a greater effect on children's math achievement than on their reading achievement. Children's reading achievement was more highly influenced by their background and prior experiences than was their math achievement. Teachers had a critical impact on student achievement. A high rate of student turnover in a class had a deleterious effect on the class' reading achievement. The effect was greatest on children who start the year with relatively high reading achievement.

Mandeville and Quinn (1977) used the fourth and seventh grade achievement data from 92 school districts in South Carolina to determine which input variables were most likely to affect educational quality. The results of this study were obtained using zero-order correlation analyses, partial correlation analyses and regression analyses. The racial composition of student population and percentage of students who received free or reduced price lunches were also consistently associated with achievement. Mandeville and Quinn concluded the study with the following remark "the major result of this study was that a large amount of achievement variation was associated with the few non-manipulable variables examined in this study. Very little achievement variation was related to the extensive set of manipulable input variables" (p. 80). Further, the authors stated that the design of the study may have been the cause of these results and that continued attempts to refine this type of research must be carried out.

> Unfortunately, past analysis of student achievement and educational production relationships have been plagued by both a lack of conceptual clarity and a number of potentially severe analytical problems. As a result, there is considerable confusion not only about what has been learned, but also about how such studies should be conducted and what can be learned (Hanushek, 1979, p. 359).

With these words, Hanushek described the years of production function research that had been completed when he undertook his critical review of these studies.

Hanushek investigated various output measurements and concluded that the use of test scores can be justified as a measurement of educational output because test scores related to continuation of schooling. Test scores relate directly to the real outputs (increasing job satisfaction, personal wealth, health) through a selection mechanism. In addition, educators valued test scores as a measurement device and decision makers appeared to value higher test scores.

Hanushek (1979) also raised the question of how to measure the interaction between multiple outputs. He pointed out that consideration of multiple outputs suggested that production functions estimated with test score measures might be more appropriate in earlier grades where the emphasis tended to be more on basic cognitive skills, reading and arithmetic, than in later grades. In other words, these outputs appeared to be much more heavily weighted than others at earlier grades and therefore, the potential problems of multiple outputs are less than in later grades.

In his journal article Fox (1981) pointed out that the production function was a rigidly defined relationship between factors of production and units of output. He further indicated that it is difficult to identify technology, managerial skill and human capital in the educational setting. His beliefs were based on his review of 30 studies that attempted to measure importance of size economies. He did not believe that the production function should be used to test for size economies in education. While many researchers have used expenditure as a cost proxy in size economies studies, Fox indicated that a serious difficulty could result because expenditure levels were determined in the political arena. He indicated that expenditure levels in a district or between schools in the district were not likely to be cost minimizing or consistent across a district. Thus, "an intra-district analysis based on expenditures would be most susceptible to differences in expenditures based on political motivations" (p. 285).

Wendling and Cohen (1981) investigated the relationship between school resources and school average achievement levels in reading and math for third grade students in New York state. Although Wendling and Cohen did not use individual student data for their study, they argued that "since education is in competition for public funds with other public services, it is increasingly important to show whether and in what circumstances additional dollars can lead to improved outcomes" (p. 45). The results of their study showed that greater teacher quality, as measured by experience and degree status, was related to achievement. This was also true for operating expenditure per pupil and instructional expenditure per pupil. Percent below poverty income and higher percent of minority were also related to lower achievement.

In their review of literature concerned with input-output analysis of schools, Glasman and Biniaminov (1981) divided output measures into two categories (1) cognitive including achievement tests and other tests; and (2) noncognitive, including student attitudes and other similar categories. Three-fifths of the studies reviewed used only cognitive output measures, one study used only noncognitive output measures and the remaining studies used both.

Glassman and Biniaminov (1981) also studied the effects of different inputs on outputs. Input variables were categorized as (a) student inputs including student background, school related student characteristics, student attitudes; and (b) school inputs including school conditions and instructional personnel. Findings concerning student background indicated that family background was more strongly associated with verbal scores of Caucasian students. They also found the unique variance in cognitive achievement due to student background characteristics to be larger than that due to school characteristics. Reviewing school related student characteristic inputs revealed that the percentage of Caucasians was positively associated with achievement of all race/ethnicity groups. Students in predominantly Caucasian schools have a better educational environment at home and aspire more to go to college; the latter two variables affected verbal achievement more than race/ethnicity does. Peer inputs explained more of the variance in verbal achievement than did facilities and teachers.

Regarding school condition inputs, Glasman and Biniaminov (1981) determined it is unclear what school and teacher inputs measure. The results of studies concerning school inputs were mixed and insignificant. Results regarding instructional personnel indicated that instructional personnel measures were clearer than school condition inputs results. Because of teacher-student interaction, these measures were central and direct to student achievement. These instructional personnel variables were found to affect outputs positively: (a) degree, (b) undergraduate institution type, (c) experience, (d) job satisfaction, (e) time in major, (f) teacher verbal scores, (g) teacher race and (8) teacher sex. Teacher load and time spent on student discipline produced negative effects.

Glasman and Biniaminov (1981) also reported on the statistical methods used in the studies they reviewed. All but two of the studies used regression analysis. In 16 studies one equation on the ordinary least squares regression was used. Four studies used simultaneous equations or the two stage least squares regression. The remaining eleven studies used other regression procedures such as stepwise regression, variance partitioning, commonality analysis and path analysis.

Finally, Glasman and Biniaminov (1981) put forth their proposed structural model which is based on selected causal relationships found in the literature.

Monk (1981) was interested in the allocation of resources at the federal, state and district levels, as well as the allocation of resources within individual districts. He concluded that educational production function studies were unable to account for the interactions that exists among the district, school, and classroom levels of the educational systems. In addition, Monk questioned a basic assumption of production function studies, called technical efficiency. He contended that because so many people were involved in the educational process it was difficult for all of them to arrive at a consistent definition of what is efficient. Also, since the outcomes of the education process were numerous and difficult to define, decision makers were often in disagreement over what to produce. Third, it is difficult and maybe undesirable to limit the diversity of educational goals. Finally, if goals or outcomes could be agreed upon, it would still be very difficult to determine how to achieve the agreed upon outcomes. Monk stated:

> In the absence of the assumption of technical efficiency, the estimates of structural parameters

> of the so called production functions are measures of the statistical association between dependent and independent variables. Causation is not established and it is therefore inappropriate to use the estimates of the parameters to calculate the inputs marginal productivities (p. 227).

Another meta-analyses of nearly 3,000 studies of the production factors in learning was completed by Walberg (1984). In his study, Walberg developed a theory of educational productivity. He contended that nine factors required organization to increase affective, behavioral, and cognitive learning. These nine factors fell into three groups:

> (1) student aptitude including ability as measured by standardized tests, development as indexed by chronological age or stage of maturation and motivation self-concept as indicated by personality tests or the student willingness to persevere; (2) instruction including time on task and quality of the instructional experience; (3) environmental factors including the home, the classroom social group, the peer group outside of school and the use of out of school time (p. 22).

The results of Walberg's work indicated that collectively the various studies suggested that the three groups of previously defined factors were powerful and consistent in influencing learning. The first five essential factors appeared to substitute, compensate, or trade-off for one another at diminishing rates of return. Thus, all five factors were important. The other four factors were consistent correlates of academic learning; they may directly supplement, as well as indirectly influence the essential classroom factors. Synthesis of educational and psychological research in ordinary schools showed that improving the amount of quality of instruction resulted in vastly more effective and efficient academic learning.

MacPhail-Wilcox and King (1986) completed a comprehensive interpretive review and synthesis of resource allocation studies for the purpose of understanding and improving school productivity. Their study was a two part synthesis which combined resource allocation studies and production function studies into an integrated body of knowledge. In part one of the study MacPhail-Wilcox and King considered school districts as the unit of analysis. They found that there were strong positive relations among fiscal capacity, expenditure levels and the socio-economic status composition of school districts, as contrasted with strong negative relations between fiscal capacity and the number of children to be educated. In general, wealthy districts have fewer children to be educated and fewer educationally disadvantaged children to school than do poor districts. They also pointed out findings which indicated that teachers in districts with a higher percentage of low socio-economic students had more negative attitudes, lower verbal ability, lower levels of education and experience, and they were more likely to teach in a field for which they were not certified. Performance indices suggested that student attendance and cognitive skills were lower in these districts. MacPhail-Wilcox and King suggested that district size may affect resource allocation practices, noting that districts with more elementary schools, higher average enrollments, and those with larger enrollment variations spent proportionately less of the general fund on central administration.

In the second part of their review of literature, MacPhail-Wilcox and King (1986) reviewed the findings of educational production function studies. The authors reviewed the findings of the major educational production function studies including teacher characteristics, policy/administrative arrangements, and facility and fiscal characteristics. Concerning teacher characteristics, the analysis indicated that variations in teacher verbal achievement, experience and salary were significant predictors of variations in student achievement as measured by standardized achievement test scores. However, professional preparation of teachers was not consistently related to student achievement. Concerning policy and administrative arrangements, MacPhail-Wilcox and King stated:

> These findings are consistent with those derived from resource allocation studies. Both groups of studies suggested that most students, but particularly disadvantaged students, profit when they have more opportunities for direct teacher-student instructional interactions. These opportunities may be influenced by organizational

> arrangements which reduced the number of students which a teacher is to instruct during a particular unit of time, (class size), enhanced opportunities for positive teacher substitution through heterogenous grouping and by insuring that misbehavior does not dilute academic instructional time. The quality of instructional interactions has important implications for student achievement. The number of preparations that teachers have and the teacher scheduling patterns are organizational arrangements which seemed to influence the quality of instruction (p. 214).

Concerning facility and fiscal characteristics, MacPhail-Wilcox and King (1986) found that the studies of relations between facilities, fiscal conditions, and student achievement indicated wealth and expenditure levels were somehow linked to student performance. However, the relations appeared to be more indirect than are relations between educational resources and student achievement.

In his review of 147 studies from all areas of the country, which examined the research on the economics of education and schooling, Hanushek (1986) concluded:

1. Teachers and schools differed dramatically in their effectiveness. This finding was in direct opposition to the findings of many studies which concluded just the opposite. The cause of this discrepancy was confusion and difficulty in explicitly measuring the components of effectiveness and true effectiveness.
2. The results of the studies reviewed by Hanushek were consistent in showing no strong evidence that teacher-student ratios, teacher education, or teacher experience had an expected positive effect on student achievement. In addition, there appeared to be no strong or systematic relationship between school expenditures and student performance.
3. Family background was important in explaining differences in achievement.

According to Hanushek (1986), the measurement of input measures was also difficult. The severity of difficulty was dependent on the design and type of study being completed and accounted for the apparent inconsistency in findings. Moreover, within most studies, measurement errors were probably most important in the case of school inputs, leading in general to underestimates of the importance of school inputs. Hanushek's findings about class size were in disagreement with the findings of MacPhail-Wilcox and King. It is important to note that there is evidence to support each of their respective findings.

A study related to the research completed in the area of educational production analysis was conducted by Childs and Shakeshaft (1986). In their meta-analysis of 45 studies which reviewed the relationship between education expenditures and student achievement, Childs and Shakeshaft examined the studies by dividing them into three categories: (1) studies which indicated no relationships (19 studies); (2) studies which indicated a positive relationship (14 studies); and (3) studies which indicated a positive relationship under certain conditions (12 studies). They found that the grade levels most examined in order of frequency were third grade, fifth grade, sixth grade and ninth grade. The most used unit of analysis was the school district and the most used achievement groupings were composite score, language arts score and math score. The results of their analysis showed a small about of variance (1.04%) in the reported correlation between educational expenditures and student achievement in studies which used mean correlations. Instructional costs (school districts) and instructional costs divided by weighted average daily attendance produced the largest amount of variance among educational expenditures accounting for 6% and 9% of the variance respectively. The authors pointed out that an explanation for these findings might be that while instructional costs aid in improving student achievement, other expenditures have little or no relationship to student achievement and are a major cause of the reported differences in expenditures between school districts. Childs and Shakeshaft concluded that their analysis indicated that the relationship between student achievement and the level of educational expenditures was minimal with those expenditures which related directly to instruction such as teacher salary and instructional supplies having the most positive relationship to student achievement. However, it was not known at what point expenditures make a difference. Further, past a certain point, it may well be that the amount of money a school district spent was not as vital as how the money was spent.

Stern (1989) studied the effect of teacher salaries on third and sixth grade achievement in California schools. Teacher salary expenditures were broken into four categories: (1) teacher/pupil ratio; (2) level of starting salaries; (3) steepness of the salary schedule; (4) and placement of teachers on the salary schedule. Stern determined that per pupil spending for teacher salary appeared to have no consistent and significant association with student achievement. However, when the four categories were examined separately, Stern pointed out that teacher's seniority and education did have a positive and statistically significant association with achievement, but the teacher/pupil ratio had a negative association with achievement and per pupil spending on teachers salaries.

Spottheim (1989) completed a study using 200 New York school districts to calibrate proposed models which he constructed. The goal of his study was to determine the best composition of available "factors of production," measured in dollar amounts by function, that would lead to a situation whereby school districts would produce a predetermined level of desired educational ends, while considering the students, community, teachers and other educational attributes observed in school districts. Spottheim used a highbred approach composed of economics and management science paradigms to construct his descriptive model and his prescriptive model. Twenty-eight logistic equations, each of which portrayed the quantitative relationships between school district resources and scholastic outcomes were used in the descriptive model. Based upon the results obtained in the descriptive model, Spottheim made the following inferences:

1. His model confirmed the perception that the school districts are "firms whose mission is to render a publicly induced collective service" (p. 31) and as such the scholastic outcomes of their "production efforts were influenced by (a) a mix of available financial resources; (b) non-financial resources; (c) teachers' qualifications; (d) socio-economic attributes of the community

they served which were beyond their control and (e) scholastic performance trends.

2. The results of this model suggested the economic concepts regarding the educational production function, non-market firm's behavior, and biostatistical and econometric techniques could be reconciled into an amalgamated approach. In using this approach, arrays of educational data were reduced to a manageable set of equations, thereby allowing for a better understanding of the technical relationships between the quality of educational outcomes produced and the corresponding resources used by the district.

In the prescriptive model, Spottheim (1989) allocated resources available within the district so as to achieve the desired level of scholastic outcomes. The prescriptive model demonstrated the following:

1. The relationships between educational means and ends were quantified into a model through the application of the economic theory of a

non-market firm in conjunction with a logistic modeling approach; and

2. multiobjective decision analysis techniques were applied in conjunction with the above mentioned model to the problem of efficacious resource allocation within school districts so as to ascertain preemptive educational targets.

In 1990 a study of 611 Oklahoma school districts was completed by Lavalley. Input-output analysis was used to research the relationship between budgetary expenditures for the 1987-88 school year and student achievement. Specifically, how well did a proposed model which depicted allocation of resources in Oklahoma school districts predict student achievement. The expenditure variables studied were: (a) instruction, (b) fixed charges, (c) libraries, (d) transportation and (e) administration. Student achievement was measured using the results of the third, seventh, and tenth grade metropolitan achievement tests. The author could not prove the validity of the proposed model using the results that were obtained.

Gyimah-Brempong and Gyapong (1991) completed a study using 1986 and 1987 data from 175 school districts with a population of 1,000 or more in the state of Michigan. Canonical regression analysis was used to investigate the effects of socio-economic characteristics of communities in the production of high school education. Two measures of output were used: ACT scores in mathematics and English. As a proxy for socio-economic characteristics of communities (SEC), the variables included in the study were income, educational attainment of adult population, poverty, and crime rates. A conclusion obtained in the study was that socio-economic characteristics were important inputs in the production of education. Of the four SEC variables used in this study, only education of the adult population can be used to represent essential characteristics of communities. Their final conclusion was school resources positively influenced student performance.

Hughes (1991) completed a study of 131 schools in the commonwealth of Virginia to determine if the amount of money spent made a difference on delivery of educational services. After ranking the districts by total current expenditure per average daily membership, a comparison of 26 school and community variables was made. The comparison was made between the top 25% highest ranking districts and the lowest 25% ranking districts. The highest ranked expenditure group displayed higher achievement scores; higher community income and education levels; greater ability to raise revenues; higher expenditure per pupil; smaller class size and higher salaries paid to teachers.

The Taxpayers Federation of Illinois (1993) completed a study of Illinois school districts which developed a ranking of schools relative to their students' test performance, percent of low income students and per pupil expenditures. Data were gathered from the results of the Illinois state report cards for the years 1988-89, 1989-90, 1990-91 and 1991-92 and used to compute multi-year averages. This study concluded that the method of comparison used in the study was a more meaningful set of indicators than the comparisons presented in the Illinois State School Report Card. The reason for this was that districts with similar characteristics were grouped together so that questions may be asked about districts which were distant from the mean.

Relevant Production Function Studies Completed In the State of Illinois

A number of production function studies which used various methods of research have been completed in the state of Illinois. These studies have generally been concerned with Illinois high school or unit districts. These studies have served as a basis for this research project and therefore will be presented in an attempt to further develop a theoretical foundation for this study.

Yong, (1987) using data from the Illinois School Report Card, investigated the impact of district wealth and size on student and school performance. District wealth was measured by equalized assessed valuation per pupil, median family income and Chapter 1 percentage. District size was measured using student enrollment. Student performance variables selected were ACT composite and subtest scores, graduation rate, and attendance rate. School performance variables used were pupil-teacher ratio, operating expenditure per pupil, and average teacher salary. Relationships between the dependent and independent variables were tested for linearity. Regression analyses were then conducted. Yong drew the following conclusions:

1. Median family income and Chapter 1 percentages were generally good predictors of student and school performance. Relationships between wealth and school performance variables were often curvilinear illustrating the law of diminishing returns.
2. The relationship between district size and the dependent variables were generally more curvilinear than linear. As district size increased, scores on the dependent variables (except attendance rate) also increased, initially at an increasing rate.
3. Stepwise regression indicated that wealth measured by median family income was a better predictor of ACT scores than were size and the interaction of wealth and size.
4. District size accounted for a small amount of the variation in ACT scores when district wealth was held constant.

A study which involved 419 unit school districts in Illinois was completed by Genge (1990) and served as the model for the production function used in this research paper. In his study, Genge used a statistical technique called the cost-achievement quadriform. The technique was completed in three steps using data averaged from a number of school years. Regression analysis was used to examine student achievement. The average composite ACT test scores for each district were regressed on the (a) district percent of attendance; (b) district percent mobility; (c) district percent involved in vocational education; (d) percent of the district students in college preparatory courses; (e) percent of the class taking the ACT test; (f) the number of test takers in the district; and (g) the percent of low income families in the district. Next, the district average operating expenditure per pupil was regressed on the equalized assessed valuation and the percent of low income families in the district as well as the interaction between these two variables. The school districts were then assigned to a particular area of the cost-achievement quadriform: technically economically efficient, low service, high service, technically economically inefficient, or the voided cross (districts which were eliminated because of nearness to the mean).

In the third and final phase Genge (1990) completed an analysis of the variables and the relationships that existed between them. To complete the analysis a three step approach was used. Step one consisted of reviewing data for significant differences using the test for least significant difference, Tukey honestly significant difference test and Scheffe's test. In the second step, the Chi-square statistical method was used to analyze the possible relationships that might exist between one of three categories and the four quadrants in the quadriform. The final step in the analysis process was a cross tabulation of the ratio of district operating expense per pupil to per capita tuition charge in an attempt to discover if small, rural school districts spent less on "extra" programs.

Genge (1990) reported that technically economically efficient districts had the lowest average spent on transportation, the lowest average mobility, and the highest average attendance rate. They also had an above average educational spending ratio and are either geographically located in small cities or rural areas. The low service districts had the lowest average per capita tuition charge. The high service districts tended to borrow more than the other districts to provide services to their students. Technically inefficient districts reported the lowest average attendance rate.

Another study using the quadriform was completed by Liu (1989). Using data from the state report card, he studied 114 public high schools and 420 unit school districts in the state of Illinois. The purposes of Liu's study were to determine the following relative to the levels of district economic efficiency (as defined in the quadriform): (a) the relationships between expenditure related variables (teacher salary, pupil teacher ratio, and district enrollment) and district economic efficiency after the effects of selected non-institutional variables on student ACT achievement scores and district operating expenditures per pupil had been taken into account; (b) the difference in expenditure related variables among the districts sorted into each category of the quadriform.

Liu's (1989) analysis helped him to conclude the following:

1. Districts with a higher percentage of low income families were predicted to have lower mean ACT scores. Districts with higher percentage of college bound students within the number of test takers were predicted to have higher mean ACT scores.
2. District wealth indicators, equalized assessed valuation per pupil and percent of low income families, were believed to have a strong relationship with operating expenditure per pupil.
3. More districts had higher mean ACT scores for lower cost per pupil when compared to districts grouped in any other predicted grouping.
4. The expenditure related variables accounted for a very small amount of the variation in district economic efficiency indices.
5. Compared to mean teacher salary and district enrollment, pupil-teacher ratio contributed

more to the explanation of district economic efficiency.

6. Both wealthy and poor districts could achieve economic efficiency on the basis of the operational definition of economic efficiency purposed in this study.

Summary

This review of the literature has provided background information about statewide testing and school accountability in Illinois. In addition, an explanation of the theoretical framework of the production function was also provided. Finally, a review of the impact of socio-economic status on student outcomes, a historical review of major production function studies, and a review of selected production function studies in Illinois have been presented.

CHAPTER III

PROCEDURES AND DESIGN OF THE STUDY

This study used a statistical procedure known as the quadriform of educational production and placed suburban Cook County elementary school districts into four quadrants: technically economically efficient, high service, low service and technically economically inefficient. Once the districts were placed into these quadrants, statistical tests were used to determine if a relationship existed between districts in each quadrant and selected financial variables, personnel variables, socio-economic attributes and school wealth factors. This chapter describes the methods and procedures which were used to complete this study.

Population

The population for this study was comprised of the 115 public suburban elementary school districts in Cook County. No sampling was done because data were available for all districts of interest. These districts were selected because they were of greatest relevance to the author. In addition, the cost of living in counties in Illinois varied because of proximity to the city of Chicago and living conditions in each county. Using school districts which were all located in the same county, minimized the effect county differences exerted on the results.

Conceptual and Empirical Background

The literature reviewed in Chapter II indicated that no theory or study could definitively provide the guidance for a researcher to decide which variables should be included or which procedures should be employed for analyzing the relationship between student achievement and school related and non-school related variables. However, conceptual and empirical approaches were combined so that the subject of district economic efficiency in suburban Cook County elementary districts was able to be researched and form the basis of this study.

Conceptually, children attended school and brought their accumulated influence from families and communities with them. These home environmental influences are known to have affected students' academic performance. The significant effects of a student's socio-economic status on achievement have been verified in many studies over decades. Coleman

(1966), Hanusek (1986), Bowles (1969) and Glasman and Biniaminov (1981) have all documented the influence home environmental factors have exerted on academic achievement. However, the influence from family and community (non-school variables) has been beyond the control of school administrators and teachers. In order to compare school effects on academic performance at the district level, student family characteristics or socio-economic factors had to be taken into consideration.

From an empirical point of view, students with a higher socio-economic status backgrounds were expected to have higher test scores than those students who had lower socio-economic status backgrounds. Districts with fewer disadvantaged students were expected to have on the average higher test scores than districts with more disadvantaged students. Two other non-school variables that were beyond the control of school administrators and were reflective of student and family attitudes were student mobility rate, defined as the number of students transferring into a school district and out of a school district for a given time period, and attendance rate. A higher mobility rate has a negative impact on student test scores because the more frequently students enter or leave a school district, the more fragmented instruction will be for the students who were entering and leaving a school district. A low attendance rate is often a experienced by schools with low achievement tests scores. The underlying causes for the low test scores may be the reduced amount of teacher student interaction or the fact that school is not viewed as important and therefore attendance is low. These two non-school variables were used in this study as proxy measures for student attitudes toward school and stability of home environment. Therefore, the concept of "expectation" originating from the non-school variables was used in the present research design and the regression analysis.

In summary, non-school factors were used to explain district performance on IGAP tests rather than the ability of administrators and teachers to influence or control these factors.

In this study, mean IGAP composite scores were used as an indicator of average student academic performance in a district. With the ordinary least squares regression, all district predicted IGAP composite scores were calculated as a linear combination of the non-school variables. In regression analysis, if a district's actual IGAP composite score was higher than predicted, the district performance was viewed as being beyond expectations based on the non-school variables. In the regression analysis the difference between predicted value and actual value was called a residual. The variation in residual IGAP composite scores indicated that part of the IGAP score could not be explained by district percent of low income families, student mobility rate and student attendance rate taken jointly as a model. Thus, the residual value served as a criterion to stratify district performance levels for the purpose of comparing schooling effects. Conceptually, the influence of home environment characteristics on student achievement was first controlled for across the observed districts and then examined as to whether or not a district performed beyond expectation in comparison to other districts. Data analysis in the present study included this conceptual and empirical approach.

The same conceptual and empirical techniques used in the comparison of composite IGAP scores were also employed in the comparison of district wealth. The empirical evidence indicated that in Illinois, schools were not equally funded (Hickrod et al. 1987; Toenjes, 1982). Furthermore, there was a strong correlation between district wealth as measured by equalized assessed valuation per pupil and district operating expenditure per pupil (Yong, 1987). Therefore, the total district revenues were be considered a function of district wealth. The district spending level per pupil was expected to be higher in high wealth districts than in low wealth districts. Evidence indicated that there was a strong relationship between student achievement and district wealth (Yong, 1987). District wealth was likely to influence, directly or indirectly, student academic performance. In such situations, it was difficult to compare district economic efficiency in terms of spending level relative to improving the level of learning.

The Illinois state funding formula has been based on the district number of Chapter I students, enrollment, and tax rate. Districts having a high percent of students from low income families have often been considered as low wealth districts. Through the funding formula, districts having a higher percent of low income families have tended to receive more funding from the state than those with a lower percent of low income families. Theoretically, the funding system has been intended to reduce the variance in spending levels between wealthy and poor districts. In practical terms, district spending level variance often has been a function of state or local political actions which might be beyond the control of the funding formula itself. Political values may be reflective of local freedom of choice or rewarding local effort for a higher property tax rate. Thus, when other factors were held constant, the interaction between the funding formula and political influence has resulted in an unequitable amount of support received per child. This situation created a second research difficulty in examining district economic efficiency because districts had unequal starting points for the spending of money.

With these difficulties in mind, the "expectation" concept was also included in district operating expenditure per pupil data analysis of the present study. Wealthy (higher equalized assessed valuation (EAV) per pupil) districts were expected to receive additional dollars from local support. Districts with a high percent of low income families were expected to receive more funds from the state. District wealth and percent of low income families were two non-school variables used for predicting district spending levels. These two variables were used to stratify district expected spending levels. The cost residual per pupil was derived through the regression analysis. Conceptually, the effects of district wealth and percent of low income families on spending level were neutralized across the observed districts so as to examine whether district actual spending level was above or below the expected spending level.

Based on the review of literature and the conceptual framework relative to student achievement and educational expenditure, this study employed non-school variables in the first two stages of data analysis adjusted for inherent differences among districts on achievement and expenditure. The assumption was that both wealthy and poor districts had the potential to achieve economic efficiency.

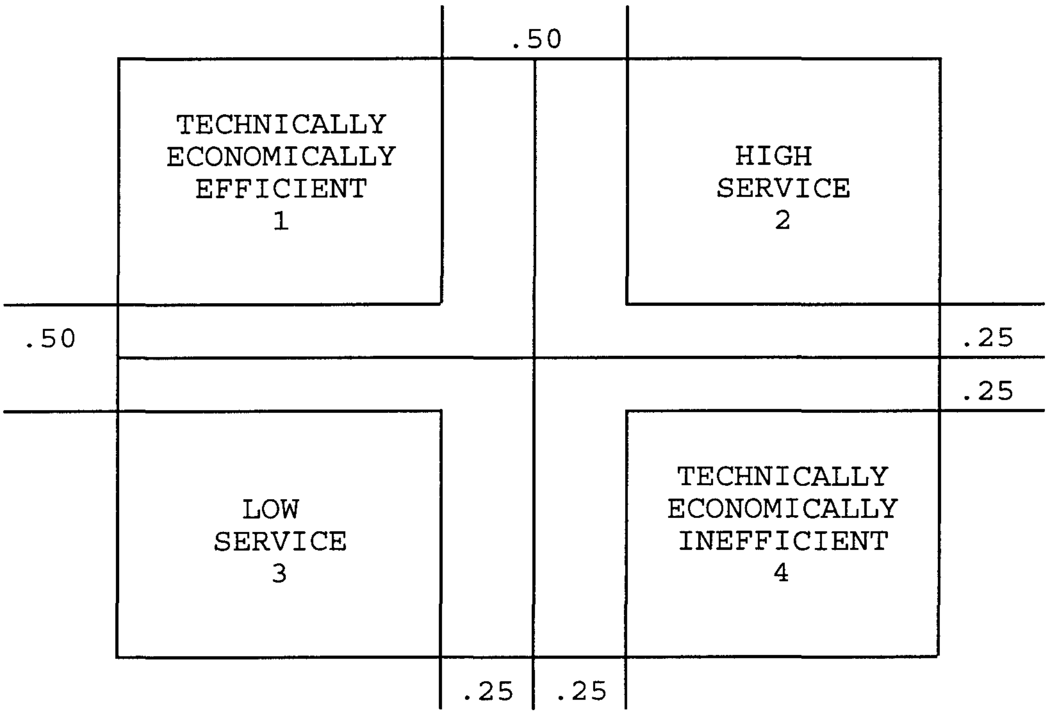
Hickrod (1990) claims "the quadriform is a measuring device used to reflect an abstract situation" (p. 5). The quadriform used two sets of data to produce a representation which located specific cases in relation to other cases. The quadriform had its roots in cost and short-form production functions. It also attempted to divide variables which were controllable by the local school from those which were not. The major difference of the quadriform from other cost and production functions was the manner in which it was used to analyze data. The research question addressed by the quadriform is: what could be a solid operational definition of economic efficiency for a public school district? In this study the definition of economic efficiency used was when districts obtained higher than expected test scores at lower than expected costs. A shortened production function was used to predict the test scores that were expected in a school district given certain school district characteristics over which the district had little control. The shorter cost equation was also used to predict expenditures from variables over which the district had little control. Following the logic of the least squares principle, each regression model resulted in some amount of residual, which was the difference between the observed and the expected dependent variable values. The quadriform technique supposed that each residual was not random or error variance, but rather taken together the joint residual variance produced a meaningful pattern. The pattern was different than the one produced by each residual being looked at individually.

Table 3.1 is a graphic representation of the pattern that emerged when the residuals from the two equations were combined. The upper left hand corner contains districts with higher than expected test scores and lower than expected costs or technically economically efficient districts. The upper right hand corner contains districts with higher than expected test scores and higher than expected costs, the high service districts. Contained in the lower left hand corner are districts which have lower than expected test scores at lower than expected costs, the low service districts. Contained in the lower right hand

Table 3.1

<u>Quadriform</u>

Quadrant	Standardized Average IGAP Composite Residual		Standardized Average Operating Expenditure Residual	
1	GT	+0.25	LT	-0.25
2	GT	+0.25	GT	+0.25
3	LT	-0.25	LT	-0.25
4	LT	-0.25	GT	+0.25



Horizontal Axis: Regression Line, DEOPP, District Operating Expenditure Per Pupil

Vertical Axis: Regression Line, District IGAP Composite Score corner are the districts with lower than expected test scores at higher than expected costs, technically inefficient districts.

Hickrod et al. (1990) pointed out that there was an area in the quadriform which was the result of the error of estimate in the two equations which produced the residuals. The size of this space which was filled with error variance or "noise" was dependent upon the size of the standard error of estimate used to produce the space. Based upon the work of Hickrod, et al. one half of a standard error of estimate was selected as being sufficient to guard against random error in the residuals. In quadriform analysis, the area has come to be known as the "voided cross" since information contained in this area is not used in subsequent analyses.

Source of Data

The data source for this study was the Illinois State Board of Education. Illinois School Report Card data for the 1988-89, 1989-90, and 1990-91 school year were used. Financial data were obtained from the Illinois School District Annual Financial Report for each school district for the fiscal years ending June 30, 1989, 1990, and 1991.

Methodology

The data analyses were carried out in three phases using the SPSS computer program. In phase one, mean values for all variables were calculated for each of the 115 suburban Cook County elementary school districts. The variables used are listed in Table 3.2 and arranged according to research question number. Each variable is listed in alphabetical order under the research question in which the variable is found. Whenever one of the selected variables is referred to in this study it will be a three year mean that is being discussed.

When the composite mean for the Illinois Goal Assessment scores (IGAP scores) was calculated it was necessary to develop a methodology which took into account the number of students who completed the IGAP tests and the grade levels at which the tests were administered. Table 3.3 presents the step-by-step procedure used to calculate the composite IGAP score which was a three-year average of math and reading scores at the third, sixth, and eighth grades weighted for enrollment. The first step was to obtain the

TABLE 3.2

Variables Used in the Analysis

Variables	Variable Name
Question 1	
AIGPSC	Three Year Average District IGAP Composite Score
DATTN	Three Year Average District Attendance Percentage
DEAVADA	Three Year Average District Equalized Assessed Evaluation Per Pupil
DEOPP	Three Year Average District Operating Expenditure Per Pupil
DLINEVAD	Three Year Average District Low Income Percent Multiplied by Equalized Assessed Valuation
DLINSQRD	Three Year Average District Low Income Squared
DLOINC	Three Year Average District Low Income Percentage
DMOBL	Three Year Average District Mobility Percentage
Question 2	
DABIFX	Three Year Average District Bond and Interest Fund
DABIFXP	Three Year Average District Percent Bond and Interest Fund Expenditure of Total Expenditure
DACIFX	Three Year Average District Capital Improvement Fund

Variables	Variable Name
DACIFXP	Three Year Average District Percent Capital Improvement Fund Expenditure of Total Expenditure
DAEFX	Three Year Average District Education Fund Expenditure
DAEFXP	Three Year Average District Percent Education Fund Expenditure of Total Expenditures
DAIRMFFX	Three Year Average District IMRF Fund
DAIRMFXP	Three Year Average District Percent IMRF Fund Expenditures of Total Expenditures
DAOMFX	Three Year Average District Operations and Maintenance Fund Expenditure
DAOMFXP	Three Year Average District Percent Operations and Maintenance Fund Expenditures of Total Expenditure
DAORXPCT	Three Year Average District Operating Expense Divided by Per Capita Tuition Charge
DARTFX	Three Year Average District Rent Fund
DARTFXP	Three Year Average District Percent Rent Fund Expenditures of Total Expenditures
DASCFX	Three Year Average District Site and Construction Fund
DASCFXP	Three Year Average District Percentage Site and Construction Expenditure of Total Expenditure
DATADX	Three Year Average District Administration Expenditure

Variables	Variable Name
DATEXP	Three Year Average District Total Expenditure
DATIX	Three Year Average District Instructional Expenditure
DATRFX	Three Year Average District Transportation Fund
DATRFXP	Three Year Average District Percent Transportation Expenditures of Total Expenditures
DATSSX	Three Year Average District Support Services Expenditures
DPCTC	Three Year Average District Per Capita Tuition Charge
DOTXR	Three year average district operating tax rate
DTXR	Three year average district total tax rate
Question 3	
DAADMSAL	Three Year Average District Administrator Salary
DATCHSAL	Three Year Average District Teacher Salary
DATEXP	Three Year Average District Teacher Years of Experience
DELPTR	Three Year Average District Pupil Teacher Ratio
DPADMR	Three Year Average District Pupil Administrator Ratio

Variables	Variable Name
XBAD	Three Year Average District Percent of Teachers with Bachelors Degree
XMAD	Three Year Average District Percent of Teachers with Masters Degree
<u>Question 4</u>	
DAAFR	Three Year Average District Enrollment Percent of African American Students
DAASP	Three Year Average District Enrollment Percent of Asians Students
DADA	Three Year Average District Enrollment Average Daily Attendance
DAHPP	Three Year Average District Enrollment Percent of Hispanic Students
DANAP	Three Year Average District Enrollment Percent of Native American Students
DENR	Three Year Average District Enrollment
DLEP	Three Year Average Percent of Limited English Proficiency Students
<u>Question 5</u>	
DAFR	Three Year Average District Federal Revenue
DAFRADA	Three Year Average District Federal Revenue Per ADA
DAFRP	Three Year Average District Federal Revenue Percent of Total Revenue
DALR	Three Year Average District Local Revenue

Variables	**Variable Name**
DALRADA	Three Year Average District Local Revenue Per Average Daily Attendee
DALRP	Three Year Average District Local Revenue Percent of Total Revenue
DARVEX	Three Year Average District Difference Between Revenue and Expenditure
DASR	Three Year Average District State Revenue
DASRADA	Three Year Average District State Revenue Per ADA
DASRP	Three Year Average District State Revenue Percent of Total Revenue
DASTRV	Three Year Average District General State Aid Divided by Total Revenue
DATREV	Three Year Average District Total Revenue
DEAVADA	Three Year District Average Equalized Assessed Evaluation Per Average Daily Attendee

number of students who were enrolled in third, sixth and eighth grade in each school district. Next, the district enrollment at each of the designated grade levels was multiplied by the percent of students who completed the reading and math tests for the third, sixth, and eighth grades. This operation yielded the number of students who took a given test for a given grade level for each of the three school years considered. A district reading score and a district math score were calculated for each of the three school

TABLE 3.3

Procedures Used to Calculate IGAP Composite Scores

DISTRICT ENROLLMENT	x	PERCENT OF TEST TAKERS AT EACH GRADE LEVEL FOR EACH SCHOOL YEAR	=	NUMBER OF TEST TAKERS FOR EACH TEST AT EACH GRADE
NUMBER OF TEST TAKERS SCORE	x	DISTRICT SCORE FOR A GRADE LEVEL	=	WEIGHTED GRADE LEVEL IGAP

GRADE 3 WEIGHTED IGAP SCORE	+	GRADE 6 WEIGHTED IGAP SCORE	+	GRADE 8 WEIGHTED IGAP SCORE	=	SCHOOL YEAR WEIGHTED IGAP SCORE

$$\frac{\text{SCHOOL YEAR WEIGHTED IGAP SCORE}}{\text{NUMBER OF TEST TAKERS}} = \text{SCHOOL YEAR IGAP COMPOSITE}$$

$$\frac{\text{SCHOOL YEAR IGAP COMPOSITE 1989} + \text{SCHOOL YEAR IGAP COMPOSITE 1990} + \text{SCHOOL YEAR IGAP COMPOSITE 1991}}{3} = \text{IGAP COMPOSITE FOR SUBJECT AREA}$$

$$\frac{\text{IGAP COMPOSITE FOR SUBJECT AREA}}{2} = \text{IGAP COMPOSITE}$$

years. This was accomplished by multiplying the number of test takers at each grade level by the average IGAP score for that grade level. The products of these calculations for each grade level and each subject area for each school year were added together. The results were then divided by the total number of test takers for each grade level for each year. It was necessary to complete this step in order to obtain the correct proportion of grade level scores. The weighted IGAP score for each year for reading and the weighted IGAP score for math for each year were added together and divided by three to arrive at a weighted IGAP three year average score for reading and a weighted IGAP three year score for math. Finally, the weighted IGAP three year average score for reading and the weighted IGAP three year average score for math were added together and divided by two. This operation yielded the IGAP composite score which was used as an indicator of academic achievement.

The second phase of the data analysis was placing into the appropriate quadrant of the quadriform each of the suburban Cook County elementary school districts. The first step in this process was to use regression analysis to predict student achievement. The IGAP composite was regressed on the district percent of attendance, district percent of mobility, and the district percent of low income families squared. The percent of low income families was squared because research has indicated that the percent of low income families is an important predictor of test scores for a district. It has also been demonstrated that this variable has a curvilinear impact on student achievement, that is when the percentage of low income children in a district is larger than 50 percent, test scores fall dramatically departing from linearity (Hickrod et al., 1990). The residuals for each of the districts were calculated. The residuals were standardized by dividing each residual by an estimate of its standard deviation.

The second step was to regress the three year district average operating expenditure per pupil (DEOPP) on the interaction between average percent of low income and average equalized assessed value, average percent of low income and average equalized assessed value per pupil. Residuals from the DEOPP were calculated and then standardized.

The regression equations arrived at were as follows:

Regression Equations

IGAP COMPOSITE

$$Y = \alpha + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4$$

Where α (alpha) is the intercept term for the model, b_1 through b_4 are simple regression coefficients and:

x_1 = District Percent of Attendance

x_2 = District Percent of Mobility

x_3 = District Percent of Low Income

x_4 = District Low Income Squared

District Operating Expenditure Per Pupil

$$Y = \alpha + b_1X_1 + b_2X_2 + b_3X_3$$

Where α (alpha) is the intercept term for the model, b_1 through b_3 are simple regression coefficients and:

x_1 = Average Percent Low Income

x_2 = Average Equalized Assessed Value per Pupil

x_3 = Average Interaction Between Low Income and Equalized Assessed Value

If the units of measure of the variables used in each regression equation were from the same metric, then the coefficients of these variables could be used to compare the relative importance of the variables. The beta weights were calculated for each regression coefficient in an attempt to determine the importance of the independent variables. The coefficients of the independent variables were the beta weights when all of the variables were expressed in standardized form (Norusis, 1991). Comparing beta weights allowed the researcher to determine how much more important one variable was than another. Phase two of the analysis was completed at this point.

Phase three focused on the analysis of the variables under consideration and the possible relationships that existed between them. The first step of phase three was to investigate the three year average values of the independent variables for each district to see if there were significant differences in the values with regard to the quadrant of the quadriform in which each district fell. The statistical technique known as analysis of variance was used to complete this task. Analysis of variance tests were used to determine the effects of individual variables as well as for combinations of variables. This operation was completed to determine if the variables used in the "control" equations might have more far reaching effects on the cost-effectiveness of a school district than placement in a regression equation might indicate.

The third step of phase three was to use a multiple comparison technique to determine which differences among the variables were significant. Using the Tukey-B test was determined to be necessary because the F statistic obtained in phase three step one was significant indicating only that the population means were probably of unequal size. The Tukey-B test was used to pinpoint where the differences occurred and which differences were significant at the .05 level.

Once the statistical analysis was complete, the results were reviewed to determine what information could be gathered from the analysis. This information was then prepared in tabular form and presented in Chapter 4 of this study. Based on the information obtained, conclusions and recommendations were formulated and presented in Chapter 5.

This chapter has presented the theoretical background upon which this study was based. In addition, the procedures used to carry out this exercise were presented and explained.

CHAPTER IV

DATA PRESENTATION AND ANALYSIS OF THE FINDINGS

This study used a statistical procedure known as the quadriform to group suburban Cook County public elementary districts into four quadrants: technically economically efficient, high service, low service and technically economically inefficient. Once the districts were divided into these quadrants, statistical procedures were used to determine if relationships existed among districts and selected financial variables, personnel variables, socio-economic attributes and school wealth factors. This chapter contains a report of the data analysis and presentation of the findings of this study.

The findings in this chapter were organized in a manner which answers the five research questions posed in Chapter I. The questions were:

1. Using the quadriform of educational production, which suburban Cook County public elementary districts were classified as economically technically efficient, or high

service or low service or technically economically inefficient?

2. What were the common financial attributes that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which financial attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low service districts, and technically economically inefficient districts?

3. What were the common personnel attributes that exist among technically economically efficient suburban Cook County public elementary school districts. Further, which personnel attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low service districts and technically economically inefficient districts?

4. What were the common socio-economic attributes that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which socio-economic attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low service districts, and technically economically inefficient districts?
5. What were the common wealth factors that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which wealth factors were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low service districts, and technically economically inefficient districts?

Research Question Number 1

Using the quadriform of educational production, which suburban Cook County public elementary districts were classified as technically economically efficient, or high service or low service or technically economically inefficient?

The first step in determining which districts were technically economically efficient was to calculate the means over three years for each district for each variable used in the study. Once this process was completed, correlation coefficients were obtained between the IGAP composite score and each of the independent variables used in quadriform analysis. The correlation coefficients and regression results for the composite IGAP score analysis are shown in Table 4.1. Zero-order correlations provided an initial estimate of the strength and direction of effects of the variables chosen to be used in the quadriform analysis. Regressing the IGAP composite score (three year average of third, sixth, and eighth grade IGAP scores weighted by the number of pupils at each grade) allows the covariance between predictor variables to be taken into account. This was a helpful procedure because the zero-order correlations may have masked inter-correlations between the predictor variables. The regression analysis was used to allow for a sorting out of the unique, direct effects of each predictor variable in the IGAP composite score, net of the

Table 4.1

Correlation and Regression Results for Three Year Average IGAP Composite Score Regression Equation

Variable	r	r^2	p-level	Beta	p-level	Model adj. R^2
DLOINC	-.74	.54	<.01	-1.09	<.00	
DATTN	-.08	.01	>.10	-.01	>.90	
DMOBL	-.71	.50	<.01	-.25	<.01	
LOWINC-SQRD	-.61	.37	<.01	.57	<.00	
						.62

influence of other predictor variables used in the quadriform model.

The variables average percent of mobility in the district (DMOBL), average percent of district attendance (DATTN), average percent of low income enrollment in the district (DLOINC) and average percent of low income squared (DLINSQRD) were chosen for use as predictor variables for a number of reasons. First, these variables were used in the Genge (1990) study which served as a model for this study. Second, the body of literature reviewed in Chapter 2 indicated these were variables that exerted an influence on test scores or other outcome measures. Finally, these variables were being taken into account because for the most part they were viewed as beyond the control of school personnel. An attempt was made to estimate the importance of these environmental variables and then control for that influence. The results of these procedures were a more accurate look at the influence exerted by variables which can be controlled by school personnel. The estimates which were obtained for r^2, the coefficient of determination, indicated the proportion of variance in the average IGAP scores across the three years which were accounted for by each factor, considered uniquely without respect to other variables. The r^2 estimates were proportional reduction in error measures, providing a better baseline for comparison across variables than the zero-order Pearson's correlation coefficients. Also shown respectively are the probability levels (p-levels) for the correlations, the standardized regression coefficients (betas), the level of significance for the accompanying t-tests, and the adjusted R_2 for the regression model as a whole.

A review of the r^2 values reveals that DLOINC and DMOBL are the most potent predictors of the composite IGAP score accounting for 54% and 50% of the variance respectively. Because some of the explained variance may be due to joint or overlapping relationships between predictor variables, summation of the r^2 values exceeded 100%. Multiple regression analysis was used to sort through which variables were most important and how well the variables taken collectively predicted the composite IGAP score. The results of these tests bear out the importance of having controlled for DLOINC, DMOBL, DATTN, and DLINSQRD. Collectively, these variables accounted for over 62% of the variance in the IGAP composite scores.

Before reviewing the multiple regression analysis results it is important to consider the intercorrelations between predictor variables used to predict the IGAP composite score and the district operating expense per pupil (DEOPP).

Table 4.2 reports and lists the predictor variables for the IGAP composite score along with their intercorrelations and an asterisk to indicate if they were significant at or below the .05 level of probability. Zero-order correlations between DLOINC, DMOBL, and the curvilinear term DLINSQRD are of the most interest in assessing the covariance between predictor variables used in the regression model for composite IGAP scores. Even though it was not a significant predictor of the IGAP composite score at the zero-order level ($r=-.08$, $p>.10$), DATTN is included in Tables 4.1 and 4.2 to provide greater comparability with the conceptual framework and past research. The results indicated that districts with a greater percentage of low income families also tended toward high percentages of mobility ($r=.75$, $p<.01$). Mobility was also highly intercorrelated with the curvilinear term for percentage of low income ($r=.62$, $p<.01$). Intercorrelations among the predictor variables included in the regression for predicting district operating expenses per pupil will be reviewed after discussion of the regression results for the IGAP composite scores.

Table 4.2

Intercorrelations Among Regression

Equation Predictor Variables

IGAP COMPOSITE VARIABLES:	DATTN	DLOINC	DMOBL	DEAVADA	DLINEVAD	DLINSQRD
DATTN	1.00	.08	.06	- .22	- .05	-.05
DLINSQRD	-.05	.94*	.62*	- .31*	.37*	1.00
DMOBL	.06	.75*	1.00	- .32*	.47*	.62*
AVERAGE OPERATING EXPENSE PER PUPIL VARIABLES:						
DEAVADA	- .22	- .38*	-.32*	1.00	.31*	-.31*
DLINEVAD	- .05	.51*	.47*	.31*	1.00	.37*
VARIABLE COMMON TO BOTH EQUATIONS:						
DLOINC	.08	1.00	.75*	- .38*	.51*	.94*

*Significant at the .05 level of probability.

Assessing the overall appropriateness of the multiple regression model for the IGAP composite scores, we obtained an R^2=.62, indicating an acceptable fit of the model to the data. In addition, the predictor variables selected for use in the model accounted for over three-fifths of the variance in the output measure for IGAP composite scores (see Table 4.1). DLOINC, DATTN, and DMOBL were forced into the equation in one step. The strongest effect was exhibited by DLOINC (beta=>-1.09, $p<.00$), indicating lower IGAP composite scores in districts with higher proportions of low income children. The variable LOWINCSQRD was significant (beta=.57,$p<.00$) and curvilinear indicating that the impact of poor residents on IGAP composite scores is not uniformly linear across the distribution of IGAP composite scores. Further this finding was consistent with Hickrod et al. who indicated that once a district's low income enrollment reaches 50% or more of the total student enrollment, test scores fall dramatically.

Finally, a higher rate of mobility (DMOBL) was related to a lower IGAP composite score (beta=-.25, $p=<.01$). In this model, the proportion of low income residents was approximately twice as important a factor as geographic mobility in depressing IGAP composite scores. This judgement was made because standardized regression coefficients can be directly compared in strength.

Table 4.3 reports zero-order correlations, regression statistics, and corresponding probabilities

Table 4.3

Correlation and Regression Results For Three Year Average District Operating Expense Per Pupil Regression Equation

Variable	r	r^2	p-level	Beta	p-level	Model adj. R^2
DEAVADA	.79	.62	<.01	.91	<.01	
DLINEVAD	.20	.04	<.05	-.18	<.05	
DLOINC	-.24	.06	<.01	.18	<.05	
						.62

for the factors used in predicting district operating expenses per pupil (DEOPP). The use of these variables was based on the notion that not all school districts have equal access to financial resources and this access was beyond the control of the district personnel. Therefore, an attempt to measure the impact of variables which may be controlled by school personnel must include an attempt to estimate and control for variables which were beyond the control of district personnel. These variables have been identified by Genge (1990) as average equalized assessed evaluation per pupil (DEAVADA), average percent of low income children (DLOINC) and the average interaction of these two variables (DLINEVAD). Average assessed valuation (DEAVADA) explained more of the variance in DEOPP than the other two factors (r^2=.62). The interaction term (DLINEVADA) between DLOINC and DEAVADA, calculated to assess whether the impact of DEAVADA on DEOPP depended upon the percentage of low income students in a district was only marginally important (r=.20, .01<p<.05), accounting for only 4% of the variance in DEOPP. While DLOINC was also significant at the zero-order level (r=-.24,p<.01), it contributed only modestly to the explained variance (r^2=.06). Returning to Table 4.2, we can see how the predictor variables were related to each other. There was an inverse and significant zero-order correlation between DEAVADA and DLOINC (r=-.38, p<.01), indicating that as the percent of low income increased, the assessed valuation per pupil declines. The correlations between each of these factors and their interaction term (DLINEVAD) are reported in Table 4.2 for convenience and completeness, but were not of immediate diagnostic or intuitive value because it can be expected that each variable will covary with the interaction term. Both DEAVADA and DLOINC had relatively strong correlations with the interaction term DLINEVAD.

Returning to Table 4.3, a review of the table indicates that this model reasonably predicted the DEOPP since the adjusted R^2=.62. Most of the explained variance for the model was attributed to the introduction of DEAVADA, since beta =.91($p<.01$). While DLOINC does remain significant controlling for other factors in the model (beta=.18, $.01<p<.05$), both it and the interaction term add little to the explained variance (DLINEVAD beta=-.18, $.01<p<.05$). Results for both regressions indicated that both equations provided reasonable approximations to the observed values for IGAP composite score and DEOPP, even though some predictor variables were more important than others. Specifically, percentage of low income students was more important in predicting IGAP composite scores while average assessed valuation per pupil was more important in predicting district operating expenditure per pupil. The regression equations arrived at for this study are as follows:

Regression Equations

IGAP Composite (AIGPSC)

$$Y = 308.48 - .0001x_1 - .8171x_2 - 2.3145x_3 + .0160x_4$$

		BETA
x_1 =	District Percent of Attendance	- .01
x_2 =	District Percent of Mobility	- .03
x_3 =	District Percent of Low Income	-1.09
x_4 =	District Low Income Squared	+ .57

Adj. R^2 = .62 F = 47.33 Signif. F = .0000

District Operating Expenditure Per Pupil (DEOPP)

$$Y = 3425.84 - .0001x_3 + 13.74x_1 + .0106x_2$$

		BETA
x_1 =	Average Percent Low Income	.17
x_2 =	Average Equalized Assessed Value per Pupil	.91
x_3 =	Average Interaction Between Low Income and Equalized Assessed Value	-.16

Adj. R^2 = .62 F = 63.48 Signif. F =.0000

DEOPP Maximum Average=	9,100.33
DEOPP Minimum Average=	3,072.33
Std. Dev.=	1,410.07
DEOPP Mean=	5,234.54
IGAP Composite Maximum Average=	366.20
IGAP Composite Minimum Average=	172.78
Std. Dev.=	38.29
IGAP Composite Mean=	273.44

Prior to allocating districts to the quadriform cells, it was necessary to calculate the regression equations for the IGAP composite scores (AIGPSC) and the DEOPP. The residuals from each equation were calculated and stored in the computer as separate variables. In terms of the familiar principle of least-squares, the standardized residuals measured the distance from the best fitting regression line to actual data points. Using the standardized residuals, those greater than +1.96 or less than -1.96 can be considered outliers. However, in this case we wished to concentrate on relatively extreme cases, which maximized the utility of the quadriform by increasing the differences between cases in each cell of the quadriform. In essence, this approximated "ideal type" analysis very common in the social and administrative sciences by capitalizing on differences calculated on key variables of interest. Recall the usual regression assumptions that residuals are distributed approximately standard normal with mean of zero and unit variance.

Visual inspection of the plot of standardized residuals confirmed only a few outliers above or below the 1.96 criterion (consistent with the .10 level of probability for a two-tailed test), which further confirmed a relatively nice fit of the model of these data for both equations. The shape of the residuals approximated a bell-shaped curve, indicating normality. The standardized residuals and raw data equivalents are given in Table 4.4 for each district, along with indication of where each case fell into the quadriform. A standardized residual close to zero placed a district into the voided cross area of the quadriform. The districts were presented in ascending order of standard residual for IGAP composite scores (AIGPSC).

Table 4.4

Statistics for the Placement of Suburban Cook County Elementary Districts into the Quadriform

QUADRANT 1: TECHNICALLY EFFICIENT

District Number	District Name	Raw IGAP Composite Score	Raw DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
162	Matteson	254.79	4,563.67	.39742	.54508
127	Chicago Ridge	289.18	4,398.33	.41582	- .71342
102	LaGrange	295.66	4,397.67	.44287	- .46673

QUADRANT 1: TECHNICALLY EFFICIENT (continued)

District Number	District Name	Raw IGAP Composite Score	Raw DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
142	Forest Ridge	256.51	3,822.67	.52684	- .82248
95	Brookfield	269.60	4,631.00	.54747	- .62091
97	Oak Park	299.56	5,172.67	.58235	- .65724
111	Burbank	257.08	4,335.00	.58246	- .35058
158	Lansing	282.07	3,817.00	.62552	- .52219
135	Orland	274.13	4,546.67	.64679	- .36224
146	Tinley Park	267.91	4,599.67	.70800	- .44225
113	Lemont	277.37	4,089.00	.72214	- .65268
153	Homewood	300.79	4,597.00	.77757	- .72208
23	Prospect Heights	291.03	4,823.67	.79235	- .32379
140	Kirby	274.82	3,175.33	.82520	-1.12458
161	Flossmoor	299.15	4,262.67	.84384	- .65327
101	Western Springs	323.47	4,970.00	.97131	- .28508

QUADRANT 2: HIGH SERVICE

District Number	District Name	Raw IGAP Composite Score	Raw DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
86	Union Ridge	276.46	6,357.00	.28729	1.01556
68	Skokie	320.11	7,605.33	.32050	.71930
34	Glenview	314.75	5,719.00	.40086	.26142
110	Central Stickney	261.06	5,740.67	.41929	2.73597
59	Elk Grove	298.84	6,214.33	.50441	1.45569
73	East Prairie	286.75	7,430.00	.55179	.71159
72	Skokie Fairview	306.22	7,225.00	.61101	2.57098
70	Morton Grove	302.80	6,589.00	.62136	.86080
80	Norridge	283.47	4,557.33	.62146	.80779
79	Pennoyer	265.74	5,704.67	.64156	.82638
31	West Northfield	335.76	7,965.67	.64148	2.72541
78	Rosemont	294.55	8,480.00	.64125	4.98144
96	Riverside	301.61	5,612.33	.70188	.48504
67	Golf	314.95	8,181.33	.73152	.95575
94	Komarek	244.91	7,097.67	.73178	1.16884
35	Glencoe	335.97	7,945.67	.75143	.58573
74	Lincoln-wood	316.46	6,409.67	.80179	.92313

QUADRANT 2: HIGH SERVICE (continued)

District Number	District Name	Raw IGAP Composite Score	Raw DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
107	Pleasant-dale	290.09	6,098.00	.87175	1.05949
64	Park Ridge	310.56	6,802.67	.90144	.59251
106	LaGrange Highlands	299.87	4,696.33	.93176	.30760
36	Winnetka	343.38	7,723.67	.94161	.74728
92.5	West-chester	286.41	4,698.67	.9600	.58584
37	Avoca	366.20	8,116.00	.97153	1.25946
38	Kenilworth	359.43	7,855.67	.98182	.69592
28	Northbrook	336.73	8,597.00	.99104	1.77372
27	Northbrook	318.66	6,177.33	1.02127	.81536
29	Sunset Ridge	345.55	6,931.33	1.05137	1.91976
90	River Forest	332.64	6,936.33	1.05139	.28213

QUADRANT 3: LOW SERVICE

District Number	District Name	Raw IGAP Composite Score	Raw DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
133	Patton	228.39	4,011.00	-3.72384	- .70612
152	Harvey	207.95	3,896.33	-2.88174	- .70605

QUADRANT 3: LOW SERVICE (continued)

District Number	District Name	Raw IGAP Composite Score	Raw DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
147	W. Harvey Dixmoor	185.97	4,868.00	-2.81672	- .58736
170	Chicago Heights	194.79	4,864.33	-2.61792	- .68153
143.5	Posen-Robbins	186.14	4,310.33	-2.47723	- .69947
99	Cicero	211.51	3,604.00	-2.43459	- .81689
169	Ford Hts.	172.78	5,736.00	-2.03349	- .56820
152.5	Hazel Crest	218.79	3,758.67	-1.91327	- .78453
151	South Holland	233.59	5,129.33	-1.69335	- .32400
156	Lincoln	243.54	3,571.67	-1.66931	- .88802
130	Blue Island	220.18	4,593.00	-1.60107	- .74929
144	Prairie Hills	220.34	3,812.00	-1.56372	- .99920
89	Maywood	220.09	3,534.67	-1.48169	- .94530
168	Sauk Village	223.85	3,515.00	-1.42680	-1.08987
132	Calumet Park	202.58	3,938.33	-1.32396	- .94984
155	Calumet City	229.97	3,730.33	-1.17116	- .74709
104	Summit	236.57	4,420.67	-1.11905	- .45448

QUADRANT 3: LOW SERVICE (continued)

District Number	District Name	Raw IGAP Composite Score	Raw DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
88	Bellwood	219.12	4,343.00	- .93925	- .80986
194	Steger	267.78	3,875.33	- .76355	- .91869
87	Berkeley	230.56	4,695.00	- .66157	- .36804
143	Midlothian	237.41	4,267.00	- .65478	- .94184
98	Berwyn North	255.40	4,670.33	- .61703	- .72309
154.5	Burnham	269.55	3,940.67	- .54844	- .94817
163	Park Forest	227.54	4,636.00	- .47899	-1.14014
65	Evanston	266.63	6,868.00	- .45387	- .36050
148	Dolton	232.90	3,322.33	- .45387	- .36050
167	Brookwood	273.11	4,324.00	- .31879	- .83491

QUADRANT 4: TECHNICALLY INEFFICIENT DISTRICTS

District Number	District Name	Raw IGAP Composite Score	Raw DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
84.5	Rhodes	246.98	7,637.67	- .78728	.84227
70	Morton Grove	302.80	6,589.00	- .54930	3.81255
81	Schiller Park	249.58	4,564.00	- .45154	.38067

VOIDED CROSS: DISTRICTS NOT USED IN ANALYSIS

District Number	District Name	Raw IGAP Composite Score	RAW DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
83	Manneheim	267.22	6,208.00	- .71057	.13425
91	Forest Park	265.75	6,203.00	- .31629	.00958
157	Hoover-Schrum	241.38	4,559.33	- .28631	.03919
105	LaGrange	284.60	6,911.67	- .14197	1.11263
172	Sandridge	250.03	3,072.33	- .13659	.59200
93	Hillside	285.91	7,151.67	- .12017	1.99122
109	Union Springs	252.82	4,356.67	- .11151	- .80668
100	Berwyn South	265.79	4,489.67	- .10247	- .48457
26	River Trails	302.54	5,585.67	- .05117	- .01420
62	DesPlains	273.33	7,101.00	- .01860	- .69723
69	Skokie	279.62	6,371.00	- .00867	.15595
159	Matteson	260.90	4,886.00	.01323	- .61389
84	Franklin Park	272.71	6,526.00	.01602	.30207
149	Dolton	224.27	3,932.67	.02553	- .81066
15	Palatine	298.42	5,107.00	.03309	- .12266
160	Country Club Hills	229.46	3,085.33	.09510	-1.05804
122	Ridgeland	285.78	4,765.33	.11373	- .45806

VOIDED CROSS (continued)

District Number	District Name	Raw IGAP Composite Score	Raw DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
125	Atwood Hts.	257.07	4,565.00	.14892	- .71866
21	Wheeling	289.34	5,086.67	.18478	- .0792
103	Lyons	271.13	4,040.67	.19067	- .11155
145	Arbor Park	269.37	3,924.67	.19528	- .77388
108	Willow Springs	269.54	4,076.00	.20303	- .63716
171	Sunny Brook	263.05	3,541.67	.21523	-1.04691
117	North Palos	276.76	4,086.33	.21888	- .30214
127.5	Worth	260.56	3,791.67	.21909	- .72656
92	Lindop	244.21	4,041.33	.23621	- .41286
124	Evergreen Park	298.16	4,199.32	.24959	- .37428
63	East Maine	302.67	5,734.00	.31485	- .00495
73.5	Skokie	310.42	6,315.00	.37817	- .12746
85.5	River Grove	270.11	4,463.00	.41363	- .21175
54	Schaum-burg	280.58	5,047.67	.61113	- .23392
123	Oak Lawn-Home	278.46	4,521.00	.74247	.04817
150	South Holland	274.33	4,101.00	.75659	- .20521

VOIDED CROSS (continued)

District Number	District Name	Raw IGAP Composite Score	Raw DEOPP	Standard Residual IGAP Composite Score	Standard Residual DEOPP
25	Arlington Hts.	309.01	5,612.00	.75759	- .22786
126	Alsip-HzLg-OkLn	274.57	4,790.00	.77273	.09991
118	Palos	313.33	5,163.00	.79555	- .11325
154	Thorton	266.34	3,801.67	.82038	- .18330
128	Palos Hts.	297.40	5,488.33	.87047	.12520
39	Winnetka	336.63	6,387.33	.91708	.13932
57	Mt. Prospect	303.64	5,680.67	.91782	.23879
30	Nrthbk-Glenvw	315.24	6,004.67	1.01634	.22214

Table 4.5 presents a summary of how many districts were allocated to each quadrant of the quadriform as well as the number of districts which fell into the voided cross area. It is important to remember that since this analysis was concerned with "ideal cases," the districts in the voided cross area were no longer needed for use in this study. The number of districts which fell into quadrant one, technically economically

Table 4.5

Frequency Count by Quadrant

Value Label	Value	Frequency	Percent
Technically Economically Efficient	1	16	13.9%
High Service	2	28	24.4%
Low Service	3	27	23.4%
Technically Economically Inefficient	4	3	2.6%
Four Quadrant Total		74	64.3%
In "voided cross" (eliminated)	0	41	35.7%
TOTAL		115	100.0%

efficient, lower than expected costs and higher than expected IGAP composite scores, were 16 or 13.9%. Quadrant two, high service districts, higher than expected average expenditure per pupil and higher than expected composite IGAP score contained 28 districts or 24.4% of the population. Twenty-seven districts or 23.4% fell into quadrant three, low service, lower than expected average expenditure per pupil and lower than expected composite IGAP score. Quadrant four, technically economically inefficient districts, higher than expected average expenditure per pupil and lower than expected composite IGAP scores, contained three districts or 2.6% of the population. Because of the small number of districts which fell into this quadrant, the results of additional statistical analysis have been deemed as unreliable and, therefore, were not be presented in this study. It is interesting to note in this day of constant school bashing that only three Cook County suburban elementary school districts were categorized technically economically inefficient as a result of the quadriform analysis.

Table 4.6 depicts the quadriform, the standardized IGAP composite residual used to determine how districts were placed in each quadrant of the quadriform. Also shown are the minimum and maximum average AIGPSC and DEOPP, standard deviations and means.

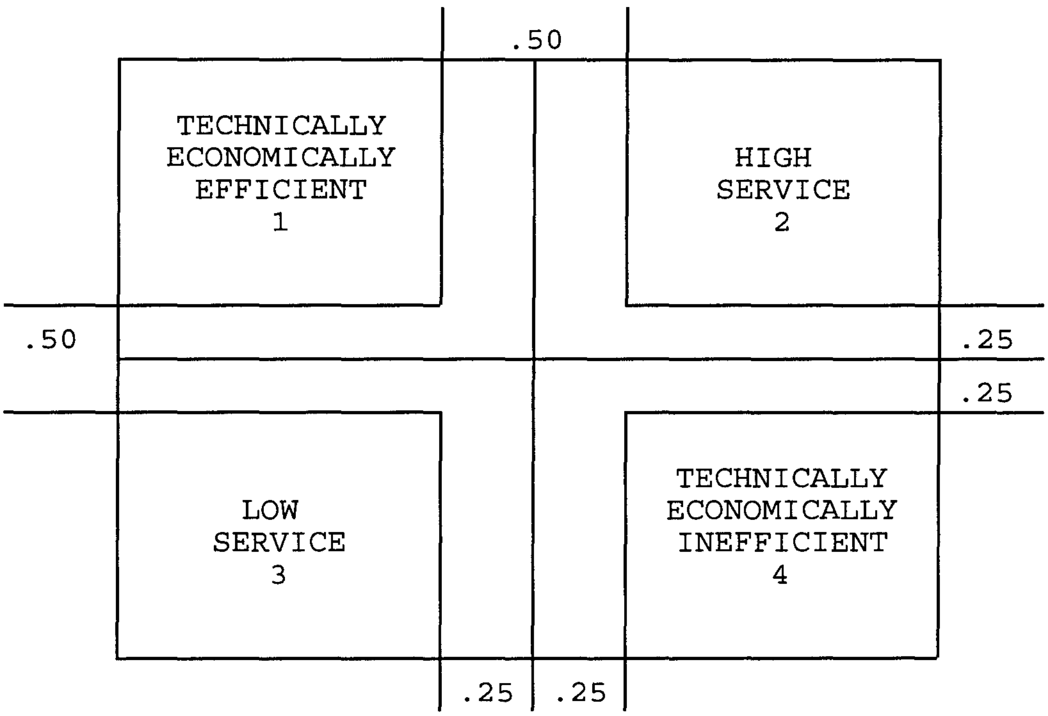
Research Question Number 2

What were the common financial attributes that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which financial attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low service districts, and technically economically inefficient districts?

Table 4.6

<u>Quadriform</u>

Quadrant	Standardized Average IGAP Composite Residual		Standardized Average Operating Expenditure Residual	
1	GT	+0.25	LT	-0.25
2	LT	-0.25	LT	-0.25
3	GT	+0.25	GT	+0.25
4	LT	-0.25	GT	+0.25



Horizontal Axis: Regression Line, DEOPP
Vertical Axis: Regression Line, IGAP Composite Score

DEOPP
Maximum Average = 9100.33 Std. Dev. = 1410.07
Mean = 5234.54 Minimum Average = 3072.33

IGAP Composite Score
Maximum Average = 366.20 Std. Dev. = 38.29
Mean = 273.44 Minimum Average = 172.78

Table 4.7 presents analysis of variance, goodness-of-fit statistics for the financial variables relating to research question two. Analyses of variance directly addressed some key issues raised in this research question. Specifically, the research hypothesis tested in these analyses were that at least two of the group means were significantly different. Heuristically, stated in terms of the null hypothesis, $H_0:X_1=X_2=X_3=X_4$ where X_n referred to subgroup means for each cell of the quadriform.

Analysis of variance partitioned the variance, in this case on each financial variable reported in Table 4.7, into relationship and error sums of squares. Overall, the null hypothesis was evaluated with an F-ratio test statistic, for respective degrees of freedom, and compared to critical values of the F-distribution. The null hypothesis evaluated the probability that the ratio of "relationship" to "error" sums of squares (between group sums of squares and within group sums of squares, respectively) was sufficiently small that we failed to reject the H_0. For present purposes, when the probability for the calculated F-ratio test statistic was lower than or

Table 4.7

Question 2: Analysis of Variance Results

VARIABLE	F-RATIO	df	p-level
DPCTC	48.86	3,69	.0000*
DAEFX	1.54	3,69	.2112
DAEFXP	0.58	3,69	.6331
DAOMFX	0.42	3,69	.7363
DAOMFXP	26.10	3,69	.0000*
DABIFX	5.79	3,69	.0014*
DABIFXP	8.73	3,69	.0001*
DATRFX	2.73	3,69	.0500*
DATRFXP	6.26	3,69	.0008*
DAIRMFFX	0.57	3,69	.6378
DAIRMFXP	3.39	3,69	.0227*
DARTFX	0.73	3,69	.5369
DARTFP	0.73	3,69	.5388
DACIFX	0.73	3,69	.5389
DACIFXP	0.38	3,69	.7651
DASCFX	3.65	3,69	.0166*
DASCFXP	1.14	3,69	.3382
DATEXP	1.52	3,69	.2168
DATIX	4.72	3,69	.0047*
DATSSX	0.89	3,69	.3013
DATADX	2.41	3,69	.4499
DAORXPCT	23.19	3,69	.0000*
DOTXR	11.12	3,69	.0000*
DTXR	21.49	3,69	.0000*

*Significant at the .05 level of probability.

equal to 0.05, then the H_0 was rejected. Reviewing Table 4.7, it can be seen that the variables per capita tuition charge (DPCTC), operations and maintenance fund as a percent of total expenditures (DAOMFXP), total expenditures for bond and interest (DABIFX), bond and interest fund expenditures as a percent of total expenditures (DABIFXP), total expenditures for transportation (DATRFX), transportation fund expenditures as a percent of total expenditures (DATRFXP), rent fund expenditures as a percent of total expenditures (DARTFXP), total expenditures for site and construction (DASCFX), district operating expense per pupil divided by per capita tuition charge (DAORXPCT), district operating tax rate (DOTXR), and total district tax rate (DTXR), all had significance levels at or below the .05 significance level indicating a significant difference between at least two of the four types of school districts represented in the quadriform. Analysis of variance was appropriate to use when the independent variable was nominal with two or more categories and dependent variables were measured at the interval level. In this study, there were four groups which we wished to compare and the dependent variables were all measured at the interval level.

Table 4.8 presents means and Tukey-B contrasts for the financial variables related to research question two. In addition, the lowest mean for each variable is marked with a single plus (+). The double plus (++) is used to designate the lowest mean for each variable when the lowest mean for a variable was Group I, technically economically inefficient districts. As stated earlier in this study, Group I districts were not considered in this analysis; therefore, the double plus (++) indicated the lowest mean when not considering Group I districts. There were two other relevant diagnostic possibilities. First, relative ranks between the four groups was of interest. Secondly, the Tukey-B comparisons were useful because they pinpointed exactly which group means varied from exactly which other ones. Considering the ranking of means and pattern of significant differences addresses substantive issues regarding the usefulness of constructing these four "ideal" types of school districts.

Consider, for instance, the case of the first variable in Table 4.7 and Table 4.8, DPCTC. The probability for the F-test indicated that we can reject the H_0 for DPCTC (p=.0000). Considering the Tukey-B comparisons located in the right portion of Table 4.8, we see that Group E is significantly different from

Table 4.8

Question 2: Sub Group Means and Tukey-B Results

	SUB GROUP MEANS				TUKEY-B RESULTS			
GROUP QUAD	E	H	L	I	E	H	L	I*
DPCTC	3,986.00	6,489.00	3,677.00+	6,728.00	H	L,E	H	
DAEFX	7,082,345.00	4,874,562.00+ +	7,412,518.00	2,817,801.00+				
DAEFXP	67.5%	67.0%+	70.2%	74.0%				
DAOMFX	817,383.00	1,025,453.00	793,967.00+ +	496,985.00+				
DAOMFXP	8.0%	15.2%	7.2%+	14.1%	H	L,E	H	
DABIFX	795,904.00	219,521.00+ +	824,638.00	22,102.00+	H	L,E	H	
DABIFXP	7.8%	3.4%+ +	9.2%	.4%+	H	L,E	H	
DATRFX	519,363.00	217,572.00+ +	375,509.00	140,038.00+	H	E		
DATRFXP	4.9%	2.8%+	4.0%	3.8%	H	L,E	H	
DAIRMFFX	159,845.00	138,480.00+ +	182,983.00	75,028.00+				
DAIRMFXP	1.6%+	1.9%	1.6%+	2.1%				
DARTFX	4,199.00+	0	4,445.00	0				
DARTFXP	.2%+	0	.3%	0		L	H	
DACIFX	7,453.00	1,487.00+ +	1,609.00	0+				
DACIFXP	.05%	.04%	.01%+ +	.0000+				
DASCFX	562,716.00	116,332.00+ +	247,573.00	42,222.00+	H	E		
DASCFXP	4.4%	2.3%+ +	2.6%	.9%+				
DATEXP	9,949,212.00	6,593,409.00+ +	9,843,306.00	3,594,178.00+				
DATIX	5,081,663.00	3,527,118.00+ +	5,071,932.00	2,239,311.00+				
DATSSX	3,112,620.00	2,331,6357.00+ +	3,228,729.00	1,042,667.00+				
DATADX	408,658.00	266,800.00+ +	387,144.00	233,029.00+				
DAORXPCT	1.09%	1.04+%	1.17%	1.06%	H	L	E	
DOTXR	2.972	2.148+ +	2.919	1.040+	H	L,E	H	
DTXR	3.410	2.297+ +	3.727	1.419+	H	L,E	H	

\+ Lowest mean for each variable
\+ + Lowest mean when inefficient districts are not considered
E Technically Efficient Districts
H High Service Districts
L Low Service Districts
I* Technically Inefficient Districts; no relationships are shown because of the small number of school districts in this quadrant.

Group H (indicated by an E in column H and a H in column E). In addition, Group L is significantly different from Group H (indicated by a H in column L and a L in column H). The results for Group I were ignored. The relative rank of the group means helped in interpreting this pattern. On the average, Group E, technically efficient districts, had a significantly lower per capita tuition charge (DPCTC) than Group H, high service districts, and Group L, low service districts, had a significantly lower DPCTC than Group E districts.

Further review of Table 4.8 indicated that Group E, technically efficient districts, had significantly lower means than Group H, high service districts, for variables DPCTC and DAOMFXP.

Table 4.8 also indicated that Group H, high service districts, had significantly lower means than the Group E, technically efficient districts, for the variables DABIFX, DABIXP, DATRFX, DATREXP, DACIFX, DASCFX. DOTXR and DTXR.

Group H districts had significantly lower means than Group L districts for variables DAORXPCT, DOTXR, and DTXZ.

Group L districts had significantly lower means than Group E districts for the variables DPCTC and DOTXR. Group I districts were not considered in this analysis because of the small number of districts in this quadrant.

In summary, technically efficient districts had a significantly lower per capita tuition charge and percent of total expenditures spent for operations and maintenance than did high service districts. Group H, high service districts, spent significantly less than Group E, technically efficient districts, for bond and interest expenditures, transportation expenditures, capital improvement expenditures and site and construction expenditures. Group H, high service districts, had a significantly lower percentage of total funds spent for bond and interest expenditures and transportation expenditures. In contrast, the total operating tax rate and total tax rate were significantly lower for Group H, high service districts, when compared to Group L, low service districts. This phenomenon was especially interesting since it indicated the high service district had the lowest tax rates. This, however, did not necessarily indicate that the actual taxes paid by the citizens of these districts were lower. On the average, the ratio of operating expenditure per pupil to per capita tuition charge was significantly lower for high service districts when contrasted to low service districts. This ratio called the basic education ratio was an indicator of the presence of special programs in a school district. The lower the ratio, the less that is spent by a district on special programs. High service districts spent the least on special programs directing their funds to the basic education program. Group L low service districts spent more on special programs than any other group of districts. Low service districts when compared to technically efficient districts had a significantly lower per capita tuition charge and total operating tax rate.

Research Question Number 3

What were the common personnel attributes that existed among technically economically efficient suburban Cook County public elementary school districts? Significantly, which personnel attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service, low service, and technically inefficient districts?

Table 4.9 presents analysis of variance goodness-of-fit statistics for the financial variables related to research question three. A review of Table 4.9

Table 4.9

Question 3: Analysis of Variance Results

VARIABLE	F-RATIO	df	p-level
DAADMSAL	18.59	3,69	.0000*
DATCHSAL	29.90	3,69	.0000*
DATEXP	1.17	3,69	.3256
DELPTR	32.49	3,69	.0000*
DPADMR	6.42	3,69	.0007*
XBAD	4.46	3,69	.0063*
XMAD	3.49	3,69	.0202*

*Significant at the .05 level of probability.

indicated that the variables average administrator salary (DAADMSAL), average teacher salary (DATCHSAL), pupil teacher ratio (DEIPTR), pupil administrator ratio, percent of teachers with bachelors degrees and percent of teachers with masters degrees all had p-levels at or below the .05 significance level indicating a significant difference between at least two of the four types of districts represented within the quadriform.

Table 4.10 presents means and Tukey-B contrasts for the financial variables related to research question three. In addition, the lowest mean for each variable was marked with a single plus (+). The double plus (++) was used to designate the lowest means for a variable when the lowest mean for a variable was Group I, technically inefficient districts. As stated earlier, Group I districts were not considered in this analysis; therefore, the double plus (++) indicated the lowest mean when Group I districts were not considered. Review of Table 4.10 indicated that Group E, technically efficient districts had significantly lower means than Group H, high service districts for the variables. Average administrator salary (DAADMSAL), average teacher salary (DATCHSAL) and pupil teacher ratio (DELPTR) Group H, high service districts, also had significantly lower means than Group L, low service districts for DAADMSAL and DATCHSAL.

Group H, high service districts had significantly lower means than Group L, low service districts, for the variable percent of teachers with a masters degree. Group L, low service districts, has significantly lower means than Group E, technically efficient districts, for the variables average administrator salary

(DAADMSAL) and average teacher salary (DATCHSAL). Group L districts had significantly lower means than Group H districts for the variables average administrator salary (DAADMSAL), average teacher salary (DATCHSAL), pupil teacher ratio (DELPTR), pupil administrator ratio (DPADMR), percent of teachers with a bachelors degree (XBAD), and percent of teachers with a masters degree (XMAD).

In summary, Group E, technically efficient districts, had lower average administrator salaries than high service districts, but low service districts had the lowest average administrator salaries. Technically efficient districts had lower average teacher salaries than high service districts, but once again low service districts had the lowest average teacher salaries.

Technically efficient districts had the lowest pupil teacher ratio. This finding is in contrast to the commonly held belief that class size must be large for a school district to be efficient.

Table 4.10

Question 3: Sub Group Means and Tukey-B Results

SUB GROUP MEANS					TUKEY-B RESULTS			
GROUP QUAD	E	H	L	I	E	H	L	I*
DAADMSAL	55,351.40	64,798.95	48,283.65+	62,327.22	L,H	L,E	E,H	
DATCHSAL	31,891.57	35,684.13	29,129.51+	32,736.66	L,H	L,E	E,H	
DATEXP	15.52	15.27	14.78++	13.23+				
DELPTR	14.22+	19.38	14.89	19.32	H	E,L	H	
DPADMR	147.91+	217.02	182.90	247.27		L	H	
XBAD	57.45%	65.25%	53.07+%	55.50%		L	H	
XMAD	44.47+%	45.14%	48.90%	48.38%		L	H	

+Lowest mean for each variable
++Lowest mean when inefficient districts are not considered
E Technically Efficient Districts
H High Service Districts
L Low Service Districts
I* Technically Inefficient Districts; no relationships are shown because of the small number of school districts in this quadrant.

Group L, low service districts, had a significantly lower pupil administrator ratio than high service districts. Finally, low service districts had a significantly lower percentage of teachers with bachelors degrees than high service districts. In contrast, the high service districts had a significantly lower percentage of teachers with masters degrees than low service districts. This finding was interesting in that it demonstrated that the number of teachers with masters degrees does not necessarily increase test scores enough to justify the cost.

Research Question Number 4

What were the common socio-economic attributes that existed among technically economically efficient suburban Cook County public elementary school districts? Further, which socio-economic attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service, low service, and technically inefficient districts?

Table 4.11 presents analysis of variance goodness-of-fit statistics for the variables related to research question four. A review of Table 4.11

indicated that the variables average percent of African American (DAAFR), average percent of Asians (DAASP), average daily attendance (DADA), average percent of Hispanics (DAHPP), district percent Native American (DANAP), average enrollment (DENR) and average percent of limited English proficient students (DLEP) all had significance levels at or below the .05 level indicating a significant difference between at least two of the four types of school districts represented by the quadriform.

Table 4.11

Question 4 Analysis of Variance Results

VARIABLE	F-RATIO	df	p-level
DAAFR	26.39	3,70	.0000*
DAASP	10.26	3,70	.0000*
DADA	24.59	3,70	.0000*
DAHPP	9.92	3,70	.0007*
DANAP	10.81	3,70	.0000*
DENR	4.83	3,70	.0041*
DLEP	4.24	3,70	.0082*

*Significant at the .05 level of probability.

Table 4.12 presents means and Tukey-B contrasts for the socio-economic variables related to research question four. As was the case for previous tables of this type, the lowest mean for each variable was marked with a single plus (+). The double plus (++) was used to designate the lowest means for a variable when the lowest mean for a variable was Group I, technically inefficient districts. As stated earlier, Group I districts were not considered in this analysis; therefore, the double plus (++) indicates the lowest mean when Group I districts were not considered. Inspection of Table 4.12 indicated that Group E, technically efficient districts had significantly lower means than Group H, high service districts for the variables average percent of Asian students (DASSP), average percent of enrollment (DENR), average percent of limited English proficient students (DLEP).

In addition Group E, technically efficient districts had significantly lower means then Group L, low service districts, for the variables average percent of African American students (DAAFR), and average percent of Hispanic students.

Group H, high service districts, had significantly lower means than Group E, technically efficient districts for the variable district enrollment (DENR). Group H districts had significantly lower means than

Group L, low service districts for variables average percentage of African American students (DAAFR) and district enrollment (DENR).

Group L, low service districts, had significantly lower means than Group H districts for the variables average percent of Asian students (DAASP), average daily attendance percentage (DADA) and average percent of Native American students (DANAP). Group L districts also had a significantly lower mean than Group E districts for the variable average daily attendance percentage (DADA).

In summary, Group E, technically efficient districts, when compared to Group H, high service districts, had a significantly lower percentage of Asian students, Native American students and limited English proficient students.

Group E, technically efficient districts, when compared to Group L, low service districts, had a significantly lower percentage of African American students and Hispanic students.

Group H, high service districts, when compared to Group E, technically economically efficient, districts had a lower average enrollment. Group L, low service

Table 4.12

Question 4: Sub Group Means and Tukey B Results

SUB GROUP MEANS					TUKEY-B RESULTS			
GROUP QUAD	E	H	L	I	E	H	L	I*
DAAFR	6.56%	.82% +	46.32%	1.03%	L	L	H,E	
DAASP	2.35%	10.87%	1.02% +	10.24%	H	L,E	H	
DADA	95.55%	95.62%	94.15% +	94.76%	L	L	E,H	
DAHPP	2.19% +	2.89%	12.18%	15.91%	L	L	E,H	
DANAP	.87%	3.71%	.37% +	3.92%	H	L,E	H	
DENR	2,215.04	1,036.57 + +	2,201.75	626.88 +	H	L,E	H	
DLEP	.85% +	4.96%	3.92%	10.08%	H	E		

+Lowest mean for each variable
+ +Lowest mean when inefficient districts are not considered
E Technically Efficient Districts
H High Service Districts
L Low Service Districts
I* Technically Inefficient Districts; no relationships are shown because of the small number of districts in this quadrant.

districts, when compared to high service districts had significantly lower percentage of Native American students, Asian students and daily attendance.

Finally, Group L, low service districts, when compared to Group E, technically efficient districts, had a significantly lower percentage of daily attendance.

Research Question Number 5

What were the common wealth factors that existed among technically economically efficient suburban Cook County public elementary school districts? Further, which wealth factors were significant when technically economically efficient suburban Cook County public school districts were compared to high service, low service, and technically inefficient districts?

Table 4.13 presents analysis of variance, goodness-of-fit statistics for the variables related to research question five. A review of Table 4.13 indicated that the variables average amount of federal revenue (DAFR), average federal revenue per average daily attendance (DAFRADA), average federal revenue as

Table 4.13

Question 5 Analysis of Variance Results

VARIABLE	F-RATIO	df	p-level
DAFR	10.62	3,69	.0000*
DAFRADA	4.98	3,69	.0035*
DAFRP	25.82	3,69	.0000*
DALR	.69	3,69	.5604
DALRADA	55.97	3,69	.0000*
DALRP	48.74	3,69	.0000*
DARVEX	2.76	3,69	.0485*
DASR	13.81	3,69	.0000*
DASRADA	37.62	3,69	.0000*
DASRP	43.36	3,69	.0000*
DASTRV	4.48	3,69	.0062*
DATREV	1.19	3,69	.3170
XDEOPP	40.86	3,69	.0000*
DEAVADA	42.97	3,69	.0000*

*Significant at the .05 level of probability.

a percent of total revenue (DAFRP), average local revenue per average daily attendance (DALRADA), average local revenue as a percent of total revenue (DALRP), average difference between total revenue and total expenditure (DARVEX), average amount of state revenue (DASR), average state revenue per average daily attendance (DSRADA), average state revenue as a percent of total revenue (DASRP), average state aid as a percent of total revenue (DASTRV), average district operating expenditure per pupil (DEOPP) and average equalized assessed valuation per pupil (DEAVADA) all had significance level at or below the .05 level, indicating a significant difference between at least two of the four types of school districts represented by the quadriform.

Table 4.14 presents means and Tukey B contrasts for the wealth variables related to research question five. In addition, the lowest mean for each variable was marked with a single plus (+). The double plus (++) was used to designate the lowest means for a variable when the lowest mean for a variable was Group I, technically inefficient districts. As stated earlier, Group I districts were not considered in this analysis; therefore, the double plus (++) indicated the lowest mean when Group I districts were not considered.

Review of Table 4.14 indicated that the Group E, technically efficient districts, had significantly lower means than Group H, high service districts, for revenue per average daily attendance (DAFRADA), amount of federal revenue as a percent of total revenue

Table 4.14

<u>Question 5: Sub Group Means and Tukey-B Results</u>

SUB GROUP MEANS					TUKEY-B RESULTS			
GROUP	E	H	L	I	E	H	L	I*
DAFR	214,425	79,346++	553,116	70,585+	H	E		
DAFRADA	98.11+	112.92	286.04	115.15	L	L	E,H	
DAFRP	2.03%	1.12%+	5.74%	1.83%	L	L	H,E	
DALR	5,470,312.76	4,683,260.63	3,874,122.32++	2,139,388.04+				
DALRADA	2,661.46	5,175.51	1,905.07+	4,350.20	L,H	L,E	E,H	
DALRP	77.93%	92.86%	56.14%+	91.01%	L,H	L,E	E,H	
DARVEX	-742,434	-81.726+	-819,194	-394839		L	H	
DASR	2,002,698	433,290++	3,541,554	251,308	L,H	L,E	H,E	
DASRADA	945.19	455.76+	1802.81	471.49	H,L	E,L	H,E	
DASRP	20.02%	6.00%+	38.11%	7.14%	H,L	E,L	H,E	
DASTRV	4.35+%	6.18%	9.23%	10.54%	L	L	E,H	
DATREV	10,104,400.96	7,190,787.65++	9,807,298.93	3,402,160.77+				
DEOPP	4,111.73	6,435.71	4094.60+	6840.88	H	L,E	H	
DEAVADA	108,374	301,473	71.705+	415,610	H	L,E	H	

+Lowest mean for each variable
++Lowest mean when inefficient districts are not considered

E Technically Efficient Districts
H High Service Districts
L Low Service Districts
I* Technically Inefficient Districts; no relationships are shown because of the small number of school districts in this quadrant.

(DAFRP), average amount of state revenue (DASR), amount of state revenue as a percent of total revenue (DASRP), and amount of general state aid as a percent of total revenue (DASTRV).

Group H, high service districts, had significantly lower means than Group E, technically efficient districts, for the variables average amount of federal revenue (DAFR), average amount of state revenue (DASR), average state revenue per average daily attendance (DASRADA), and state revenue as a percent of total revenue (DASRP).

Group H, high service districts, had significantly lower means than Group L, low service districts for the variables, average amount of federal revenue per average daily attendance (DAFRADA), average amount of federal revenue as a percent of total revenue (DAFRP), average difference between revenue and expenditure (DARVEX), average amount of state revenue (DASR), average amount of state revenue per average daily attendance (DASRADA), state revenue as a percent of total revenue (DASRP), and average general state aid as a percent of total revenue (DASTRV).

Group L, low service districts, had significantly lower means than Group E, technically efficient districts, for the variables local revenue per average daily attendee (DALRADA), and local revenue as a percent of total revenue (DALRP). Finally, Group L, low service districts, had significantly lower means than Group H, high service districts, for the variables average amount of local revenue per average daily attendance (DALRADA), average local revenue as a percent of total revenue (DALRP), average operating expenditure per pupil (DEOPP), and average assessed valuation per pupil (DEAVADA).

In summary, on the average Group E, technically efficient districts, when compared to Group H, high service districts, received less local revenue per average daily attendance, received a significantly lower percent of revenue from local sources, had a significantly lower operating expenditure per pupil and a significantly lower equalized assessed valuation per pupil.

Group E, technically efficient districts, when compared to Group L, low service districts, on the average received a significantly lower amount of federal revenue per average daily attendee, federal revenue as a percent of total revenue was significantly lower, state revenue was significantly lower, received a significantly lower amount of state revenue per average daily attendee and state revenue as a percent of total revenue was significantly lower.

Group H, high service districts, on the average when compared to Group E, technically efficient districts, received significantly less federal and state revenue, received significantly less state revenue per average daily attendee and state revenue as a percent of total revenue was significantly lower.

Group H, high service districts when compared to Group L, low service districts received a significantly lower amount of federal revenue per average daily attendee, federal revenue as a percent of total revenue was significantly lower, had a significantly lower difference between total revenue and total expenditure, received significantly less state revenue, received significantly less state revenue per average daily attendee, state revenue as a percent of total revenue was significantly lower, general state aid as a percent of total revenue was significantly lower.

Group L, low service districts, when compared to Group E, technically efficient districts, had a significantly lower amount of local revenue per average daily attendance, a significantly lower amount of local revenue as a percent of total revenue, and had a significantly lower equalized assessed valuation per child.

Group L, low service districts when compared to Group H, high service districts, had a significantly lower amount of local revenue per average daily attendee, a significantly lower amount of local revenue as a percent of total revenue, a significantly lower district operating expenditure per pupil and a significantly lower equalized assessed valuation per pupil.

Presented in this chapter were the findings for the five research questions which served as the basis of this study. As a result of the quadriform analysis, 16 districts, or 13.9%, were placed in the technically economically efficient quadrant. Twenty-eight districts, or 24.4%, were placed in the high service quadrant; 27 districts, or 23.4%, were placed in the low service quadrant; and 3 districts, or 2.6%, were placed in the technically economically inefficient quadrant.

Of the 53 variables investigated in this study, 35 or 66% were found to be significant between at least 2 of the 3 group means. The next chapter will present the conclusions, implications, and recommendations for this study.

CHAPTER V

SUMMARY OF PROCEDURES, DESIGN OF STUDY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This study used a statistical procedure known as the quadriform to group suburban Cook county elementary districts into four quadrants: (1) technically economically efficient, (2) high service, (3) low service, and (4) technically economically inefficient. Once the districts were divided into these quadrants, statistical procedures were used to determine if relationships existed among districts and selected financial variables, personnel variables, socioeconomic attributes and school wealth factors.

This chapter contains a summary of research questions, the procedures and design of the study, conclusions, limitations, implications for policy and practice and recommendations for further research.

Summary of Procedures and Design of Study

This study was designed to answer the following five research questions:

1. Using the quadriform of educational production, which suburban Cook County public elementary districts were classified as economically technically efficient, or high service or low service or technically economically inefficient?
2. What were the common financial attributes that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which financial attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low service districts, and technically economically inefficient districts?
3. What were the common personnel attributes that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which personnel attributes were significant when technically economically efficient suburban

Cook County public school districts were compared to high service districts, low service districts and technically economically inefficient districts?

4. What were the common socio-economic attributes that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which socio-economic attributes were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low service districts, and technically economically inefficient districts?

5. What were the common wealth factors that existed among technically economically efficient suburban Cook County public elementary school districts. Further, which wealth factors were significant when technically economically efficient suburban Cook County public school districts were compared to high service districts, low

service districts, and technically economically inefficient districts.

The population of this study was comprised of 115 public suburban elementary districts in Cook county. No sampling was done because data were available for all districts of interest. These districts were selected because they are of greatest relevance to the author. In addition, the cost of living in counties in Illinois varied because of proximity to the city of Chicago and living conditions in each county. Using school districts which were all located in the same county, minimized the effect county differences could exert on the results.

All data used in this study were obtained from the Illinois State Board of Education. Illinois School Report Card data for 1988-89, 1989-90, and 1990-91 were used. Financial data were obtained from the State of Illinois Annual Financial Report for each school district for the fiscal years ending June 30, 1989, 1990 and 1991.

Conclusions

The conclusions presented in the following paragraphs have been formulated as a result of the statistical analyses and findings of this study:

Conclusion Research Question 1

> The definition of technically economically efficient school districts used in this study allowed school districts with either a high operating expenditure per pupil or a low operating expenditure per pupil to be classified as technically economically efficient. This same principle was also true for high service districts, low service districts and technically economically inefficient districts.

In this study the quadriform of educational production was used to categorize districts according to expected composite IGAP scores and expected district operating expenditure per pupil. The expected IGAP composite score was arrived at by obtaining the raw IGAP score and controlling for the effect of percentage of low income enrollment, district mobility rate, and district attendance rate. The expected district operating expenditure per pupil was arrived at by obtaining the raw district operating expenditure per pupil and controlling for percent of low income and access to wealth.

The result of this procedure yielded a group of 16 technically economically efficient districts with a range of raw IGAP composite scores of 254.79 to 323.47. The range of the raw district operating expenditure per pupil for the districts was $3,175.33 to $5,172.67. The range of raw composite IGAP scores for high service districts was 276.46 to 359.43. The range of district raw operating expenditures for these same districts was $4,557.33 to $8,597.00. The range of raw composite IGAP scores for low service districts was 172.78 to 273.11 while the range for raw district operating expenditure per pupil was $3,322.33 to $6,868.00. The range of raw composite IGAP scores for technically inefficient districts was 246.98 to 302.80 while the district raw operating expenditure per pupil was $4,564 to $7,637.67.

<u>Conclusion Research Question 2</u>

> The common financial variables which have been found to be significant within technically economically efficient suburban Cook County public elementary school districts were: district per capita tuition charge, operation and maintenance fund expenditures as a percent of total expenditures, bond and interest fund expenditures as a percent of total expenditures, bond and interest fund expenditures, transportation fund expenditures as a percent of total expenditures, transportation fund expenditures, IMRF fund expenditures as a percent of total expenditures,

site and construction fund expenditures, operating tax rate and total tax rate.

The findings of this study which were based on the results of analysis of variance and Tukey-B procedures indicated that technically economically efficient school districts when compared to high service school districts had a significantly lower per capita tuition charge and a lower percent of total expenditures spent for operations and maintenance fund expenditures.

In addition, technically economically efficient districts when compared to high service districts had a significantly higher operations and maintenance expenditure, bond and interest expenditure, transportation expenditure, capital improvement expenditure, site and construction expenditure, percent of total expenditures spent for bonds and interest, and total expenditures spent on transportation.

Technically economically efficient school districts when compared to low service school districts had a significantly higher per capita tuition charge and total operating tax rate.

Of the 24 common financial variables investigated in this study 10 or 41.66% were found to be significant for technically economically efficient school districts.

Conclusion Research Question 3

> The common personnel attributes which have been found to be significant within technically economically efficient suburban Cook County public elementary school districts were: average administrator salary, average teacher salary, and pupil/teacher ratio.

The findings of this study which were based on the results of analysis of variance and Tukey-B procedures indicated that technically economically efficient school districts when compared to high service school districts had a significantly lower average administrator salary, average teacher salary, and teacher/pupil ratio. Technically economically efficient districts when compared to low service districts had a significantly lower teacher/pupil ratio.

Of the seven personal attributes investigated in this study, three or 42.85% were found to be significant for technically economically efficient school districts.

Conclusion Research Question 4

> The common socio-economic attributes which have been found to be significant within technically economically efficient suburban Cook County public

elementary school districts were: percent of Asian students, percent of Native American students, percent of African American students, percent of Hispanic students, percent of limited-English proficient students, district enrollment and average daily attendance.

The findings of this study which were based on the results of analysis of variance and Tukey-B procedures indicated that technically economically efficient school districts when compared to high service districts had a significantly lower percent of Asian students, percent of Native American students, percent of limited-English proficient students but a significantly higher enrollment. Technically economically efficient districts when compared to low service districts had a significantly lower pupil/teacher ratio, percent of African American students, and percent of Hispanic students. In addition, technically economically efficient school districts when compared to low service districts had a significantly higher rate of average daily attendance. Of the seven socio-economic variables investigated in this study, all seven, or 100%, were found to be significant for technically economically efficient school districts.

Conclusion Research Question 5

> The common wealth factors which have been found to be significant within technically economically efficient suburban Cook County public elementary school districts were: amount of federal revenue, amount of federal revenue per average daily attendee, federal revenue as a percent of total revenue, amount of local revenue per average daily attendee, local revenue as a percent of total revenue, amount of state revenue, amount of state revenue per average daily attendee, state revenue as a percent of total revenue, amount of general state aid as a percent of total revenue, district operating expenditure per pupil, and district equalized assessed valuation per average daily attendee.

The findings of this study which were based on the results of analysis of variance and Tukey-B procedures indicated that technically economically efficient school districts when compared to high service school districts had a significantly lower amount of local revenue per average daily attendee, percent of total revenue attributed to local sources, operating expenditure per pupil and equalized assessed valuation per pupil. In addition, when technically economically efficient districts were compared to high service districts, efficient districts had a significantly higher amount of federal revenue, amount of federal revenue per average daily attendee, amount of state revenue, amount of state revenue per average daily attendee, and percent of total revenue attributed to state sources.

Technically economically efficient districts when compared to low service school districts, had a significantly lower amount of federal revenue per average daily attendee, percent of total revenue attributed to federal sources, amount of state revenue, amount of state revenue per average daily attendee and percent of total revenue attributed to state sources. In addition, when technically economically efficient districts were compared to low service districts, efficient districts had a significantly higher amount of local revenue per average daily attendee, percentage of total revenue attributed to local sources and amount of equalized assessed valuation per pupil. Further, it is important to note that the relationship between the IGAP composite score and district operating expenditure per pupil is of greatest importance when attempting to categorize districts based on technical efficiency. Of the 14 wealth factors investigated in this study, 12 or 85.7% were found to be significant for technically economically efficient school districts.

Implications for Policy and Practice

This study was developed and completed in an effort to determine procedures and practices a school administrator might use to develop a more efficient school district or produce higher student outcomes at the same or reduced cost. The method of investigation to arrive at the answer to this question was to identify and separate school districts into four categories based on achievement and per pupil expenditure, control for variables that were beyond the scope of the school administrator and then determine which of the 53 variables were significant.

This study reaffirms the many studies which have demonstrated the impact exerted on educational outcomes by factors beyond the control of the school administrator; specifically, percentage of low income enrollment, student mobility rate and access to wealth. This finding underscores the need for the state legislature to develop solutions for these problems. The implementation of a new state funding mechanism which more evenly distributes revenue would help to equalize the differences that exists among districts. The seemingly high concentrations of low income students in specific school districts should not be allowed to continue without an attempt by the state legislature to provide the services needed to educate these students. Additional evidence to support the need to reform the state formula for funding education can be found in the fact the property value decreases as the number of low income students increases. While this finding is consistent with the original purposes for using property tax as a funding mechanism for schools, it is not consistent with current educational research which indicates that children from low income families are more costly to educate.

The implications of this study for local school administrators include:

1. Technically economically efficient districts are able to maintain low pupil-teacher ratios at a low per pupil cost.
2. Technically economically efficient districts have a higher percentage of teachers with a bachelor's degree than with a master's degree.

3. Technically efficient districts have a relatively low pupil-administrator ratio with a low per pupil cost.
4. Technically economically efficient districts were characterized as having a teaching staff with more experience than teachers in the other three types of districts.
5. Technically efficient districts had a relatively low equalized assessed valuation, a relatively high operating tax rate, and a relatively high total tax rate.
6. Technically efficient districts had a relatively high expenditure for the bond and interest fund.

Recommendations for Future Research

Based upon the review of the literature and an analysis of data collected for this study the following recommendations for additional research were compiled:

1. This study examined the relationships that existed among districts that were classified as technically economically efficient, high service, low service, and technically economically inefficient. The data for this

study were arrived at by combining three years of data and then arriving at an average. It is recommended that the study be replicated using a different time period so that a determination can be made as to the changes that have occurred within and among school districts from one time period to another.

2. The study could be replicated with Cook county public high schools as the population. A comparison could then be made between the results of the elementary school study and the high school study.
3. A study might be conducted which includes the districts in the "voided cross area" for the purpose of more closely examining these districts.
4. A study might be constructed which includes the variables in this study as well as additional curriculum variables.
5. This study might be replicated by grade level in an attempt to see how the results compared to this study.

6. This study might be replicated at the building level to determine differences that may exist within school districts.
7. This study could be replicated for the entire state of Illinois using sampling techniques.
8. This study could be replicated in different states and a comparison of results might be made.

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The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the dissertation is now given final approval by the Committee with reference to content and form.

The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Education.

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