THE VALIDITY OF THE TEXAS ECONOMIC INDEX

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THE VALIDITY OF THE TEXAS ECONOMIC INDEX

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CHAPTER I

INTRODUCTION

Statement of the Problem

The problem of this study is to determine the validity of the economic index as a measure of the relative taxpaying ability of local administrative units under the existing tax structure of Texas.

Background for the Study

The enactment of the Gilmer-Aikin school bills into law in 1949 effected a reorganization of the Texas public school system. These laws made sweeping changes in the administrative setup of the system and in methods of finance. Two very important instruments of measurement were created. One instrument defined a minimum foundation program of education to be guaranteed to all of the school children in every school district, and gave instructions concerning how to compute the cost of that program. The other instrument, which is the subject of this study, was a device used to measure the relative taxpaying ability of each local school district. When these two instruments are applied to any school district of the state, they determine the amount of state school funds which that district should receive. The cost of the minimum

foundation program of a district minus the local fund assignment determined by the economic index equals the amount of state funds which that district is entitled to receive.

When the Gilmer-Aikin proposals were being written, it was estimated that the total cost of the minimum program desired for the state would be $180,000,000.00. Of that amount it was thought that the local districts should raise about 25 per cent, or $45,000,000.00; so that amount was written into the law to be raised by the local districts. In order to assign each district its proportionate share, a measure of taxpaying ability was needed. Under the old equalization law, a uniform tax rate of fifty cents on the $100.00 valuation of property had been required as local effort, but this was thought to be unfair because property was not assessed at the same rate in all school districts. Therefore, the Gilmer-Aikin Committee needed a better measure of taxpaying ability than assessed values, to make it possible to assign the $45,000,000.00 to the local districts on a more equitable basis.

Evidently, the committee turned to some of the recent research in the field of public school finance and found that Cornell (2) had demonstrated in New York that economic factors could be combined into an index that would measure the true value of property more accurately than assessed valuation was being used to measure it. At that time, three states—Alabama, Florida, and West Virginia—had adopted indexes to measure taxpaying ability. So it seems that the committee

decided to try something that was relatively new, and therefore recommended an economic index. However, it appears that the index as it was written into the law was not a scientific creation but perhaps a legislative compromise, for at that time very little research was available to suggest the economic factors to be used or the weights to be assigned to them.

The first index was written into law as percentages to be raised by each county, but the next index was to be calculated as specified in the law by the State Commissioner of Education. After the laws had been passed, the economic index was one of the first parts of the law to require further study. A special committee of the State Board of Education was appointed, several work conferences were held, and three times the school administrators of the state studied the index at their mid-winter advisory conference on education. A number of criticisms were offered, some of which were conflicting, but two significant recommendations were made. One was that three-year average data should be used instead of data for a single year. The other was that the index should be computed each year instead of every four years. In 1953, the Fifty-third Legislature made those two recommended changes in the law (9).

Now it appears that the general opinion among school people over the state is that the economic index is the best measure of taxpaying

ability available; however, there is little evidence that this opinion is based upon scientific investigation.

Purpose of the Study

Since the economic index is one of the two instruments which are so important to the financing of every school district of the state, and since the index is a hypothetical measure, it should be studied at regular intervals. Therefore, the purpose of this study is to re-examine the economic index used in Texas school finance for the purpose of determining its validity.

Hypothesis

In view of the purpose of this study as stated above, it seems that the hypothesis should be that one of the three following statements is true:

1. The economic index is a valid measure of taxpaying ability and should be continued in use.

2. The economic index needs to be improved as a measure of taxpaying ability and continued in use.

3. The economic index is not a valid measure of taxpaying ability and should be discarded as soon as a better measure can be developed and adopted.

Statement of the Law

Before delimiting this problem, the following portion of the law giving the main provisions of the economic index in its present form needs to be quoted:

> Article 2922-16. Section 3. In determining the taxpaying ability of each school district, the State Commissioner of Education, subject to the approval of the State Board of Education, shall calculate an economic index of the financial ability of each county to support the Foundation School Program. The economic index of a county shall be calculated to approximate the percent of the total taxpaying ability in the State which is in a given county, and shall constitute for the purpose of this Act a measure of one county's ability to support schools in relation to the ability of other counties in the State. The economic index for each county shall be based upon and determined by the following weighted factors:
>
> a. Assessed valuation of the county, weighted by twenty (20);
>
> b. Scholastic population of the county, weighted by eight (8);
>
> c. Income for the county as measured by: Value added by manufacture, value of minerals produced, value of agricultural products, payrolls for service establishments, weighted collectively by seventy-two (72).
>
> Provided, however, that during the 1953-54 and the 1954-55 fiscal years no county shall be assigned an amount, in any one year, that exceeds the previous year's assignment more than ten percent. Upon application of the economic index all amounts in excess of ten percent increase over the previous year's assignment shall be deducted from that county's assignment and redistributed among the balance of the counties in the State in the same proportion that each county's assignment under the new economic index, bears to the total amount assigned to the counties that showed less than a ten percent increase.

> The Commissioner of Education, subject to approval of the State Board of Education, shall re-compute annually a new economic index not later than the first week in March of each year, using an average of data for a three-year period which shall be taken from the most recently available official publications and reports of agencies of the State of Texas or the Federal Government. The first economic index so determined for each county under the provisions of this amendatory Act shall be effective beginning with the 1953-54 school year, and thereafter the economic index re-computed annually shall be effective beginning with the new school year in the calendar year of its re-computation.
>
> Provided, however, that the requirement of this Act that the re-computation of the economic index shall be had not later than the first week in March of each year, shall not preclude the computation of the index prescribed herein after that time for the purposes of the 1953-54 school year (10, pp. 38-39).

Delimitations of the Study

There are two other sections of the above article which provide for determining the taxpaying ability and the local fund assignments of school districts within counties, but this study is concerned only with the measurement of taxpaying ability at the county level. Since the only legal tax that a local school district in Texas can levy is the property tax, taxpaying ability is limited to mean the tax that could be levied on property.

Although all 254 counties of Texas are considered, only twenty-five are used as a sample in this investigation; and the conclusions reached are based upon the findings in those counties. The determination of validity in this study is limited to a comparison of the legal index and its factors to a criterion index calculated upon true property

values. The extent of validity is reported in terms of tests of "goodness of fit" and the range of error. True property values are dependent upon the accuracy of sampling sales in each county and upon obtaining the percentage of assessed value to sale value. The Texas Constitution states that taxation shall be equal and uniform and that all property in the state shall be taxed in proportion to its value (8); therefore, it is assumed in this study that the law is being followed within the counties; that assessment ratios within a county are equal; and that a sample of those ratios will produce the county rate of assessment.

Definition of Terms

An economic index is used to refer to a group of two, three, or more economic factors properly weighted and combined into a formula that can be used to estimate or measure the taxpaying ability of local administrative units.

Validity is used to mean the extent to which a measuring device such as the economic index measures what it purports to measure.

True value or actual value is used to mean the price at which property sold or for which it would have sold during 1953 at a free sale between a "willing buyer and a willing seller."

Taxpaying ability in this study means the tax that could legally be levied on property.

Local fund assignment is used to mean the amount of funds that a local school district is assigned to raise in order to meet its share of the cost of a minimum foundation program of education.

State fund as used in this study refers to the state per capita apportionment and to the foundation or equalization fund.

Sources of Data

The sources of data for this study comprise textbooks on school finance, theses and dissertations dealing with problems of state aid and measures of taxpaying ability, official reports of the Texas Education Agency, state school codes, minutes of the Citizens Advisory Committee on the Economic Index, Research Bulletins of the National Education Association, proceedings and recommendations of the School Administrators Advisory Conference on Education, statistical data compiled by the Texas Education Agency for restrictive release only, information that can be secured from county offices, and current periodical literature dealing with the subject of this study.

Procedure and Treatment of Data

After this introduction, Chapter II begins with an extensive analysis of the literature which seems pertinent to this problem. This analysis starts with a discussion of the early principles of public education which led to the need for a device for measuring local taxpaying

ability. Four methods of measuring that local ability are explained and briefly evaluated. After this national background for the use of an economic index is laid, the origin of the Texas index is presented, and a comparison is made of the Texas index with similar devices that have been employed in other states.

Research carried on in recent years in an effort to develop better methods of formulating an economic index is reported. Lee's (4) six standards for judging or developing an index are given first. These standards are followed by a set of criteria which Skipping (8, pp. 16-17) used to make an analysis of the Texas index in 1950. After his criteria are listed, three methods of assigning weights to the factors of an index are explained. One of these methods leads to a discussion of the techniques developed by Meyer and Johns (6) of assigning weights to factors by using certain mathematical procedures. These techniques and procedures are explained and evaluated briefly.

In Chapter III a theoretical evaluation is made of the Texas economic index. First, the standards of Lee mentioned previously are applied to the Texas index and its factors. That application is followed by a review of Skipping's analysis of the Texas index in 1950 and a re-evaluation of his findings. The Texas index is then considered in the light of the new techniques of assigning weights by mathematical procedures. After the theoretical evaluation is completed, a summary is made of the findings.

In Chapter IV the Texas economic index is evaluated by making a comparison of the index and each of its factors with a criterion index based upon actual property values. Twenty-five counties were selected for this phase of the study, and the true value of each county was determined by sampling sales, finding the ratio of assessed value to sale value, and applying that ratio to the total assessed value of that county. Then, upon the basis of the actual value of each county, a criterion index was calculated. This criterion index is used as a standard to judge the legal index, its factors, and other possible indexes and factors. The results of the comparison are reported in terms of "goodness of fit" and range of error.

In the last chapter, findings are summarized, conclusions are reached, and recommendations are offered.

Related Studies

It has been only nineteen years since Cornell (2) demonstrated that economic factors could be used successfully to determine an index that would measure local taxpaying ability.

Two years later, in 1938, Johns (3) prepared the first index that was used by the state of Alabama.

In 1950, Lee (4) developed criteria for selecting factors to be used in an ability index.

In that same year, Skipping (8) made an analysis of the Texas economic index which had just been adopted.

Meyer and Johns (6) developed a mathematical procedure for assigning weights to economic factors in 1951.

Later in 1951, Malmborg (5) tested the validity of the techniques of Meyer and Johns.

Then, in that same year, Mills (7) devised a method of measuring the financial ability of school districts in Kentucky.

The Committee on Tax Education and School Finance of the National Education Association (1) prepared a report and published it in October, 1953, reviewing the theory and practice in the use of measures of local taxpaying ability.

In November, 1954, the Texas Research League (11) completed an evaluation of the Gilmer-Aikin school laws for the State Board of Education of Texas. The report of that study included the findings, conclusions, and some recommendations in regard to the Texas economic index; however, in that brief report no information was given as to how the decisions were reached.

Although the foregoing investigations represent almost all of the research that has been reported, much more work has been devoted to this field of study by the staff members of the Texas Education Agency. Since the Texas economic index was adopted, they have been experimenting with various factors and weights, hoping to find a better index to

recommend to the State Legislature for adoption. Much of the information that has been gathered by the Texas Education Agency has never been interpreted in a formal report. However, that information was made available for this study.

There have been numerous study conferences dealing with the Texas economic index, and in most cases recommendations have been written; however, the conclusions reached were based almost entirely upon the opinions of the best informed persons and not upon an analysis of evidence.

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CHAPTER II

ANALYSIS OF TECHNIQUES FOR DEVELOPING INDEXES

National Background

The use of the economic index in school finance apparently was the result of a need which grew out of several early principles of public education. First, it should be remembered that public education is a function of the state. This principle is implied in the Tenth Amendment to the Constitution of the United States, and Mort (13, p. 41) has stated that education has long been recognized in constitutional law and legal theory as a state function. Although local school districts have been given wide powers relative to support and control, all of these powers are delegated to the local districts by the state, and courts have held repeatedly that there is no inherent authority in the local school district.

Since public education is a function of the state, it also becomes its responsibility; and it therefore appears necessary for the state to set up certain minimum educational requirements to be met in local districts. At first these requirements related principally to tax rates to be levied on local property to support the educational program. It

soon became evident, however, that the amounts that could be raised by means of a property tax which was the only or chief source of local school support were very unequal from district to district within the same state. Also, it was discovered that many local school districts could not support the educational program desired by the people of the whole state. This gave rise to state support for education and the principles of "state equalization" and "reward for effort" which were identified by Cubberly (5, p. 202) in 1905.

During the next decade Updegraff (22, p. 207) accepted the equalization principle and broadened the application of the principle of "reward for effort." His studies were followed by those of Strayer and Haig (16, p. 205), who pointed out that "reward for effort" was in conflict with equalization. They stated that local school districts should be free in the exercise of whatever local effort they desired to make toward the improvement of their school program above that of the minimum program. This controversy went on for years, but gradually the equalization principle gained ground in school legislation. Moehlman (11), writing in 1927, noted that the consensus favored the provision of a standard educational program for every child and the development of the finance program on that basis; however, he suggested that special grants might be used to induce districts to develop their programs beyond minimum standards.

The equalization principle continued to gain general acceptance and, by 1948, forty-one states had passed equalization laws, and five states were distributing state funds on the basis of need without attempting to equalize the cost to the local districts, while Delaware and North Carolina were providing state support for the major part of their school programs. This evidence shows that it had been recognized in all forty-eight of the states that state funds were necessary to provide the minimum program of public education desired by the people of the state.

In the states attempting to provide a program of state equalization, a serious problem was encountered. How was the state to share the cost of the program with the local districts so that equalization could be accomplished? This partnership plan of state finance required two new measures: first, a measure of educational need; and, second, a measure of local ability. The measure of educational need had to be such that the cost of the minimum program desired for each district could be converted into dollars and cents. Then the measure of local ability was needed to determine the amount that each local district should be expected to raise in defraying the cost of its program. It was the need for this measure that led to the use of an economic index in school finance.

At first the equalization movement as identified by Cubberly (5, p. 202) merely awarded more aid to the poorer districts within a state.

These districts were determined on the basis of the value of taxable property, and aid was distributed in inverse relation to local financial ability. Then it was recommended that the ability of the local district to support a minimum school program be determined on the basis of the yield of a standard tax rate upon the property valuation of the district. This would have been a good measure if all property had been assessed at the same per cent of value, but property assessment rates were found to be very unequal. This method of determining local ability was unfair to the districts that assessed property at a high per cent of value, and it encouraged local districts to reduce tax assessments so that ability would be decreased and state aid would be increased. It also discouraged local districts from trying to provide any better program than the state minimum requirements for education.

All of these criticisms concerning the use of tax assessments as a measure of local taxpaying ability were described by the National Education Association's Commission on Tax Education and School Finance as "so obviously inequitable that [they] can no longer be regarded as defensible" (2, p. 17). In an effort to remedy these conditions, much legislation was passed. Some states tried to supervise assessments, while others set up a state tax commission. This need for a better measure led to the development of the first economic index.

In the early 1930's, Mort (12), who had exercised great leadership in the state equalization movement, decided to apply the same

principles to the federal aid program. While participating in Mort's research, Newcomer (14) estimated the theoretical yield of a model tax. Using this basis and participating in the same research, Cornell (12) developed a formula consisting of readily available statistics to estimate the wealth of each of the forty-eight states. This suggested to him a new approach to the same problem within a state. He then conducted an experiment in the state of New York, where full value of property had been measured by a state tax equalization board with a reasonable degree of success. He selected that state because there he would have a criterion with which to compare his results. Measures of population; retail sales; motor vehicle registrations; the value of farming, mining, and manufacturing production; the number of individual income tax returns; and postal receipts were combined by formulas in several different ways. By applying these formulas, he found that the full value of property could be predicted with more accuracy than from using assessed values. The average per cent of error of assessed values compared to full value was 16.1 per cent, while several of his formulas were found to estimate full value with an average error ranging from 12 per cent to 14 per cent.

Cornell's (4) report of his findings was published in 1936. Two years later, Johns (6) used Cornell's theoretical techniques to prepare an index for the state of Alabama, and that index as adopted in 1939 was the first one to be used by a state as a measure of local taxpaying ability.

The Committee on Tax Education and School Finance of the National Education Association (3) gives Johns credit not only for being the first to work out an index that was adopted, but also for being more involved than any other one person in the work in those states that have adopted or considered the use of the Cornell-type index.

Florida and West Virginia followed Alabama in adopting ability indexes in 1947 and 1948, respectively; however, West Virginia abandoned its index in 1953, to use appraisal of property by a state tax commission, instead. Texas, in 1949, was the fourth state to adopt an index. Georgia and Arkansas followed in 1951, Mississippi in 1953, and Tennessee in 1955, making a total of eight states that have tried economic indexes. Kentucky uses an index, but it does not use economic measures or other substitutes for direct property measures. During the past few years, several other states, including Missouri, Nebraska, North Carolina, South Carolina, and Iowa, have considered the use of an index, but have failed to adopt one. This fact indicates that the problem of measuring local ability of school districts is still an unsolved problem in many, if not all of the states having a program of state equalization.

In 1952, Johns and Meyer (7, pp. 49-50) wrote an article for publication in which they stated that there are four methods of estimating taxpaying ability now being used. They listed them and commented as follows:

1. Local assessments. This method is highly unsatisfactory because it varies considerably from county to county with respect to true valuation. Also it is subject to local manipulation.

2. State supervised assessments. This is some improvement over local assessments in that the opinions of impartial officials are brought to bear. However, local officials still share in the valuation of property.

3. State tax commission. Such bodies appraise the true value of property in each local unit.

4. Index of taxpaying ability. In this method an objective technique is sought that will predict relative ability on the basis of the economic factors of wealth contained in the local administrative units (7, pp. 49-50).

Johns and Meyer then passed judgment on these methods by stating that obviously there are only two approaches that are really satisfactory. One is to establish a state tax commission with authority and staff necessary to appraise the true value in each local school administrative unit; and the other is to use an economic index of the relative taxpaying ability of local school units (7, pp. 49-50).

A year later, in 1953, the Committee on Tax Education and School Finance of the National Education Association (3) made a review of the use of economic indexes; and after reviewing Cornell's study in New York, they had this to say:

> It is exceedingly important to note that this study and all studies which have followed, have never found that economic measures would completely eliminate discrepancies from a theoretical full value or other criteria of taxpaying capacity. . . . In other words, the indexes of relative ability provide no panacea. They do not eliminate inequities in the measurement of relative ability. There is no substitute for good property tax assessment to permit an adequate yield of revenue on property. The technique

> must be viewed as an expediency which may have advantages of objectivity and equity and stability over the use of assessed valuation alone in the state allotment formulas (3, pp. 14-15).

Origin of the Texas Index

In 1954, Texans observed the first centennial of public education in their state. From the history of education as told by Frederick Eby (20, pp. 25-58) in the Centennial Handbook of Texas Public Schools, it is easy to see that education in Texas has certainly had its "ups" and "downs" during that period. In spite of the "downs," however, most Texans are proud of two quotations found in their state documents. The first one is contained in the Texas Declaration of Independence of 1836 and charges the Mexican government as follows:

> It has failed to establish any public system of education although possessed of almost boundless resources [the public domain], and . . . it is an axiom in political science, that unless a people are educated and enlightened, it is idle to expect the continuance of civil liberty, or the capacity for self-government (20, p. 26).

The other quotation is found in the state constitution and reads as follows:

> A general diffusion of knowledge being essential to the preservation of the liberties and rights of the people, it shall be the duty of the Legislature of the State to establish and make suitable provision for the support and maintenance of free public schools (17, p. 61).

This quotation shows that Texas accepted education as one of its functions and obligated its state government to assume responsibility

for the support of education. In the same document, portions of the public domain were set aside as a landed endowment, but it took more than land to finance schools; so it was not until 1854 that the public school system was really established. At first, the state supported education by distributing funds from the available school fund on a per capita basis. Revenue for the available school fund came from the public school lands and from other sources made available by legislation. This continued to be the only source of state support until 1915, when the first rural aid law was passed. This law provided state aid for the poor rural districts of the state. Each two years after that date, the Legislature passed a new equalization law, and gradually the amount of equalization aid and the number of districts which were allowed to receive rural aid were both increased. However, participation was limited to rural school districts that could show need for aid above the scholastic apportionment received from the state. The two systems of financing caused conflict between the large schools and the small schools. This situation led the Legislature of 1947 to create a commission to study the problem. This commission became known as the Gilmer-Aikin Committee, whose influence caused the Legislature to reorganize the Texas public school system in 1949.

Three bills were passed that became known as the Gilmer-Aikin bills. The first one of these, which was Senate Bill 115, reorganized the state's administrative structure and provided for a central educational

agency composed of an elective State Board of Education, a Commissioner of Education appointed by the State Board, and a State Department of Education, which is composed of the staff of the Commissioner. Senate Bill 116 established the Minimum Foundation School Program and prescribed formulas to make it operative. Then Senate Bill 117 created a Foundation School Fund to finance the state's share of the Minimum Foundation Program. Although all three bills made important changes, Senate Bill 116 contained two important measures which are essential to a program of state equalization. The first of these measures was the description of the minimum foundation program for every school district in the state. This is referred to in the first chapter as a measure of educational need. This description provides a method of calculating the cost of the minimum program of each local school district. The other measure included in Senate Bill 116 was a measure of local ability, and became the first economic index adopted by the state of Texas.

Before the enactment of the Gilmer-Aikin laws and under the old rural aid law, local ability was measured by requiring each district to levy a tax rate of fifty cents on every $100.00 of school district valuation. As in other states, this had caused much criticism because of unequal assessing rates. It also discouraged the improvement of tax assessing, and it reduced the initiative of the local school district.

When the Gilmer-Aikin Committee first met and started to study the problem of school reorganization in Texas, the time was right to adopt a new measure to determine local ability. As the committee worked, they found their problem somewhat different from what it had been under the old rural aid law. Under that system, the local district had been required to levy a certain tax rate on school district assessments, and whatever amount that rate produced became a measure of the local effort required. However, under the proposed new program, the committee decided upon a minimum program of education which should be guaranteed to every child of school age. When the probable cost of this program was calculated, it was found to be approximately $180,000,000. Of this amount it was thought that 25 per cent should be raised by the local districts, so the committee decided to write into the law the provision that $45,000,000 of the cost of the minimum foundation program would be raised by the local school districts of the state. Now it can be seen that the committee's problem of measuring local ability was more than simply requiring a district to levy a certain tax rate. The problem was that of determining how the sum of $45,000,000 could be assigned to all of the school districts of the state so that each district would contribute according to its taxpaying ability. Because the committee recognized inequalities in tax assessment ratios, assessed valuation was eliminated as a possible measure. The establishment of a state tax equalization commission was considered, but few believed

that the people of Texas were ready for any such commission or that they would tolerate one at any time in the near future. According to Haskew (1, p. 7), it was fortunate that business had established a pattern that could be used by government; therefore, the committee turned to the use of an index of relative purchasing power or relative business activity. Perhaps another reason why it was decided to use this method was because three other states had already adopted economic indexes.

The decision to use an economic index did not completely solve the problem. The factors to be used and the weights to be assigned had to be determined. Also, an index had to be calculated that the Legislature would accept and enact into law. The selection of factors was hindered by the fact that statistics were not available on some of the desired factors, and neither was there a criterion available. Actually, the first index had to be a legislative compromise which was written into the law as percentages for each county to raise as its share of the total $45,000,000 to be obtained from local school districts. However, provision was made in the law for the next index to be calculated by the Commissioner of Education, using county assessed values weighted by 20, scholastic population weighted by 8, and income weighted by 72. The local fund assignments within counties were to be determined according to the ratio of the district's assessed wealth to the assessed wealth of the county. According to Taylor (1, p. 10), it was recognized

that scholastic population was not an indicator of taxpaying ability, and that assessed values were what the committee was trying to get away from, but that they had to be put in the index to give it stability. He might have added that this was done to effect a legislative compromise.

The economic index was one of the first parts of the Gilmer-Aikin laws to receive study. The State Board of Education appointed a committee of its members to study the index, and this committee called in a citizens' advisory committee to help them. The school administrators of the state studied the index at several work conferences; and, after four years of study, the State Board of Education made the following recommendations to the Legislature in 1953:

1. The Economic Index is the best device available at this time for determining the relative tax-paying ability of the various counties in the state, and should be continued in use.
2. A three-year, moving average should be used in computing the index, instead of developing it on the basis of data for a single year. It would be advisable to compute the index annually, taking into account the changes in economic activity in various counties of the state as these changes occur.
3. Steps should be taken to secure more adequate statistical data, from other than present sources, for use in future amendments of the Economic Index formula.
4. Certain exceptions in the law, which relieve certain school districts of part of their share of the local fund assignment, have proved to be unnecessary and should be repealed.
5. There must be insurance that no school district will be given a local fund assignment that is beyond its financial ability, in order that each district in the state will be able to finance its minimum program (18, p. 5).

The Legislature accepted the first recommendation and amended the law to provide for the second recommendation. Several other changes in the law were made. The amount of funds to be assigned to local districts was increased from $45,000,000 to $51,600,000, and a building fund credit to the local fund assignment of each district was provided; but these changes are not a concern of this study.

Reporting back to the Legislature in January, 1955, the State Board of Education presented the following findings:

> Revisions in the economic index effected by statutes passed by the 53rd Legislature have brought about improvement in this index. Other improvements have been effected as a result of more complete statistics on wages and salaries in the various sections of the state being made available throughout other state agencies.
>
> Analysis during the past two years shows that the data on agricultural values need strengthening. It is believed that an annual census of agricultural values would do much to improve the economic index, making it a much more equal measure of the relative ability of the counties of the state to support public school education.
>
> Study of the provision in the Foundation School Program Act of granting credit against the local funds assigned on the basis of special lands being located in a school district indicates that the provision is inequitable. A special provision should be devised that provides more nearly for meeting the additional obligation placed on these districts because of State and Federal activities within the school district and that maintains the principle of equalization that is basic in the Foundation School Program (19, p. 13).

This would indicate that the State Board of Education is fairly well pleased with the index in its present form, except for the credit that is allowed to certain school districts which contain military reservations, forest lands, university lands, and prison lands. It is recognized

that this credit needs some correcting, but that problem is not considered a part of this study.

Comparison of Indexes

An examination of Table I, which shows all the indexes now in use in seven states, reveals several interesting facts. For instance, no two states have the same index. There are some indications that each new state that has adopted an index profited by the experiences of other states which had used indexes, but evidently no state was willing to accept the complete index of another state. That fact suggests that perhaps each state is so different from all others that no two states can use the same index with equal success.

It is interesting to note that, although a better measure of taxpaying ability than assessed valuation was sought, the first five states to adopt an index included assessed valuation as one factor of their indexes and assigned to it a rather large weight. However, Arkansas, Mississippi, and Tennessee—the last three states to adopt an index—omitted assessed valuation and followed completely the idea originally suggested by Cornell. Those three states also started using a new factor that is evidently proving to be a good one. That factor is the number of gainfully employed workers, with all three states excluding government workers, and Arkansas and Mississippi excluding farm workers.

TABLE I

MEASURES OF LOCAL FINANCIAL ABILITY
USED IN SEVEN STATES

Alabama Index, Adopted in 1939

Factors	Weights Expressed as Per Cents
Total assessed valuation	50.00
Assessed valuation of public utilities	8.8
State income tax	2.9
Sales tax returns	17.6
Auto license fees	14.7
Value of farm products	2.9
Value added by manufacture	2.9

Florida Index, Adopted in 1947

Factors	Weights Expressed as Per Cents
Assessed value, excluding railroad and telephone	25.0
Assessed valuation of railroad and telephone	5.0
Effective buying power	30.0
Retail sales	20.0
Motor vehicle registrations	15.0
Value of farm products	5.0

Texas Index, Adopted in 1949

Factors	Weights Expressed as Per Cents
Assessed valuation	20.0
Scholastic population	8.0
Income based on:	
Value added by manufacture	
Value of minerals produced	
Value of agricultural products	

TABLE I—Continued

Factors	Weights Expressed as Per Cents
Payrolls for retail establishments Payrolls for wholesale establishments Payrolls for service establishments	72.0

Georgia Index, Adopted in 1951

Factors	Weights Expressed as Per Cents
Property tax digest less homesteads	31.5
Public utilities tax digest	10.5
State income taxes paid	5.3
Average 5 years effective buying income	31.5
Average 5 years retail sales	10.5
Motor vehicle taxes	10.5

Arkansas Index, Adopted in 1951

Factors	Weights Expressed as Per Cents
State income tax	7.5
Sales tax returns	25.9
Auto license fees	3.5
Value of farm products	7.3
Gainfully employed non-farm, non-government workers .	55.9

Mississippi Index, Adopted in 1953

Factors	Weights Expressed as Per Cents
Assessed valuation of public utilities	24.2152
Retail sales tax	28.2970
Motor vehicle license receipts	4.4144
Value of farm products	6.5110

Factors	Weights Expressed as Per Cents
Personal income taxes	14.2688
Gainfully employed non-farm, non-government workers	22.2936

Tennessee Index, Adopted in 1955

Factors	Weights Expressed as Per Cents
Motor vehicle registration payments (3 yr. av.)	10.5
Farm products sold	6.9
Gainfully employed non-government workers	13.6
State retail sales tax collections (3 yr. av.)	69.0

Twelve factors are used by the seven states, and the number that each state uses ranges from three to seven. Alabama includes seven; Florida, Georgia, and Mississippi use six factors each; Arkansas has five; and Texas uses only three. Alabama is the only state that uses the value added by manufacturing as a factor; however, Texas includes it as a part of its income factor. Florida and Georgia are the only states that use retail sales and effective buying power as factors. In fact, those two states use the same factors except that Florida includes the value of farm products, but Georgia excludes it. Georgia is the only state of the seven that does not include the value of farm products in some way in determining its economic index. Texas is the only state that does not include motor vehicle registrations as a factor. Assessed valuation, assessed value of utilities, state income tax information, and sales tax returns are each used as factors by four different states.

The Texas index is different from those in other states in a number of ways. Besides being the only state that does not use motor vehicle registrations as a factor, it is the only state that uses income and scholastic population as factors. As has already been mentioned, the Texas index has only three factors; however, income is measured by six items which might be considered as sub-factors. This income factor is assigned a larger weight than that assigned to any other factor by another state.

The task of formulating an economic index in Texas is probably more difficult than it is in most of the other states. This is due partly to the fact that Texas is such a large state and it has so many different kinds of property, wealth, and income that it is hard to find factors that are common to all counties. Then, some factors used by other states cannot be used in Texas because this state does not levy a sales tax or an income tax, so that information is not available on these items.

Standards and Techniques

Since Cornell (4) made his study and reported it in 1936, considerable research has been conducted to determine better methods of formulating an index of taxpaying ability. The problem stated really has two parts: first, the selection of the economic factors to be used in an index; and, second, the determination of the proper weights to be assigned to the factors selected. It appears from the research reported

that the selection of factors to be included in the economic index has been considered first in all cases.

In 1950, Lee (8) completed a dissertation in which he adapted from the studies of Cornell (4), Mort (12, 13), and Johns (6, 7) the following standards for the development of indexes of the relative taxpaying ability of local school units:

> 1. The index and all economic factors should be objective; therefore, all data pertaining to these factors should be obtainable from reliable published sources.
> 2. All economic factors and the index should be independent from the influence of local assessing bodies.
> 3. Each economic factor should measure some different aspect of the wealth of the state, and a sufficient number should be included in order to represent all the principal elements of the wealth of the state.
> 4. The index should be based upon some validating measure that directly corresponds to the actual value of property.
> 5. The mathematical formula employed for the development of the index of taxpaying ability should be as sensitive to the small local units as it is to the large local units in predicting relative ability.
> 6. The index of taxpaying ability should be as equitable as possible without undue complexity in order that the formula be administratively feasible (8).

In the same year that Lee's study was reported, Skipping (15) formulated a set of criteria to be employed in evaluating the factors of the new index that had been adopted in Texas in 1949. Although he did not attempt to validate his criteria, it appears that he used common-sense principles which need no justification for their use. Skipping's criteria were the following items:

1. Universality. One or more of the most significant factors should be present in all of the local units for which financial ability figures are to be computed.
2. Stability. One or more of the most significant or heavily weighted factors must not be subject to periodic or abrupt fluctuations. Components that undergo substantial change from year to year, or from which data are incomplete, call for the inclusion of other data to lessen the effect of errors.
3. Validity. Every factor used should be clearly related to actual income or potential ability to produce income which may be tapped for revenue to support schools. The more valid the factors, the smaller the number needed.
4. Availability. Data concerning the factors should be available from regular reports without long delay after being compiled.
5. Adequacy of Data. Factors for which practically complete data cannot be obtained should not be used except in combination with other factors, or when they are made relatively less effective through appropriate weighting.
6. Currency. Information regarding the factors should be brought up to date at reasonably frequent intervals. The less stable the factor, the more frequently should new data be gathered and incorporated in revisions of the index.
7. Convenience. A small number of factors ranking high in validity, stability, and universality is easier to use and easier to understand than an assortment of components.
8. Scope. The factors used must directly or indirectly take account of all important sources of income which exist only in certain localities.
9. Selectivity. Any factor whose effect may have negative value as an indicator of tax-producing potential should not be included (15, pp. 16-17).

In the next chapter, Skipping's application of these criteria to the Texas index is reviewed and his analysis evaluated.

A brief report should be included at this point on methods of assigning weights after the factors have been selected. There are really

three methods of assigning weights to factors. One method, which makes a simple formula for calculating an index, is to assign the same weight to all factors. The factors for each local unit are expressed as percentages of the state total. These percentages for each local unit are added together and divided by the number of factors used. This method of weighting is good if all factors are of equal importance, which usually is not the case.

Another method of assigning weights is the empirical method, which evidently was used by all of the states now employing an index except Arkansas. Those who assign weights in this manner empirically decide that some factors are more important than others and assign weights according to their judgment of the significance of the individual factors. Evidently, no two individuals or groups of individuals would arrive at the same weights by using this method. The other method of assigning weights is a mathematical procedure devised by Meyer and Johns (10) and reported in 1951. It will produce the same results when different individuals use the same data but work independently. According to Meyer and Johns (7, p. 50), it is more nearly accurate than empirical approximation, and it meets all important standards for a good index. Malmborg (9) tested this method also in 1951 by applying data from several states, and he found the procedure to be valid.

The mathematical procedure for determining the weights starts with the type of mathematical formula which is desired for calculating

an index, such as

$$X_c = A_1 X_1 + A_2 X_2 + A_3 X_3 + \ldots . A_n X_n ,$$

in which X_c is the calculated index, $X_1 \ldots . X_n$ the economic factors, and $A_1 \ldots . A_n$ are the weights to be determined. This method requires that there be a validating factor which can be used as a criterion of true property value. Using the above formula and a criterion expressed as X_o, the assumption is made that the sum of the squares of the expression $\frac{X_o - X_c}{X_o}$ shall be a minimum (9). By substituting data into the formula and using this assumption, equations can be formulated and solved to produce the desired weights. This technique is a modified regression method which minimizes the sums of the squares of relative residuals.

The method of determining weights by mathematical procedure has one difficult drawback which can hardly be overcome. As has already been mentioned, it requires a validating factor or a criterion variable; and if this were available, an index would not be needed, for the criterion could be used instead. Such procedure involves circular reasoning. In most cases in which mathematical procedures have been used, assessed valuation or other property tax-related measures have been used as the criterion. Commenting on this, the Committee on Tax Education and School Finance of the National Education Association

had the following to say concerning its evaluation of the use of mathematical procedures in determing weights to be assigned to factors in an economic index:

> By virtue of the fact that assessed valuation is not a valid criterion, it is doubted that some of the elaborate proposals concerning mathematical technics or weighting should be applied too literally to this criterion. The results are complex and there is no evidence that they are any better. It is probably advisable to guard against making a fetish out of mathematical manipulations in this area (3, p. 34).

This committee also has pointed out that, in order for independent workers to arrive at the same weights, certain types of restrictions must be imposed on the workers, such as the restriction that all weights should be positive. Still another restriction would have to be agreed upon, and that is that the sums of the squares of the relative residuals should be minimized instead of using logarithmic transformations, which is just as effective in dealing with relative residuals.

Arkansas is the only state to employ this method of assigning weights, and it has found its weights to be rather burdensome to use and to indicate more precision than actually exists. Also, it has been found in that state that a simple index was just as accurate when it was employed for one year after the complex weightings were determined.

After making thorough examination of the mathematical procedures that have been used, the Committee on Tax Education and School Finance reached the following conclusion: "The conclusion seems to be that technical mathematical schemes should be applied in various

forms simply as data to use in making a final selection of measures and of weightings" (3, p. 38).

Summary

In this chapter, early principles of public education which led to the need for a measure of local taxpaying ability are reviewed, the methods of measuring that ability are discussed, and the origin of the economic index in Texas school finance is given. Brief reports on the use of the index in Texas are presented, and some revisions which have been made by the Legislature are reported. This is followed by a comparison of the indexes which have been adopted in six other states.

Then Lee's six standards for the development of an index, and Skipping's set of nine criteria are given as instruments to use in the next chapter in making a theoretical evaluation of the Texas index. These standards are followed by a discussion of three methods of assigning weights to factors of an index. Finally, the method of assigning weights by mathematical procedures is explained as a possible technique to use in judging the Texas index.

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CHAPTER III

APPLICATION OF STANDARDS AND TECHNIQUES

In this chapter the standards and techniques reviewed in the last part of Chapter II are applied to the Texas economic index and its factors. For convenience, the factors and weights of the Texas index are listed again as follows:

Factors	Weights
Assessed valuation	20
Scholastic population	8
Income based on:	
Value added by manufacture Value of minerals produced Value of agricultural products Payrolls for retail establishments Payrolls for wholesale establishments Payrolls for service establishments . .	72 (3)

Application of Lee's Standards

Lee's six standards are applied to the above index and to each of its three factors. The first of his standards is as follows:

1. The index and all economic factors should be objective; therefore, all data pertaining to these

> factors should be obtainable from reliable published sources (1).

With one exception, the above index meets the first part of this standard. That exception is that assessed valuation is not an objective factor, for assessed value can be changed by local tax assessors. One of the main reasons for changing from assessed valuation as a measure of local taxpaying ability is that assessed valuation can be manipulated by local assessors. Since the enactment of the Gilmer-Aikin school laws, the county tax assessors have been required by law to do a better job of reporting, and more value has been placed upon such data; therefore, it is believed that the county valuation can now be obtained from reliable published sources. Scholastic population meets both parts of the standard. Income is an objective factor, but there is some question about its being obtained from reliable published sources. Really, it is not the sources that are questionable, but rather the methods of gathering and reporting information to the sources. The reporting of manufacturing does not include the value added by small establishments which employ fewer than eight employees. Payrolls are not reported accurately by counties, for some large companies which have employees in a number of counties report only in their headquarters county. The lag in gathering and reporting agriculture by counties also makes those data questionable.

Lee's second standard is as follows:

2. All economic factors and the index should be independent from the influence of local assessing bodies (1).

The application of this standard to the Texas index shows that one of the three factors fails to meet the test. That again is assessed valuation. However, considering the index as a whole, it could be given a score of 80 per cent on that standard, since county valuation has a weight of only 20 per cent.

Lee's third standard is as follows:

3. Each economic factor should measure some different aspect of the wealth of the state, and a sufficient number should be included in order to represent all the principal elements of the wealth of the state (1).

If scholastic population can be considered to measure wealth at all, then each of the three factors of the Texas index does measure a different aspect of it. Three factors are hardly considered enough to represent all of the principal elements of wealth. No other state uses fewer than five factors to compose its index. It might be considered that the items listed under income would compensate for this, but each is just another measure of income and not of wealth. In fact, it takes all of the items listed to measure income.

Lee's fourth standard is as follows:

4. The index should be based upon some validating measure that directly corresponds to the actual value of property (1).

The Texas index is not based upon such a validating factor. Perhaps it was the intent of those who formulated the index to measure the

actual wealth that a local school district can tax; however, there is no indication that taxable wealth was used in any way as a validating factor when the three factors were selected to compose the index. Evidently, it was thought that the average error produced by the three factors would be less harmful than that of any one factor.

Lee's fifth standard is as follows:

> 5. The mathematical formula employed for the development of the index of taxpaying ability should be as sensitive to the small local units as it is to the large local units in predicting relative ability (1).

The Texas index fails to meet this standard, for no mathematical formulas were used to help determine the factors or to assign weights; or, at least, none has ever been reported. Both factors and weights were empirically decided.

Lee's sixth standard is as follows:

> 6. The index of taxpaying ability should be as equitable as possible without undue complexity in order that the formula be administratively feasible (1).

From the application of the other five standards it appears that the Texas index may not be as equitable as would be possible without danger of undue complexity. However, the formula is believed to be fairly simple to administer. Skipping (2) pointed out several administrative problems in 1950, such as getting county tax assessors to report on time and correctly, but it is believed that reporting has improved as a result of more experience with this requirement of the law.

A summary of the application of Lee's six standards to the Texas economic index indicates that, to a certain extent, the Texas index fails to meet completely any one of his six standards, and that it fails entirely to meet two of them.

Review of Skipping's Analysis

Before examining the conclusions of Skipping (2) in his evaluation of the Texas index, his criteria need to be restated. As listed in Chapter II, his criteria were as follows:

1. Universality. One or more of the most significant factors should be present in all of the local units for which financial ability figures are to be computed.
2. Stability. One or more of the most significant or heavily weighted factors must not be subject to periodic or abrupt fluctuations. Components that undergo substantial change from year to year, or for which data are incomplete, call for the inclusion of other data to lessen the effect of errors.
3. Validity. Every factor used should be clearly related to actual income or potential ability to produce income which may be tapped for revenue to support schools. The more valid the factors, the smaller the number needed.
4. Availability. Data concerning the factors should be available from regular reports without long delay after being compiled.
5. Adequacy of Data. Factors for which practically complete data cannot be obtained should not be used except in combination with other factors, or when they are made less effective through appropriate weightings.
6. Currency. Information regarding the factors should be brought up to date at reasonably frequent intervals. The less stable the factor, the more frequently should new data be gathered and incorporated in revisions of the index.
7. Convenience. A small number of factors ranking high in validity, stability, and universality is easier to

use and easier to understand than an assortment of components.

8. Scope. The factors used must directly or indirectly take account of all important sources of income which exist only in certain localities.
9. Selectivity. Any factor whose effect may have negative value as an indicator of tax-producing potential should not be included (2).

When Skipping applied the above criteria to assessed valuation as a factor, the following is what he found:

> Under universality this factor is ideal, for assessed valuation in every county and school district affects the index; and it is a fairly important factor, as it is assigned a 20 point weighting. Stability is also a characteristic of taxable property, though a small percentage of the total represented by personal property is not generally considered a dependable source of revenue. Since assessed valuation actually is the source of local revenue to schools, it is obviously a valid factor. Data concerning this factor are required by law to be reported annually to the Commissioner of Education, hence availability and currency are well represented. Adequacy of data, however, is certainly lacking. Our data, which are the State and County valuations reported annually by Tax Assessor-Collectors, are by no means complete. A complete report would show the actual value of all taxable property in every school district. Although practically all districts are reported, there is nothing to indicate whether the property was assessed at 10 per cent or a 100 per cent of market value. If this one defect could be removed, convenience, scope, and selectivity would be taken care of automatically. Unless something is done to improve this factor in terms of adequacy, there is reason to doubt that assessed valuation deserves a weighting value of as much as 20 points (2).

This evaluation made in 1950 still appears to be very sound, with one exception. It seems that assessed valuation would not possess the validity given it, since it fails to meet the adequacy test. How could it be a valid measure if it represented 10 per cent of actual value

in one local unit and 100 per cent of actual value in another? This may be simply a matter of deciding which criterion is going to be considered first. At any rate, it does not necessarily affect the final conclusion that was reached.

Skipping's evaluation of scholastic population as another factor in the Texas economic index was as follows:

> This factor is entitled to a perfect rating until validity is considered. School age children are neither taxable nor wealth-producing. In earlier times, children who were old enough to work were often substantial contributors to the family income; but with opportunities for the lawful employment of children now just about non-existent, their immediate value in producing revenue for school support is negative. Furthermore, it is generally recognized that the poorest communities are those where children make up the largest percentage of total population. It seems therefore that the effect of this factor may be in the opposite direction from the way in which it was expected to operate. If that is true, the fact that it is given a weighting of only 8 may be its only saving feature. It is actually of almost no significance in determining the index figure for any county (2).

Again it can be said that Skipping's evaluation is very sound; however, there is one exception. If scholastic population is given its legal weight of 8, it is significant to the extent of 8 per cent. It is believed that Skipping based his last conclusion upon the way the index has been calculated ever since it was adopted rather than upon the 8 per cent provided in the law. Scholastic population has never been given its proper weight. The work sheets used by the Texas Education Agency to calculate the index for all counties in 1952 shows that the following weights were actually given: county valuation, 21.386 per

cent; scholastic population, .001 per cent; and income, 78.613 per cent. Naturally, then, scholastic population had almost no significance. One thousand children were counted just as one thousand dollars of income. The Texas Research League also pointed out that the proper weights are not being assigned to the factors of the Texas index when this group reported as follows:

> As the index is now calculated, the actual weighting bears little similarity to that prescribed by law. The weights assigned to each factor vary as between counties. For example, the actual state average weight for the income factors is 82.41 per cent as compared with the legally prescribed weight of 72 per cent. The actual weight given to assessed values is 17.59 per cent as against a legal weight of 20 per cent, while the scholastics weight shrinks from a legally assigned 8 per cent to 15 ten-thousandths of one per cent (4).

Evidently, the League's findings were based upon the calculations of another year, but they indicate the same conclusions. Those who have been calculating the index have been multiplying the proper weights by the raw data of each county, totaling the products, and calculating the index for each county by dividing the total for the county by the total for the state. That method will never assign the proper weights specified by the law. Raw data, such as the number of scholastics, should be changed to a percentage of the state total before weights are applied. Perhaps the Texas Education Agency has produced a better index by minimizing the weight of scholastic population; but the view is taken here that either scholastic population should be given its proper weight or removed from the index entirely by legislation.

Returning now to Skipping's evaluation of the Texas economic index, the following is his appraisal of the income factor:

> This is a catch-all kind of factor which is represented in all counties and school districts, hence there is a degree of universality in it. Although the value of agricultural products is a significant item in every county and in a majority of school districts, the same can not be said for all the other items in this group. There is probably some manufacturing in every county, but the amount is so small in some ninety of them that the value is not included in the U. S. Department of Commerce report. Mineral production of any importance, as casual observation reveals, is not common to all counties and the value varies widely. Payrolls, however, are a part of income in every county, though data regarding them are not always complete and trustworthy. The more sparsely populated counties apparently have an advantage in respect to this important factor.
>
> In regard to stability, it seems that these items taken collectively should not fluctuate greatly from year to year; but each of the several components of this major factor may vary enough to affect taxpaying ability significantly in local areas. This would be less serious, of course, if all the components were present and of some importance in every county.
>
> Taxpaying ability is proportionate to net income; but because school districts levy and collect taxes on property rather than on income, this item has, of course, only indirect validity as an indicator of effective financial ability.
>
> The availability of data regarding income is a problem. State reports on most sources of income are not to be had; however, figures for oil and gas production may be gathered readily and they are satisfactorily current, as data are compiled continuously in the State Comptroller's Department. Federal sources of data regarding income are these:
>
> (a) Value of manufactures—The 1947 Census of Manufactures, which was released only a short time ago. It has the shortcoming of reporting nothing at all in more than a fourth of the counties, because the number of enterprises is so small that publishing their data might reveal confidential facts regarding their operation.
>
> (b) Value of minerals produced—State sources apparently can give the kind and amount of current data needed.

(c) Value of agricultural products—The summary of the U. S. Census taken in April, 1950, will possibly be available by the close of 1951. Another census of agriculture will be taken in 1955. The best figures available now are area reports (in which several counties are grouped together) for 1949, that have been broken down to county reports on the basis of their percentage relationship to the group in 1945.

(d) Payrolls for retail, wholesale, and service establishments—The U. S. Department of Commerce 1948 Census of Business is reported to contain the best and most recent data obtainable regarding payrolls. Release of this report is scheduled for September or October, 1950. It is not known whether the report will have the same major defect that is characteristic of others pertaining to payrolls—the practice of reporting a large company in only its headquarters county, when actually the people being paid are located in a number of counties.

It is apparent that information from Federal sources could hardly be considered current if it is reported only every four or five years, and the publication lag adds still another year or year and a half. But as already mentioned, there seems to be no better source from which to get these particular kinds of information. Unless, of course, the resources of the Texas Employment Commission may be used in supplying payroll data for each of the 254 counties (2).

It is believed that Skipping would make some changes in his appraisal of this factor if he were to reconsider it now. Methods of obtaining information have improved. For instance, he states that some ninety counties had no value of manufacturing reported in 1950, whereas the work sheets of 1954 show only forty-four such counties. However, small establishments are still not included in the reports. The value of farm products continues to be a problem due to the fact that the United States Federal Census reports agriculture by counties only every five

years, but estimates of farm income which are prepared by the Bureau of Business Research have improved these data somewhat since 1950. These improvements in data have increased the universality, validity, availability, adequacy, currency, convenience, scope, and selectivity of the income factor. Stability has been improved by the change of the law in 1953, requiring that the index be computed on average data for a three-year period.

In summary, it appears that the income factor of the Texas index could be considered one good factor if three or four more factors were available and each could be assigned an equal weight. However, the degree of validity of income as a measure of taxable property makes it an unsound factor to be weighted as much as 72.

Consideration of Weighting Techniques

After the evaluation of the factors that compose the Texas economic index, it hardly seems necessary to evaluate weights which are assigned to unsound factors. However, a part of this problem is still to evaluate the weights of the present index. Although the intent of the law is not being followed, it is assumed that the legal weights are the ones being evaluated.

In Chapter II it is pointed out that there are three methods of assigning weights to factors: first, by assigning equal weights to all factors; second, by empirically assigning weights; and third, by assigning

weights by mathematical procedure. Evidently, the weights were assigned to the factors of the Texas index by the empirical method. According to evidence presented in the previous chapter, this is not a good procedure. However, the problem here is to determine whether either of the other two methods of assigning weights to factors could be employed to improve the Texas index.

It appears that the method of assigning equal weights to all factors might be as good as any if four or five other factors of about equal importance and validity could be used, in addition to income; but since only three factors are at present included in the index, and since they have already been evaluated, it certainly could not be recommended that equal weights be assigned.

When mathematical procedures are used, it is recalled that a validating factor must be available to use as a criterion of actual value. This is lacking in Texas. In most states where this procedure has been employed, assessed valuation has been the criterion. However, in Texas this is not believed to be a valid criterion. Evidence of this is found in the recent report of the Texas Research League. That report concludes as follows:

> Assessed valuation, one of the index factors, is an unsatisfactory criterion of local ability to pay. The Economic Index was developed as a substitute for assessed values; therefore, there is no point in using assessed values as a component of the index (4).

All others who have investigated assessed valuation in Texas seem to agree that it is not a valid factor, so it is doubtful that mathematical procedures should be used to make the Texas index conform to an invalid criterion. Therefore, the conclusion is drawn that there is no proof that either of the other two methods of assigning weights could be used to improve the Texas index. The two methods referred to are the plan of assigning equal weights to all factors, and that of computing weightings by mathematical procedures.

Summary

In this chapter Lee's six standards for evaluating an economic index have been applied to the Texas index and to each of its factors. Then Skipping's evaluation of the Texas economic index is reviewed and appraised in the light of changes that have occurred since 1950. This is followed by an examination of the weights assigned to factors of the Texas index. The findings are as follows:

1. Assessed valuation fails to stand the test of a good factor to use in the Texas economic index.

2. Scholastic population does not measure taxable wealth and is therefore an unsound factor to use in the Texas index.

3. The income factor of the Texas index meets most of the tests of a good factor, except that its degree of validity as a measure of taxable wealth is low.

4. The Texas economic index fails in part to meet any of the six standards of a sound index, and it fails entirely to meet two of those standards.

5. The legal weights assigned to factors of the Texas economic index are not the weights actually being used when the index is calculated.

6. There is no criterion of true value available in Texas, so mathematical procedures can not be used to assign weights to factors.

7. There is no evidence that the Texas economic index can be improved by using either of the other two methods of assigning weights to factors that are not now in use—that is, the methods of assigning equal weights and of mathematical procedures.

8. There is no evidence that the Texas economic index can be improved by empirically changing the weights that are now assigned to its present factors.

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CHAPTER IV

COMPARISON OF INDEX AND FACTORS TO TRUE VALUE

The purpose of this chapter is to evaluate the Texas economic index by making a comparison of the index and each of its factors to a criterion based upon actual property values. This chapter first shows how twenty-five counties were selected as a sample, how the true value of each county was determined, and how a criterion based upon these values was calculated. Then the criterion is applied to the index and to each of its factors.

Selection of Counties

Since Texas contains 254 counties and is such a large state, it was necessary to select a sample of counties in order to make the desired study. The first decision was that twenty-five counties would be the number to select. This was based upon the fact that twenty-five represents approximately 10 per cent of the 254 counties in the state. Next, it was thought that each county selected should represent a different geographical area; therefore, the state was divided into twenty-five geographical areas or districts, each containing from nine to twelve

counties. The number of counties in a district was allowed to vary so that districts would be square or rectangular and district lines would meander as little as possible.

It was felt that counties should be selected to represent the entire scale of the economic indexes of all counties. This was accomplished by selecting one county to represent those with the largest index, another to represent those with the smallest index, and others to represent those counties in between in the same manner. With this in mind, the 254 counties were arranged in descending order according to their indexes for the 1954-55 school year. Harris, Dallas, and Tarrant Counties, representing those with a large index, were at the top of the list; while Rains, Real, and Somervell Counties were at the bottom, representing those with a small index. Tarrant County, being third from the top of the list, was empirically selected to represent those counties with the largest index. Then, beginning with that county and counting down the list, every tenth county was marked as a possible selection. Since a number of counties had the same index, it was possible to select counties with the indexes desired to represent each of the twenty-five geographical districts.

Determination of True Value

After the twenty-five counties had been selected, the next task was that of determining the true value of each county. Since the

assessed valuation of each county was known, the true value could be calculated if the relationship between assessed value and actual value could be established in each county. Perhaps it should be explained here that true value and actual value are used synonymously in this study. Johns (2, p. 223) has concluded that true valuation of property is generally construed by the courts to mean market value at a free sale between a "willing buyer and a willing seller."

In order to establish the relationship between assessed value and actual value, sales were sampled in each county and the total purchase price derived from these sales was compared with the county-assessed valuation of the same property. This required that several decisions be made regarding the kind of sales that would be used, the number of sales required for a sample, and the method of obtaining the information.

By reading deeds and experimenting in one county, it was decided that sales of real property would make the best samples and that sales of less than $500.00 should not be included. If the amount were less than that, in many cases it was impossible to determine the actual purchase price, for the deed would state the purchase price to be some small sum, such as ten dollars and other considerations. However, if the sale were in the amount of $500.00 or more, usually the purchase price could be determined by a careful reading of the deed. Since government revenue stamps are required on deeds, they were used to

determine the approximate amount of the sale. Where the assumption of a note is a part of the purchase price, revenue stamps are not required to cover that part of a transaction, so the reading of each deed was essential.

It was also discovered that some other sales needed to be omitted to make a good sample. For instance, an heir may sell an undivided interest in an estate. Sometimes a father sells his son some property, and there are indications that the relationship may have some influence on the purchase price. Occasionally a piece of property may not be properly identified on the county tax rolls. Therefore, it was decided to omit from the sample any sales such as those described above which might tend to make a poor sample.

Another decision reached was to select the sample of sales from those that occurred during the year of 1953. That year seemed to give the best data, since the index for the 1954-55 school year was the one to be evaluated.

The next question that had to be answered was how many sales to use as a sample. The first intention was to use one hundred sales in each county, but it was soon discovered that some counties do not have that many transactions in one year. Therefore, it was decided that in those counties where fewer than one hundred sales had occurred, all the usable sales recorded during 1953 would be used as a sample.

After experimenting in one county and seeing the danger of obtaining poor samples of sales and county values, the conclusion was reached that the same investigator should go to the county seat of each county and collect the data needed to make the sample and to determine the relationship between county value and sale value.

The next step was the collection of data. A work sheet was used to record the information that was needed. A sample of the data secured in this phase of the investigation is shown in Table VIII in the Appendix. There was a column on the work sheet to record the grantor, the grantee, and a complete description of the property. A second column was provided in which the amount of the sale could be listed; and then there was a third column to use in the tax assessor's office to record the county assessed value. When enough sales were obtained to make a good county sample, they were totaled, as were the county values in the third column.

Calculation of Criterion

When all data were collected, the relationship of assessed value to actual value was determined for each county included in the study. This was done by dividing the total assessed value of a county sample by its total sale value and expressing the relationship first as a decimal and then as a percentage.

It was found that these percentages ranged from 24.44 per cent in Harrison County down to 5.48 per cent in Chambers County. The

median per cent was 14.51, while the mean per cent was 13.92. The range of these percentages does not seem to be very significant until it is recalled that 24.44 per cent is more than four times 5.48 per cent. This means that property in Harrison County is assessed more than four times as high as it is in Chambers County.

In order to determine the true value of each county, the percentages referred to above were changed back to decimals and the decimal for each county was divided into that county's total assessed valuation for 1953. A list of the twenty-five counties selected, their assessed valuations, their assessment rates expressed as decimals, and their true values so obtained are all shown in Table II.

After the true value for each county was calculated, the twenty-five values were added, giving the total true value of the twenty-five counties. This sum was then divided into the true value of each county, and this procedure gave the percentage of true value in each county when one county was compared to the group of twenty-five counties. This procedure also produced the criterion index which is used as a standard to judge the Texas legal index and each of its factors.

Application of Criterion

Before the criterion could be applied to the index and its factors, it was necessary to recalculate the legal index on the basis of the twenty-five counties considered as a whole unit of counties. Table III shows

TABLE II

ASSESSED VALUATION, ASSESSMENT RATE, AND ACTUAL VALUE OF TWENTY-FIVE TEXAS COUNTIES

County	Assessed Valuation	Assessment Rate	Actual Value
Tarrant	$321,479,390	.1800	$1,785,996,611
Scurry	113,255,468	.1162	974,659,793
Andrews	47,217,292	.0760	621,280,158
Chambers	31,353,680	.0548	572,147,445
Jackson	46,171,495	.0838	550,972,494
Harrison	41,479,009	.2444	168,817,549
Lamb	17,212,662	.1445	119,118,768
Montague	24,363,205	.1197	203,535,547
Anderson	28,396,255	.2198	129,191,333
Gonzales	12,534,120	.1342	93,398,808
Milam	24,009,190	.1156	207,691,955
Sherman	13,877,840	.1190	116,620,504
Brown	17,535,876	.1548	113,280,853
Hall	10,502,985	.1815	57,867,686
Wheeler	12,191,423	.1154	105,644,913
Franklin	9,016,250	.1769	50,968,061
Val Verde	12,769,255	.1549	82,435,474

TABLE II—Continued

County	Assessed Valuation	Assessment Rate	Actual Value
Live Oak	$ 13,948,935	.1502	92,869,075
Presidio	7,610,133	.1525	49,902,511
Hamilton	9,519,770	.1568	60,712,819
Llano	7,059,873	.1260	56,030,739
San Jacinto	7,221,250	.1451	49,767,402
Menard	4,822,310	.1461	33,006,845
Zapata	4,334,685	.1548	28,001,841
Real	1,691,782	.0574	29,473,554
Totals	$839,573,743	. . .	$6,353,392,738

three-year average data for each factor and the legal index of the twenty-five counties when compared with those of the 254 counties of the state. Table IV shows the data expressed as per cents calculated on the basis of the twenty-five counties. This was done so that the index and all factors would be expressed with a common denominator of 100, which would be the same as that of the criterion.

TABLE III

LEGAL INDEX AND THREE-YEAR AVERAGE OF SCHOLASTICS, COUNTY VALUATION, AND INCOME OF TWENTY-FIVE TEXAS COUNTIES

County	Three-year Average Data Expressed in Thousands			Legal Index for 1954-55
	Scholastics	County Valuation	Income	
Tarrant	72	$256,266	$478,159	4.518
Scurry	5	93,944	116,939	1.176
Andrews	1	43,278	91,278	.850
Chambers	2	28,844	65,100	.601
Jackson	3	44,301	47,979	.496
Harrison	11	33,889	35,084	.366
Lamb	5	14,131	33,711	.309
Montague	3	22,560	25,351	.260
Anderson	7	28,025	21,015	.237
Gonzales	5	12,221	20,705	.198
Milam	5	18,499	16,879	.181
Sherman	1	12,765	15,740	.159
Brown	5	16,493	13,764	.151
Hall	2	10,036	14,036	.138

TABLE III—Continued

County	Three-year Average Data Expressed in Thousands			Legal Index for 1954-55
	Scholastics	County Valuation	Income	
Wheeler	2	$ 11,332	$ 12,051	.125
Franklin	1	8,973	11,069	.112
Val Verde	4	12,146	8,591	.098
Live Oak	2	10,367	7,674	.087
Presidio	2	7,261	7,509	.078
Hamilton	2	9,200	6,050	.071
Llano	1	7,000	4,819	.056
San Jacinto	2	6,185	4,388	.050
Menard	1	4,892	3,650	.041
Zapata	1	4,102	2,658	.031
Real	1	1,729	940	.012
Totals	146	$718,439	$1,065,139	10.401

TABLE IV

SCHOLASTICS, COUNTY VALUATION, INCOME, AND LEGAL INDEX OF TWENTY-FIVE TEXAS COUNTIES EXPRESSED AS PERCENTAGES

County	Data Expressed in Per Cents of Total for the Twenty-five Counties			
	Scholastics	County Valuation	Income	Legal Index
Tarrant	49.315	35.670	44.892	43.438
Scurry	3.424	13.076	10.979	11.306
Andrews	.685	6.024	8.570	8.172
Chambers	1.370	4.014	6.112	5.778
Jackson	2.055	6.166	4.504	4.769
Harrison	7.535	4.717	3.294	3.519
Lamb	3.424	1.967	3.165	2.971
Montague	2.055	3.140	2.380	2.500
Anderson	4.795	3.900	1.973	2.279
Gonzales	3.424	1.701	1.944	1.904
Milam	3.424	2.575	1.585	1.740
Sherman	.685	1.776	1.478	1.529
Brown	3.424	2.295	1.292	1.452
Hall	1.370	1.397	1.318	1.327

TABLE IV—Continued

County	Data Expressed in Per Cents of Total for the Twenty-five Counties			
	Scholastics	County Valuation	Income	Legal Index
Wheeler	1.370	1.577	1.131	1.202
Franklin	.685	1.249	1.039	1.077
Val Verde	2.740	1.690	.807	.942
Live Oak	1.370	1.443	.720	.836
Presidio	1.370	1.016	.705	.750
Hamilton	1.370	1.280	.568	.683
Llano	.685	.974	.452	.538
San Jacinto	1.370	.861	.412	.481
Menard	.685	.681	.343	.394
Zapata	.685	.571	.249	.298
Real	.685	.240	.088	.115
Totals	100.000	100.000	100.000	100.000

Table V presents data comparing the legal index to the criterion. Column 2 of that table shows the criterion expressed in percentages. In Column 3, the legal index is expressed in the same manner. The differences between the percentages of each county are shown in Column 4, while the percentages of error are given in Column 5. Column 6 gives the squares of the percentages of error. At first glance, it is difficult to understand how the percentages in Column 6 could be less than those in Column 5; however, the reason for this is that a percentage, unless it is 100 or more, is less than one when changed to a decimal; and if it is squared, it produces a number smaller than the number that is squared.

Using the data in Table V, three tests (1, 3, 4) of "goodness of fit" were applied to determine how well the legal index measures the same as the criterion does. The criterion is referred to as "X_o," the observed value, while "X_c" is the calculated value, and in this case is the legal index. The three tests used to determine "goodness of fit" are the following:

Test I: $$\frac{1}{N}\sum \left| \frac{X_o - X_c}{X_o} \right|$$

Test II: $$\frac{1}{N}\sum \left(\frac{X_o - X_c}{X_o} \right)$$

Test III: $$\frac{1}{N}\sum \left(\frac{X_o - X_c}{X_o} \right)^2$$

TABLE V

CRITERION INDEX, LEGAL INDEX, THEIR DIFFERENCES, PER CENT OF ERROR, AND PER CENT OF ERROR SQUARED FOR TWENTY-FIVE TEXAS COUNTIES

County	X_o Criterion	X_c Legal Index	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Tarrant	28.108	43.438	+15.330	+54.5	29.7025
Scurry	15.345	11.306	-4.039	-26.3	6.9169
Andrews	9.773	8.172	-1.601	-16.4	2.6896
Chambers	9.002	5.778	-3.224	-35.8	12.8164
Jackson	8.671	4.769	-3.902	-45.0	20.2500
Harrison	2.660	3.519	+ .859	+32.3	7.4936
Lamb	1.873	2.971	+1.098	+58.6	34.3396
Montague	3.211	2.500	- .711	-22.1	4.8841
Anderson	2.030	2.279	+ .249	+12.3	1.5129
Gonzales	1.464	1.904	+ .440	+30.1	9.0601
Milam	3.273	1.740	-1.533	-46.8	21.9024
Sherman	1.841	1.529	- .312	-16.9	2.8561
Brown	1.778	1.452	- .326	-18.3	3.3489
Hall	.913	1.327	+ .414	+45.3	20.5209

TABLE V—Continued

County	X_o Criterion	X_c Legal Index	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Wheeler	1.668	1.202	- .466	-27.9	7.7841
Franklin	.803	1.077	+ .274	+34.1	11.6281
Val Verde	1.291	.942	- .349	-27.0	7.2900
Live Oak	1.465	.836	- .629	-42.9	18.4041
Presidio	.787	.750	- .037	- 4.7	.2209
Hamilton	.960	.683	- .277	-28.9	8.3521
Llano	.881	.538	- .343	-38.9	15.1321
San Jacinto	.787	.481	- .306	-38.9	15.1321
Menard	.519	.394	- .125	-24.1	5.8081
Zapata	.441	.298	- .143	-32.4	10.4976
Real	.456	.115	- .341	-74.8	55.9504
Totals	100.000	100.000	0.000	-300.9	334.4936

In these formulas, "N" refers to the number of counties which, in this study, is twenty-five. The first test indicates that the number twenty-five is divided into the summation of the percentages of error found in Column 5, disregarding the signs that precede those percentages. The second test is the same as the first except that the signs are observed; and this produces a smaller average percentage which may be either a plus or a minus. In the third test, the percentages of error are squared, changing all signs to a plus before they are summed.

After these tests were applied to the legal index, they were applied to each of the three factors of the index. See Tables IX, X, XI, and XII in the Appendix for data pertaining to these factors when they were applied to the tests and compared to the criterion. Two tables were made for scholastic population; one using the number of scholastics rounded off to thousands, as is done in the calculation of the index, and the other using the exact number of scholastics.

The results of all of these tests are shown in Table VI. This table also shows the largest percentage of error and the number of times the percentage of error exceeded 50 per cent. From an examination of this table it is observed that the percentages of error are too high for the legal index or any one of its factors to be considered a good measure of local taxpaying ability.

When a comparison is made, it is found that county valuation produces a measure almost as equitable as the legal index. It has a

TABLE VI

RESULTS OF THREE TESTS OF GOODNESS OF FIT, LARGEST PER CENT OF ERROR, AND NUMBER OF ERRORS OVER 50 PER CENT WITH RESPECT TO LEGAL INDEX, COUNTY VALUATION, INCOME, SCHOLASTICS BY THOUSANDS, AND ACTUAL SCHOLASTICS

Items	Test I	Test II	Test III	Largest Per Cent of Error	Number of Errors over 50 Per Cent
Legal index	33.4%	−12.0%	13.4%	74.8%	3
County valuation	29.9%	∕12.4%	14.2%	92.1%	5
Income	37.3%	−16.6%	17.0%	80.7%	5
Scholastics by thousands	67.6%	∕28.3%	63.9%	183.3%	17
Actual scholastics	64.3%	∕23.6%	60.8%	179.1%	14

smaller percentage of error under one test, and the differences in the other two tests are small. However, county valuation produced the one highest percentage of error, and it also had more percentages of error that exceeded 50 per cent. Therefore, the conclusion is that the legal index is a better measure than any one of its factors, but it is not much better than county valuation.

The tests show income to be the second best factor. Scholastic population, whether counted by the thousands or by actual number, has

practically no validity as a measure of taxpaying ability. When scholastics were counted by thousands, seventeen cases out of twenty-five had percentages of error that were more than 50 per cent; and the largest error produced was 183.3 per cent. The conclusion here is that the legal index would be improved if scholastic population were omitted as a factor.

At this point it was decided to do some more experimentation. Since a number of states have used auto registration as a factor, an index was computed by the investigator for the twenty-five counties on that basis. Another index was computed using a simple average of actual scholastics, county valuation, income, and auto registration. Then scholastic population was omitted and the same procedure followed again. Finally, a fourth index was calculated, using only a simple average of county valuation and income. Tables XIII, XIV, XV, and XVI in the Appendix show these four indexes and other data when they are compared to the criterion index. The three tests of "goodness of fit" were applied to each of the four indexes when each index was compared to the criterion index; and the results are shown in Table VII.

Automobile registration proved to be a factor only slightly better than scholastic population. A simple average of the four factors produced a poor index. A simple average of county valuation, income, and auto registration gave an index that is comparable to the legal index.

TABLE VII

RESULTS OF THREE TESTS OF GOODNESS OF FIT, LARGEST PER CENT OF ERROR, AND NUMBER OF ERRORS OVER 50 PER CENT WITH RESPECT TO AUTO REGISTRATION, FOUR FACTORS, THREE FACTORS, AND SIMPLE AVERAGE OF INCOME AND COUNTY VALUE

Items	Test I	Test II	Test III	Largest Per Cent of Error	Number of Errors over 50 Per Cent
Auto registration	46.8%	⁄4.0%	32.8%	102.0%	12
Four factors	37.0%	⁄5.8%	18.6%	84.3%	9
Three factors	32.1%	- .07%	13.7%	62.9%	7
Simple average of income and county value	26.2%	-2.1%	9.9%	64.0%	2

In fact, it was a better index except that it had more percentages of error which were above 50 per cent. A simple average of county valuation and income produced the best index of all, and this index was better in every respect than the legal index.

Summary

In this chapter are reported the methods used in selecting twenty-five counties for study, how the true value of each county was determined,

and how a criterion index was calculated upon those true values. Then the Texas economic index, each of its factors, and other possible indexes and factors were compared to the criterion index based upon true value. The findings are as follows:

1. It was found that a fairly good sample of tax assessment rates can be obtained for a county by a reasonable amount of work and expense.

2. In the twenty-five counties selected, it was found that tax assessment rates range from 24.44 per cent of true value in one county to 5.48 per cent of true value in another county.

3. The legal index is a better measure of the true value of property than any one of its factors; however, it is very little better than assessed valuation.

4. When the legal index was compared to the criterion index of true value, it was found that, out of twenty-five cases, the largest percentage of error was 74.8 per cent, that three errors were larger than 50 per cent, and that the average percentage of error was 33.4 per cent.

5. Although tax assessment rates vary so much that some counties assess property four times higher than other counties, county valuation measures taxpaying ability better than the income factor or scholastic population.

6. Income is the second best factor, but when it is used to determine true value in the twenty-five counties, it produces an average error of 37.3 per cent, five errors above 50 per cent, and one error as high as 80.7 per cent.

7. Although scholastic population can be improved as a factor by using the actual number of scholastics instead of rounding off the number to thousands, it still produces an average error of 64.3 per cent.

8. Auto registration would be a better factor than scholastic population, but it produces an average error of 50.8 per cent.

9. Auto registration and scholastic population as factors appear to do more harm than good to an economic index in Texas.

10. A simple average of the income factor and county valuation produces a better measure of true value in every respect than the legal index; however, this measure produces an average error of 26.2 per cent, two errors out of twenty-five that are larger than 50 per cent, and one error out of twenty-five that is as large as 64 per cent.

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CHAPTER V

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The purposes of this chapter are to summarize the findings of this study, to draw conclusions based upon those findings, and to make recommendations pertinent to the problem of measuring the taxpaying ability of local administrative units in Texas.

Findings

Since two evaluations of the Texas economic index are actually made in this study, it appears that the findings should be listed separately. The findings of the theoretical evaluation reported in Chapter III are as follows:

1. Assessed valuation fails to stand the test of a good factor to use in the Texas economic index.

2. Scholastic population does not measure taxable wealth and is therefore an unsound factor to use in the Texas index.

3. The income factor of the Texas index meets most of the tests of a sound factor, except that its degree of validity as a measure of taxable wealth is low.

4. The Texas economic index fails in part to meet any of the six standards of a good index, and it fails entirely to meet two of those standards.

5. The legal weights assigned to factors of the Texas economic index are not the weights actually assigned when the index has been calculated.

6. There is no criterion of true value available in Texas, so mathematical procedures can not be used to assign weights to factors.

7. There is no evidence that the Texas economic index can be improved by using either of the other two methods of assigning weights to factors.

8. There is no evidence that the Texas economic index can be improved by empirically changing the weights that are now assigned to its present factors.

An analysis of the true values obtained in twenty-five Texas counties shows the findings to be as follows:

1. It was found that a fairly good sample of tax assessment rates can be obtained for a county by a reasonable amount of work and expense.

2. In the twenty-five counties selected it was found that tax assessment rates ranged from 24.44 per cent of true value in one county to 5.48 per cent of true value in another county.

3. The legal index is a better measure of the true value of property than any one of its factors; however, it is a very little better measure than is assessed valuation.

4. When the legal index was compared with the criterion index of true value, it was found that, out of twenty-five cases, the largest per cent of error was 74.8 per cent, that three errors were larger than 50 per cent, and that the average per cent of error was 33.4 per cent.

5. Although tax assessment rates vary so much that some counties assess property four times higher than other counties, county valuation measures taxpaying ability better than the income factor or scholastic population.

6. Income is the second best factor, but when it was used to determine true value in the twenty-five counties, it produced an average error of 37.3 per cent, five errors above 50 per cent, and one error as high as 80.7 per cent.

7. Although scholastic population can be improved as a factor by using the actual number of scholastics instead of rounding off the numbers to thousands, it still produced an average error of 64.3 per cent.

8. Auto registration would be a better factor than scholastic population, but it produced an average error of 50.8 per cent.

9. Auto registration and scholastic population as factors appear to do more harm than good to an economic index in Texas.

10. A simple average of the income factor and county valuation produced a better measure of taxpaying ability in every respect than the legal index; however, this measure produced an average error of 26.2 per cent, two errors out of twenty-five that were larger than 50 per cent, and one error out of twenty-five as large as 64 per cent.

Conclusions

Considering both lists of findings and other implications of this study, the conclusions reached are as follows:

1. County valuation and scholastic population should not be used as factors in the Texas economic index.

2. Income is a usable factor, but its degree of validity is low; therefore, its weight should not be large.

3. The weight now assigned to the income factor is much too large.

4. The Texas economic index can hardly be considered a valid measure from a theoretical standpoint, since two of its three factors are considered unsound and the validity of the third factor is low.

5. The extent of validity of the Texas economic index is that, when it is used as an instrument to measure that which it purports to measure, it may be expected to produce an average per cent of error

of 33.4 per cent, to produce an error larger than 50 per cent three times out of twenty-five, and to produce an error as large as 74.8 per cent one time out of twenty-five.

6. Due to its degree of validity described above, the Texas economic index is not considered to be a valid measure of true property value; therefore, a better measure of taxpaying ability should be sought, and the economic index should be discarded as soon as a better measure can be found and adopted.

7. It is believed that a better method of measuring taxpaying ability can be found in Texas by using the techniques described in Chapter IV of this study; namely, by sampling sales, determining assessment rates, finding the true value of each county, and calculating an index upon actual county value.

Recommendations

In the light of the foregoing findings and conclusions, the recommendations from this study are as follows:

1. The Texas Education Agency should conduct a study to determine the validity of the Texas economic index.

2. If the Texas Education Agency carries out such a study and arrives at approximately the same conclusions that have been reached in this study, then the State Commissioner of Education and the State Board of Education should recommend to the Legislature that funds be

appropriated so that assessment ratios can be determined for all 254 counties and that an index based upon true values be calculated and adopted to replace the present economic index.

APPENDIX

TABLE VIII

ILLUSTRATION OF DATA COLLECTED FROM COUNTY RECORDS IN TWENTY-FIVE TEXAS COUNTIES AND TABULATED ON A WORK SHEET

County of HALL

Description of Property		Sale Value	County Value
E. H. Duke to J. E. Duke	2 tracts: 1. All Sec. 7 in Bk. 2 T&PRY. Tr. 2. 41.1 ac. of Sec. 1 Bk. R. T. A. Thomson	16,500	4,170
W. E. Billington to R. S. Thomas, Jr.	Lot 4 & W 1/2 of 3 Bk. 2 of Brumley add. to Memphis	2,000	400
T. A. Guthrie to Ira L. Newson	All of lots 1 & 2 Bk. 69 Original Memphis	2,500	700
J. H. McWhorter to W. W. Shawhart	Lot 6 & W 15' of 7 Bk. 8 Dotson's addition to Memphis	1,000	800
J. P. Fowler to H. C. Fowler	2 tracts: 159 ac. of Sec. 70 Bk. 2 T&P RY. and 80 ac. of E 1/2 of NW 1/4 same Sec.	30,000	3,600
C. H. Williams to W. E. Williams	Part of NE 1/4 of Bk. 15 Noel's add. to Memphis	7,200	780

TABLE VIII—Continued

Description of Property		Sale Value	County Value
R. B. McMurry to W. E. Beckham	80 ac. of W 1/2 of NW 1/2 Sec. 92 Bk. 18 of H & G N Survey	20,000	1,480
Silas Evans Rice to R. B. McMurray	Lot 3 & S 25' of Lot 2, both in Bk. 12 Ansley's add. to Memphis	7,250	1,700
Homer Hulsey to R. B. McMurry	160 ac. of sec. 2 & 3 Bk. "R" T. A. Thomson Survey	12,000	2,320
W. L. Nabers to A. J. Nabers	92 ac. of Sec. 110 Bk. 1 S P Ry.	12,000	1,040
W. C. Hignight to A. J. Nabers	56.79 Ac. of Sec. 110 Bk. 1 S P Ry.	12,000	1,140
J. E. Lamb to J. F. Bartley	Lots 11 & 12 Bk. 67 Original Memphis	1,600	200
Russell L. McClure to Melvin Leo Wiley	Lots 4, 5, & 6 Bk. 11 Ansley's add. to Memphis	7,244	1,800
Clyde C. Chism to Homer Bell	Lot 17 Bk. 7 Original Estelline	1,000	650

TABLE VIII—Continued

Description of Property		Sale Value	County Value
Katie Phillips to Beulah Walthall	15.7 Ac. of SE 1/4 of Sec. 58 Bk. 1 J. Poitevent Survey	865	300
L. J. Robertson to Aubrey Robertson	N 40 Ac. of SE 1/4 of Sec. 1 Bk. 2 J. Poitevent Survey	4,000	650
Andy McAfee to T. J. Dunbar	160 Ac.: N 1/2 S 1/2 of Sec. 4 Bk. 2 J. Poitevent Survey	12,000	2,320

TABLE IX

CRITERION INDEX, AN INDEX BASED UPON COUNTY VALUATION, THEIR DIFFERENCES, THE PER CENT OF ERROR, AND THE PER CENT OF ERROR SQUARED FOR TWENTY-FIVE TEXAS COUNTIES

County	X_o Criterion	X_c County Valuation	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Tarrant	28.108	35.670	+7.562	+26.9	7.2361
Scurry	15.345	13.076	-2.269	-14.8	2.1904
Andrews	9.773	6.024	-3.749	-38.4	14.7456
Chambers	9.002	4.014	-4.988	-55.4	30.6915
Jackson	8.671	6.166	-2.505	-28.9	8.3521
Harrison	2.660	4.717	+2.057	+77.3	59.7529
Lamb	1.873	1.967	+ .094	+ 5.0	.2500
Montague	3.211	3.140	- .071	- 2.2	.0484
Anderson	2.030	3.900	+1.870	+92.1	84.8241
Gonzales	1.464	1.701	+ .237	+16.2	2.6244
Milam	3.273	2.575	- .698	-21.3	4.5369
Sherman	1.841	1.776	- .065	- 3.5	.1225
Brown	1.778	2.295	+ .517	+29.1	8.4681

TABLE IX—Continued

County	X_o Criterion	X_c County Valuation	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Hall	.913	1.397	+ .484	+53.0	28.0900
Wheeler	1.668	1.577	- .091	- 5.5	.3025
Franklin	.803	1.249	+ .446	+55.5	30.8025
Val Verde	1.291	1.690	+ .399	+30.9	9.5481
Live Oak	1.465	1.443	- .022	- 1.5	.0225
Presidio	.787	1.016	+ .229	+29.1	8.4681
Hamilton	.960	1.280	+ .320	+33.3	11.0889
Llano	.881	.974	+ .093	+10.6	1.1236
San Jacinto	.787	.861	+ .074	+ 9.4	.8836
Menard	.519	.681	+ .162	+31.2	9.7344
Zapata	.441	.571	+ .130	+29.5	8.7025
Real	.456	.240	- .216	-47.4	22.4676
Totals	100.000	100.000	0.000	+310.2	355.0774

TABLE X

CRITERION INDEX, AN INDEX BASED UPON INCOME, THEIR DIFFERENCES, THE PER CENT OF ERROR, AND THE PER CENT OF ERROR SQUARED FOR TWENTY-FIVE TEXAS COUNTIES

County	X_o Criterion	X_c Income	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Tarrant	28.108	44.892	+16.784	+59.7	35.6409
Scurry	15.345	10.979	-4.366	-28.5	8.1225
Andrews	9.773	8.570	-1.203	-12.3	1.5129
Chambers	9.002	6.112	-2.890	-32.1	10.3041
Jackson	8.671	4.504	-4.167	-48.1	23.1361
Harrison	2.660	3.294	+ .634	+23.8	5.6644
Lamb	1.873	3.165	+1.292	+69.0	47.6100
Montague	3.211	2.380	- .831	-25.9	6.7081
Anderson	2.030	1.973	- .057	- 2.8	.0784
Gonzales	1.464	1.944	+ .480	+32.8	10.7584
Milam	3.273	1.585	-1.688	-51.6	26.6256
Sherman	1.841	1.478	- .363	-19.7	3.8809
Brown	1.778	1.292	- .486	-27.3	7.4529

TABLE X—Continued

County	X_o Criterion	X_c Income	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Hall	.913	1.318	+ .405	+44.4	19.7136
Wheeler	1.668	1.131	- .537	-32.2	10.3684
Franklin	.803	1.039	+ .236	+29.4	8.6436
Val Verde	1.291	.807	- .484	-37.5	14.0625
Live Oak	1.465	.720	- .745	-50.9	25.9081
Presidio	.787	.705	- .082	-10.4	1.0816
Hamilton	.960	.568	- .392	-40.8	16.6464
Llano	.881	.452	- .429	-48.7	23.7169
San Jacinto	.787	.412	- .375	-47.6	22.6576
Menard	.519	.343	- .176	-33.9	11.4921
Zapata	.441	.249	- .192	-43.5	18.9225
Real	.456	.088	- .368	-80.7	65.1249
Totals	100.000	100.000	0.000	-415.4	425.7334

TABLE XI

CRITERION INDEX, AN INDEX BASED UPON SCHOLASTICS COUNTED BY THOUSANDS, THEIR DIFFERENCES, THE PER CENT OF ERROR, AND THE PER CENT OF ERROR SQUARED FOR TWENTY-FIVE TEXAS COUNTIES

County	X_o Criterion	X_c Per 1000 Scholastics	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Tarrant	28.108	49.315	+21.207	+ 75.4	56.8516
Scurry	15.345	3.424	-11.921	- 77.7	60.3729
Andrews	9.773	.685	-9.088	- 93.0	86.4900
Chambers	9.002	1.370	-7.632	- 84.8	71.9104
Jackson	8.671	2.055	-6.616	- 76.3	58.2169
Harrison	2.660	7.535	+4.875	+183.3	335.9889
Lamb	1.873	3.424	+1.551	+ 82.8	68.5584
Montague	3.211	2.055	-1.156	- 36.0	12.960
Anderson	2.030	4.795	+2.765	+136.2	185.5044
Gonzales	1.464	3.424	+1.960	+133.9	179.2921
Milam	3.273	3.424	+ .151	+ 4.6	.2116
Sherman	1.841	.685	-1.156	- 62.8	39.4384
Brown	1.778	3.424	+1.646	+ 92.1	84.8241

TABLE XI—Continued

County	X_o Criterion	X_c Per 1000 Scholastics	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Hall	.913	1.370	∕ .457	∕50.1	25.1001
Wheeler	1.668	1.370	- .298	- 17.9	3.2041
Franklin	.803	.685	- .118	- 14.7	2.1609
Val Verde	1.291	2.740	∕1.449	∕112.2	125.8884
Live Oak	1.465	1.370	- .095	- 6.5	.4225
Presidio	.787	1.370	∕ .583	∕ 74.1	54.9081
Hamilton	.960	1.370	∕ .410	∕ 42.7	18.2329
Llano	.881	.685	- .196	- 22.2	4.9284
San Jacinto	.787	1.370	∕ .583	∕ 74.1	54.9081
Menard	.519	.685	∕ .166	∕ 32.0	10.2400
Zapata	.441	.685	∕ .244	∕ 55.3	30.5809
Real	.456	.685	∕ .229	∕ 50.2	25.2004
Totals	100.000	100.000	0.000	∕707.1	1,596.3945

TABLE XII

CRITERION INDEX, AN INDEX BASED UPON ACTUAL SCHOLASTICS, THEIR DIFFERENCES, THE PER CENT OF ERROR, AND THE PER CENT OF ERROR SQUARED FOR TWENTY-FIVE TEXAS COUNTIES

County	X_o Criterion	X_c Actual Scholastics	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Tarrant	28.108	49.335	+21.227	+ 75.5	57.0025
Scurry	15.345	3.181	-12.164	- 79.3	62.8849
Andrews	9.773	.958	-8.815	- 90.2	81.3604
Chambers	9.002	1.299	-7.703	- 85.6	73.2736
Jackson	8.671	2.299	-6.372	- 73.5	54.0225
Harrison	2.660	7.424	+4.764	+179.1	320.7681
Lamb	1.873	3.419	+1.546	+ 82.5	68.0625
Montague	3.211	2.328	- .883	- 27.5	7.5625
Anderson	2.030	4.823	+2.793	+137.6	189.3376
Gonzales	1.464	3.064	+1.600	+109.3	119.4649
Milam	3.273	3.610	+ .337	+ 10.3	1.0609
Sherman	1.841	.383	-1.458	- 79.2	62.7264
Brown	1.778	3.757	+1.979	+111.3	123.8769

TABLE XII—Continued

County	X_o Criterion	X_c Actual Scholastics	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Hall	.913	1.623	+ .710	+ 77.8	60.5284
Wheeler	1.668	1.547	- .121	- 7.3	.5329
Franklin	.803	.690	- .113	- 14.1	1.9881
Val Verde	1.291	2.783	+1.492	+115.6	133.6336
Live Oak	1.465	1.654	+ .189	+ 12.9	1.6641
Presidio	.787	1.149	+ .362	+ 46.0	21.1600
Hamilton	.960	1.353	+ .393	+ 40.9	16.7281
Llano	.881	.609	- .272	- 30.9	9.5481
San Jacinto	.787	1.170	+ .383	+ 48.7	23.7169
Menard	.519	.498	- .021	- 4.0	.1600
Zapata	.441	.666	+ .225	+ 51.0	26.0100
Real	.456	.378	- .078	- 17.1	2.9241
Totals	100.000	100.000	0.000	+589.2	1,519.9980

TABLE XIII

CRITERION INDEX, AN INDEX BASED UPON AUTO REGISTRATIONS, THEIR DIFFERENCES, THE PER CENT OF ERROR, AND THE PER CENT OF ERROR SQUARED FOR TWENTY-FIVE TEXAS COUNTIES

County	X_o Criterion	X_c Auto Registration	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Tarrant	28.108	56.766	+28.658	+102.0	104.0400
Scurry	15.345	4.242	-11.103	- 72.4	52.4176
Andrews	9.773	1.183	-8.590	- 87.9	77.2641
Chambers	9.002	1.549	-7.453	- 82.8	68.5584
Jackson	8.671	2.054	-6.617	- 76.3	59.2169
Harrison	2.660	4.175	+1.515	+ 57.0	32.4900
Lamb	1.873	3.584	+1.711	+ 91.4	83.5369
Montague	3.211	2.717	- .494	- 15.4	2.3716
Andersen	2.030	3.524	+1.494	+ 73.6	54.1696
Gonzales	1.464	2.591	+1.127	+ 77.0	59.2900
Milam	3.273	3.235	- .038	- 1.2	.0144
Sherman	1.841	.768	-1.073	- 58.3	33.9889
Brown	1.778	1.299	- .479	- 26.9	7.2361

TABLE XIII—Continued

County	X_o Criterion	X_c Auto Registration	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Hall	.913	1.559	✓ .646	✓ 70.8	50.1264
Wheeler	1.668	1.675	✓ .007	✓ .4	.0016
Franklin	.803	.697	- .106	- 13.2	1.7424
Val Verde	1.291	1.816	✓ .525	✓ 40.7	16.5649
Live Oak	1.465	1.133	- .332	- 22.7	5.1529
Presidio	.787	.846	✓ .059	✓ .75	.5625
Hamilton	.960	1.846	✓ .886	✓ 92.3	85.1929
Llano	.881	.916	✓ .035	✓ 4.0	.1600
San Jacinto	.787	.491	- .296	- 37.6	14.1376
Menard	.519	.617	✓ .098	✓ 18.9	3.5721
Zapata	.441	.320	- .121	- 27.4	7.5076
Real	.456	.397	- .059	- 12.9	1.6641
Totals	100.000	100.000	0.000	✓100.6	820.9795

TABLE XIV

CRITERION INDEX, AN INDEX BASED UPON AN AVERAGE OF FOUR FACTORS, THEIR DIFFERENCES, THE PER CENT OF ERROR, AND THE PER CENT OF ERROR SQUARED FOR TWENTY-FIVE TEXAS COUNTIES

County	X_o Criterion	X_c Average of 4 Factors	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Tarrant	28.108	46.666	+18.558	+66.0	43.5600
Scurry	15.345	7.870	-7.475	-48.7	23.7169
Andrews	9.773	4.183	-5.590	-57.2	32.7184
Chambers	9.002	3.243	-5.759	-64.0	40.9600
Jackson	8.671	3.756	-4.915	-56.7	32.1489
Harrison	2.660	4.903	+2.243	+84.3	71.0649
Lamb	1.873	3.034	+1.161	+62.0	38.4400
Montague	3.211	2.641	- .570	-17.8	3.1684
Anderson	2.030	3.555	+1.525	+75.1	56.4001
Gonzales	1.464	2.325	+ .861	+58.8	34.5744
Milam	3.273	2.751	- .522	-15.9	2.5281
Sherman	1.841	1.101	- .740	-40.2	16.1604
Brown	1.778	2.161	+ .383	+21.5	4.6225

TABLE XIV— Continued

County	X_o Criterion	X_c Average of 4 Factors	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Hall	.913	1.474	+ .561	+61.4	13.2010
Wheeler	1.668	1.483	- .185	-11.1	1.2321
Franklin	.803	.919	+ .116	+14.4	2.0736
Val Verde	1.291	1.774	+ .483	+37.4	13.9876
Live Oak	1.465	1.237	- .228	-15.6	2.4336
Presidio	.787	.929	+ .142	+18.0	3.2400
Hamilton	.960	1.262	+ .302	+31.5	9.9225
Llano	.881	.738	- .143	-16.2	2.6244
San Jacinto	.787	.733	- .054	- 6.9	.4761
Menard	.519	.535	+ .016	+ 3.1	.0961
Zapata	.441	.451	+ .010	+ 2.3	.0529
Real	.456	.276	- .180	-39.5	15.6025
Totals	100.000	100.000	0.000	+146.0	465.0054

TABLE XV

CRITERION INDEX, AN INDEX BASED UPON AN AVERAGE OF COUNTY VALUATION, INCOME, AND AUTO REGISTRATIONS, DIFFERENCES IN THE INDEXES, THE PER CENT OF ERROR, AND THE PER CENT OF ERROR SQUARED FOR TWENTY-FIVE TEXAS COUNTIES

County	X_o Criterion	X_c Average of 3 Factors	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Tarrant	28.108	45.776	+17.668	+62.9	39.5641
Scurry	15.345	9.432	-5.913	-38.5	14.8225
Andrews	9.773	5.259	-4.514	-46.2	21.3444
Chambers	9.002	3.892	-5.110	-56.8	32.2624
Jackson	8.671	4.241	-4.430	-51.1	26.1121
Harrison	2.660	4.062	+1.402	+52.7	27.7729
Lamb	1.873	2.905	+1.032	+55.1	30.3601
Montague	3.211	2.746	- .465	-14.5	2.1025
Anderson	2.030	3.132	+1.102	+54.3	29.4849
Gonzales	1.464	2.079	+ .615	+42.0	17.6400
Milam	3.273	2.465	- .808	-24.7	6.1009
Sherman	1.841	1.341	- .500	-27.2	7.3984
Brown	1.778	1.628	- .150	- 8.4	.7056

TABLE XV—Continued

County	X_o Criterion	X_c Average of 3 Factors	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Hall	.913	1.425	+ .512	+56.1	31.4721
Wheeler	1.668	1.462	- .206	-12.4	1.5376
Franklin	.803	.995	+ .192	+23.9	5.7121
Val Verde	1.291	1.438	+ .147	+11.4	1.2996
Live Oak	1.465	1.098	- .367	-25.1	6.3001
Presidio	.787	.855	+ .068	+ 8.6	.7396
Hamilton	.960	1.232	+ .272	+28.3	8.0089
Llano	.881	.780	- .101	-11.5	1.3225
San Jacinto	.787	.588	- .199	-25.3	6.4009
Menard	.519	.547	+ .028	+ 5.4	.2916
Zapata	.441	.380	- .061	-13.8	1.9044
Real	.456	.242	- .214	-46.9	21.9961
Totals	100.000	100.000	0.000	- 1.7	342.6563

TABLE XVI

CRITERION INDEX, AN INDEX BASED UPON SIMPLE AVERAGES OF COUNTY VALUATION AND INCOME, THEIR DIFFERENCES, THE PER CENT OF ERROR, AND THE PER CENT OF ERROR SQUARED FOR TWENTY-FIVE TEXAS COUNTIES

County	X_o Criterion	X_c Average of County Valuation and Income	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Tarrant	28.108	40.281	+12.173	+43.3	18.7489
Scurry	15.345	12.028	-3.317	-21.6	4.6656
Andrews	9.773	7.297	-2.476	-25.3	6.4009
Chambers	9.002	5.063	-3.939	-43.8	19.1844
Jackson	8.671	5.335	-3.336	-38.5	14.8225
Harrison	2.660	4.006	+1.346	+50.6	25.6036
Lamb	1.873	2.566	+ .693	+37.0	13.6900
Montague	3.211	2.760	- .451	-14.0	1.9600
Anderson	2.030	2.936	+ .906	+44.6	19.8916
Gonzales	1.464	1.822	+ .358	+24.5	6.0025
Milam	3.273	2.080	-1.193	-36.4	13.2496
Sherman	1.841	1.627	- .214	-11.6	1.3456
Brown	1.778	1.793	+ .015	+ .8	.0064

TABLE XVI—Continued

County	X_o Criterion	X_c Average of County Valuation and Income	$X_o - X_c$ Differences	$\frac{X_o - X_c}{X_o}$ Per Cent of Error	$\left(\frac{X_o - X_c}{X_o}\right)^2$ Per Cent of Error Squared
Hall	.913	1.357	+ .444	+48.6	23.6196
Wheeler	1.668	1.354	- .314	-18.8	3.5344
Franklin	.803	1.144	+ .341	+42.5	18.0625
Val Verde	1.291	1.248	- .043	- 3.3	.1089
Live Oak	1.465	1.082	- .383	-26.1	6.8121
Presidio	.787	.861	+ .074	+ 9.4	.8836
Hamilton	.960	.924	- .036	- 3.8	.1444
Llano	.881	.713	- .168	-19.1	3.6481
San Jacinto	.787	.637	- .150	-19.1	3.6481
Menard	.519	.512	- .007	- 1.3	.0169
Zapata	.441	.410	- .031	- 7.0	.4900
Real	.456	.164	- .292	-64.0	40.9600
Totals	100.000	100.000	0.000	-52.4	247.5002

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