

Memo. No. 781

The Use of Regression Analysis
In Economics Of Education

By

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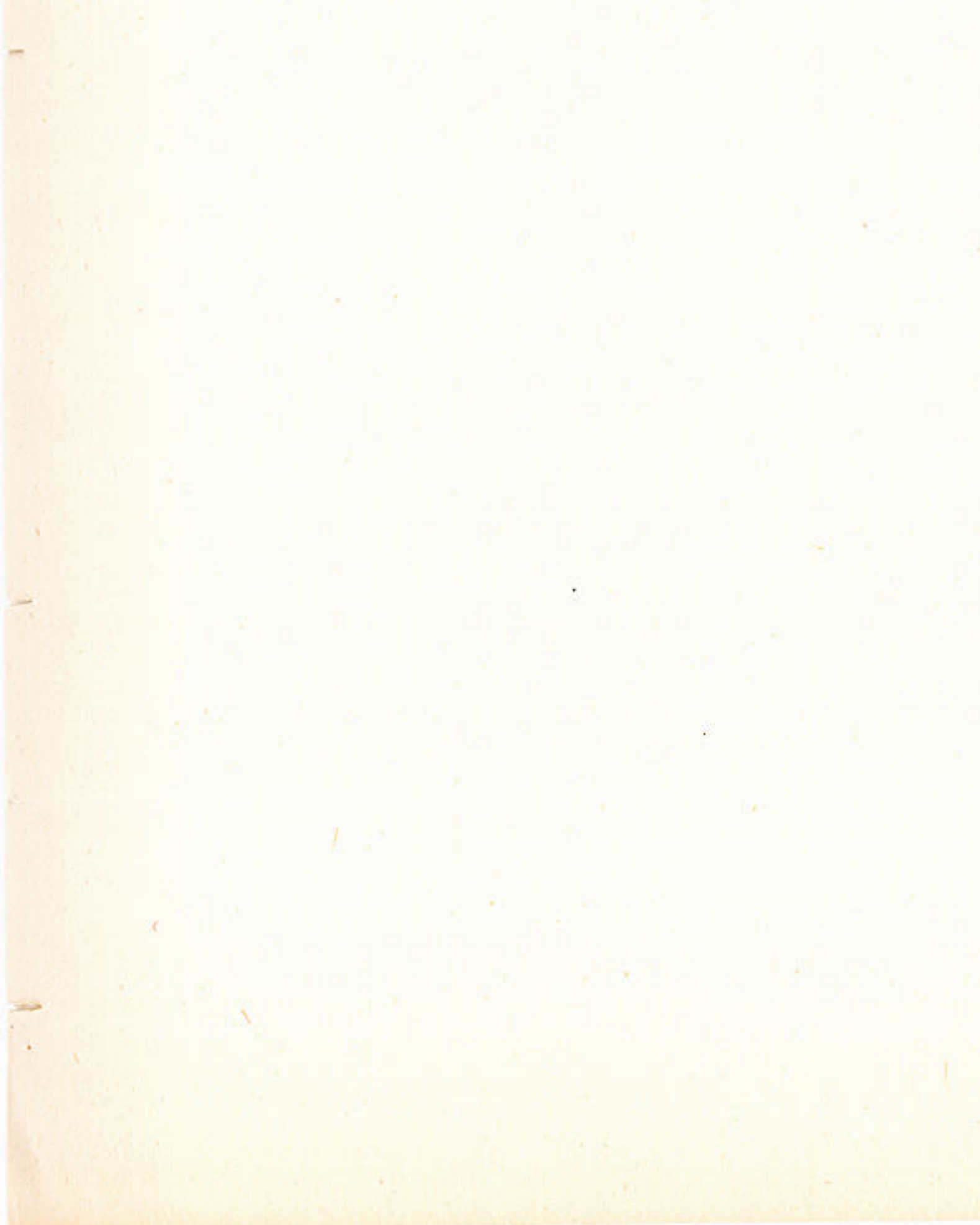
1873

Attest my hand and seal of office
this 1st day of March 1873

John A. [unclear] [unclear]

[unclear]

"Opinions Expressed and Positions Taken
by Authors are Entirely their Own and do not
Necessarily Reflect the Views of the Institut
of National Planning".



may be explained partly by the fact that a large percentage of the employed personnel is lacking the proper education. These emphases were also the result of the recognition that the return on investment in education is comparable, if not to be greater, with that on impersonal investment. The recognition, by the decision makers, of the positive relationship between education and growth may be one of the reasons for the emphasis on education.

It was meant by emphasis on education, that there was a realization of the need for improving the quality of the existing education system. This improvement was needed in local, state, and national levels. In general, to improve something that does already exist, requires a knowledge of what we have and the setting of definite standards to be achieved by the act and process of improvement. A knowledge of what we already have can be furnished by studies that analyze the existing situations and find the causes of the present relationships. Then these findings can be presented to the people who are the decision makers, to use them as a guide and to help them in making the right decisions.

Statement of the Problem

The people of the State of Iowa, being aware of the fact that something has to be done to improve their local education,

uations which may be useful from the highest grade to the individual parent in making decisions concerning plans for the future schools. To develop future decision makers must have available detailed data available on the school districts,

The information needed by the decision makers is not only in a descriptive form but must also be in a predictive form. It is meant by predictive here, an information which describes the quantitative relationships as they exist. There are many detailed descriptive informations on the school system in Iowa. Moreover, several descriptive studies have been completed on the educational system in Iowa as to various particular parts of the State. These studies are valuable, but they are not enough. What is really needed are studies that point out the quantitative factors which determine the quality of the school system, the quality of the teacher, the quality of the student, and other factors. This information is needed to help the decision makers in making their future plans for education with more effective results.

Objectives of the Study

It is the purpose of this study to present a detailed analysis of the present school districts in the State of Iowa.

is that whether a school is producing educational an efficient manner. In general, two major problems researchers in the past and still face them are in trying to determine school qualities. The first is the difficulty of defining and measuring the product being produced. The second problem results from the nature of the school system.

A second objective of this study is to determine and estimate coefficients for the possible different variables that may explain the variation in the quality of the schools in the districts. These coefficients may be used, by the school makers, in the prediction of the results of their educational programs. It has to be mentioned here that the coefficients can be used only for prediction for the future.

The third objective of this study is to provide school makers and decision makers with sufficient information for them to make a rational decision concerning the quality of educational services that they would like to provide for the new generations.

Frequency Distribution of Iowa Approved High
Districts by A.D.A. for 1962-1963

<u>Code Size</u>	<u>A.D.A.</u>	<u>Number of</u>
1	116	11
2	234	52
3	334	70
4	463	117
5	629	78
6	849	88
7	1289	35
8	1729	22
9	1928	14
<u>10</u>	7183	<u>30</u>
Total		517

This table shows that Iowa approved high districts vary in average daily attendance from 116 to the most frequent A.D.A. is 463.

The study was limited to those high schools that have records for the scores of the Iowa Test Development for students in the 10th, 11th, and 12th the school years 1960-1961, 1961-1962, and 1962-1963.

the ITED for the same pupils for the 11th grade 1962-63 were obtained as well as for the 12th grade for 1963-64 shows that the same pupils were followed in the next year. This ITED score comparison for the same pupils over three school years will be used as a basis for the determination of the quality of Iowa educational output. That is, an increase or decrease in the ITED scores of the 11th and 12th grades can be attributed to the quality of the school.

It was found that only 366 high school districts of 517, have records for the ITED scores for the three years of the study. The following table shows the distribution for these 366 approved high school districts by average daily attendance.

Frequency Distribution of the 366 Approved
School Districts by A.D.A. for 1962-63

	<u>Code Size</u>	<u>A.D.A.</u>	<u>Number of Schools</u>
1	1	116	0
	2	234	20
	3	334	46
	4	463	88
	5	629	56
	6	849	73
	7	1289	29
	8	1729	19
	9	1928	11
	10	7183	24
	Total		366

for the Iowa Test of Educational Development for the school years. Data for the variables used in this study are therefore limited to these 366 approved school districts.

Analytical Model

It was stated previously that one of the studies is to find the factors that are responsible for the present quality of Iowa school districts. In other words, to determine the quality of education given to the students. Education is the output and is influenced by many factors. A direct measure of education quality is hard to find because there are many factors that may increase or decrease the quality in a school district. There are also two important factors that do influence a person's education, but do not have anything to do with the quality and efficiency of the education. These are the person's native intelligence and his attitude toward knowing and learning.

The composite and vocabulary scores of the Iowa Test of Educational Development are considered, for the purpose of this study, a reasonable measure for the efficiency of educational output. But these ITED composite and vocabulary scores do not give a complete measure of educational quality since the native intelligence and motives to learn are not the same for all students. It is felt that these two important factors have to be kept as constant as possible. This can be believed to be achieved by using the change in the composite

A public school system in a neighborhood at in many ways as any business that operates in a neighborhood. A school must use and compete scarce resources to produce the educational services offered to the public. It must pay for the input factors that it uses. Amount of input factors, for a school system, is the amount of public funds available, the quantity and quality of teachers, quality of units offered and others. On the other hand, a school system cannot be operated on the maximizing principle as in the case of a business. One reason for this is that its charges for its services are far below the cost of producing these services. Another reason may lie in the fact that the demand for educational services is not determined in the market place. The demand for educational services, in general, is reflected by the amount of public funds allocated to education by the decision makers, on the assumption that they reflect the wishes of the voters.

The quality and efficiency of the educational services are influenced by, as mentioned previously, many factors. The purpose of this study is to determine those factors that have the most influence -- in other words, to determine the factors that are responsible for the variation in educational services between schools. A linear multiple regression analysis is used to find out these quantitative relationships.

grade for 1960-1961 to 1962-1963 school

Y_3 = Ratio of change in ITED composite score
in ITED vocabulary score from the 10th
grade for 1960-1961 to 1962-1963 school

These three variables were used as reasonable measures of educational services quality given in a high school. These quality measures can be presented in general form with other variables as follows:

$$Y_i = f_i(X_{ij} \cdot \cdot \cdot \cdot X_{in})$$

where Y 's are the dependent variables,
 X 's are the independent variables,
 $i = 1, 2, \text{ and } 3$, and
 $j = 1, 2, \dots, n$

This general function can be put in a more specific form as follows:

$$Y_i = \beta_{i0} + \beta_{i1}X_{i1} + \beta_{i2}X_{i2} + \cdot \cdot \cdot + \beta_{in}X_{in}$$

where β_{i0} is constant, and

β_{ij} are unknown parameters and they represent partial regression coefficients.

To estimate these parameters, a sample has to be selected and we will have the following equation:

$$\hat{y}_i = b_{i0} + b_{i1}x_{i1} + b_{i2}x_{i2} + \cdot \cdot \cdot +$$

will be minimized.

The b_{ij} 's are known as the sample partial coefficients. For example, b_{11} is called the sample regression coefficient of y_1 , and X_1 , and represents the change in y_1 that would vary per unit change in X_1 if all other variables are fixed.

The selection of the independent variables was limited to the availability of data. Fourteen independent variables were selected to explain as much as possible the variation in the three dependent variables used. The independent variables were used to represent and reflect the following factors, four to represent and reflect the availability of good teachers and units offered, and one to represent school size.

Among the independent variables used to represent economic factors, one was to measure the amount of general funds devoted to public education, since it is the primary revenue source for school districts. It is believed that there is a positive relationship between the quality of educational services and the amount of funds devoted to education. The amount of general funds devoted to education was expressed as a percentage. Another independent variable reflected the availability of proper school building. This was expressed as the per pupil building value in dollars. The economic

system. The other independent variables that reflect factors are per pupil spending in general control, auxiliary services, operation of plant, maintenance charges. These will show how the school is dividing available funds to different spending classes. This division makes it easy to determine the relationship that may exist between each one of these spending classes and the quality of educational services. This will help decision makers to, if necessary, reallocate their funds in a better way to improve their educational services.

The quality of a school's educational service, generally speaking, depends highly on the quality of teachers and the quantity of the units that are being taught. One of the problems that always faces researchers in the field of education, is that of how to determine a unique and practical measure that can be used to indicate the efficiency and quality of teachers. Teachers' efficiency and quality depends on many factors that are related in one way or another. One of the most important factors is the ability to teach which is believed to be a natural gift. Among other factors that affect teachers' efficiency are the training background, the assignment and class size of the teacher, whether the teacher has experience or not, whether the teacher is teaching in his or her major field, and the teacher's personality. A single measure or index that reflects some of these factors is hard to find. But a reasonable measure that may be used as an indication of teachers' efficiency