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# Analyzing the Relative Equity of School Aid Distribution Relating to Oil and Gas Tax, Employing Impact Aid, Property Tax, and Severance Tax Systems

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# ANALYZING THE RELATIVE EQUITY OF SCHOOL AID DISTRIBUTION RELATING TO OIL AND GAS TAX, EMPLOYING IMPACT AID, PROPERTY TAX, AND SEVERANCE TAX SYSTEMS

by

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Don -

Thanks enormously
for your help + encouragement -

Danny

This Dissertation submitted by Harry Lee Weisenberger in partial fulfillment of the requirements for the Degree of Doctor of Education from the University of North Dakota is hereby approved by the Faculty Advisory Committee under whom the work has been done.

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Title ANALYZING THE RELATIVE EQUITY OF SCHOOL AID DISTRIBUTION RELATING TO OIL AND GAS TAX, EMPLOYING IMPACT AID, PROPERTY TAX, AND SEVERANCE TAX SYSTEMS

Department Center for Teaching and Learning

Degree Doctor of Education

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ABSTRACT

Statement of the Problem

The purpose of this study was to define "relative equity" and then propose an alternative to the present system for more equitable financial assistance to school districts in which taxes on severed resources are substituted for taxes on increment of property wealth related to existence of resources.

There apparently was a great deal of dissatisfaction among school administrators in North Dakota, as well as those individuals in the public sector who are informed of the issues, concerning the present system of generation and distribution of oil and gas tax revenues in North Dakota. It has been argued that the present formula for generation and distribution of oil and gas tax revenue does not meet the intent of the North Dakota State Foundation Aid Program. The intent of the foundation program was to provide equal educational opportunity, as reflected by weighted dollars, for every student in the state.

An additional need for this study was outlined in federal legislation which addresses itself to providing "equity guidelines" to use in developing state foundation aid programs. House Concurrent Resolution 1037 of the Forty-Fifth Legislative Assembly indicated the need for this study when it stated that recent court decisions, e.g., (Serrano versus Priest) have focused attention on the fact that the state had an obligation to provide an equal opportunity for all students and that local support could not be the function of the wealth of the local school district. This resolution

further resolved that there was a need to study the financial effect on school districts of large industrial plants, both those subject to property taxes and those subject to taxes in lieu of property taxes, including a study of deductions from state foundation program payments for taxes received from such plants and other sources of tax revenue.

## Method of the Study

Four alternative models were tested to determine the difference in the amount of state and local aid received by sample school districts. Plan A which was the present severance tax model; Plan B which was the capitalization of income model; Plan C which was the property tax model; and Plan D which was an impact aid model, were tested using the statistical method of multiple linear regression in this study. Comparisons were made by analyzing the present North Dakota model and the three alternative models, identified later in the study. These comparisons were made to determine which elements within each model contributed most significantly to an equitable distribution of the tax on severed resources. An equitable distribution was a distribution where the actual per pupil cost of education matched the predicted per pupil cost of education.

After determining the effect of elements within the present North Dakota model and the three alternative models, a composite model for generation and distribution of oil and gas tax was to be developed. Attempts to construct a composite model failed. As a result, a composite model is not presented in this study.

A systematic sample was taken of all school districts in North Dakota which received oil and gas tax revenue during the 1976-77 school term. The sample was obtained by listing all oil and gas districts by county in alphabetical order. Every third district was selected from this list.

## The Results

Research Hypothesis number one stated whether school districts were being compensated excessively, sufficiently, or insufficiently for additional students generated by oil and gas activity. As a result of an analysis using an established range it was found that fifteen school districts received certain amounts of oil and gas tax revenue that were above the hypothetical equity range. One school district received revenue which was below the hypothetical equity range, while five school districts received sufficient revenue according to the present formula of generation and distribution of oil and gas tax revenue and based on the hypothetical equity range.

Research hypothesis number two stated what features of alternative systems of generation and distribution of oil and gas taxes to school districts provided them with more "relative equity" than the present system. Using a descriptive statistical procedure it was found that there were differences in "relative equity" for various school districts from one alternative model to the other. Although these differences were evident between models for various school districts, none of the four alternative models were more equitable than the present model.

Research question number three asked whether there was an eclectic model of generation and distribution of oil and gas tax that would be more equitable than the present system. As a result of analyzing the variable data from the four alternative plans of generation and distribution of oil and gas revenue, the writer was unable to determine any characteristics of any of the four plans that seemed to be consistently more equitable. Since no apparent commonality was identified in any of the variables in any of the four plans no eclectic model was presented.

## Conclusions

The following conclusions were drawn from the analysis of the data collected and from the review of the literature.

1. There was a high correlation between the per pupil cost of education and the per pupil oil and gas tax revenue.

2. The utilization of a hypothetical equity range showed that certain school districts received sufficient revenue from oil and gas taxes which were within the range, while others received amounts above the range, and one district received revenue below the range under the present system of generation and distribution of oil and gas tax revenue.

3. The identified independent variables contributed a low percentage to the prediction of the dependent variable.

4. The size of a school district had a substantial effect on the "relative equity" of generation and distribution of oil and gas tax revenue.

5. There seemed to be no consistent similarities in data that could have a causal effect on high or low residuals. The writer could not determine the reason for this inconsistency other than conjecture that some other variable or variables, that had not yet been identified, were having an effect on the dependent variable.

6. The variables identified did not determine the "relative equity" of generation and distribution of oil and gas taxes.

7. The "relative equity" of the distribution of oil and gas tax revenue affected individual districts differently in four alternative plans.

8. The mean mill levy for school districts that received oil and gas taxes was low in comparison to the state average local mill levy.

# CHAPTER I

## INTRODUCTION

As a result of laws enacted by the North Dakota State Legislature during the past 25 years, a certain amount of tax revenue from coal, oil, and gas was allocated to school districts in North Dakota. The revenue was generated in the form of a tax on production and was distributed by a formula described in the statutes. The portion of these revenues which went to the state general fund was distributed to school districts throughout the state. The statutes called for a percentage of such revenues to go the state general fund for statewide distribution. An additional percentage was to go to school districts in counties where mineral resources were severed.

Mineral resources were not a significant factor in generating revenue for the schools in North Dakota prior to 1951. In that year the first successful oil well was drilled on the Clarence Iverson farm in Williams County. More recently, the shortage of energy producing fuel has drawn national attention to the vast coal supply in the state. Coal mining was not new in North Dakota but has recently become a great influence on North Dakota's economy and on the economy of selected school districts in the western part of the state. This influence is anticipated to increase.

Although various minerals were mined in the state, this study was limited to the review of coal, oil and gas severance. Because of the

limited amount of available data on coal revenues and their potential impact, the major focus of the study was on oil and gas revenues. There were similarities in these mineral resources and in the statutes that dictate tax generation and distribution resulting from the severance of these resources. While this study focused upon oil and gas data, the recommendations made also applied to coal revenues and impact.

## Need for the Study

There apparently is a great deal of dissatisfaction among school administrators in North Dakota, as well as among those individuals in the public sector who are informed of the issues, concerning the present system of generation and distribution of oil and gas tax revenues in North Dakota. Winkjer (1963) stated his dissatisfaction with the formula of taxing and distribution of oil and gas tax revenues, which is still in affect at this time: "For the 1961-62 fiscal year, exempt oil property in Williams County taxed on an ad valorem basis would have yielded local government units $2,151,452 using the mill rate at that time. The generation of oil and gas tax revenue based on the present 5 percent production tax generated only $352,985." The present distribution formula for oil and gas tax revenue called for counties to receive 75 percent of the first $200,000 collected each fiscal year. The remaining 25 percent went to the state general fund. For the second $200,000 the counties received only 50 percent and the state received 50 percent. For the third $200,000 and over the counties received 25 percent and the state general fund received 75 percent. Because of the increase in the price per barrel of oil from $2.40 when the law was passed to about $14 at the time of this study the 5 percent tax on gross production caused the $200,000 figure to be reached much earlier in the fiscal year. As a result, the counties were receiving

a smaller percentage while the state general fund was receiving a larger percentage. This seems to be a continuing problem. In an interview with Olson (1978), Superintendent of Schools in Williston, the following dissatisfaction was voiced: "The $200,000 figure may have to be changed due to the increased value of oil. The state is continually receiving a larger percentage of tax while the counties are receiving smaller percentages."

During testimony at a November, 1977 advisory meeting for a project entitled, "Financing Elementary and Secondary Education in North Dakota", satisfactions and dissatisfactions were voiced regarding the posed question: "Is the distribution of oil and gas tax revenue fair in its present form?" Following are comments made by participants at this meeting:

> Yes, in most districts it is paying back for impact costs incurred during height of activity.
>
> In Billings County and other counties receiving an abnormally high per pupil tax, there should be a limit placed on the amount received per enrolled pupil, like maybe $100 per pupil. (FESEND Advisory Committee Minutes 1978)

There appeared to be dissatisfaction with state government involvement in the present form of taxation of oil and gas. During an interview with Olson (1978) the following statement was made:

> The western part of the state would have been better off if they [The North Dakota State Legislature] had allowed us to tax the additional value of the oil and gas industry as local revenue and get the impact taken care of through excess mill levy. The enrollment in the Williston Public Schools doubled and the state of North Dakota still owes us [Williston Public School District] thirty-five years of repayment for impact.

These dissatisfactions have prompted this study. It had been argued that the present formula for generation and distribution of oil and gas tax revenue does not meet the intent of the North Dakota State Foundation Aid Program. The intent of the foundation program was to

provide equal educational opportunity, as reflected by weighted dollars, for every student in the state.

An additional need for this study was outlined in federal legislation (Section 842 of Public Law 93-380, as amended) which addresses itself to providing "equity guidelines" to use in developing state foundation aid programs. Thus, this study had implications for one of the questions involved with equity in distribution of revenue and the effect that the revenue generated from natural resources had on the state foundation aid program in North Dakota. Chapter 156.15 of the United States Government Federal Register (1975) is entitled "Tax Support" and gives the following directive: "The financial assistance shall be financed by a tax system which is equitable."

Additional documentation showing the need for this type of study came from House Concurrent Resolution 1037 of the North Dakota Forty-Fifth Legislative Assembly, presented 4 January 1977, by Representative Knutson from Taylor, North Dakota. A portion of House Concurrent Resolution 1037 that pertained to the need for this study was as follows:

> Whereas, recent court decisions, (Serrano versus Priest) have focused attention on the fact that the state has an obligation to provide an equal opportunity for all students. . . .
>
> Whereas, there is a need to study the financial effect on school districts of large industrial plants, both those subject to property taxes and those subject to taxes in lieu of property taxes, including a study of deductions from State Foundation Program payment for taxes received from such plants and other sources of tax revenue. . . .
>
> Now, therefore, be it resolved by the House of Representatives of the state of North Dakota, the senate concurring therein: That the Legislative Council, with the assistance of the Superintendent of Public Instruction, is hereby directed to study the entire field of the financing of elementary and secondary schools in North Dakota, with emphasis upon the foundation program payments, and the methods of accounting and reporting used by the various schools and school districts; and
>
> Be it further resolved, that the Legislative Council makes its report and recommendations to the Forty-sixth Legislative

> Assembly, together with any legislation required to carry out such recommendations. (Legislative Research Council Document June 1977, p. 16)

Various bills, such as Senate Bill 2027, House Bill 1500, and Amendment to House Bill 1026, were introduced during the 1977 North Dakota legislative session in an attempt to further equalize the present foundation program for schools. This goal was to be accomplished by subtracting coal, oil and gas payments from state payments to school districts. Counties would serve as a conduit for the funds generated from oil and gas taxes. Because of the uncertainty regarding whether the current additional payments to school districts, resulting from the existing laws, were in fact disequalizing factors, each of the bills was defeated in favor of a study to be conducted by the Legislative Research Council during the 1977-79 interim.

## Purpose of the Study

The purpose of this study was to define "relative equity" and then propose an alternative system for more equitable financial assistance to school districts in which taxes on severed resources are substituted for taxes on increment of property wealth related to existence of resources.

## Method of the Study

Four alternative models were tested to determine the variance in the amount of state and local aid received by sample school districts. Multiple linear regression was used in this study. Comparisons of the four models were made by analyzing the present North Dakota model and the three alternative models, identified later in the study. These comparisons were made to determine which elements within each model contribute

most significantly to an equitable distribution of the severed resources. An equitable distribution will be a distribution where the average district per pupil cost was equal to the per pupil revenue generated from local, county and state revenue.

After determining the effect of elements within the present North Dakota model and the three alternative models, a composite model for generation and distribution of oil and gas tax was suggested. It was intended that this composite model would be more equitable than the present model.

A systematic sample was taken of all school districts in North Dakota which receive oil and gas tax revenue. The sample was obtained by listing all oil and gas districts by county in alphabetical order. Every third district was selected from this nonstratified list. While this approach did not meet all the assumptions of a random sampling technique, a visual examination of the districts did not suggest the introduction of any systematic error.

A sample of twenty-nine districts was used in this study. Data about the districts and about the students were obtained and validated in a number of ways.

There was a concern about aggregation problems when independent variables were used that consisted of a mixture of individual data and group data. Hannon (1970) discussed the potential aggregation problems in a publication entitled, Problems of Aggregation and Disaggregation in Sociological Research. He felt that complications are almost certain to arise when substantive specialists employ techniques of linear causal analysis. He stated, "The advocacy of the use of linear causal techniques demands an examination of the impact on inferences of those complications

which are thought to be most probable in specific substantive areas.

Some of the areas that econometricians and biometricians, who have pioneered in the development of the techniques under discussion, think will cause complications are: (1) errors in measurement (including measurement error), (2) errors of specification, (3) multicollinearity, (4) identification problems, (5) autocorrelation, (6) introduction of unmeasured variables and, (7) changes in units of analysis.

Considering the nature of the independent variables used in this study it could be argued that the assumptions that are made in the linear causal techniques may be flawed because of potential aggregation or disaggregation problem. As a result of studying the variables, a discussion of potential problems are presented in Appendix Q.

The methods used to gather the data follow. The school superintendent in each sample school district was mailed a questionnaire requesting the following information:

1. school name
2. county name
3. school identification number
4. county identification number
5. person providing data
6. method used in collecting data
7. number of students enrolled during the 1976-77 school term whose parents or guardians are employed in oil and gas related occupations
8. comments regarding abnormal impact from oil and gas related activity
9. capital expenditures for years 1951-78

An attached cover letter offered suggestions regarding alternative methods such as student records, personal knowledge or student survey that could be utilized in gathering this information. The cover letter also stressed the need for accurate data. A copy of the letter is contained in appendix J.

Time was allowed for school district officials to gather the data, then the superintendent of the school district was contacted by telephone to clarify and verify the collected data and to thank them for their assistance. A 100 percent return of the questionnaire was required for this study. All of the questionnaires were returned.

The validity of the impact data was checked through a personal interview with the school superintendent in five randomly selected school districts in the sample.

The five that were checked were selected at random from a set of random numbers. Only five districts were checked, based on the recommendation of the graduate committee. They were as follows:

1. Alexander #2 (McKenzie County)
2. Tioga #5 (Williams County)
3. Glenburn #26 (Renville County)
4. Marmarth #12 (Slope County)
5. Southheart #9 (Stark County)

The total number of producing oil wells in each sample district were gathered by identifying wells within school district boundaries from a 1976 North Dakota Geological Survey map, showing the precise locations of these wells. After the producing wells within each school district boundary were identified, each well was recorded according to the well number. The barrels of oil were counted to obtain the production

of all the producing wells in each school district. Information about all producing wells were validated by checking permit numbers with annual production reports compiled by the North Dakota Geological Survey.

The average daily attendance was gathered by calling county superintendents in counties where sample school districts were located. Average daily attendance was a statistic that was used in the present distribution formula to determine the amount of tax revenue that was due each district.

The following data were obtained or computed from official reports supplied to the Department of Public Instruction and each county superintendent: (1) average daily membership, (2) per pupil valuation, (3) district per pupil cost, (4) per pupil oil and gas revenue, (5) per pupil revenue from the county equalization fund, (6) local mill levies, and (7) total valuation. The per pupil oil and gas revenue figure is not always accurate as it is reported to the Department of Public Instruction from the school district clerk's report. To guard against inaccurate data, these data were compared with and corrected from figures supplied by the North Dakota State Tax Department.

To better understand this study, the reader should be aware that the following assumptions were made.

## Assumptions

1. By statute, education is a state responsibility; therefore, additional student impact created by oil and gas development should be funded, at least in part, from state revenues

2. A local school district should not be penalized nor favored because of oil and gas activity within the boundaries of that district

3. Taxes from mineral wealth should benefit both the state and local school district where minerals are severed

4. School districts would have a lower mill levy if their taxable valuation was higher as a result of local assessment of mineral related industries

5. Because of similarities in coal, oil, and gas activity, a model for generation and distribution of oil and gas revenues, with appropriate modification, could be applied to coal

6. The definition of "relative equity" as defined on page 12 was agreeable to the informed reader

7. The finance related variables included in this study were the basic sources of revenue and costs in the sample school districts

8. Student impact information provided by school districts was accurate as validated by phone and random checking

9. The dependent variable, average district per pupil cost, was at the present level due to local choice

## Definition of Terms

For the purpose of this study, the following terms and their definitions are pertinent:

Ad Valorem. A term that means "according to the value"; of a tax on goods imposed at a rate percent of the value

Assessed Valuation. The monetary value assigned to real and personal property by the local property assessor or the State Board of Equalization

Average Daily Attendance. The total number of days that students in a school district are in attendance divided by the number of school days

Average Daily Membership. The total number of days that all students in a school district are enrolled divided by the number of school days

County Average Level of Assessment. The ratio of assessed value of property to full market value as determined by the biennial sales ratio study

County Equalization Fund Revenue. Revenue received by the school district from the state foundation aid program and the adjusted 21 mill county levy

Comparative Local Mill Levy. The total mills levied by a local school district for general fund expenditures subtracted from the average general fund mills levied in the state

District Per Pupil Cost. The total cost of education (including capital expenditures) in a school district divided by the average daily membership in the district

Legislative Research Committees. Groups established by the legislature to hear testimony from interested parties relative to proposed legislation between legislative sessions

Legislative Research Council. (Now called Legislative Council) A group established by statute to draft bills during the legislative interim

Mineral Resources. Those products taken from the ground that have value such as coal, oil and gas

North Dakota Taxable Valuations. Fifty percent of assessed valuation

Per Pupil Oil and Gas Revenue. The school district's share of oil and gas revenue divided by the average daily membership

Per Pupil Valuation. The total taxable valuation of property in a school district divided by the average daily membership in the district

Relative Equity. The degree to which the actual per pupil cost matches the predicted per pupil cost and is shown in the multiple regression as a residual figure near zero. Whenever the income and expenditures do not match, relative equity does not exist

Severance. The act of extracting coal, oil or gas from the earth

Student Impact. The number of students that attend public schools in a district as a direct result of their parents or guardians working in coal, oil and gas related occupations

## Delimitations of the Study

The scope of this study was limited to:

1. The effects of oil and gas severance on school finance
2. The effects on school district revenue as a result of taxation of oil and gas production
3. The tax structure related to oil and gas only as it related to production of tax revenue
4. Data available from local school district, State Department of Public Instruction, State Tax Department, County Auditors, County Superintendent of Schools, North Dakota Geological Survey, and Legislative Research Council
5. Four plans of generation and distribution of oil and gas revenue

## Research Questions

1. Were sample school districts being compensated excessively, sufficiently or insufficiently for additional students generated by oil and gas activity?

2. What features of alternative systems of generation and distribution of oil and gas taxes provided more "relative equity" than the present system?

3. Was there an eclectic model of generation and distribution of oil and gas tax that would be more equitable than the present system?

## Hypotheses to be Tested

1. Twenty-nine school districts that received oil and gas tax revenue in North Dakota were compensated appropriately for the dollars lost in the ability to tax oil and gas businesses as real property.

2. There was no significant difference in "relative equity" using four alternative plans of generation and distribution of gas and oil tax revenue.

# CHAPTER II

## REVIEW OF LITERATURE

Educational finance has had as long a history as has public education. Many types of support were tried in the early colonies. Monroe (1940) reported that in Boston, a pattern was established for educating the larger population centers. Schools for elementary teaching were not supported by the town until 1819 and were not combined with the city system until 1855. Control was in the hands of a school committee on inspection. During the early 1800's lotteries and license taxes were widely used for the support of schools until it became evident that these partially hidden taxes were not sufficient to supplement the funds derived from the land grants.

Bayles and Hood (1966), in examining the early history of school finance in America, reported that public taxation gradually came into the fore with the necessary legislation for its authorization. At first such legislation was permissive, various local and state legislative bodies granting permission for groups within their jurisdiction to levy taxes for public schools. Further summarizing their thoughts they indicated that a taxing unit must have legal permission to levy a tax when a majority of its voting population was favorable. Otherwise, any taxpayer who wishes may bring court action to secure release from the obligation to pay such a tax. Permissive legislation, either citywide or statewide soon proved infeasible. Its spottiness made it too hard to initiate and too

easy to evade. The various states gradually took the legislative and judicial actions necessary to establish compulsory local and state taxation for public school support.

Certain common concepts of school finance, according to Barr (1960, p. 213) seemed to accompany the gradual development of state systems of schools. "It was necessary that the state accept the responsibility for determining the nature of the uniform system of public schools, the method of local operation, the safeguards necessary for prudent use of state and local fiscal system and to some degree the minimum standards of operation."

As the state system of education developed, there was a marked change in the means and in the attitude toward school support. "Rate bills and private subscriptions were abandoned, state and national endowments for education were increased, and the principle of taxing all property of the district for the education of the children of the district became firmly established." (Mort and Reusser 1941, p. 536)

The development of educational finance has come a long way since colonial days. Burchill (1970, p. 11) talked about the present system of educational finance.

> The present period in the development of educational finance began approximately at the beginning of the twentieth century. This has been a period of rapidly expanding sources of revenue, and a time for education of all youth. This new emphasis had its roots in the last century, but did not really expand until after World War I. The need for supplementing the property tax by means of other and newer forms of taxation, became more evident after the depression.

The federal Constitution did not make provision for the establishment of the school system. Since education was not mentioned in the federal Constitution, the responsibility was retained by the states, however,

the federal government is becoming more and more involved in education. The rationale for this involvement comes from the general welfare clause of the Preamble to the Constitution of the United States (1787, p. 1) which states:

> We, the people of the United States, in order to form a more perfect Union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this constitution for the United States of America.

The federal government's interest and impact on educational finance was demonstrated by a recent grant to North Dakota, principal investigator Dr. Richard Hill and was funded for the purpose of studying educational finance in North Dakota. The study was made possible by the Educational Amendments of 1974, Public Law 93-380. The study was, "to collect and analyze school finance data, report findings and concerns growing out of that analysis, and where justified, state conclusions and frame recommendations. The purpose was to maintain and improve equity in state funding of elementary and secondary education." (United States Department of Health, Education and Welfare, FESEND Proposal 1975, p. 32, 329)

A number of studies have been done and suggestions made regarding equitable educational finance. There seemed to be little agreement on the "one best way" to support education.

Knezevich (1975, p. 529) made the following statement regarding support for public education:

> Approaches to school support have always mirrored the times, particularly the economy and value systems of the given period, and have been modified continually to cope with emerging challanges. Early in our history a large part of school support came from nonmonetary sources. Later there was an attempt to support public education from income derived from land endowments and rents, lotteries, and gifts and bequests. Clearly, limiting school support to non-tax resources was creating a financial crisis, and a new method was tried--financing education

by means of a local property tax. By the last quarter of the nineteenth century, the local property tax had become the backbone of public school support.

Taxes levied by various governmental units were the primary sources of revenues for public education. Inflation plus greater public expectations have taken their toll on the tax dollar in all public institutions. School boards and administrators, charged with procuring adequate resources for school programs during the 1970's were encountering increased resistance to taxation from taxpayers at all levels.

At the time of this writing there was a movement taking place throughout the United States calling for a reduction in property taxes. The most notable of this movement was California's Proposition 13 which called for a substantial reduction in property taxes.

State governments were responsible, by law, for providing equal educational opportunity for all youth in the state. From this mandate came a financing process generally referred to as state foundation programs.

The concept of an equitable foundation program in North Dakota was given attention as early as 1959. Attention needed to be given to the development of a program of funding which would guard against any district being unfairly advantaged or disadvantaged financially.

Concepts such as equality, disparity, variation, and fiscal neutrality have been used in conjunction with expenditures, property tax yields, and resources. One outcome of the thinking, discussion, and research on equity has been the requirement that there be an attempt to articulate a definition of equity. It became apparent that no common definition existed. Equity, obviously could not be defined in such a way that unanimity of agreement would be achieved; however, it would be useful to examine some attempts at such a definition.

Berke (1974, p. 163) defined an equitable situation as one in which equals are treated equally. He goes on to say that "an equitable situation is one in which unequals are treated unequally."

Berne (1977, p. 2) brought out the point of value judgements as they relate to defining equity:

> It is important to point out where value judgements enter. If we can measure what is meant by "treatment" and if the population for which we are assessing equity consists of equals, then the equal treatment of equals would be the only relevant definition of equity. Value judgements would be required to determine how we measure the degree of inequality among equals and in this case the measurement of equity is the measurement of equality.

At the national level, Strayer and Haig (1923) discussed equality for tax burden when they reported that in order to raise funds for equal purpose by local and state taxation, the tax rate should be adjusted in such a manner as to bear upon all localities at the same rate in relation to tax-paying ability. They believed that citizens or businesses that could not afford to pay a tax would be unfairly burdened by local and state taxation.

The North Dakota State Constitution (1889) speaks to the issue of equity in Section 145 of Article VIII:

> The Legislative Assembly shall provide at their first session after the adoption of this constitution, for a uniform system of public schools throughout the state, beginning with the primary grades and extending through all grades up to and including the normal and collegiate courses.

A number of studies have been done in North Dakota for the purpose of looking at the equity of educational opportunity in North Dakota. These studies were significant background for the study of oil and tax revenue as they relate to the question of equitable distribution.

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the basis of his data tried to arrive at a conclusion as to whether or not a change in our taxation system was needed. In his study he showed the extent of the inequalities in wealth per child among the counties of the state. Steele County, with the highest wealth per child, had nearly 2 1/2 times the ability to support schools as Mercer County, which had the lowest wealth per child.

Benson (1948) studied taxable valuation, tax levies, and revenues of various school districts. His study indicated a lack of uniformity in the state at that time.

Cushman (1950) stated that no child should be denied the opportunity of self-realization, economic efficiency, civic effectiveness, and competence in human relationships. He spoke to the area of equal opportunity for all.

Wax (1962, p. 176) studied the amount of state and local support required for a North Dakota equalization program whereby all the children of the state have available that quality of education which was judged adequate by competent educators. He used four measures: (1) local need, (2) foundation level, (3) ability to pay, and (4) local effort. He found that the North Dakota Foundation Program at that time did not maintain an adequate support level. He also concluded that "a foundation level of $6,400 per classroom unit would adequately support the expenditure program in the schools of North Dakota." He further found that "the range in ability to support education among the local districts is so great that an equalization program is imperative."

In 1973 House Bill 2026 was passed in North Dakota in an attempt to better equalize educational opportunity for all students. The average property tax base supporting each student was $4,000. The tax base ranged

from $103 per student in the poorest district to $37,000 per student in the richest district. A mandatory twenty-one mill county levy was instituted to provide an equalizing effect within each county. The state's share in the cost of education, as an average, increased from 42 percent to 70 percent. Attention was given to additional cost related to sparsity, and it provided a system of combining state, county and local sources of revenue in the formulae for dollar distribution (Legislative Research Council Memorandum 1977).

These were neither new problems nor were they new ideas as evidenced in a study by Benson (1948, p. 29) where he stated:

> Theoretically, all the children of the state are equally important and entitled to have the same advantages; practically, this can never be quite true. The duty of the state is to secure for all as high a minimum of good instruction as possible, but not to reduce all to this minimum; to equalize the advantages to all as nearly as can be done with the resources at hand; to place a premium on those local efforts which will enable communities to rise above the legal minimum as far as possible, and to encourage communities to extend their educational energies to new and desirable undertakings.

Equality of educational opportunity was not incompatible with these concepts. Identical education was not sought for each child, but state and local government needed to provide certain minimal essentials of financial support. Local boards of education were empowered by the state legislature to go beyond providing these minimums to meet the needs of the children of their locality.

In North Dakota there was documentation of attempts to equalize educational opportunities. A Legislative Research Council Memorandum (1977) stated that the North Dakota Foundation Program for schools has been in effect since 1959. Although North Dakota provided assistance to schools for more than twenty years prior to 1959, it was the 1959 legislative session that first enacted a comprehensive program which included

uniform minimum efforts at the local level. The legislation enacted in 1959 was the result of an interim study by the Legislative Research Council. The committee recommended that the state guarantee 60 percent of the statewide cost of education with local districts providing the remainder. A county mill levy of twenty-one mills and an adjusted state appropriation provided a certain dollar amount per student. This state support gave each school district sufficient revenue to provide a hypothetical foundation level of education. Circumstances varied in school districts in that some high cost schools in the state needed to continue to operate regardless of future school district reorganization plans. With this thought in mind, the 1959 North Dakota Legislative Assembly incorporated a system of weighting the payments to favor schools with lower enrollments and higher costs. The 1959 law also recognized the higher costs for educating high school students and provided a higher weighting factor for this level.

The foundation program remained virtually unchanged from 1959 until 1973. Just prior to 1973 a concept called "fair share" was introduced by the state legislature which mandated that the amount that could be raised by a certain number of mills be subtracted from the total entitlement to each school district. A 1971 "fair share" bill was defeated, but a variation of the concept was again advanced in Senate Bill 2026, introduced in the 1973 legislative session. During this time a new problem arose.

> During the course of the 1971-73 interim study, a new element was introduced into the school finance picture. On August 31, 1971, a landmark opinion on school finance was handed down by the California Supreme Court in the case of Serrano v. Priest. The California Court held that the level of spending for a child's publicly financed education should not depend upon the wealth of the child's school district or family. The court found that as a direct result of the property tax system, the residents of a poor district often pay taxes at a higher rate than residents of more wealthy districts, and such inequities were found in violation

> of the equal protection clause of the Fourteenth Amendment of the United States Constitution. Although a similar case in Texas, Rodriguez v. San Antonio Independent School District, was later reversed by the United States Supreme Court, the view was expressed that it was not fear of court action that prompted the 1973 law but rather it was based upon the conviction that the financing of schools is a state's responsibility and that every effort should be made to provide the most equitable system of providing equal educational opportunity to all North Dakota pupils. (Legislative Research Council Memorandum 1977, p. 3-4)

In 1973 Senate Bill 2026 introduced, in addition to the "fair share" concept, some major changes in the entire program of financing elementary and secondary education in North Dakota. Some of the major features of Bill 2026 were: (1) the state appropriation for education increased state support to approximately 70 percent of the actual cost of education, (2) the weighting factors for grade schools were changed to reflect four size categories which were (a) one room rural, (b) less than 100 average daily membership, (c) 100-199 students, (d) 200-999 students, and (e) district average daily membership of 1,000 or more students. Secondary schools were also grouped into four size categories, 0-75 students; 75-149 students; 150-549 students; and above 550, (3) portions of federal impact revenue were subtracted from the state payment, (4) transportation payments were increased, and (5) the maximum mill levy for high school districts (without requiring a vote of the electors) was reduced from thirty-four to twenty-four mills.

The 1975 legislative assembly made permanent the basic concepts which were included in the 1973 law. The 1975 legislation, which also numbered Senate Bill 2026, made some changes in weighting factors which included a new classification for seventh and eighth grade pupils in recognition of the higher costs associated with junior high school instruction. Two years later the 1977 legislature enacted House Bill 1026 which changed the previous foundation program very little except

to increase the per pupil payment, provided funding for preschool special education students and increased the state's share of the transportation payment.

Various factors had impact on the intent of the state foundation program. One of these factors that needed to be examined was the potential revenue from the taxation of coal, oil, and gas. The taxation of these resources had the potential to effect the state foundation program in a disequalizing manner. To better understand the potential problems related to the taxation of coal, oil and gas, the historical development of these minerals was analyzed.

## History of Coal, Oil and Gas

Regarding the mineral development outside North Dakota, Christopherson (1953, p. 4) outlined early oil and gas development in the United States.

> The commercial production of oil and gas in the United States began with the completion of Colonel Drake's first well at Titusville, Pennsylvania, in 1859. However, the first inception of the modern oil industry dates back to 1857 to Romania's production of 2,000 barrels. Canada first produced oil in 1862, Russia in 1883.

Oil and gas activity in North Dakota took place on a very small scale prior to the 1950's. For example as early as 1907, gas was discovered nine miles south of Westhope, North Dakota (Schaff 1962).

Babcock (1891, p. 15) gave a sense of the feeling about mineral resources at the turn of the century in the following statement:

> The existence of extensive beds of coal in North Dakota has been known for some time. New finds are continually extending the known area of coal deposits, and still there is undoubtedly a vast extent of coal in North Dakota not yet absolutely known.
> . . . . . .
> North Dakota alone has, without doubt, enough coal to supply herself and less fortunate neighboring states for years, probably centuries

to come.

. . . . . .

Numerous rumors of oil have been afloat, but I have not been able to see any indications of such, nor could one reasonably expect oil in a district with such formations and physiography.

Barger (1937, p. 5) stated that "various reports indicated a presence of small amounts of oil and gas. Geological findings show the possibility of oil promising."

Schaff (1962) reported that on April 4, 1951 Amerada Petroleum Company struck oil on the Clarence Iverson farm. This well was North Dakot's first successful oil well. According to North Dakota Facts and Figures (1976), 1,671 wells were producing oil and gas in fifteen counties. These wells pumped in excess of 20 million barrels annually. Exploration and drilling have taken place in all but three of the fifty-three counties in the state. The three counties were Cass, Trail and Ransom. Approximately 5,769 North Dakotans were employed in the petroleum industry in North Dakota in 1976. Petroleum accounted for 73 percent of the value of all minerals produced in the state. The average daily production per well was 44.1 barrels. There were also extremes to the forty-four barrel average. In an area near the North Dakota Badlands, drillers at the Slaaten and Thorlackson wells in McKenzie County were producing more than 2,000 barrels (forty-two gallons per barrel) daily. This amount of production was the exception rather than the rule.

Regarding reserves, production and national ranking, North Dakota had 600 million barrels of proven reserves of oil and gas liquids underground in 1976. North Dakota ranked eleventh in the nation in annual production of oil which was refined to produce gasoline, jet fuel, kerosene, heating oil, diesel fuels and LP gas. Williams County was the leading county in the state in the production of crude oil.

According to an article in the United States Bureau of Mines 1974 Yearbook (1976) oil production began in 1951 and by 1966 was producing 27.1 million barrels per year. In 1975, production of oil in North Dakota reached 30.5 million barrels (North Dakota Geological Survey 1976).

The development of oil had a substantial effect on the state's economy, accounting for more than 1,700 new jobs in the 1950's. Employment declined slightly in the 1960's primarily because of a decrease in exploration-related employment and petroleum-production employment. This reduction was partially, but not completely, compensated for by increases in employment in the petroleum-extraction service industry and by a small increase in employment in petroleum refining. Employment in extraction of oil has remained virtually constant since 1970 even though one would expect the oil industry employment to decline once production began. This stabilization was probably attributable in part to increased exploration activity in response to higher petroleum prices.

While coal was not the focus of this study, the relationship to oil and gas was similar enough to justify the review of the coal industry along with the oil and gas industry. Coal received major attention in North Dakota during the seventies as an alternative energy source was sought. As one looked at the historical background of coal in North Dakota, it was noted that, Loundsberry (1901, p. 5), founder and publisher of the Bismarck Tribune, made the following statement: "There is enough coal in North Dakota to warm the entire population of the United States for 10,000 years."

An article, "History of Coal in North Dakota" (1977), stated that historians agreed that without the abundance of lignite as a cheap,

readily accessible fuel, settlement of the state's treeless plains would have been severely inhibited. Hendrickson (1977), a reporter for the Tribune, made the following statement: "Lignite was not only an aid for early pioneers but also attracted people to the state who saw a profitable investment in its commercial production."

Oihus (1978) stated that the United States Geological Survey reported total production in 1900 at 129,883 tons per year, but she believed her research had revealed that the figure was in error, far short of the actual total. She noted that the Mouse River Mine alone was capable of producing 75,000 tons per year. Her research showed that with the major impact of North Dakota coal development yet to be felt, total coal production in 1976 was nearly 20 million tons per year.

A publication by the North American Coal Company (1977, p. 1) stated:

> Coal, long a part of North Dakota's heritage, is bringing exciting change to the state today. A national energy shortage coupled with new coal utilization techniques means North Dakota can begin supplying significant quantities of energy to the nation. Coal development will bring new jobs and a high standard of living. North Dakotans want to preserve the land as well as reap the benefits of coal.

In a publication entitled, North Dakota Public Investment Plan (1977, p. 15) the following statement was made about coal:

> Lignite has been mined for a number of years in North Dakota for domestic purposes, both as a heating fuel and as a boiler fuel for electrical generation. However, recent years have seen fundamental changes in the nature of the coal sector in North Dakota and this resource has become an increasingly important part of the state's export base.
>
> Coal production decreased between 1950 and 1960, mostly because lignite was being replaced as a heating fuel by natural gas. However, production more than doubled from 1960 to 1970 as a number of large coal-fired electrical generating plants were built. Production has almost doubled again since 1970 as

additional generating plants have been built at, or very near, the lignite mines. North Dakota's lignite has two major markets other than generating plants: the sugar beet processing industry and power generating plants outside the state.

Of the total of 2658 megawatts of lignite-fired generating capacity in the state (under construction or on line), only 13.5 megawatts were developed before 1950; another 136 megawatts were developed in the 1950's; the 1960's saw an increase of 389 megawatts; and 683 megawatts of generating capacity are under construction and scheduled for completion by the end of the decade.

## Taxation of Mineral Resources

Mineral resources are a commodity that have value. Vaughan (1922, p. 435) spoke to the issue of taxation of mineral resources in the following statement: "It is a cardinal rule which should never be forgotten that whatever property is worth for the purpose of income and sale, it is also worth for the purpose of taxation."

Principles of taxation were difficult to agree upon. Therefore, the taxation of mineral resources was not free from difficulty either. Stannard (1961, p. 28) stated that the guiding principal of taxation should be that, "benefits received should be related to both the tax revenues furnished and the need."

Spaeth (1949, p. 73) speaking on taxes, stated that the present and future revenue needs of all branches and subdivisions of government must look at the same general source of all taxes, namely, the income and wealth of the people of the state and nation. "Consideration of the tax structure must be based on the goal of achieving a just coordination in the requirements of the local, state and federal government; and the objectives must be the equitable distribution of the burden of the taxes levied to meet these requirements."

In order to better comprehend alternatives in taxation of natural resources, one needed to look at other tax structures in other states

regarding the taxation of mineral resources. Spaeth (1948, p. 41) mentioned iron ore, a valuable mineral in Minnesota in 1940. He stated: "Iron ore was taxed on an ad valorem basis of 50 percent of true value. These taxes, like the regular real estate taxes throughout the state, were levied principally for the financial support of municipalities and school districts."

Some of the problems related to the taxation of mineral resources were recognized very early by Vaughan (1922, p. 435): "The assessment of mineral lands and resources on an ad valorem basis is very complex and difficult. It is, at best, a job for the experts who are specialists in petroleum engineering or in petroleum geology."

In order to comprehend alternatives in mineral taxation, especially coal, oil, and gas, the writer looked at tax structures within selected states that were involved in the taxation of coal, oil, and gas. Previewing legislation that had been enacted in selected states, the investigator found that most states had some form of taxation of coal and oil. There was a great deal of variety in the form of taxation from state to state.

Selected states were contacted through their State Tax Department (1978). The states that were contacted were Maryland, Tennessee, Utah, Michigan, Montana, Wyoming, Illinois, Colorado, West Virginia, Virginia, and Kentucky. Information from these states was summarized below and on table 1.

A wide variety of methods of generation of tax revenue from coal, oil, and gas were found to be in use were: (1) local assessment of property based on a value that had been established by capitalizing the income generated, (2) assessment and taxation of mineral rights,

(3) licenses, registration fees, and permits, (4) severance tax based on a specific dollar amount or percentage, (5) sales tax, (6) gross proceeds tax, (7) retailers occupation tax based on selling price, (8) excise tax, and (9) percentage tax on gross income.

The generation and distribution of revenues had certain similarities from state to state (See table 1). Most states had enacted legislation which provided for a percentage of the revenue to go to the state general fund or to specific state funds for assistance after depeletion of mineral resources or to both. Most states assured that counties and local subdivisions, such as cities and school districts would share in the tax wealth generated from the severed resources (FESEND Monograph 1978). The method of revenue distribution varied from state to state and seemed to be determined by legislative philosophy and intent. The literature showed that there were differences in perception regarding the amount of revenue that should go to the state, the county, the municipalities and the school district. These differences tended to reflect a variation in philosophy regarding whether natural resources were the property of the state or the local subdivision. Another taxation issue was related to the amount of impact subsidy to which the various levels of government were entitled.

Droege (1960) reviewed the early discussions regarding taxing of oil. A summary of this review showed that, because the discovery of oil in North Dakota occurred late in 1951, no action could be taken on oil policies by the state legislaure until they reconvened in 1953. The Legislative Research Committee on Finance and Taxation (1952) believed that the severance tax was the most equitable and applicable tax

TABLE 1

SUMMARY OF GENERATION AND DISTRIBUTION OF MINERALS RESOURCE TAXES IN SELECTED STATES

| State | Type of Tax | Percentage | Distribution | Special Fees |
|---|---|---|---|---|
| Maryland | Local option severance | Up to 1% of gross receipts | State General Fund | Registration |
| | State Income Tax | 7% of net earnings | | |
| | Local property tax | | | |
| Tennessee | Local option severance | Up to 1% of gross receipts | State General Fund | Report |
| | Income tax (state) | 6% net earnings | | |
| | Severance | 20¢ per ton of coal severed | | |
| Utah | Property | Value based on income from property | State General Fund | |
| Iowa | Property | Minerals are assessed separately from other property | State General Fund | License fees |
| | Franchise Tax | | | Drilling Permit |
| Michigan | Sales Tax | Four percent | Sixty percent to schools | |
| Montana | Severance | Thirty percent of value | Ten percent for schools | Five cents per mining fee |

TABLE 1--Continued

| State | Type of Tax | Percentage | Distribution | Special Fees |
|---|---|---|---|---|
| West Virginia | Local option severance tax | 1% of gross receipt | | Registration |
| | Income tax (state) | 6% on income of producers | State General Fund | |
| | Local property tax | | | |
| | State severance tax | 3.85% of gross proceeds | | |
| Kentucky | Local option severance | 1% of gross receipts | | Registration |
| | Severance | 4% of gross value | State General Fund | |
| | Income Tax (state) | 4-5.8% of net earnings | | |
| | Gen. State Property Tax | | | |
| | Local Property Tax | | | |
| Virginia | Local option severance | 1% of gross receipts | | Report fees |
| | Income Tax (state) | 6% of net earnings | State General Fund | Local severance |
| | Intangible Tax | .30 per 100.00 of capitol value | | License |

TABLE 1--Continued

| State | Type of Tax | Percentage | Distribution | Special Fees |
|---|---|---|---|---|
| Wyoming | Ad valorem on value of gross production | Locally assessed and current mill levy applied | According to mill levy | None |
| | Severance | Nine and seven tenths percent of gross value mined | | |
| Illinois | Retailers occupation tax | Five percent of selling price | State general fund | |
| Colorado | Gross income on metals | 2.25 percent | | |
| | Gross income on oil and gas | sliding scale of two to five percent | 100 percent to State General Fund | |
| | Severance on oil shale | 4% tax on gross proceeds | 40% State General Fund<br>40% State Severance Tax Trust Fund<br>20% to local government severance tax fund | None |
| | Coal gross production | $3.85 per 100.00 gross value production | 75% counties<br>25% state | |

to apply to oil production in North Dakota to get the oil companies to carry their fair share of the tax burden.

On 10 October 1952 the legislative committee met in the hearing room of the North Dakota State Capitol to conduct a hearing on oil and gas regulatory laws. Discussion centered around the possibility of adopting a new model oil and gas conservation act. The generation and distribution of oil and gas tax revenues were also discussed.

On 19 November 1952, the Legislative Research Committee on Finance held another meeting on oil and gas taxation. Pearce (1952, p. 4) expressed the opinion of the North Dakota Gas and Oil Association stating that North Dakota, in this early stage of development, would do well to take no steps in regulation or taxation which would discourage or slow down the development of North Dakota oil and gas revenues. He recommended that the North Dakota tax structure be such that the local political subdivisions, in which the oil was produced, share in whatever tax was placed on oil and gas so that they might be compensated for the additional expenses that fall upon them through exploration and development. He further recommended that the state share in revenues over and above those necessary to compensate the local political subdivisions for their added burdens.

Haines (1952, p. 4) recommended that North Dakota consider adopting an ad valorem tax similar to that used in Nebraska. Duckworth (1952, p. 4) recommended that the state adopt a gross production tax in lieu of an ad valorem tax, similar to that used in Oklahoma. Dedmen (1952, p. 4) agreed with Duckworth and suggested that the tax on the oil be 2.3 percent of value per barrel of oil produced. He advocated an equitable distribution of oil and gas tax revenue among the state, counties, and

school districts. He recommended that the oil and gas tax revenue paid to the state be divided between the state, counties and school districts on a sliding scale formula so that, during the years of high expense for the local governments and low production, a larger share of the available revenues would go to the lower units of government. Later, a larger percentage would go to the state general fund for statewide distributions.

Boone (1952, p. 4) asked the legislative research committee to create an atmosphere which encouraged North Dakota investments in the oil and gas industry. He felt that an initially high tax rate would make it economically unfeasible to develop the oil industry in the state.

In response to this testimony, the 1953 legislative research committee recommended a tax of 4 percent on the gross value of oil at the wellhead, plus 1/4 of 1 percent to cover the cost of regulation. Later in 1953 the State Legislature adopted this recommendation. The 1/4 of 1 percent that was imposed for administration was raised to 1 percent in 1957. The total tax then became 5 percent of the value of the oil at the wellhead.

The North Dakota Century School Code (1971) outlines a portion of the statute that describes the generation and distribution of oil and gas tax which became law in 1953. The statute is stated as follows:

> 57-51-15 "APPORTIONMENT AND USE OF PROCEEDS OF TAX" The gross production tax provided for in this Act shall be apportioned as follows, to with:
>
> 1. First an amount equal to one-quarter of one percent of the gross value at the well of the oil and gas upon which a tax is collected under this Act shall be deposited with the state treasurer, who shall credit it to the general fund.

2. The first two hundred thousand dollars of annual revenue after the deduction of the amount provided for in subsection 1 of this section from oil or gas produced in any county shall be allocated seventy-five percent to that county and twenty-five percent to the state general fund. The second two hundred thousand dollars of annual revenue after the deduction of the amount provided for in subsection 1 of this section from oil or gas produced in any county shall be allocated fifty percent to that county and fifty percent to the state general fund. All annual revenue after the deduction of the amount provided for in subsection 1 of this section above four hundred thousand dollars from oil or gas produced in any county shall be allocated twenty-five percent to that county and seventy-five percent to the state general fund.

3. Forty percent of all revenues allocated to any county hereunder shall be credited by the county treasurer to the county road and bridge fund. Forty-five percent of all revenues allocated to any county shall be apportioned by the county treasurer quarterly to school districts within the county on the average daily attendance distribution basis, as certified to him by the county superintendent of schools. Fifteen percent of all revenues allocated to any county hereunder shall be paid quarterly by the county treasurer to the incorporated city and village according to the last official decennial federal or official state census.

On 13 December 1953 oil counties received their first tax benefits. Residents of Williams County were returned $53,189 of the $79,000 tax revenue generated by oil production. School districts in Williams County divided $23,935.05 based on the average daily attendance of the districts.

The amount of oil and gas tax revenue has increased steadily since 1953. During fiscal year 1975 North Dakota oil and gas production taxes totaled $6.8 million. Counties received $2.7 million and the state $4.1 million in production taxes in fiscal year 1975. From the time oil was first discovered in 1951 through 1975, the oil and gas industry had paid more than $64.5 million in gross production taxes.

The distribution of revenue generated by the oil and gas tax was not free from difficulty. Discussion at the Legislative Research Committee on Finance and Taxation (1952) suggested that a part of the revenue should go to the state of North Dakota because one of the natural resources of the state was being depleted.

At the same hearings it was suggested that, in addition to the revenue that went to the state general fund, a certain amount of the revenues from the oil and gas tax should go to local subdivisions such as counties, cities and school districts because of impact caused by production. Impact on counties was partly through wear and tear on the highways created by the hauling of heavy drilling equipment. Another impact on the local counties and on school districts was through the influx of oil workers with their families; thus, there was an increased need for municipal and school facilities and services.

Additional discomfort was felt by local subdivisions due to an inflated economy resulting from high salaries paid by oil and gas companies. In an interview with a Superintendent of Schools from western North Dakota, the following point was made regarding economic impact in school districts where oil and gas activity is taking place. "A factor that very few people ever take into consideration is that we have to pay our bus drivers and custodians $10 per hour in order to compete with the salary paid on the oil rigs." (Pearson, 1978)

There was no exact measure or standard upon which to base the distribution of the oil and gas tax revenue in order to respond appropriately to impact resulting from oil and gas development. Manifestly, the local subdivisions felt the impact most severely during the early stages of development. Ultimately, the increase of population would

bring an increase in the tax base, but that increase would lag several years behind the demand for public services. Hence, it has been argued that a greater share of the tax should go to the local subdivisions during the early years of production.

In the early years of oil activity (1951-55), impact was felt through additional population in areas where oil activity took place. The population of Williston, North Dakota, increased by 32 percent from 1950-54. The population in Ray, North Dakota, increased by 100 percent during the same period of time. Tioga's population has increased the most of any of the cities in the Williston Basin, a 450 percent increase, and even Stanley, at the periphery of the oil and gas activity, grew by 11 percent (Schaff 1962).

The impact caused problems that were difficult to "gear-up" for because of the speed at which the impact was happening. Even though some money was being generated from oil tax revenue, there also were high expenditures. For example, in 1952 Williston constructed a $480,000 water and sewer facility, a $3 million water reservoir and a $113,000 street lighting project. During the five year period between 1951-56, Williston constructed $740,000 worth of school facilities in addition to the utilities.

It was very difficult to determine if these projects were the result of need or the result of opportunity. Records obtained from the Williams County Superintendent of Schools showed a history of stable growth up to 1951. Following the discovery of oil in 1951, the population increased substantially during the next ten years. According to local residents, no other industry explained this increase in growth during this period of time. It was concluded, certainly with contrary

arguments, that the majority of the construction was due to impact from the oil and gas activity.

The following records were obtained from the Williams County Superintendent of Schools. The data on table 2 was used to analyze "people impact" resulting from oil and gas activity.

In an interview with Anderson (1978) points were made regarding student impact in Ray, North Dakota, since the oil boom began in 1951:

> In 1952 things began happening. Between 1952-62 there was a lot of drilling. The town of Ray had five trailer courts full of kids (about 200 trailers). Mostly young couples lived in these trailers with lots of kids. School facilities weren't large enough. High School burned down in 1948 [sic]. In 1951 we built a gymnasium and four classrooms. In 1954 the new addition cost $112,000; in 1957 another addition cost $85,000; 1965 another addition cost $190,000; in 1978 we built new offices and music rooms at a cost of $180,000.

Anderson was asked whether it was possible to separate "need to build" from "opportunity to build". It was his impression that the 1951, 1965 and 1978 building projects were due to student impact related to gas and oil activity. He also stated his belief that the oil and gas production tax (5 percent) was not sufficient for capital expenditures. The local district needed to increase its bonded indebtedness in order to construct building additions. In 1951, $52,000 was spent for capital expenditures; $20,000 was spent in 1954; $53,000 was spent in 1957; $113,000 was spent in 1964; $150,000 was spent in 1976.

Anderson (1978) stated: "There was a great deal of uncertainty about whether people were going to stick around. As a result of this uncertainty, the city auditorium and churches were used during the oil boom as new buildings were being constructed."

TABLE 2

SCHOOL ENROLLMENTS IN WILLIAMS COUNTY--1945-75

| Years | Williston | Nesson | Eight-Mile | New #8 | Tioga | Cottonwood Lake | Epping | Wildrose | Grenora |
|---|---|---|---|---|---|---|---|---|---|
| 1945-46 | 1,509 | 205 | 120 | 541 | 153 | 107 | 59 | 107 | 190 |
| 46-47 | 1,531 | 216 | 137 | 511 | 147 | 104 | 64 | 104 | 207 |
| 47-48 | 1,528 | 218 | 101 | 487 | 146 | 125 | 63 | 110 | 198 |
| 48-49 | 1,544 | 213 | 125 | 472 | 157 | 110 | 79 | 113 | 187 |
| 49-50 | 1,570 | 206 | 112 | 470 | 149 | 109 | 79 | 127 | 166 |
| 40-41 | 1,493 | 234 | 140 | 644 | 168 | 147 | 86 | 177 | 200 |
| 35-36 | 1,496 | 235 | 85 | 1,087 | 199 | 175 | 126 | 186 | 217 |
| 30-31 | 1,434 | 320 | 75 | 1,600 | 220 | 142 | 155 | 323 | 208 |
| 50-51 | 1,728 | 215 | 111 | 472 | 160 | 102 | 88 | 132 | 228 |
| 51-52 | 1,664 | 246 | 114 | 485 | 187 | 107 | 88 | 138 | 213 |
| 52-53 | 1,972 | 393 | 117 | 481 | 350 | 115 | 97 | 148 | 238 |
| 53-54 | 2,239 | 413 | 134 | 491 | 515 | 118 | 104 | 145 | 233 |
| 54-55 | 2,315 | 413 | 155 | 491 | 601 | 119 | 108 | 155 | 245 |
| 55-56 | 2,276 | 349 | 174 | 471 | 584 | 115 | 104 | 151 | 240 |
| 56-57 | 2,345 | 333 | 166 | 478 | 601 | 114 | 102 | 160 | 243 |
| 57-58 | 2,482 | 340 | 175 | 480 | 616 | 118 | 96 | 150 | 264 |

TABLE 2--Continued

| | Williston | Nesson | Eight-Mile | New #8 | Tioga | Cottonwood Lake | Epping | Wildrose | Grenora |
|---|---|---|---|---|---|---|---|---|---|
| 1958-59 | 2,588 | 332 | 181 | 498 | 700 | 116 | 98 | 141 | 251 |
| 59-60 | 2,769 | 322 | 165 | 469 | 763 | 135 | 101 | 146 | 255 |
| 60-61 | 2,936 | 307 | 150 | 436 | 797 | 143 | 104 | 165 | 268 |
| 61-62 | 2,986 | 328 | 165 | 377 | 788 | 140 | 113 | 203 | 271 |
| 62-63 | 3,066 | 354 | 163 | 344 | 894 | 135 | 136 | 191 | 346 |
| 63-64 | 3,144 | 364 | 156 | 327 | 898 | 147 | 146 | 190 | 350 |
| 64-65 | 3,254 | 384 | 142 | 304 | 939 | 141 | 139 | 180 | 340 |
| 65-66 | 3,344 | 400 | 132 | 296 | 948 | 149 | 124 | 177 | 338 |
| 66-67 | 3,252 | 421 | 144 | 257 | 908 | 136 | 119 | 153 | 346 |
| 67-68 | 3,329 | 413 | 145 | 225 | 884 | 133 | 120 | 139 | 339 |
| 68-69 | 3,464 | 413 | 129 | 227 | 873 | 116 | 105 | 126 | 336 |
| 69-70 | 3,451 | 431 | 136 | 218 | 829 | 123 | 108 | 122 | 323 |
| 70-71 | 3,419 | 392 | 153 | 184 | 787 | 113 | 99 | 125 | 307 |
| 71-72 | 3,362 | 365 | 158 | 156 | 737 | 111 | 91 | 125 | 290 |
| 72-73 | 3,267 | 333 | 166 | 159 | 693 | 100 | 76 | 120 | 277 |
| 73-74 | 3,171 | 307 | 163 | 150 | 672 | 94 | 64 | 118 | 250 |
| 74-75 | 3,041 | 289 | 163 | 163 | 637 | 95 | 58 | 116 | 232 |

Wilson (1978) discussed impact and taxation of the oil industry in an interview at Tioga, North Dakota on 5 June 1978. The following statements were made regarding oil and gas activity: "The peak year for enrollment was 1965 in Tioga. Enrollment is more stable now and much easier to plan for. A source of revenue for financing additional enrollment would be workover rigs which are not presently taxed in our community and are worth about $400,000 per rig."

In an interview with Olson (1978), Superintendent of Schools in Williston, people impact in Williams County was discussed. Olson believed that the communities of Tioga, Ray and Williston received most of the people impact in Williams County. He went on to say:

> It is tough to decide whether impact is positive or negative. We know that the pupil increase in 1952 was due to oil and gas development because there was no other industrial development or expansion in Williston at that time. Oil and gas production tax was not sufficient for the additional capital expenditures. We are still retiring bonds that were sold to build school buildings during 1951-67. These buildings were constructed to take care of the student population increase due to the influx of oil and gas people. (Olson 1978)

There seemed to be a great deal of dissatisfaction in North Dakota with the present generation and distribution of oil and gas tax revenues. Statements from various informed sources substantiated that there was a need to revise present legislation concerning gas and oil taxation and distribution.

During the 1963 legislation session, North Dakota lawmakers were challanged by a group from Williams County to look at the distribution formula that was in existence at that time. A group of school district personnel and concerned citizens testified that the local subdivisions were not receiving a large enough share of the oil and gas tax revenue.

Winkjer (1963), attorney, legislator and local resident from Williston, presented data which showed that for the 1961-62 fiscal year, exempt oil property in Williams County taxed on an ad valorem basis would have yielded local government units $2,151,452 based on the existing mill rate. The 1961-62 form of taxing, which was still in existence at the time of this study, provided only $352,985. Data were also presented that showed in 1961-62 the North Dakota general fund received 65.2 percent of the oil production tax. On an ad valorem basis the State of North Dakota would have received less than 4 percent of the tax on the exempt real and personal property located in Williams County.

Alternate bills were introduced in an attempt to ameliorate the dissatisfaction but with a recommendation that further study be done. In 1978 there were still dissatisfactions with the existing statutes. For example, in an interview with the Superintendent of Schools from Williston the following dissatisfaction was voiced:

> The $200,000 figure may have to be changed due to the increased value of oil. The state is continually receiving a larger percentage of the tax while the counties are receiving a smaller percentage. In 1973 the state and counties each received about 50 percent of the tax revenue. In 1977 the counties were receiving about 34 percent of the tax and the state general fund received about 66 percent. (Olson 1978)

Voicing another dissatisfaction, Wilson (1978) believed that erratic payments of tax revenue from the county treasurer made budgeting difficult. He pointed out there was an uncertainty about the dollar amount his school district would receive each quarter. In checking with the State Tax Department, the writer learned that the erratic payments from quarter to quarter and year to year are due to the present formula for distributing the state and county's share. Burian (1978), Deputy Tax Commissioner, felt that a better understanding of the present formula

by school administrators and county officials would facilitate planning and budgeting at the local level.

Additional dissatisfactions were voiced at a FESEND Advisory Committee Meeting held at Carrington, North Dakota, in November of 1977. The purpose of the meeting was to ask FESEND Advisory Committee members to advise a study entitled, Financing Elementary and Secondary Education in North Dakota (FESEND Study). Two questions were asked of the group. The first question asked whether they thought that the present method of distribution of oil and gas tax revenue was fair. The second question was the same except it referred to coal. Responses were as follows:

> "Yes, in most districts it [oil and gas tax] is paying for impact costs incurred during height of activity in the fifties. State still owes school districts in oil and gas areas thirty-five years of back-payment.
>
> "There should be a limit placed on the amount of tax revenue received in counties where they are receiving an abnormally high amount of oil and gas tax per pupil.
>
> "People in the west feel that the right to tax the oil industry as local property was taken out of their hands so they lost a great deal of revenue over the past 25 years in the form of local and real property tax.
>
> "The state is getting a much larger percentage every year because of the increase in price of oil. It takes less time to reach $200,000 limit [at which time the state and local percentages change].
>
> "The western part of the state would have been better off if they [local school district] had just been left alone to tax it [the additional value] as local revenue and get the "impact" taken care of chrough excess levy. Williston doubled enrollment so the state of Norch Dakota still owes them thirty-five years of repayment for impact.
>
> "Because of impacts on school and community, they [local school districts] deserve every bit that they get.

"Coal is part of the wealth in the county where it is found, so even though there is no impact the county should still get the revenue.

"Communities receive benefits from the impact of people. The larger the community and the slower and impact, the more easily the impact can be absorbed.

"Something needs to be done in school districts where there is great impact and very little money to help counties "gear-up" for impact.

"The Coal Impact Office should be able to take care of the impact because this office was intended to provide grants to counties for capital and extra-ordinary expenditures.

"With some counties receiving very high amounts, they will tend to disequalize the state foundation program.

"A large portion of coal revenue needs to go to a state trust fund for the time when coal is gone. We should allow schools to borrow from this fund at a low interest rate." (Financing Elementary and Secondary Education Project 1978)

When looking at alternative methods of taxing oil and gas there was a need to be cognizant of those methods that were available, workable, tested, and potentially equitable. Before discussing the alternate methods of taxing mineral resources, unique characteristics of mineral resources such as coal, oil and gas are discussed.

## Characteristics of Mineral Resources

Christopherson (1953, p. 48) identified certain distinguishing features of mineral resources in the following statement:

Mineral resources including oil and gas have several distinguishing features which make them essentially different from other forms of property and wealth. In the first place, the minerals are used up in the process of being removed from the earth. When taken from the soil or water they are gone forever so far as those particular deposits are concerned.

Another distinctive characteristic of mineral deposits was that satisfactory appraisals or valuations often were extremely difficult if

not impossible, to determine. Being underground, its value could be merely estimated relative to both quantity and quality.

> It is very difficult if not impossible to predict with any real accuracy the oil reserve in each county in the state. The amount of oil reserves will be predicted at a different amount each time someone different does the predicting. (Folsum 1978)

A third characteristic of mineral deposits was that they were usually located in one section of a state. This form of property was not distributed as evenly throughout the state as were other forms of wealth.

Christopherson (1953, p. 58) made the following statement about taxing of mineral resources:

> Being a heritage of the state, an exhaustible natural resource should be taxed in such a manner and amount as to reimburse the state which is entitled to a very substantial amount of revenue for the impoverishment of its resources and the great increase in its regulatory problems and expenses. This argument is said to be especially significant when mines and oil wells are owned and operated by absentee capital or when raw materials are exported directly from the state. Many of the large mineral properties are owned and operated by out-of-state capital. Hence, the taxation trend seems to reflect an indirect effort to recover some of the natural wealth which has been taken over by the private interests.

Oil and gas were a type of one-time harvest and measures needed to be taken to insure that this commodity was not exploited by outside interests without due reimbursement to the state. The taxation of mineral resources raised philosophical questions that needed to be answered. Following are advantages and disadvantages of alternative methods of generating revenue by taxing mineral resources. The distribution of tax revenue from mineral resources may take the form of formula distribution, tax on property, or distribution of tax revenue according to amount of impact.

## Alternative Methods of Taxing Mineral Resources

### Severance Taxes

The severance tax was a levy placed on the production of oil and gas and other minerals as they were severed from the earth.

> A severance tax should be imposed on the value of the units of output at the source according to a schedule graduated by difference of costs of extraction. The new kind of tax, in order to function effectively, would have to imposed and administered by the state. (Kendrich 1951, p. 279)

Severance taxes were either fees to cover services of supervision, regulation, or inspection, or they were a method of taxation that had been developed as a substitute, or in lieu of the property tax. The severance tax basically served to reimburse a state for the right to remove minerals from its control. The severance tax was traditionally administered by a state or local agency. Historically, however, the desire for additional state revenue had frequently outweighted the philosophical reasons for the tax and in many cases had been the sole criterion for its application.

The theory that natural resources were a part of the common heritage of all people was frequently used to justify severance taxes. The scope of imposition of severance taxes is shown as follows:

> A severance tax is a tax on the privilege of extracting natural resources from soils and water. Currently, in the United States, at least thirty states impose, some form of severance tax. According to data recently released by the United States Department of Commerce, revenues accruing to state and local governments from such a tax totaled almost $1.3 billion in fiscal year 1974. Most of this revenue was generated through levies imposed on the extraction of coal, oil and natural gas. (Brown 1975, p. 1)

Usually a severance tax was levied to facilitate control of certain activities, to discourage consumption of individual commodities,

or to compensate society for additional costs that some activities entail. Among the positive features of a severance tax was that it usually was easy to administer. This was true because of the manner in which the rate was applied to volume measures such as gross receipts or tonnage values. Brown (1975, p. 3) spoke of advantages of a severance tax:

> In addition to the ease of administration, perhaps the most attractive aspect of a severance tax is that it is imposed on immobile factors of production (i.e., natural resources). To the extent that these resources are either owned by nonresidents or are transferred out of the taxing jurisdiction in commerce, the tax represents one of the few opportunities for the taxing authority to shift the burden of taxation to areas beyond its jurisdictional boundaries.

Dorgan (1977, p. 13) defended the severance tax as a method of taxing mineral resources. He stated that the development of resources such as coal, oil and gas created three distinct needs:

1. The need to replace or complement traditional taxes, particularly the property tax, in the financing of ordinary costs that are basic to any kind of increased industrial development. The basics are such things as schools, roads, health care, law enforcement, recreation, etc.

2. The need to implement some kind of "industry specific" tax that would place a dollar value on some of the previously unacknowledged costs that are extraordinary and unique to mineral development.

3. The need to establish a form of compensation for the cost to future generations of losing a non-renewable resource.

Although a severance tax may embody all of the positive characteristics discussed earlier, no tax is without its drawbacks. The negative aspects of the severance tax appeared to focus on four critical problems.

First, the imposition of a severance tax represented a deviation from the recent trend away from excise taxation and toward an increased

reliance on broad based taxes which were responsive to general economic activity. On this basis, it could have been argued that it singled out one type of commerce for purposes of taxation.

Second, a severance tax was usually levied on the basis of gross receipts or tonnage values. While these figures reflected total number of transactions, they often showed little relationship to the taxpayer's overall profitability. Such was the finding of a 1970 study on the West Virginia coal turnover tax which compared the relationship between net income before taxes and gross receipts. Alvis (1970, p. 7) of the Bureau of Business Research at the University of West Virginia concluded:

> The consequences of a flat tax rate of 1.35 percent of total receipts applied to all firms differ greatly among firms according to their size, ranging from hastening or perhaps even triggering bankruptcy where firms are suffering losses, to simply some reduction in the rate of net profits in others.

Third, an undesirable effect of a severance tax occurred when the tax was shifted forward to final consumers. In the event of such a shift, wide differences may arise in the total amount of tax included in the price of various products, (e.g., electricity, gas and oil).

The fourth criticism of severance taxation concerned the instability of tax collections. Revenues from a severance tax, like those from many narrow-based taxes, fluctuated widely from year to year. This variation in tax revenue was due to the fluctuation in the output of the product and the price from year to year.

A variety of rationale were used in defending the uses of severance taxes. In studying legislation from the state of Colorado, it was found that the 1977 Severance Tax Act, House Bill 1076, was enacted by the Colorado General Assembly to serve two purposes.

Frick (1977, p. 2) summarized the purposes of Colorado Mineral legislation when he stated that it was intended to: "(1) recover a portion of the wealth lost in resources, and (2) generate revenues necessary to assist local governments in mitigating the impact of resource development."

One tax authority, Crockett (1948, p. 228) has said that "when all factors are considered, the severance tax is superior to the ad valorem method of taxing mineral resources. When some of the disadvantages of a severance tax were examined the severance tax with a moderate ad valorem tax for local purposes was probably desirable."

In North Dakota philosophies differed in regard to the question of who owned the mineral resources found within the boundaries of the state. The geographical location of the group seemed to determine whether they felt that the severance revenue should be shared equally by all citizens of North Dakota or whether the majority of the revenue should remain in the county or school district where it was generated or severed.

## Property Tax

Another alternative to taxing mineral resources was the use of the general property or real estate tax. Following are some of the advantages and disadvantages to this form of tax.

The property tax has been the backbone of local school district tax revenues. Knezevich (1975) stated that the property tax for all of its shortcomings was particularily well adapted to administration by small units. Recent federal court decisions such as "Serrano" and "Rodriquez" threaten the continued nature of the use of the local

property tax in states where local districts had great disparities in property wealth.

Another disparity or wealth neutrality problem not directly related to the property tax as a method of taxing minerals, rather a potential disparity problem as a result of the method of distribution that was used in distributing coal severance tax. This potential problem was alluded to in an article entitled "Severance Tax May Unbalance School Aid" (1978, p. 10) which stated:

> A school finance expert from the University of North Dakota says that a provision in North Dakota's coal severance tax that distributes the revenues to schools in the state's lignite region could get the state into a lawsuit or hot water with the federal government. . . . The provision, which returns about six percent of tax revenues to schools in coal mining counties, could unbalance the complex system of school aid the state has set up. That could mean the state's school aid system would not meet Federal standards designed to even out differences in educational financing caused by wealth or lack of wealth in school districts.

Mineral resources have been taxed more widely and for a longer period of time in the form of property or ad valorem tax than by any other taxing system used. Crockett (1948, p. 201) spoke to the issue of property tax as a system of taxation:

> The fact that the real and personal property have remained throughout the years as one of the fundamental basis for revenues in the tax structure is a strong recommendation for their continuance. However, it may not be amiss to point out some of the advantages and disadvantages of the general property tax. Some of the advantages might be listed as follows: (1) that property is widely distributed, (2) that the tax brings in much revenue, (3) that the revenue derived is stable, (4) that it is direct and simple, and (5) the tax is quite easily administered.
>
> The disadvantages or limitations of the property tax may be several, but only a few of the more obvious ones are mentioned, (1) the general property tax responds slowly to economic changes, (2) it falls heavily on real property, (3) due to new construction and reappraisals, assessments have increased greatly, yet not in any sense paralleled that in prices and incomes, (4) rate limits are placed on the tax by various statutes, (5) value does not take depreciation into consideration, and (6) assessments are permitted below market value.

Property taxation as a method of taxing oil and gas resources had their advantages and disadvantages also. Christopherson (1953, p. 65) discussed property taxes as a source of revenue:

> The general property tax is depended upon by the majority of states for the support governmental functions on all levels--state, county and local. Taxes are levied as a necessity on the income of the people in order that the function of government is allocated to that level of government that can best perform them and that the sources of revenue are likewise apportioned to support those functions. However; in practice this seldom if ever works out and inequalities result. Values on which taxation is based are seldom distributed evenly. Hence, new taxes other than the general property tax, or ad valorem taxes, are employed to supplement the property tax.

In North Dakota, personal property was exempted from taxation by the North Dakota State Legislature in 1971. Real property continued to be taxed. A portion of the statute that distinguishes real from personal property is quoted:

> 57-02-05.1. "Personal property" defined - Personal property, for the purpose of taxation, shall include all property that is not included within the definition of real property. (North Dakota Century School Code 1971)

Real property has been taxed for purposes of raising revenue from many of the properties in the state. A portion of the law that explains the taxation of real property is quoted:

> 57-02-04. "Real property" defined - Real property, for the purpose of taxation, includes:
> 1. The land itself, whether laid out in town lots or otherwise, and improvements to the land, such as ditching, surfacing, and leveling, except plowing and trees, and all rights and privileges thereto belonging or in anywise appertaining, and all mines, minerals, and quarries in and under the same and shall expressly include all such improvements made by persons to lands held by them under the laws of the United States, all such improvements to land the title to which still is vested in any railroad company and which is not used exclusively for railroad purposes, and improvements to land belonging to any other corporation whose property is not subject to the same mode and rule of taxation as other property.

2. All structures and buildings, including systems for the heating air conditioning, ventiliating, sanitation, lighting, and plumbing of such structures and buildings, and all rights and privileges thereto belonging or in anywise appertaining, but shall not include items which pertain to the use of such structures and buildings such as machinery or equipment used for trade or manufacture which are not constructed as an integral part of and are not essential for the support of such structures or buildings, and which are removable without materially limiting or restricting the use of such structures or buildings.
3. Machinery and equipment, but no including small tools and office equipment, used or intended for use in any process of refining products from:
   a. oil or gas extracted from the earth, but not including such equipment or appurtenances located on leased oil and gas production sites, or
   b. sugar beets. (North Dakota Century School Code 1971)

In looking at a disadvantage of the property tax, Lutz (1936, p. 655) stated his perceptions:

> It is probably true that a heavy annual tax such as is imposed under the property tax, based on assessments purporting to include the entire known quantity of the resources still in the ground, is a factor tending to speed up the rate of exploitation. Accumulation of each year's taxes against the value of the resource lessens the probable profit margin when it is produced. Hence, there is pressure to get it out quickly.

Droege (1960, pp. 1-2) outlined ways of using a property tax as a method of taxing oil and gas.

> In some instances, a specific property tax is applied to the total worth of all the factors of production used in drilling, transporting, storing and refining oil. The exemptions in these instances is the oil itself.
>
> There is difficulty in evaluating the property to be taxed. Yet it is easier to appraise the value of specific items, such as drilling rigs, than it is to evaluate unknown wealth, such as unproduced oil. Just as the "proof of the pudding is in the eating", the proof of the value of the oil is in the production. Favorable characteristics of property tax is that the revenue from such a tax will not fluctuate as much as some other taxes, therefore, simplifying budgeting procedures by the taxing authorities.

In a personal interview with Hulteen and Jakes (1978), employees of the North Dakota State Tax Department, the following

points were made regarding the taxation of the oil and gas industry as personal property:

> Tanks and oil and gas lines are considered as real property at this time and are assessed and taxed locally. Gas plants and gathering lines are treated in a similar manner. There are sometimes questions on certain oil lines relative to their assessment. The "rule of thumb" that is used in assessing gas and oil lines is that they are assessed by the State Board of Equalization and taxed by each local subdivision.
>
> There is reason to believe that most companies prefer that their carrying lines be assessed by the State Board rather than local assessors. History shows that the State Board of Equalization assesses at a rate that is more favorable to the companies. The status of a given pipeline is very often decided in the courts.

The personal property tax has additional problems. According to Hill (1978, p. 15) assessment of property on which property taxes were based was open to many questions. Some of them were as follows:

> North Dakota faces some of the same problems in assessment as do other states. How does one judge if property has been properly assessed? As an example, if property correctly assessed at its true value of $10,000 is sold to an individual willing to pay double its value, is it correct to say that the property was underassessed because of sales ratio data.
>
> Several other questions also appear to be as difficult to answer. Should farm property located near a city be assessed at its value as farm property or at its value as property for housing? Should property be assessed at the highest rate that any one person would be willing to pay for it? None of these questions have easy answers and furthermore, any one answer would most likely provoke other questions.

In North Dakota, by law, property was to be assessed at full market value. It was obvious that this was not being done. In fact, the percentage that assessed value was of actual selling price has been steadily declining in the state. The average assessment sales ratio in North Dakota has fallen from 19.1 percent in 1972 to 17.4 percent in 1974 to 12.3 percent in 1976 (Hill 1978).

## Capitalization of Income

The "capitalization of income" concept is somewhat similar to an income tax. One of the differences is that in the capitalization of income concept, income from the sale of oil is the basis for the value of the property. The value of barrels of oil sold became the property value and was the base for determining a valuation in which an assessment could be made. Once the assessment had been established and certified to the county assessor it was put on the county and school district tax rolls and taxed according to the local mill levy.

The capitalization of income from gas and oil is used in the state of Wyoming. Title 39, Article 6, Sec. 39-222 of The Wyoming Century Code stated that the capitalization of income is ". . . in lieu of taxes upon the land of such claims while the same are being worked or operated." The law further states:

> The owner, owners, leesee or operator of mines or mining claims from which gold, silver, and other precious metals, soda, saline, coal, petroleum, or other crude or mineral oil, or natural gas, or other valuable deposits, in production, but not while the same are simply in the course of development, shall, not later than the second Monday in February in each year, file with the State Board of Equalization a sworn assessment schedule statement setting gross product in tons, gallons, or thousands of cubic feet as the case may be during the calendar year.
>
> Based on the information received or procured pursuant to W.S. 39-223, the Department of Revenue and Taxation shall annually fix the value of the gross product, in appropriate unit measures of all mines and mining claims from which hydrocarbons, fissionable materials, fossil fuels, minerals, or other valuable deposits are produced, at the fair cash market value of the product at the mine or mining claim where produced, after the mining or production process is completed. (Wyoming Century Code 1975, p. 501)

In addition to the three alternative plans of generation of tax revenue from coal, oil and gas revenue, a possible method of distribution of tax revenue is described in the following paragraphs.

## Impact Aid

When studying the effects of oil and gas or coal, there seemed to be a strong argument for providing a certain amount of tax revenue to school districts in the activity area. This revenue would assist school districts in meeting extraordinary expenses associated with the rapid influx of additional students whose parents were involved in coal or oil and gas activity.

Impact payments, as a source of revenue, have been proposed and implemented in the past. Payments to school districts have generally been in lieu of revenue lost or replacement revenue for local school districts.

An example of impact payments would be the "874 payments" made by the Federal Government. These payments were made to school districts where government employees work or live, or in some cases both, on land or property that was exempt from the general property or real estate tax. These impact payments were intended to replace money that local school districts lost due to inability to tax local property owned by the United States Government.

The following excerpts from a publication entitled Impacted Area Schools Information Service clarify and explain certain guidelines and criteria contained in Public Law 874. The regulations provided that the average daily membership for federally connected students must be determined by conducting a membership count of all children to determine the percent of federally connected children. The membership count must be conducted sometime after the first four days of school and prior to the cutoff date for filing the application form. "Students reimbursed in the 3b category resides with parent employed on federal property

located in whole or part in the same county or school district" (Fish, 1975, p. 251).

The Dickinson Public Schools have addressed the problem of determining the number of coal, oil and gas impact students by gathering statistical data relative to impact from mineral severance activity. It is believed that the intent of the data gathering was an attempt to receive impact funds from the North Dakota Coal Impact Office. The form that was used is found in appendix O.

Student impact from oil and gas activity has caused problems for local school districts. Not only were school districts having problems where extraction of oil and gas was occurring, but also districts across county lines have been receiving impact and in many cases, no revenue.

Primary impact from individuals directly related to mineral activity could be identified, but it was argued that there may also be secondary impact which were individuals indirectly involved with mineral activity. These indirectly involved individuals also caused impact problems but were not so easily identified. Some people felt that secondary employment impact was not a negative factor for a community because it paid its own way through other forms of taxes.

Dewing (1978) gave his impressions about secondary impact in an interview when he said that "a great deal of impact is secondary employment which tends to pay its own way in the form of taxes. Impact in large cities is not nearly as crucial as impact in smaller towns."

Additional population related to mineral activity will not always reside in school districts where taxing property is located.

Dorgan (1977, p. 10) addressed this issue in regard to the coal industry:

> The additional population will not be confined to the counties housing new energy plants. These projects, because of their size will have regional impact. Using the traditional property tax, neighboring counties experiencing substantial impact would not have the expanded industrial tax base available to them. An additional problem is that a property tax, which would be levied upon completion of the construction of a plant, would not be available in time to provide money for "front-end" early impact costs which occur in the construction phase of a project of these proportions. Therefore, as a result of the inability of the traditional property tax to cope with this type of development, part of the severance tax is really a replacement for the property tax.

Snortland (1977) presently North Dakota State Superintendent of Public Instruction, presented a plan to the Senate Finance and Taxation Committee for discussion purposes. The plan proposed ways to deal with impact problems that schools encountered as a result of mineral severance. The following summary provides the substance of the plan:

Proposed Plan to Senate Finance and Taxation Committee (Formula for Schools).

1. In determining the impact payments for operating expenses of school districts, the following formula shall be used:
   a. Impact payments shall be allowed only for pupils whose parent or parents are employed by a coal gasification plant or electrical generating plant which is subject to a special privilege tax in lieu of ad valorem taxes on personal property.
   b. The amount of such impact payment shall equal the statewide average educational cost per pupil exclusive of payments from county equalization funds, and the state payment for impact for operating expenditures shall be the product of that amount times the number of eligible pupils in each school district making application for funds pursuant to the provisions of this Act.
2. In determining the impact payment for school construction costs the following formula shall be used.
   a. Each year the department of public instruction shall establish the cost per pupil to construct new facilities based on the average cost per pupil for the previous school year in those districts which completed construction of new facilities during such year.

b. The payment to each district constructing facilities shall be determined by multiplying the amount calculated in subdivision "a." of this subsection by the number of eligible pupils in each school district making application for funds pursuant to the provisions of the Act. (Legislative Research Council Minutes, 1978)

Hill et al. (1978, p. 15) in a monograph from the FESEND Study, discussed the issue of impact and offered remedies for this program:

> If an "impact basis" should be adopted for the distribution of coal revenues to schools, consider the utility of a study to determine retroactively school costs associated with oil and gas impacts. Preliminary study suggests that process will not be easy nor will its results be precise. That data in hand would permit considering an "impact basis" for the distribution of oil and gas severance revenues to schools.

It is a challenge to the decision makers to consider the various advantages and disadvantages of different methods of taxation of mineral resources prior to making a decision on the generation and distribution of coal, oil or gas tax revenue. As the coal, oil and gas industry is studied, it seems that there are no easy answers for the difficult questions related to the equitable generation and distribution of coal, oil, and gas tax revenues. The foregoing descriptions of the most common taxes levied on the oil industry were more meaningful when the competitiveness of the industry and the nature of the commodity market was evaluated. Application of certain taxes, or a specific tax, should be more closely analyzed in the context of the industry being dealt with and the advantages and disadvantages of each.

Droege (1960, p. 12) summarized implications for the taxation of oil and gas in the following statement:

> When looking at the distribution of oil and gas tax revenues there emerge problems relating to equity. Local school districts

> and county governments are very much concerned about severance taxes. If the severance tax is in lieu of the property tax, problems arise pertaining to the collection and distribution of the tax yield. When the tax is made payable to the state, which is the situation in most cases, the problem of equitable distribution of the tax yield to the various localities is of major importance. To be equitable, the distribution should be based upon the amount of revenue the localities would have received if a property tax were imposed. Levying both the severance tax and personal property tax would stimulate additional difficulties. To figure what percent of the total yield should be in the form of property taxes and what percent should be in the form of severance taxes would defeat the simplicity of the tax.

This writer believed that in light of the points brought out in the literature, there might be a more equitable method of generating and distributing oil and gas tax revenue than the method that was presently being used. Because of similarities in coal, oil and gas, an equitable plan for the generation and distribution of oil and gas tax revenue should also be applicable to coal severance taxation. The following analysis of data and research questions on the following pages test the research hypotheses that have been developed from the review of related literature.

# CHAPTER III

## PROCEDURE

The research hypotheses, questions to be answered, and procedures for gathering the data to test the hypotheses are described below. The data were collected from the following sample districts that were systematically selected from ninety-nine districts receiving oil and gas tax revenue.

1. Billings County #1
2. Cardena #4
3. Westhope #17
4. Souris #29
5. Lansford #35
6. Newburg #48
7. Rhame #17
8. Nebo #27 (Rhame)
9. Scranton #33
10. Powers Lake #27
11. Flaxton #35
12. Divide County #1
13. Alexander #2
14. Earl #18
15. Horse Creek #32
16. New Town #1
17. Williston #1
18. Eight-Mile #6
19. Tioga #15
20. Ray (Nesson #2)
21. Grenora #99
22. Mohall #9
23. Glenburn #26
24. Marmarth #12
25. Central Elementary (Amidon)
26. Taylor #3
27. Southheart #9
28. Elementary Grove #13
29. Lefor #27

This study may have been more concise if data would have been gathered for all ninety-nine school districts receiving oil and gas tax revenue. This was not done because of limitations in time and resources that would have been necessary to gather the data for that large a number of districts.

The first hypothesis to be tested pertained to whether school districts were receiving revenue that was above, below, or within the hypothetical equity range from the present method of generation and distribution of oil and gas tax revenue. Following is the research hypothesis, the question to be answered and the procedure to be used.

## Research Hypothesis

Twenty-nine school districts that receive oil and gas tax revenue in North Dakota were compensated appropriately for the dollars lost in the inability to tax oil and gas businesses as real property.

## Research Question

1. Are sample school districts being compensated excessively, sufficiently or insufficiently for additional students generated by oil and gas activity?

## Procedures used

1. The amount of gross production tax received by school districts where oil and gas was severed was obtained from school district clerks' reports. These reports were validated and corrected with data from the North Dakota State Tax Department.

2. The data regarding the number of oil and gas impact students was gathered for each sample school district by a mailed questionnaire

to the school superintendent and a follow-up telephone interview.

3. The taxable valuation of business and agricultural property in at least 70 percent of the sample school districts was collected from county auditors with a questionnaire and a follow-up telephone call.

4. The total school district mill levy, less the portion set aside to support a junior college, special reserve fund, and recreation mills was obtained from the Department of Public Instruction PI3-080-AA forms.

5. The taxable valuation of producing oil wells in the district was computed by counting the producing wells and multiplying the number of wells times an average value. The average value was obtained from an industry source and validated by Folsom (1978). The assessed value was determined by using the county sales ratio percentage. The assessed valuation was divided by two to obtain the taxable valuation.

6. Criteria was established to determine whether the present amount of oil and gas tax revenue for sample school districts fell within a range. One end of the equity range was identified as the valuation figure and was computed by multiplying school district mills times the taxable valuation of producing oil wells in the district. The other end of the range was identified as the impact figure and was computed by multiplying the taxable valuation of agriculture and business property times the school district levy. The impact figure was divided by the total average daily membership. The new figure was multiplied by the number of impact students. The amount of oil and gas tax revenue was subtracted from the larger of the two figures in the range to obtain a plus or minus figure. The figure obtained

in the subtraction determined, according to this formula, whether school districts were receiving revenue that was above, below, or within the hypothetical equity range for the oil and gas impact students.

7. The school district was considered to be receiving sufficient revenue if the total oil and gas revenue fell between the valuation figure and the impact figure. Plus or minus discrepancy depicted that the present oil or gas figure was above the highest figure or below the lowest figure in the hypothetical equity range.

The second question to be answered pertains to whether there was a difference in relative equity in four alternative methods of generation and distribution of oil and gas tax revenue. "Relative equity" is defined in Chapter I in the definition of terms section.

## Null Hypothesis

There was no significant difference in "relative equity" using four alternative plans of generation and distribution of gas and oil tax revenues.

## Research Question

2. What features of alternative systems of generation and distribution of oil and gas taxes provided more "relative equity" (cost and revenue equal) than the present system?

## Procedures used

1. Data were gathered from the twenty-nine school districts relative to revenue, impact and taxable valuation.

2. Figure 1 illustrates the data which were gathered for each sample district for each of the four alternative models. Data were collected from the North Dakota Tax Department, the Department

of Public Instruction, County School Superintendents, the North Dakota Geological Society, and personnel from sample school districts. The data were gathered by interviews, questionnaires, and pulling information from available records received from the State Tax Department, the Department of Public Instruction, and County School Superintendents.

| VARIABLE | PLAN A | PLAN B | PLAN C | PLAN D |
|---|---|---|---|---|
| Average District Per Pupil Cost | X | X | X | X |
| Average Daily Membership | | | | X |
| Local Mill Levy | X | X | X | X |
| Per Pupil Valuation | X | X | X | X |
| Impact Students | | | | |
| Per Pupil Oil and Gas | X | | | |
| Total Valuation | | | | |
| State Foundation Aid | | | | |
| Average Daily Attendance | X | X | X | |

Figure 1. Variable data to be collected

NOTE: X denotes independent variables used in each plan for multiple linear regression procedure

Four alternative plans were identified in this study. The four plans were chosen because of their use in North Dakota or in other states. The use of each method of generation or distribution of oil and gas tax revenue provided credibility to the method and provided for an alternative to analyze and compare for its potential "relative equity".

## Description of Four Alternative Plans

### Plan A

According to the North Dakota Century School Code (1971) the following portion of the statute outlines the present plan of generation and distribution of oil and gas revenue:

57-51-02. NORTH DAKOTA GROSS PRODUCTION TAX

A tax on five percentum of the gross value at the well-head will be levied on the going price of each barrel of oil.

57-51-03. GROSS PRODUCTION TAX TO BE IN LIEU OF OTHER TAXES
The payment of taxes herein imposed shall be in full, and in lieu of all ad valorem (at value) taxes by state, counties, cities, towns, townships, school districts, and other municipalities, upon any property rights attached to or inherent in the right to producing oil or gas.

57-51-15. APPORTIONMENT AND USE OF GROSS TAX

1. First an amount equal to one percent of the gross value at the well of the oil and gas upon which a tax is collected under this chapter shall be deposited with the state treasurer who shall credit it to the general fund.
   The remaining amounts are partially credited to the county general fund from which forty-five percent is paid to school districts and part of the amount is paid to the state general fund. The percentage of revenue that goes to the county general fund and the state general fund varies in percentage as the cumulative amounts reach varying amounts.

### Plan B

The amount of money that was generated in this alternative plan was obtained by multiplying the number of barrels of oil produced by

the wells in each school district times $8.40. During the base year of this study, 1976-77, the crude oil was $8.40 per barrel. Folsom (1978) indicated in an interview that: "With the variance in the price of old and new oil and other allowances, $8.40 per barrel is a reasonable average."

The calculated value (percentage of true value) became an assessed value figure calculated by the county sales ratio study data. This assessed value was divided by two to find the taxable valuation. The taxable valuation was used in computing the revenue that each district general fund would receive at their 1976-77 school district mill levy rate.

## Plan C

Using a map from the North Dakota Geological Society (1976) at the University of North Dakota in Grand Forks the number of oil producing wells within the sample school district boundaries was identified. The value of the production equipment of producing wells were given an average value according to the method discussed earlier. The average value of oil wells in McKenzie County was $100,000 per well; in Bottineau and Renville County $50,000 per well; and in all other oil producing counties, wells were valued at $75,000 per well.

In order to determine the amount of additional valuation for each sample school district, the calculated value was adjusted to reflect the county sales ratio data before it became the assessed valuation and ultimately the taxable valuation.

Plan D

This alternative plan was based on an established method of distributing revenue for local school districts that were experiencing student impact but did not have the authority to tax the business where parents were employed, as real property. This method was found in the Federal Public Law 874. A count was made of all students whose parents work in oil and gas related activity and multiplied times an established Public Law 874 figure of $375 per impact student for "3b" students. "Oil and gas impact" students would become analogous to Public Law 874 "3b" students in this alternative plan.

To assist the investigator in deciding what type of data gathering instrument to use, a book entitled, The Science of Educational Research, by George J. Mouly was studied as a major source. The choice of a questionnaire, in preference to other survey techniques, is generally a matter of weighing its strengths and weaknesses against those of an interview with which it is most nearly interchangeable.

Mouly (1970, p. 245) compared the techniques of questionnaires and interviews regarding strengths and weaknesses of each.

> Some of the major strengths of the questionnaire are that it permits wide coverage at a minimum of expense. It also reaches persons who are difficult to contact. Particularly when it does not call for a signature or other means of identification, the questionnaire may elicit more candid and objective replies. On the other hand the questionnaire does not permit the investigator to note the apparent reluctance or evasiveness of his respondents, a matter which is better handled through the interview, nor does it permit the investigator to follow through on misunderstood questions or inadequate answers. The questionnaire also permits more considered answers. Its use would be indicated in situations in which the respondent needs to check his information or in which group consultation would result in more valid information.

Most writers describing research methods agree that the major weakness of the questionnaire is undoubtedly the problem of non-returns. The

validity of questionnaire data also depends in a crucial way on the ability and willingness of the respondent to provide the information requested.

A major disadvantage of the questionnaire is the possibility of misinterpretation of the questions. Validating the information called for in a questionnaire can be done a number of ways. According to Mouly (1970) an adequate approach to validation consists of checking the agreement between the responses elicited by the questionnaire with an external criterion.

The advantages of an interview are that it allows the investigator to remain in command of the situation throughout the investigation. It permits the establishment of greater rapport and thus, stimulates the respondent to give more complete and valid answers.

The major weakness of the interview is "interview-bias" which stems in a large part from its flexibility--which is then both its major advantage and disadvantage. It is difficult to guarantee that the people doing the interview will ask questions in the same manner as someone else doing the same interview. Some of this potential error can be eliminated if only one person interviews all of the subjects.

Another disadvantage of the interview as a research technique is its cost. Not only can it be expensive, especially when the survey covers a wide geographic area, but it also is costly in time and effort since it almost invariably necessitates callbacks, long waits, and travel.

The advantages and disadvantages of the interview and the questionnaire were examined. This investigator chose to combine the

strong points of both and also to be cognizant of validity checking.

Mouly (1970) addressing the problem of data collections said that sometimes the advantages of the interview and questionnaire can be combined by leaving a questionnaire to be completed and calling back at an appointed time to check on aspects that need clarification.

Personal and telephone interviews with school superintendents were used to collect student impact data for the school year 1976-77. Student impact data were recorded on a record sheet shown in appendix M. This record sheet was mailed to all sample school districts prior to the telephone interview.

3. After data had been gathered that were called for in the variable list, they were analyzed using the statistical technique of multiple linear regression. This technique attempted to measure the "relative equity" of each of the four alternative plans utilizing variables identified in figure 2. There was also an attempt made in the statistical analysis to show for each model which variable accounted for the highest percentage of variation in the dependent variable. The districts which had the lowest residuals (which was the difference between the observed and expected value of the dependent variable) were considered to have the most equitable distribution. Also the plan that showed the highest correlation between the dependent variable and the eight independent variables was considered as the plan that was most equitable.

For statistical purposes, the following identification of variables was used:

1. $Y_1$ = school district per pupil cost
2. $X_1$ = average daily membership

3. $X_2$ = per pupil valuation
4. $X_3$ = additional students resulting from oil and gas activity
5. $X_4$ = per pupil oil and gas revenue
6. $X_5$ = per pupil revenue from County Equalization Fund
7. $X_6$ = local mill levy (general fund) plus or minus as compared to state average
8. $X_7$ = average daily attendance
9. $X_8$ = total valuation in school district

The independent variables shown were fitted against the dependent variable of per pupil cost of education in each sample school district during the 1976-77 school terms.

In employing the variable, average district per pupil cost as a dependent variable, the writer recognized certain potential shortcomings of this statistic. Namely, some districts may be losing money at that level (spending more in the 1976-77 school year than they are receiving in revenue) or some districts might be gaining money at that level (that is, securing more revenue than they spent). Also, the school year 1976-77 may not have been a typical year. With the named shortcomings in mind, it was assumed that this statistic was an equitable measure of the actual cost of education in each sample school district.

The following tables provide statistical information related to the independent variables for the four alternative plans of generation and distribution of oil and gas tax revenue. Table 3 presents the means and standard deviations for the eight independent variables in Plan A. Table 4 presents the correlation coefficients for the eight independent variables in Plan A. Table 5 presents the results of the factor analysis.

TABLE 3

MEANS AND STANDARD DEVIATIONS FOR INDEPENDENT VARIABLES
PLAN A

| Variables | Mean | Standard Deviation | N |
|---|---|---|---|
| Average Daily Membership | 299.07 | 512.90 | 29 |
| Per Pupil Valuation | $11,676.59 | $10,414.47 | 29 |
| Impact Students | 44.76 | 111.04 | 29 |
| State Foundation Payment | $620.24 | $177.70 | 29 |
| Local Mill Levy | -20.17 | 25.68 | 29 |
| Average Daily Attendance | 285.76 | 490.80 | 29 |
| Total Property Valuation | $1,765,126.52 | $1,861,339.00 | 29 |
| Per Pupil Oil Revenue | $114.76 | $188.50 | 29 |

TABLE 4

CORRELATION COEFFICIENTS FOR INDEPENDENT VARIABLES
PLAN A

| | ADMEMB | PPUVAL | IMPSTU | PPUOIL | STAFOU | LOCMIL | ADATEN | TOTVAL |
|---|---|---|---|---|---|---|---|---|
| Average Daily Membership | 1.00 | | | | | | | |
| Per Pupil Valuation | -0.33 | 1.00 | | | | | | |
| Impact Students | 0.87 | -0.26 | 1.00 | | | | | |
| Per Pupil Oil Revenue | -0.14 | 0.25 | -0.11 | 1.00 | | | | |
| State Foundation Payment | 0.15 | -0.81 | 0.08 | -0.22 | 1.00 | | | |
| Local Mill Levy | 0.16 | 0.41 | 0.10 | -0.28 | 0.34 | 1.00 | | |
| Average Daily Attendance | 1.00 | 0.33 | 0.87 | -0.14 | 0.15 | 0.16 | 1.00 | |
| Total Valuation | 1.00 | 0.31 | 0.79 | -0.00 | 0.10 | 0.14 | 0.91 | 1.00 |

NOTE: ADMEMB = Average Daily Membership
PPUVAL = Per Pupil Valuation
IMPSTU = Impact Students
PPUOIL = Per Pupil Oil Revenue
STAFOU - State Foundation Payment
LOCMIL = Local Mill Levy
ADATEN = Average Daily Attendance
TOTVAL = Total Valuation

The results of the factor analysis were rotated using varimax procedures. The varimax rotated factors with eigenvalues greater than 1.0 are presented in table 5. From these rotated factors, the independent variables for the prediction equation were identified. A brief explanation of the varimax procedure for obtaining eigenvalues follows:

TABLE 5

ROTATED FACTOR MATRIX (FACTOR ANALYSIS) USING VARIMAX PROCEDURES WITH EIGHT INDEPENDENT VARIABLES: PLAN A

| | Factor 1 | Factor 2 |
|---|---|---|
| Average Daily Membership | 0.98 | 0.17 |
| Per Pupil Valuation | -0.19 | -0.90 |
| Impact Students | 0.87 | 0.10 |
| Per Pupil Oil Revenue | 0.06 | -0.30 |
| State Foundation Payment | -0.00 | 0.86 |
| Local Mill Levy | 0.09 | 0.44 |
| Average Daily Attendance | 0.99 | 0.17 |
| Total Property Valuation | 0.90 | 0.12 |

NOTE: eigenvalues for factor 1 = 2.88, factor 2 = 1.26
percent variance in factor 1 = 60.2, factor 2 = 26.4

The varimax procedure is a statistical procedure to get maximum loading of individual variables on individual factors. The purpose of rotating the results of the factor analysis is to try to fit the two factors together into a "best fit" relationship. The eigenvalue is a statistic that represents the amount of variance accounted for by each factor and is extracted from a correlation matrix.

Within factor one, the variable average daily membership has a coefficient of .98; the variable impact students has a coefficient of .87; and the variable average daily attendance has a coefficient of .99. These variables are apparently measuring identical components. In order to have independent predictors in the multiple regression analysis, average daily attendance was retained as the measure for this factor.

Factor two showed the variable, per pupil valuation, with a correlation coefficient of .90, and the variable, state foundation payment with a coefficient of .86. The highest of these two coefficients, per pupil valuation was retained. The variables, per pupil oil revenue and local mill levy, had no high loadings on either factor, therefore were retained.

In summarizing the factor analysis the following variables were relatively independent of each other and thus retained:

1. average daily attendance
2. per pupil valuation
3. per pupil oil revenue
4. local mill levy

A linear model based on the above variables was used to predict the dependent variable for Plan A. A stepwise multiple linear regression was used in the treatment of the data from the four orthogonal independent variables. The results of these calculations are found in Chapter IV.

Table 6 presents the means and standard deviations for the seven independent variables used in Plan B. Table 7 presents the

correlation coefficients for the seven independent variables in Plan B.

A factor analysis was also calculated with the seven independent variables in this plan in order to identify the independent variables. Table 8 presents the results of that analysis.

TABLE 6

MEANS AND STANDARD DEVIATIONS FOR INDEPENDENT VARIABLES
PLAN B

| Variables | Mean | Standard Deviation | N |
|---|---|---|---|
| Average Daily Membership | 299.07 | 512.89 | 29 |
| Per Pupil Valuation | $14,982.41 | $18,033.67 | 29 |
| Impact Students | 44.90 | 110.98 | 29 |
| State Foundation Payment | $451.24 | $667.78 | 29 |
| Local Mill Levy | -20.17 | 25.68 | 29 |
| Average Daily Attendance | 285.76 | 490.80 | 29 |
| Total Property Valuation | $2,003,362.00 | $1,995,440.00 | 29 |

The factor analysis for Plan B was analyzed in the same manner as for Plan A as described on page 74. In analyzing the factor analysis, the following variables were retained because of their independent nature:

1. per pupil valuation
2. local mill levy
3. average daily attendance

Table 9 presents the means and standard deviations for the seven independent variables in Plan C. The correlation coefficients for this plan are presented in table 10.

TABLE 7

INTERNAL CORRELATIONS FOR INDEPENDENT VARIABLES
PLAN B

| | ADMEMB | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | TOTVAL |
|---|---|---|---|---|---|---|---|
| Average Daily Membership | 1.00 | | | | | | |
| Per Pupil Valuation | -0.28 | 1.00 | | | | | |
| Impact Students | 0.87 | -0.20 | 1.00 | | | | |
| State Foundation Payment | 0.16 | -0.92 | 0.11 | 1.00 | | | |
| Local Mill Levy | 0.22 | -0.45 | 0.15 | 0.35 | 1.00 | | |
| Average Daily Attendance | 1.00 | -0.28 | 0.87 | 0.16 | 0.22 | 1.00 | |
| Total Valuation | 0.86 | -0.26 | 0.82 | 0.17 | 0.15 | 0.86 | 1.00 |

NOTE: ADMEMB = Average Daily Membership
PPUVAL = Per Pupil Valuation
IMPSTU = Impact Students
STAFOU = State Foundation Payments
LOCMIL = Local Mill Levy
ADATEN = Average Daily Attendance
TOTVAL = Total Valuation

TABLE 8

ROTATED FACTOR MATRIX (FACTOR ANALYSIS) USING VARIMAX PROCEDURES WITH SEVEN INDEPENDENT VARIABLES: PLAN B

| | Factor 1 | Factor 2 |
|---|---|---|
| Average Daily Membership | 0.98 | 0.16 |
| Per Pupil Valuation | -0.13 | -0.99 |
| Impact Students | 0.89 | 0.09 |
| State Foundation Payments | 0.02 | 0.93 |
| Local Mill Levy | 0.14 | 0.41 |
| Average Daily Attendance | 0.98 | 0.16 |
| Total Valuation | 0.87 | 0.15 |

NOTE: eigenvalue in factor 1 = 3.10, factor 2 = 1.73
percent of variance in factor 1 = 64.2, factor 2 = 35.8

TABLE 9

MEANS AND STANDARD DEVIATIONS FOR INDEPENDENT VARIABLES PLAN C

| Variable | Mean | Standard Deviation | N |
|---|---|---|---|
| Average Daily Membership | 299.07 | 512.89 | 29 |
| Per Pupil Valuation | $12,999.38 | $12,721.81 | 29 |
| Impact Students | 44.90 | 110.98 | 29 |
| State Foundation Payment | $585.36 | $251.22 | 29 |
| Local Mill Levy | -20.17 | 25.68 | 29 |
| Average Daily Attendance | 285.76 | 490.80 | 29 |
| Total Property Valuation | $1,899,847.00 | $1,908,535.00 | 29 |

TABLE 10

INTERNAL CORRELATIONS FOR INDEPENDENT VARIABLES
PLAN C

| | ADMEMB | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | TOTVAL |
|---|---|---|---|---|---|---|---|
| Average Daily Membership | 1.00 | | | | | | |
| Per Pupil Valuation | -0.32 | 1.00 | | | | | |
| Impact Students | 0.87 | -0.27 | 1.00 | | | | |
| State Foundation Payment | 0.17 | -0.91 | 0.09 | 1.00 | | | |
| Local Mill Levy | 0.16 | -0.39 | 0.10 | 0.36 | 1.00 | | |
| Average Daily Attendance | 1.00 | -0.32 | 0.87 | 0.17 | 0.16 | 1.00 | |
| Total Valuation | 0.89 | -0.33 | 0.81 | 0.17 | 0.15 | 0.89 | 1.00 |

NOTE: ADMEMB = Average Daily Membership
PPUVAL = Per Pupil Valuation
IMPSTU = Impact Students
STAFOU = State Foundation Payment
LOCMIL = Local Mill Levy
ADATEN = Average Daily Attendance
TOTVAL = Total Valuation

Because of the apparent interrelatedness of the independent variables, a factor analysis was computed to determine which variables were independent of each other. The results of the factor analysis were rotated using varimax procedures. Varimax rotated factors with eigenvalues greater than 1.0 are presented in table 11.

On factor one, the variable average daily membership had a coefficient of .98. The variable, impact students had a coefficient of .88; and the variable, average daily attendance had a coefficient of .99 while the variable total valuation had a coefficient of .89. These variables were apparently measuring identical components and in order to have orthogonal predictors in the multiple regression analysis, average daily

TABLE 11

ROTATED FACTOR MATRIX (FACTOR ANALYSIS) USING VARIMAX PROCEDURES WITH SEVEN INDEPENDENT VARIABLES: PLAN C

| | Factor 1 | Factor 2 |
|---|---|---|
| Average Daily Membership | 0.98 | 0.15 |
| Per Pupil Valuation | -0.19 | -0.97 |
| Impact Students | 0.88 | 0.09 |
| State Foundation Payment | 0.02 | 0.94 |
| Local Mill Levy | 0.09 | 0.39 |
| Average Daily Attendance | 0.99 | 0.15 |
| Total Valuation | 0.89 | 0.16 |

NOTE: eigenvalues for factor 1 = 3.86, factor 2 1.72
percent of variance in factor 1 = 69.2, factor 2 = 30.8

attendance was retained as the variable in factor one. In factor two, the variable per pupil valuation had a correlation coefficient of .97 and the variable state foundation aid had a correlation coefficient of .94. Taking the highest correlation coefficient in this factor, the variable per pupil valuation was retained.

The variables that were retained because of their independence of each other were:

1. average daily attendance
2. per pupil valuation
3. local mill levy

Table 12 presents the means and standard deviations for the eight independent variables in Plan D. The correlation coefficients for this plan are shown in table 13. Table 14 presents the results of the factor analysis that was calculated on the eight independent variables to identify independent variables that were not highly interrelated.

In summarizing the factor analysis for Plan D it was found that the following variables were orthogonal or independent of each other and thus retained.

1. average daily membership
2. per pupil valuation
3. local mill levy

TABLE 12

MEANS AND STANDARD DEVIATIONS FOR INDEPENDENT VARIABLES
PLAN D

| Variable | Mean | Standard Deviation | N |
|---|---|---|---|
| Average Daily Membership | 299.07 | 512.89 | 29 |
| Per Pupil Valuation | $11,676.59 | $10,414.47 | 29 |
| Impact Students | 44.90 | 110.98 | 29 |
| State Foundation Payment | 595.88 | 210.10 | 29 |
| Local Mill Levy | -20.17 | 25.68 | 29 |
| Average Daily Attendance | 285.76 | 490.80 | 29 |
| Impact Payment | $32,877.44 | $85,791.83 | 29 |
| Total Valuation | $1,765,126.52 | $1,861,339.00 | 29 |

TABLE 13

ROTATED FACTOR MATRIX (FACTOR ANALYSIS) USING VARIMAX PROCEDURES
WITH EIGHT INDEPENDENT VARIABLES: PLAN D

| | Factor 1 | Factor 2 |
|---|---|---|
| Average Daily Membership | 0.97 | 0.12 |
| Per Pupil Valuation | -0.24 | -0.91 |
| Impact Students | 0.94 | 0.02 |
| State Foundation Payment | 0.01 | 0.89 |
| Local Mill Levy | 0.00 | 0.33 |
| Average Daily Attendance | 0.97 | 0.12 |
| Impact Payment | 0.94 | 0.02 |
| Total Valuation | 0.90 | 0.12 |

TABLE 14

INTERNAL CORRELATIONS FOR INDEPENDENT VARIABLES
PLAN D

| | ADMEMB | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | IMPPAY | TOTVAL |
|---|---|---|---|---|---|---|---|---|
| Average Daily Membership | 1.00 | | | | | | | |
| Per Pupil Valuation | -0.32 | 1.00 | | | | | | |
| Impact Students | 0.88 | -0.26 | 1.00 | | | | | |
| State Foundation Payment | 0.10 | -0.58 | 0.01 | 1.00 | | | | |
| Local Mill Levy | 0.00 | -0.22 | 0.02 | 0.19 | 1.00 | | | |
| Average Daily Attendance | 0.02 | -0.13 | 0.12 | 0.07 | 0.02 | 1.00 | | |
| Impact Payment | 0.42 | -0.24 | 0.57 | 0.09 | 0.01 | 0.83 | 1.00 | |
| Total Valuation | 0.91 | -0.31 | 0.79 | 0.00 | 0.04 | 0.02 | 0.39 | 1.00 |

NOTE: ADMEMB = Average Daily Membership
PPUVAL = Per Pupil Valuation
IMPSTU = Impact Students
STAFOU = State Foundation Payment
LOCMIL = Local Mill Levy
ADATEN = Average Daily Attendance
IMPPAY = Impact Payment
TOTVAL = Total Valuation

Research Question

3. Is there an eclectic model of generation and distribution of oil and gas tax that would be more equitable than the present system?

Procedure used

An eclectic model utilized data from the eight independent variables found in figure 1. Findings were obtained by substituting the lowest residual from the variables tested earlier in the study or adjusted in such a way as to further reduce the residual. An attempt was made to modify certain data to reduce the discrepancy (residuals) between actual and expected value of the variables.

Analysis

A number of statistical procedures were conducted. The major one was a stepwise multiple linear regression. In the regression analysis, the values of the dependent variable were predicted from a linear function of the form $Y_1 = A+BX$, where $Y_1$ was the estimated value of the dependent variable Y, B was a constant by which all values of the independent variable X were multiplied, and A was a constant which was added to each case. The difference between the actual and estimated value of X for each case was called the residual (the error in prediction) and can be represented by the expression "Residual = $Y-Y_1$".

The regression strategy involved the selection of A and B in such a way that the sum of the squared residuals was smaller than any alternative combination of A and B. Expressed in another way, Sum of $(Y-Y_1)^2 = SS_{res}$ is minimum. It can be shown that the optimum values for B and A were obtained from the following formulas:

$$B = \frac{SP_{xy}}{SS_x}$$

$$A = \overline{Y} - B\overline{X}$$

Where $SP_{xy}$ was the symbolic notation for the sum of cross products of X and Y and $SS_x$ denoted the sum of squares of X. The constant A (referred to as the Y intercept) was the point at which the regression line crosses the Y axis and represented the predicted value of Y when X = 0. The constant B, usually referred to as the (nonstandardized) regression coefficient, was the slope of the regression line and indicated the expected "change" in Y with a "change" on one unit in X. The predicted (per pupil cost) $Y_1$ values fell along the regression line, and the vertical distances $(Y-Y_1)$ of the points from the line represented residuals (or errors in prediction). Since the sum of squared residuals was minimized, the regression line was called the least-squares line or line of best fit. In other words, there was no other line which was "closer" to the points, for example, for no other line was the sum of $(Y-Y_1)^2$ smaller (Nie et al. 1975).

The preceding was an example for one independent variable. It must be noted that this study intended to use eight independent variables in the following models: $Y_1$ (predicted average per pupil cost in each sample district) = A (intercept) + $B_1X_1$ (average daily membership) + $B_2X_2$ (per pupil valuation) + $B_3X_3$ (impact students) + $B_4X_4$ (per pupil oil and gas revenue) + $B_5X_5$ (revenue from County Equalization Fund) + $B_6X_6$ (local mill levy) + $B_7X_7$ (district per pupil cost) + $B_8X_8$ (total property valuation). As a result of a factor analysis only four independent variables were used in Plan A and Plan D while three independent variables were used in Plan B and Plan C.

A factor analysis was conducted to determine which independent variables were interrelated. A partial correlation was calculated to determine whether correlations changed between the dependent variable and the independent variables as a result of controlling for, or partialling out, individual or groups of independent variables. Scattergrams were also calculated to determine linear or non-linear correlations.

Multiple regression was chosen as a statistical tool because the intent of the study and the uses of this procedure were similar. Nie et al., (1975, p. 321) described the uses of multiple regression as a statistical technique. The description was as follows:

> Multiple regression is a general statistical technique through which one can analyze the relationship between a dependent or criterion variable and a set of independent or predictor variables. Multiple regression may be viewed either as a descriptive tool by which the linear dependence of one variable on others is summarized and decomposed, or as an inferential tool by which the relationships in the population are evaluated from the examination of sample data. The most important uses of the technique as a descriptive tool are: (1) to find the best linear prediction equation and evaluate its prediction accuracy; (2) to control for other confounding factors in order to evaluate the contribution of a specific variable or set of variables; and (3) to find structural relations and provide explanations for seemingly complex multivariate relationships, such as done in path analysis.
>
> For every use of regression as a descriptive tool, there is usually a corresponding question of statistical inference - whether one can generalize the results of the sample observation to the universe. The problems of statistical inference can be conveniently grouped into two general categories: estimation and hypothesis testing.

The following two chapters present the data used and an analysis of the findings obtained from conducting the statistical test mentioned earlier in the study. The analysis was used in presenting appropriate conclusions and recommendations.

# CHAPTER IV

## ANALYSIS OF THE DATA

### Introduction

This chapter was devoted to reporting and describing the data that were collected relative to the three questions to be answered. The two research hypotheses were tested using descriptive statistics. Question number one, two, and three were analyzed using the descriptive statistical analysis of multiple linear regression. The results are shown on the following pages.

### Research Hypothesis

1. Twenty-nine school districts that receive oil and gas tax revenue in North Dakota were compensated appropriately for student impact and for the revenue lost in the ability to tax oil and gas businesses as real property.

### Research Question

1. Are sample school districts being compensated above, below, or within a hypothetical equity range for additional students generated by oil and gas activity?

An attempt was made to determine whether school districts were receiving sufficient revenue as compensation for additional students resulting from oil and gas activity.

There was an attempt to collect data relative to property valuation in the areas of business and agriculture in each of the twenty-nine sample school districts. The number of impact students was also collected for each sample school district.

Impact data were received from all twenty-nine districts relative to impact students, but only twenty-one county auditors were able to provide a break-down of property valuation for residential, business, and agriculture in each of the sample districts. The data in table 15 were used to determine whether school districts were receiving oil and gas tax revenue that was above or below the hypothetical equity range with the present method of distribution of oil and gas tax revenue.

In table 16 data are presented for the discrepancy analysis. The impact figure was used to determine whether a district's present total oil and gas revenue was within the range or was above or below the range in either the valuation figure of the impact figure. The discrepancy column depicts whether the present oil and gas tax revenue exceeded the highest dollar figure or fell below the lowest dollar figure. The reader will note that on table 16 there were zero values for certain districts in either the valuation column or the impact column. These values do not depict missing data; rather some districts did not have any impact students or any oil wells.

The discrepancy column shows a negative number if the district was getting an amount of oil and gas tax revenue that was below the hypothetical equity range. A positive number shows that the district was getting an amount of oil and gas tax revenue that was above the hypothetical range. A zero in this column shows that a district received an adequate amount of oil and gas revenue according to the to the equity criteria used.

TABLE 15

RAW VALUES FOR ADEQUACY MEASURES OF
TWENTY-ONE SCHOOL DISTRICTS

| District | Average Daily Membership | Impact Students | Taxable Valuation of Oil Wells | Taxable Valuation Agricultural and Business Property | Total Oil and Gas Tax Revenue |
|---|---|---|---|---|---|
| Billings County | 123 | 19 | $303,013.00 | $2,262,404.00 | $120,013.00 |
| Gardena | 28 | 2 | 00.00 | 439,280.00 | 2,604.00 |
| Westhope | 325 | 107 | 308,775.00 | 1,186,595.00 | 20,888.00 |
| Souris | 99 | 2 | 89,500.00 | 1,237,709.00 | 7,434.00 |
| Rhame | 130 | 6 | 00.00 | 706,477.00 | 14,569.00 |
| Nebo | 5 | 0 | 66,788.00 | 184,257.00 | 809.00 |
| Scranton | 255 | 0 | 00.00 | 1,451,594.00 | 30,471.00 |
| Powers Lake | 251 | 43 | 303,600.00 | 1,310,281.00 | 23,512.00 |
| Flaxton | 83 | 6 | 752,100.00 | 532,449.00 | 9,014.00 |
| Divide County | 659 | 9 | 245,625.00 | 4,376,161.00 | 21,546.00 |
| Alexander | 117 | 4 | 00.00 | 1,290,776.00 | 21,722.00 |
| Earl | 22 | 0 | 22,300.00 | 253,742.00 | 4,487.00 |
| Horse Creek | 10 | 0 | 66,900.00 | 278,053.00 | 1,366.00 |
| New Town | 699 | 77 | 00.00 | 1,315,948.00 | 29,151.00 |
| Williston | 2,774 | 508 | 00.00 | 3,769,161.00 | 135,496.00 |
| Marmarth | 29 | 0 | 00.00 | 368,567.00 | 813.00 |
| Central Elementary | 35 | 0 | 00.00 | 976,906.00 | 1,612.00 |
| Taylor | 118 | 3 | 00.00 | 908,573.00 | 4,356.00 |
| Southheart | 386 | 6 | 232,200.00 | 1,390,154.00 | 14,303.00 |
| Elm Grove | 343 | 45 | 25,800.00 | 763,559.00 | 15,627.00 |
| Lefor | 43 | 0 | 00.00 | 495,234.00 | 2,028.00 |

TABLE 16

DISCREPANCY INFORMATION ON
OIL AND GAS TAX PAYMENT

| District | Valuation Figure | Oil & Gas Payment | Impact Figure | Discrepancy |
|---|---|---|---|---|
| Billings County | $13,333.00 | $120,013.00 | $15,337.00 | $+104,676.00 |
| Souris | 5,549.00 | 7,434.00 | 1,550.00 | + 1,885.00 |
| Rhame | 00.00 | 14,569.00 | 3,065.00 | + 11,504.00 |
| Nebo | 2,204.00 | 809.00 | 00.00 | - 1,395.00 |
| Scranton | 00.00 | 30,471.00 | 00.00 | + 30,471.00 |
| Powers Lake | 21,859.00 | 23,512.00 | 16,161.00 | + 1,653.00 |
| Flaxton | 60,768.00 | 9,014.00 | 3,079.00 | - 51,754.00 |
| Divide County | 23,580.00 | 21,546.00 | 5,737.00 | - 2,034.00 |
| Alexander | 00.00 | 21,722.00 | 3,221.00 | + 18,501.00 |
| Earl | 00.00 | 4,487.00 | 00.00 | + 4,487.00 |
| Horse Creek | 2,408.00 | 1,366.00 | 1,001.00 | + 365.00 |
| New Town | 00.00 | 29,151.00 | 12,032.00 | + 17,119.00 |
| Williston | 00.00 | 135,496.00 | 57,290.00 | + 78,206.00 |
| Marmarth | 00.00 | 813.00 | 1,347.00 | - 534.00 |
| Central Elementary | 00.00 | 1,612.00 | 1,172.00 | + 440.00 |
| Taylor | 00.00 | 4,356.00 | 1,987.00 | + 2,369.00 |
| Southheart | 11,610.00 | 14,303.00 | 1,080.00 | + 2,693.00 |
| Elm Grove | 1,393.00 | 15,627.00 | 5,409.00 | + 10,218.00 |
| Lefor | 00.00 | 2,028.00 | 311.00 | + 1,717.00 |
| Gardena | 00.00 | 2,604.00 | 3,232.00 | - 628.00 |
| Westhope | 25,937.00 | 20,888.00 | 32,816.00 | - 5,049.00 |

NOTE: Valuation figures and impact figures were established as a range for each school district.

In analyzing the range as depicted by the valuation and impact figure it can be concluded that some schools were receiving oil and gas tax revenue in excess of the amount considered adequate according to this particular formula. The district names and the amount of funds above the hypothetical equity range under the present method of generation and distribution of oil and gas tax revenue are shown in table 17. The revenue in table 17 is the dollar amount above the valuation figure or impact figure, whichever is higher. School districts receiving funds below the hypothetical equity range as a result of the present system of taxation and generation is shown in table 18. The revenue in table 18 is the dollar amount below the valuation figure or impact figure, whichever is lower. School districts that are receiving sufficient amounts of oil and gas revenue according to the hypothetical equity range are shown in table 19. Sufficient revenue was when the dollar amount of oil and gas revenue fell between the valuation figure and the impact figure.

Research Question

2. What features of alternative systems of generation and distribution of oil and gas taxes provided more "relative equity" than the present system?

Question number two was answered and the hypothesis tested using a descriptive statistical analysis. The data were analyzed using multiple linear regression. This test was to measure "relative equity" of four alternative plans for sample school districts. There was also an attempt made in the statistical analysis to show which independent variable accounts for the most variability on the dependent variable. The dependent variable in this study was the average per pupil cost of education in each sample school district.

TABLE 17

SCHOOL DISTRICTS RECEIVING FUNDS ABOVE THE HYPOTHETICAL EQUITY RANGE ACCORDING TO THE PRESENT SYSTEM OF GENERATION OF OIL AND GAS TAX REVENUE

| | |
|---|---|
| Billings County | $104,637.00 |
| Souris | 1,885.00 |
| Rhame | 11,504.00 |
| Scranton | 30,471.00 |
| Powers Lake | 1,653.00 |
| Alexander | 18,501.00 |
| Earl | 4,487.00 |
| Horse Creek | 365.00 |
| New Town | 17,119.00 |
| Williston | 78,206.00 |
| Central Elementary | 440.00 |
| Taylor | 2,369.00 |
| Southheart | 2,693.00 |
| Elm Grove | 10,218.00 |
| Lefor | 1,717.00 |

TABLE 18

SCHOOL DISTRICT RECEIVING FUNDS BELOW THE HYPOTHETICAL EQUITY RANGE ACCORDING TO THE PRESENT SYSTEM OF GENERATION OF OIL AND GAS TAX REVENUE

| | |
|---|---|
| Nebo | $1,395.00 |

TABLE 19

SCHOOL DISTRICTS RECEIVING SUFFICIENT FUNDS ACCORDING TO THE PRESENT SYSTEM OF GENERATION OF OIL AND GAS TAX REVENUE

| | |
|---|---|
| Flaxton | $ 9,014.00 |
| Divide County | 21,546.00 |
| Marmarth | 813.00 |
| Gardena | 2,604.00 |
| Westhope | 20,888.00 |

## Plan A

In Plan A, the present form of generation and distribution was used as a basis for the revenue received through taxation of severed oil at 5 percent of the value. The data were collected from a variety of sources. Sources were identified in Chapter I of this study.

The collected data were treated using a stepwise multiple linear regression. The four independent variables were fitted against the dependent variable, average district per pupil cost. Table 20 shows the sample districts and their average per pupil costs including capital outlay.

The following tables provide statistical information relative to the four independent variables tested in the multiple linear regression for Plan A. Table 21 provides a summary of the multiple regression.

The multiple R, which is the relationship between a set of independent variables and a criterion or dependent variable, increased very little from step one to step four. Step one, with the variable per pupil oil revenue, shows a multiple R of .46, increasing to .53 with the variable, average daily attendance; to .59 with the variable local mill levy; to the highest multiple R of .61 with the variable per pupil valuation.

The R square figure, is the proportion of variance accounted for between a dependent variable and an independent variable or a set of independent variables, is .22 for the independent variable, per pupil oil revenue. The amount of variance accounted for is increased by 6 percent by adding average daily attendance. An additional 7 percent of variance is accounted for by adding the variable, local mill levy. Finally an additional 3 percent of the variance is accounted for with the variable, per pupil valuation. The total percentage of variance accounted for

TABLE 20

AVERAGE DISTRICT PER PUPIL COST
BY SCHOOL DISTRICT

| School District | Average District Per Pupil Cost |
|---|---|
| Billings County #1 | $1,987.00 |
| Gardena #4 | 1,405.00 |
| Westhope #17 | 1,170.00 |
| Souris #29 | 1,691.00 |
| Lansford #35 | 1,312.00 |
| Newburg #48 | 1,835.00 |
| Rhame #17 | 1,513.00 |
| Nebo #27 | 1,370.00 |
| Scranton #33 | 1,405.00 |
| Powers Lake #27 | 1,438.00 |
| Flaxton #35 | 1,546.00 |
| Divide Co. #1 | 1,410.00 |
| Alexander #2 | 1,676.00 |
| Earl #18 | 1,695.00 |
| Horse Creek #32 | 1,790.00 |
| New Town #1 | 1,355.00 |
| Williston #1 | 1,311.00 |
| Eight-Mile #6 | 1,760.00 |
| Tioga #15 | 1,166.00 |
| Nesson #2 | 1,301.00 |
| Grenora #9 | 1,472.00 |
| Glenburn #26 | 1,531.00 |
| Marmarth #12 | 1,905.00 |
| Central Elementary #32 | 1,499.00 |
| Taylor #3 | 1,502.00 |
| Southheart #9 | 1,015.00 |
| Elm Grove #13 | 1,279.00 |
| Lefor #27 | 1,256.00 |
| Mohall #9 | 1,292.00 |

between the dependent variable and the set of independent variables is 38 percent.

The regression coefficient, is the unstandardized weight for a given variable in the prediction. These coefficients were also reported for each of the four independent variables in Plan A which were retained. The constant for the prediction equation is identified with an asterisk.

Each of the four variables shows a significant correlation with the dependent variable at the .05 level. The standard error, which is the amount of error in the prediction, is shown for each variable in the analysis. The standard error for Plan A as shown on table 21 is 200.74.

In the multiple regression an attempt was made to predict the dependent variable, average district per pupil cost. The difference between the observed value of the dependent variable and the value of the predicted dependent variable is shown as a residual. The residual may be positive or negative. In this study, the residual is the difference between the predicted and observed per pupil cost and is a meaure of "relative equity". The closer that a residual, positive or negative, is to zero the more equitable the generation and distribution mix is judged to be for a particular sample school district.

Table 22 depicts the observed average district per pupil cost, the predicted average per pupil cost, and the residual differences. It is noted that the highest positive residual is 334.64. The lowest negative residual is -317.30. The residual closest to zero is 2.74 which is the Divide County School District. Based on the definition of "relative equity" in this study, the district with the reported residual at 2.74 was receiving the most equitable tax revenue.

TABLE 21

MULTIPLE REGRESSION SUMMARY FOR ORTHOGONAL INDEPENDENT VARIABLES
PLAN A

| Variable | Multiple R | R Square | RSQ Change | Regression Coefficient* | F Value | Degree of Freedom | Significance | Standard Error |
|---|---|---|---|---|---|---|---|---|
| Per Pupil Oil Revenue | 0.46 | 0.22 | 0.22 | 0.6497 | 7.41 | 1,27 | <.05 | 212.09 |
| Average Daily Attendance | 0.53 | 0.28 | 0.07 | -0.1170 | 5.10 | 2,26 | <.05 | 206.77 |
| Local Mill Levy | 0.59 | 0.35 | 0.07 | 3.0585 | 4.46 | 3,25 | <.05 | 200.79 |
| Per Pupil Valuation | 0.61 | 0.38 | 0.03 | 0.0042 | 3.60 | 4,24 | <.05 | 200.74 |

NOTE: *Constant for prediction equation was $1,203.94.

TABLE 22

OBSERVED, PREDICTED AND RESIDUAL VALUES
PLAN A

| School District | Observed Average District Per Pupil Cost | Predicted Average District Per Pupil Cost | Residual |
|---|---|---|---|
| Billings County | $1,987.00 | $2,020.24 | -33.24 |
| Marmarth | 1,905.00 | 1,576.72 | +328.28 |
| Newburg | 1,835.00 | 1,616.41 | +218.59 |
| Horse Creek | 1,790.00 | 1,510.62 | +279.38 |
| Eight-Mile | 1,760.00 | 1,471.07 | +288.93 |
| Earl | 1,695.00 | 1,360.36 | +334.64 |
| Souris | 1,691.00 | 1,465.13 | +225.87 |
| Alexander | 1,676.00 | 1,565.30 | +110.70 |
| Flaxton | 1,546.00 | 1,521.91 | +24.09 |
| Glenburn | 1,531.00 | 1,410.79 | +120.21 |
| Rhame | 1,513.00 | 1,557.09 | -44.09 |
| Taylor | 1,502.00 | 1,491.50 | +10.50 |
| Central Elementary | 1,499.00 | 1,454.58 | +44.43 |
| Grenora | 1,471.00 | 1,465.11 | +5.89 |
| Powers Lake | 1,438.00 | 1,459.70 | -21.70 |
| Divide Co. | 1,410.00 | 1,407.26 | +2.74 |
| Scranton | 1,405.00 | 1,491.36 | -86.36 |
| Gardena | 1,405.00 | 1,626.79 | -221.79 |
| Nebo | 1,370.00 | 1,609.58 | -239.58 |
| New Town | 1,355.00 | 1,400.99 | -45.99 |
| Lansford | 1,312.00 | 1,503.05 | -191.05 |
| Williston | 1,311.00 | 1,169.28 | +141.73 |
| Ray | 1,301.00 | 1,409.05 | -108.05 |
| Mohall | 1,292.00 | 1,472.86 | -180.86 |
| Elm Grove | 1,279.00 | 1,351.59 | -72.59 |
| Lefor | 1,256.00 | 1,341.28 | -85.28 |
| Westhope | 1,170.00 | 1,462.15 | -292.15 |
| Tioga | 1,166.00 | 1,361.93 | -195.93 |
| Southheart | 1,015.00 | 1,332.30 | -317.30 |

Figure 2 shows the plot of the standard deviation of the residuals. The school districts are arranged from the highest to the lowest average district per pupil cost. The residuals from the twenty-nine cases are distributed close to what would be expected with the arrangement of cases ranked from the highest to the lowest average district per pupil cost. There is one "outlier" school district, Williston, that is evident in the plot. A regression analysis was run excluding this case. No sustantial change took place in the arrangement of the residuals when the Williston data was excluded. Due to an apparent skewness in the independent variables a logarithmic technique was attempted. The differences in correlations were slight using this technique and were not significant.

In order to determine to what extent certain variables were contributing to correlations, predictions, and percentages of accounting for variance, a partial correlation was calculated. Table 23 shows coefficients and significance values for the dependent and independent variables. Table 24 shows the partial correlations and tests of significance when controlling for individual and groups of independent variables. The symbol > means greater than and indicates that the relationship is not significant beyond that level. The symbol < means less than and indicates that the relationship is significant beyond that level.

Partial correlations were calculated excluding one, then two, and finally three variables from the calculation. This procedure provided an opportunity to analyze all correlations and significance levels of the dependent variable with each independent variable while controlling for each variable and groups of variables. Following figure 2 is a description of the changes that took place in correlation coefficients

and significance levels as independent variables were partialled out or controlled.

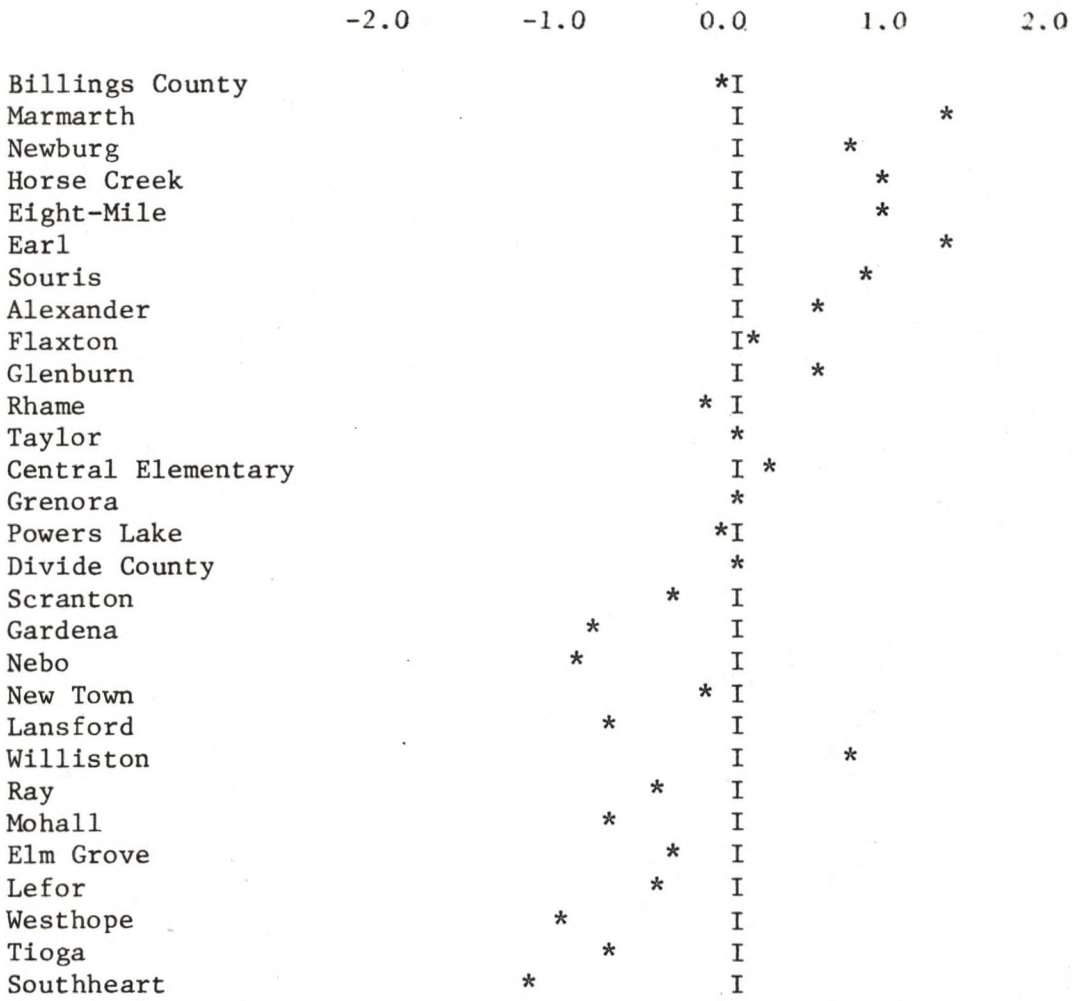


Figure 2. Plot of standardized residuals against twenty-nine sample school districts in rank order from highest to lowest average per pupil cost (Plan A).

Table 23 shows a correlation coefficient of .25 between average district per pupil cost and per pupil valuation. When per pupil oil was controlled for, the correlation dropped to .16 as shown on table 15. In neither case was there significance at the .05 level.

The correlation as shown on table 23 between average district per pupil cost and per pupil oil was .46 with a significant correlation

at the .01 level. Table 24 shows that when local mill levy was partialled out the correlation went up to .51 and the correlation was significant at the .01 level.

The correlation between average district per pupil cost and average daily attendance was -.32 when allowing for size differences in the districts. When per pupil valuation was controlled for, the correlation dropped to .26. In neither case was the correlation significant at the .05 level.

TABLE 23

COEFFICIENTS AND SIGNIFICANCE FOR DEPENDENT AND INDEPENDENT VARIABLES (DIRECTIONAL HYPOTHESIS) PLAN A

| | AVDIPC | PPUVAL | PPUOIL | LOCMIL | ADATEN |
|---|---|---|---|---|---|
| Average District Per Pupil Cost | 1.0000<br>( 0)<br>S=0.001 | | | | |
| Per Pupil Valuation | 0.2522<br>( 27)<br>S=0.093 | 1.0000<br>( 0)<br>S=0.001 | | | |
| Per Pupil Oil Revenue | 0.4640<br>( 27)<br>S=0.006 | 0.2507<br>( 27)<br>S=0.095 | 1.0000<br>( 0)<br>S=0.001 | | |
| Local Mill Levy | 0.0867<br>( 27)<br>S=0.327 | -0.4083<br>( 27)<br>S=0.014 | -0.2767<br>( 27)<br>S=0.073 | 1.0000<br>( 0)<br>S=0.001 | |
| Average Daily Attendance | -0.3185<br>( 27)<br>S=0.046 | -0.3324<br>( 27)<br>S=0.039 | -0.1361<br>( 27)<br>S=0.241 | 0.1588<br>( 27)<br>S=0.205 | 1.0000<br>( 0)<br>S=0.001 |

The correlation between average district per pupil cost and local mill levy was .09. When partialling out per pupil oil and per pupil valuation, the coefficient went up to .34 and the correlation became significant at the .05 level. When average daily attendance was also controlled for, the correlation coefficient went to .35.

The correlation between average district per pupil cost and per pupil oil had a coefficient of .46 and was significant at the .01 level. When per pupil valuation was partialled out the coefficient dropped to .43. Partialling out local mill levy raised the coefficient to .51. Controlling for per pupil valuation and local mill levy raised the coefficient to .49. When controlling for per pupil valuation and average daily attendance the coefficient dropped to .43. When controlling for local mill levy and average daily attendance the coefficient was raised to .51. Controlling for per pupil valuation, local mill levy and average daily attendance dropped the coefficient to .50.

It was important to note that no matter which variables were partialled out of the correlation between average district per pupil cost and per pupil oil, the correlation was still significant at the .05 level. In addition to this level of significance, when local mill levy, average daily attendance, per pupil valuation, were partialled out there was a significant correlation at the .01 level.

In summarizing Plan A it was noted that the independent variable, per pupil oil, had the highest predictive value for the dependent variable, average district per pupil cost. The four remaining independent variables accounted for 38 percent of the variance.

The coefficient for the correlation with the highest predictive value was .46. The coefficient increased to .61 with the addition of

TABLE 24

PARTIAL CORRELATIONS CONTROLLING FOR CERTAIN INDEPENDENT VARIABLES WITH DEPENDENT VARIABLE-- AVERAGE DISTRICT PER PUPIL COST
PLAN A

| Independent Variables | Variables Controlled for | Partial Correlations | Significance |
|---|---|---|---|
| Per Pupil Valuation | Per Pupil Oil | .16 | >.05 |
| | Local Mill Levy | .32 | >.05 |
| | Average Daily Attendance | .16 | >.05 |
| | Per Pupil Oil and Local Mill Levy | .28 | >.05 |
| | Per Pupil Oil and Average Daily Attendance | .07 | >.05 |
| | Local Mill Levy and Average Daily Attendance | .24 | >.05 |
| | Per Pupil Oil, Local Mill Levy and Average Daily Attendance | .20 | >.05 |
| Per Pupil Oil | Per Pupil Valuation | .43 | <.05 |
| | Local Mill Levy | .51 | <.01 |
| | Average Daily Attendance | .45 | <.01 |
| | Per Pupil Valuation and Local Mill Levy | .49 | <.01 |
| | Per Pupil Valuation and Average Daily Attendance | .43 | <.05 |
| | Local Mill Levy and Average Daily Attendance | .51 | <.01 |
| | Per Pupil Valuation, Local Mill Levy and Average Daily Attendance | .50 | <.01 |
| Average Daily Attendance | Per Pupil Oil | .29 | >.05 |
| | Per Pupil Valuation | .26 | >.05 |
| | Local Mill Levy | .34 | <.05 |
| | Per Pupil Oil and Per Pupil Valuation | .26 | >.05 |
| | Per Pupil Oil and Local Mill Levy | .34 | <.05 |
| | Per Pupil Valuation and and Local Mill Levy | .27 | >.05 |
| | Per Pupil Oil, Per Pupil Valuation and Local Mill Levy | .28 | >.05 |

TABLE 24 - Continued

| Independent Variables | Variables Controlled for | Partial Correlations | Significance |
|---|---|---|---|
| Local Mill Levy | Per Pupil Oil | .25 | >.05 |
| | Per Pupil Valuation | .21 | >.05 |
| | Average Daily Attendance | .15 | >.05 |
| | Per Pupil Oil and Per Pupil Valuation | .34 | <.05 |
| | Per Pupil Oil and Average Daily Attendance | .31 | >.05 |
| | Per Pupil Valuation and Average Daily Attendance | .23 | >.05 |
| | Per Pupil Oil, Per Pupil Valuation and Average Daily Attendance | .35 | <.05 |

the other three variables. The relationship between the dependent variable, average district per pupil cost, and the four independent variables was significant at the .05 level in this plan.

Plan B

In Plan B the total barrels of oil were valued at the average price of a barrel of oil in 1976-77. This value was capitalized and became the assessed valuation to be taxed according to the local mill levy. Raw data for this plan are found in appendix B. The data for Plan B were collected in the same manner as that for Plan A. The collected data were also treated using a stepwise multiple linear regression as was done in Plan A. A multiple regression procedure was also used in Plan B to predict the dependent variable and a set of independent variables.

Table 25 provides a summary of the stepwise regression analysis. The multiple R increased very little from step one to step four. Step one, with the independent variable, average daily attendance shows a multiple R

TABLE 25

MULTIPLE REGRESSION SUMMARY OF THREE
ORTHOGONAL INDEPENDENT VARIABLES
PLAN B

| Variable | Multiple R | R Square | RSQ Change | Regression Coefficient* | F Value | Degree of Freedom | Significance | Standard Error |
|---|---|---|---|---|---|---|---|---|
| Average Daily Attendance | 0.32 | 0.10 | 0.10 | -0.1389 | 3.05 | 1,27 | >.05 | 226.95 |
| Per Pupil Valuation | 0.34 | 0.12 | 0.02 | 0.0023 | 1.75 | 2,26 | >.05 | 229.04 |
| Local Mill Levy | 0.35 | 0.13 | 0.01 | 0.9125 | 1.19 | 3,25 | >.05 | 232.71 |

NOTE: *Constant for prediction equation was $1,505.09

of .32 increases to .34 with the variable, per pupil valuation, and a total of .35 with the addition of the step three variable, local mill levy. The R square statistic shows that only 10 percent of the variance is accounted for between the dependent variable and the independent variable in step one. The percentage of variance accounted for increases by 2 percent when the variable, per pupil valuation, is added and another 1 percent when the independent variable, local mill levy is added. None of the correlations of the four steps are significant at the .05 level. The standard error or error in prediction for each step in the analysis is shown on table 25. Step one shows a standard error 226.95; step two shows a standard error of 229.04; and step three shows a standard error of 232.71.

In the multiple linear regression procedure an attempt was made to predict the dependent variable, average district per pupil cost. The difference between the observed value of the dependent variable and the value of the predicted dependent variable is shown as a residual, which may be either positive or negative.

In Plan B of this study, the residual was a measure of "relative equity". The closer that a residual, positive or negative, was to zero the more equitable the generation and distribution formula was judged to be for a particular school district.

Table 26 depicts the observed average district per pupil cost, the predicted average per pupil cost, and the residual differences. It is noted that the highest positive residual is 477.53. The lowest negative residual is 420.22. The residual closest to zero is -5.29 which is the Taylor Public School District. Based on the definition of "relative equity" in this study, the district with the reported residual of -5.29

TABLE 26

OBSERVED, PREDICTED AND RESIDUAL VALUES
PLAN B

| School District | Observed Average District Per Pupil Cost | Predicted Average District Per Pupil Cost | Residual |
|---|---|---|---|
| Billings | $1,987.00 | $1,509.47 | +477.53 |
| Marmarth | 1,905.00 | 1,548.23 | +356.77 |
| Newburg | 1,835.00 | 1,494.56 | +340.44 |
| Horse Creek | 1,790.00 | 1,591.93 | +198.07 |
| Eight-Mile | 1,760.00 | 1,488.48 | +271.52 |
| Earl | 1,695.00 | 1,457.62 | +237.38 |
| Souris | 1,691.00 | 1,500.27 | +190.73 |
| Alexander | 1,676.00 | 1,504.58 | +171.42 |
| Flaxton | 1,546.00 | 1,513.39 | +32.61 |
| Glenburn | 1,513.00 | 1,498.74 | +14.26 |
| Rhame | 1,531.00 | 1,450.22 | +80.78 |
| Taylor | 1,502.00 | 1,507.29 | -5.29 |
| Central Elementary | 1,499.00 | 1,522.65 | -23.65 |
| Grenora | 1,471.00 | 1,491.30 | -20.30 |
| Powers Lake | 1,438.00 | 1,472.79 | -34.79 |
| Divide County | 1,410.00 | 1,428.43 | -18.43 |
| Scranton | 1,405.00 | 1,554.65 | -149.65 |
| Gardena | 1,405.00 | 1,477.61 | -72.61 |
| Nebo | 1,370.00 | 1,658.75 | -288.75 |
| New Town | 1,355.00 | 1,421.91 | -66.91 |
| Lansford | 1,312.00 | 1,497.98 | -185.98 |
| Williston | 1,311.00 | 1,138.45 | 172.55 |
| Ray | 1,301.00 | 1,465.64 | -164.64 |
| Elm Grove | 1,279.00 | 1,436.20 | -157.20 |
| Lefor | 1,256.00 | 1,471.77 | -215.77 |
| Westhope | 1,170.00 | 1,470.27 | -300.27 |
| Tioga | 1,166.00 | 1,421.79 | -255.79 |
| Mohall | 1,292.00 | 1,455.80 | -163.79 |
| Southheart | 1,015.00 | 1,435.22 | -420.22 |

was receiving the most equitable tax revenue.

Because of difficulty in determining which variables contributed to the correlations between the dependent variable and independent variables, a partial correlation was computed. Table 27 shows the correlation coefficients and significance levels between the dependent and independent variables. Table 28 outlines the correlation and significance as a result of controlling for individual and groups of variables.

The correlation between average district per pupil cost and average daily attendance was significant at the .05 level. When per pupil valuation was partialled out the correlation was no longer significant at the .05 level. When local mill levy and per pupil valuation were controlled for, the correlation between average district per pupil cost and average daily attendance was not significant at the .05 level.

Figure 3 shows a plot of the standard deviation of the residuals. The school districts are arranged from the highest to the lowest average district per pupil cost. According to the way that the sample cases were arranged, except for the one "outlier" school district, Williston, the plot is almost normal. A multiple regression was computed excluding this case. No substantial change was noted in the arrangement of the residuals when the Williston School District was excluded.

Summarizing Plan B, it was noted that the independent variable, average daily attendance, had the highest predictive value as shown in step one of the multiple regression. The three steps of the stepwise regression accounted for 13 percent of the variance. The degree of relationship between the dependent variable and the independent variables, average daily attendance, in step one was .32 increasing to .35 with the additional two steps. The relationship between the dependent variable,

TABLE 27

COEFFICIENTS AND SIGNIFICANCE VALUES FOR
DEPENDENT AND INDEPENDENT VARIABLES
PLAN B

| | AVDIPC | PPUVAL | LOCMIL | ADATEN |
|---|---|---|---|---|
| Average District Per Pupil Cost | 1.0000<br>( 0)<br>S=0.001 | | | |
| Per Pupil Valuation | 0.2141<br>( 27)<br>S=0.132 | 1.0000<br>( 0)<br>S=0.001 | | |
| Local Mill Levy | -0.0509<br>( 27)<br>S=0.397 | -0.4495<br>( 27)<br>S=0.007 | 1.0000<br>( 0)<br>S=.001 | |
| Average Daily Attendance | -0.3185<br>( 27)<br>S=0.046 | -0.2758<br>( 27)<br>S=0.074 | 0.2172<br>( 27)<br>S=0.129 | 1.0000<br>( 27)<br>S=0.001 |

TABLE 28

PARTIAL CORRELATIONS CONTROLLING FOR CERTAIN INDEPENDENT VARIABLES
WITH DEPENDENT VARIABLE -- AVERAGE DISTRICT PER PUPIL COST
PLAN B

| Independent Variables | Variables Controlled for | Partial Correlations | Significance |
|---|---|---|---|
| Per Pupil Valuation | Local Mill Levy | .21 | >.05 |
| | Average Daily Attendance | .14 | >.05 |
| | Local Mill Levy and Average Daily Attendance | .16 | >.05 |
| Local Mill Levy | Per Pupil Valuation | .05 | >.05 |
| | Average Daily Attendance | .02 | >.05 |
| | Per Pupil Valuation and Average Daily Attendance | .09 | >.05 |
| Average Daily Attendance | Per Pupil Valuation | -.27 | >.05 |
| | Local Mill Levy | -.32 | >.05 |
| | Per Pupil Valuation and Local Mill Levy | -.28 | >.05 |

average district per pupil cost, and the three independent variables was not significant at the .05 level in this plan.

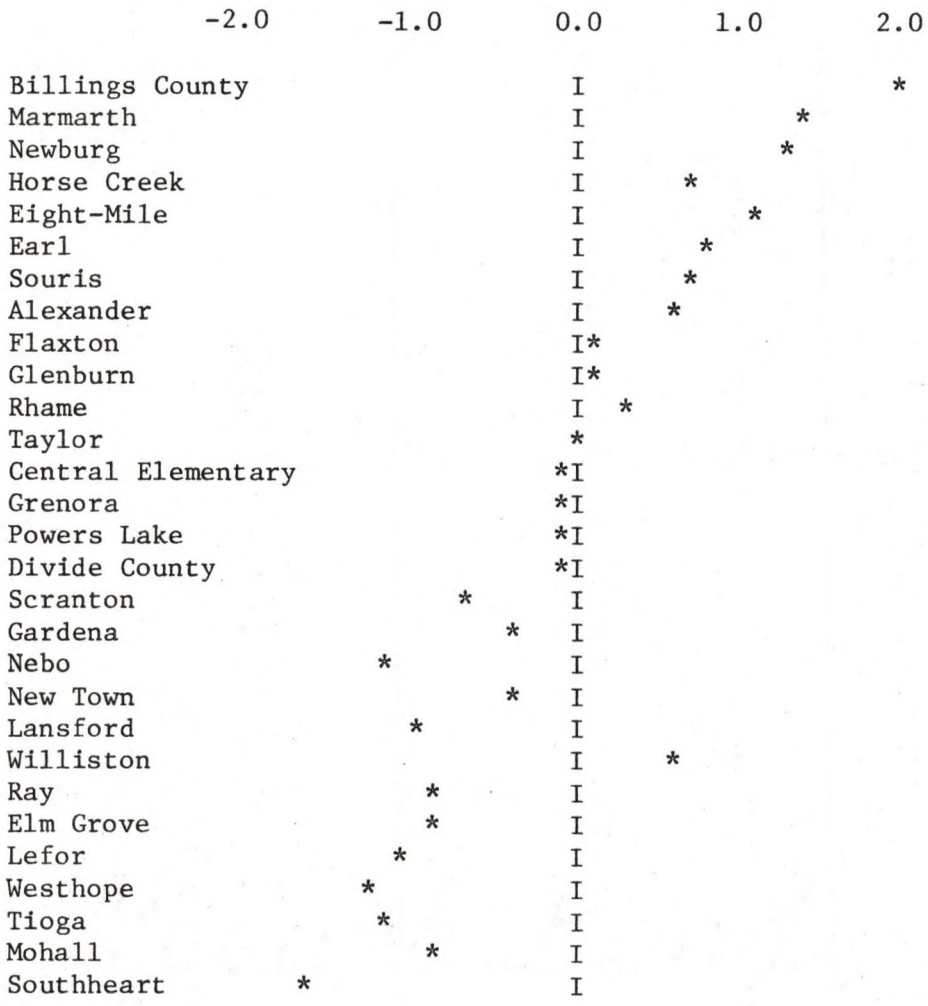


Figure 3. Plot of standardized residuals against twenty-nine school districts in rank order from highest to lowest average per pupil cost (Plan B).

## Plan C

In Plan C the number of producing oil wells in each sample school district were counted and multiplied times an average per well value to obtain a property valuation to be taxed according to local mill levy.

The following tables provide descriptive statistical information relative to three independent variables tested in the multiple linear

regression.

Table 29 provides a summary of the stepwise regression analysis for Plan C. In this table the statistic multiple R shows that the relationship between the dependent variable, average district per pupil cost and the independent variable, average daily attendance is .32. When the variable, per pupil valuation, is added to step two the degree of relationship goes to .35 or an increase of .03. With the addition of the variable, local mill levy, in step three the relationship raises to .40 which is the total for the set of independent variables. The R square statistic shows that 10 percent of the variance is accounted for with the independent variable, average daily attendance. An additional 2 percent is accounted for with the addition of the variable per pupil valuation. When the third variable, local mill levy is added, the amount of variance accounted for goes to 16 percent which is the total percentage of variance accounted for between the dependent variable and the set of independent variables. None of the three steps showed a significant correlation with the dependent variable, average district per pupil cost, at the .05 level. The standard error, which is the amount of error in the prediction is shown for each step in the analysis on table 29. The standard error in Plan C is 228.77.

In Plan C, the dependent variable, average district per pupil cost, was used in a stepwise multiple regression. In this regression an attempt was made to predict the dependent variable.

The difference between the observed value of the dependent variable and the value of the predicted dependent variable is shown as a residual. The residual may be positive or negative. In this study, the residual was a measure of "relative equity". The closer that a positive

TABLE 29

MULTIPLE REGRESSION SUMMARY OF THREE
ORTHOGONAL INDEPENDENT VARIABLES
PLAN C

| Variable | Multiple R | R Square | RSQ Change | Regression Coefficient* | F Value | Degree of Freedom | Significance | Standard Error |
|---|---|---|---|---|---|---|---|---|
| Average Daily Attendance | 0.32 | 0.10 | 0.10 | -0.1354 | 3.05 | 1,27 | >.05 | 226.95 |
| Per Pupil Valuation | 0.35 | 0.12 | 0.02 | 1.9845 | 1.79 | 2,26 | >.05 | 228.32 |
| Local Mill Levy | 0.40 | 0.16 | 0.04 | 2.0040 | 1.56 | 3,25 | >.05 | 228.77 |

NOTE: *Constant for prediction equation was $1,505.20

or negative residual was to zero the more equitable generation and distribution formula was judged to be for a particular sample school district. Table 30 depicts the observed average district per pupil cost and also the predicted per pupil cost for Plan C. The table also presents the residual differences. The range of residuals shows that the highest positive residual is 504.89. The lowest negative residual is -383.71. The residual closest to zero is -2.37, which is the Flaxton Public School District. Based on the definition of "relative equity" in this study, the district with the reported residual of -2.37 is receiving the most equitable tax revenue.

Figure 4 shows a plot of the standard deviation of the residuals. The school districts are arranged from the highest to the lowest average district per pupil cost. The twenty-nine cases were distributed almost as would be expected with the arrangement of cases ranked from the highest to the lowest average district per pupil cost. There is one "outlier" school district, which is Williston, which is evident in the plot. A regression analysis was run excluding this case. No substantial change took place in the arrangement of residuals when the Williston school district data was excluded.

Due to difficulty in determining to what extent certain variables contributed to correlations, predictions, and percentages of accounting for variance, a partial correlation was computed. Table 31 shows correlation coefficients and significance values for the dependent variable and three independent variables.

Table 32 shows partial correlations when controlling for individual independent variables and groups of independent variables. Partial correlations were calculated excluding one, then two, and finally three

TABLE 30

OBSERVED, PREDICTED AND RESIDUAL VALUES
PLAN C

| District Name | Observed Average District Per Pupil Cost | Predicted Average District Per Pupil Cost | Residual |
|---|---|---|---|
| Billings | $1,987.00 | $1,482.11 | +504.89 |
| Marmarth | 1,905.00 | 1,591.53 | +313.47 |
| Newburg | 1,676.00 | 1,511.16 | +164.84 |
| Horse Creek | 1,835.00 | 1,599.26 | +235.74 |
| Eight-Mile | 1,790.00 | 1,552.90 | +237.10 |
| Earl | 1,760.00 | 1,493.04 | +266.96 |
| Souris | 1,695.00 | 1,377.60 | +317.40 |
| Alexander | 1,691.00 | 1,498.60 | +192.40 |
| Flaxton | 1,546.00 | 1,548.37 | -2.37 |
| Glenburn | 1,531.00 | 1,428.08 | +102.92 |
| Rhame | 1,513.00 | 1,529.54 | -16.54 |
| Taylor | 1,502.00 | 1,521.08 | -19.07 |
| Central Elementary | 1,499.00 | 1,522.70 | -23.70 |
| Grenora | 1,471.00 | 1,485.19 | -14.19 |
| Powers Lake | 1,438.00 | 1,470.26 | -32.26 |
| Divide County | 1,410.00 | 1,437.66 | -27.66 |
| Scranton | 1,405.00 | 1,478.17 | -73.17 |
| Gardena | 1,405.00 | 1,601.76 | -196.76 |
| Nebo | 1,370.00 | 1,661.51 | -291.51 |
| New Town | 1,355.00 | 1,422.79 | -67.79 |
| Lansford | 1,312.00 | 1,504.26 | -192.26 |
| Williston | 1,311.00 | 1,148.40 | +162.60 |
| Ray | 1,301.00 | 1,468.87 | -167.87 |
| Mohall | 1,292.00 | 1,449.26 | -157.26 |
| Elm Grove | 1,279.00 | 1,406.75 | -127.75 |
| Lefor | 1,256.00 | 1,427.75 | -171.75 |
| Westhope | 1,170.00 | 1,477.30 | -307.30 |
| Tioga | 1,166.00 | 1,391.38 | -225.38 |
| Southheart | 1,015.00 | 1,398,71 | -383.71 |

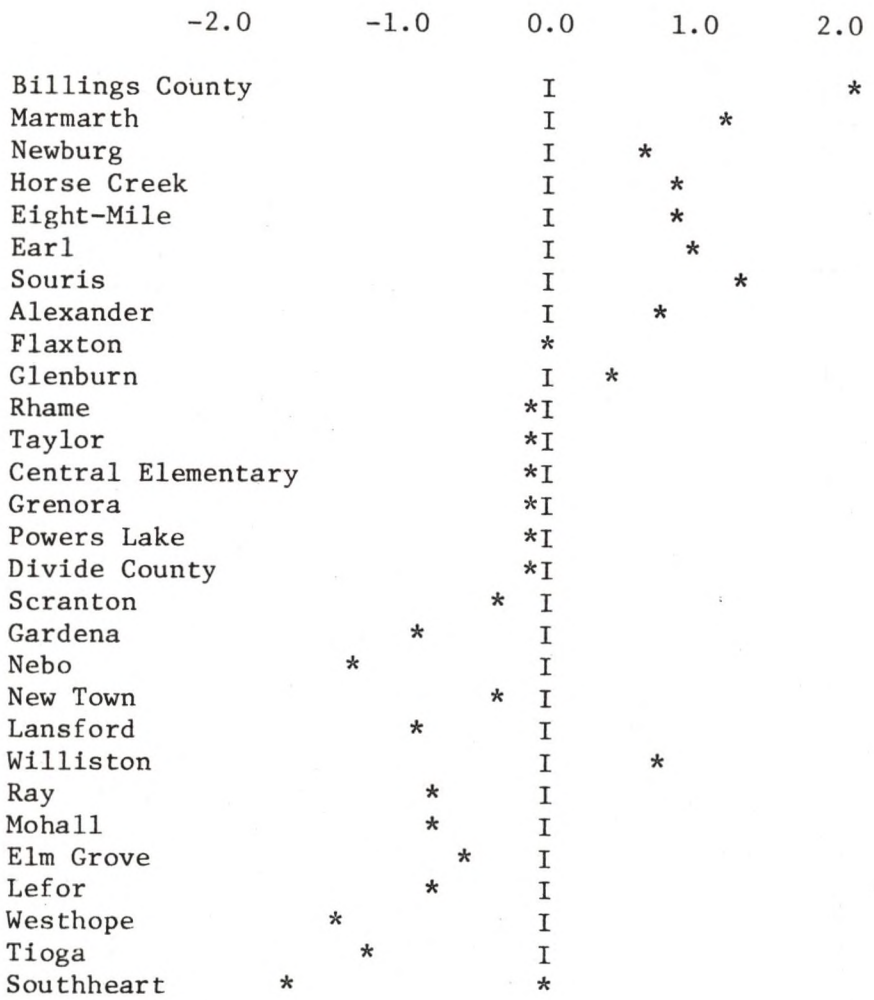


Figure 4. Plot of standardized residuals against twenty-nine school districts in rank order from highest to lowest average per pupil cost (Plan C).

variables from the calculation. This procedure provided an opportunity to analyze all correlations and significance levels of the dependent variable with each independent variable while controlling for each variable separately. A description of the changes that took place in correlation coefficients and significance levels as independent variables were partialled out follows below.

Table 31 showed that there was no significant correlation at the .05 level between average district per pupil cost and the three independent variables. There was a significant correlation between the independent variable local mill levy and per pupil valuation at the .05 level. Also the independent variables per pupil valuation and average daily attendance showed a significant correlation at the .05 level. Table 32 showed that the only partial correlation that was significant at the .05 level between average district per pupil cost and the variable, average daily attendance was when local mill levy was controlled.

Summarizing Plan C it was noted that the independent variable, average daily attendance, had the highest predictive value for the dependent variable, average district per pupil cost. The three remaining independent variables accounted for 16 percent of the variance. The coefficients for the correlations with the highest predictive value was .32. The coefficient increased to .40 with the addition of the other two variables. There was no significant correlation between the dependent variable and the independent variables, local mill levy, per pupil valuation, and average daily attendance.

TABLE 31

COEFFICIENTS AND SIGNIFICANCE VALUES FOR
DEPENDENT AND INDEPENDENT VARIABLES
PLAN C

| | AVDIPC | LOCMIL | PPUVAL | ADATEN |
|---|---|---|---|---|
| Average District Per Pupil Cost | 1.0000<br>( 0)<br>S=0.001 | | | |
| Local Mill Levy | 0.0867<br>( 27)<br>S=0.327 | 1.0000<br>( 0)<br>S=0.001 | | |
| Per Pupil Valuation | 0.2239<br>( 27)<br>S=0.121 | -0.3941<br>( 27)<br>S=0.017 | 1.0000<br>( 0)<br>S=0.001 | |
| Average Daily Attendance | -0.3185<br>( 27)<br>S=0.046 | 0.1588<br>( 27)<br>S=0.205 | -0.3218<br>( 27)<br>S=0.044 | 1.0000<br>( 0)<br>S=0.001 |

TABLE 32

PARTIAL CORRELATIONS CONTROLLING FOR CERTAIN INDEPENDENT VARIABLES
WITH DEPENDENT VARIABLE--AVERAGE DISTRICT PER PUPIL COST
PLAN C

| Independent Variables | Variables Controlled for | Partial Correlations | Significance |
|---|---|---|---|
| Local Mill Levy | Per Pupil Valuation | .20 | >.05 |
| | Average Daily Attendance | .15 | >.05 |
| | Per Pupil Valuation and Average Daily Attendance | .21 | >.05 |
| Per Pupil Valuation | Local Mill Levy | .28 | >.05 |
| | Average Daily Attendance | .14 | >.05 |
| | Local Mill Levy and Average Daily Attendance | .21 | >.05 |
| Average Daily Attendance | Per Pupil Valuation | -.27 | >.05 |
| | Local Mill Levy | -.33 | <.05 |
| | Per Pupil Valuation and Local Mill Levy | -.28 | >.05 |

## Plan D

In Plan D impact students were identified by whether their parents were employed in oil and gas related occupations. The number of impact students was multiplied times $375 to obtain the figure for impact payment. The Federal Government uses a figure of $375 per impact students enrolled in their school district. Thus, this plan used the same figure.

A linear model based on the four independent variables was used to predict the dependent variable for Plan D. Table 33 provides a summary of the stepwise regression analysis. The multiple R, or relationship, changes very little during the three steps of the stepwise multiple regression. Step one, with the independent variable, average daily membership, shows a multiple R of .32; increases to .35 in step two with the variable, per pupil valuation; and reaches a total of .40 in step three with the addition of the third variable, local mill levy. The R square shows that only 10 percent of the variance is accounted for with the independent variable, average daily membership in step one. An additional 3 percent is accounted for with the addition of the variable, per pupil valuation in step two. When the third variable, local mill levy is added in step three, the amount of variance accounted for, raises to 16 percent which is the total percentage of variance accounted for between the dependent variable and the set of independent variables. None of the correlations of the three steps are significant at the .05 level. The standard error, which is the amount of error in the prediction, is shown for each of the three steps. The standard error for Plan D was 228.20.

TABLE 33

MULTIPLE REGRESSION SUMMARY OF THREE
ORTHOGONAL INDEPENDENT VARIABLES
PLAN D

| Variable | Multiple R | R Square | RSQ Change | Regression Coefficients* | F Value | Degree of Freedom | Significance | Standard Error |
|---|---|---|---|---|---|---|---|---|
| Average Daily Membership | 0.32 | 0.10 | 0.10 | -0.1135 | 3.06 | 1,27 | >.05 | 226.90 |
| Per Pupil Valuation | 0.35 | 0.13 | 0.02 | 0.0048 | 1.87 | 2,26 | >.05 | 228.14 |
| Local Mill Levy | 0.40 | 0.16 | 0.03 | 0.8953 | 1.57 | 3,25 | >.05 | 228.20 |

NOTE: *Constant for prediction equation was $1,365.73

In Plan D, the dependent variable, average district per pupil cost, was used in a stepwise multiple regression. An attempt was made to predict the dependent variable. The difference between the observed value of the dependent variable and the value of the predicted dependent variable is shown as a residual in table 34. The residual may be either positive or negative. In this study, the residual was a measure of "relative equity". The closer that a residual, positive or negative, was to zero the more equitable the generation and distribution mix was judged to be for a particular sample school district.

Table 34 shows the observed average district per pupil cost and also the predicted per pupil cost for this plan. This table also presents the residual differences. Looking at the range of residuals it is noted that the highest positive residual was 479.25. The lowest negative residual is -393.72 The residual closest to zero is 9.68, which is the Taylor Public School District. Based on the definition of "relative equity" in this study, the district with the residual at 9.68 was receiving the most equitable tax revenue.

Figure 5 shows the plot of the standard deviation of the residuals. The residuals from the twenty-nine cases are distributed close to what would be expected with the arrangement of cases arranged from the highest to the lowest average district per pupil cost. There is one "outlier" school district, Williston, that is evident in the plot. A regression analysis was run excluding this case. No substantial change took place in the arrangement of residuals when the Williston School District data was excluded.

In order to determine to what extent certain variables were contributing to correlations, and significance levels, a partial

TABLE 34

OBSERVED, PREDICTED AND RESIDUAL VALUES
PLAN D

| District Name | Observed Average District Per Pupil Cost | Predicted Average District Per Pupil Cost | Residual |
|---|---|---|---|
| Billings County | $1,987.00 | $1,507.75 | +479.25 |
| Marmarth | 1,905.00 | 1,542.45 | +362.55 |
| Newburg | 1,835.00 | 1,615.12 | +219.88 |
| Horse Creek | 1,790.00 | 1,566.34 | +223.66 |
| Eight-Mile | 1,760.00 | 1,461.32 | +298.68 |
| Earl | 1,695.00 | 1,440.14 | +254.87 |
| Souris | 1,691.00 | 1,495.56 | +195.44 |
| Alexander | 1,676.00 | 1,499.36 | +176.64 |
| Flaxton | 1,546.00 | 1,488.45 | +57.55 |
| Glenburn | 1,531.00 | 1,431.27 | +99.73 |
| Rhame | 1,513.00 | 1,580.51 | -67.51 |
| Taylor | 1,502.00 | 1,492.32 | +9.68 |
| Central Elementary | 1,499.00 | 1,554.80 | -55.80 |
| Grenora | 1,471.00 | 1,487.34 | -16.34 |
| Powers Lake | 1,438.00 | 1,451.67 | -13.67 |
| Divide County | 1,410.00 | 1,423.95 | -13.95 |
| Scranton | 1,405.00 | 1,464.11 | -59.11 |
| Gardena | 1,405.00 | 1,648.51 | -243.51 |
| Nebo | 1,370.00 | 1,666.89 | -296.88 |
| New Town | 1,355.00 | 1,397.40 | -42.40 |
| Lansford | 1,312.00 | 1,480.92 | -168.92 |
| Williston | 1,311.00 | 1,162.52 | +148.48 |
| Ray | 1,301.00 | 1,449.76 | -148.76 |
| Mohall | 1,292.00 | 1,441.11 | -149.11 |
| Elm Grove | 1,279.00 | 1,412.78 | -133.78 |
| Lefor | 1,256.00 | 1,465.04 | -209.04 |
| Westhope | 1,170.00 | 1,447.42 | -277.42 |
| Tioga | 1,166.00 | 1,402.47 | -236.47 |
| Southheart | 1,015.00 | 1,408.72 | -393.72 |

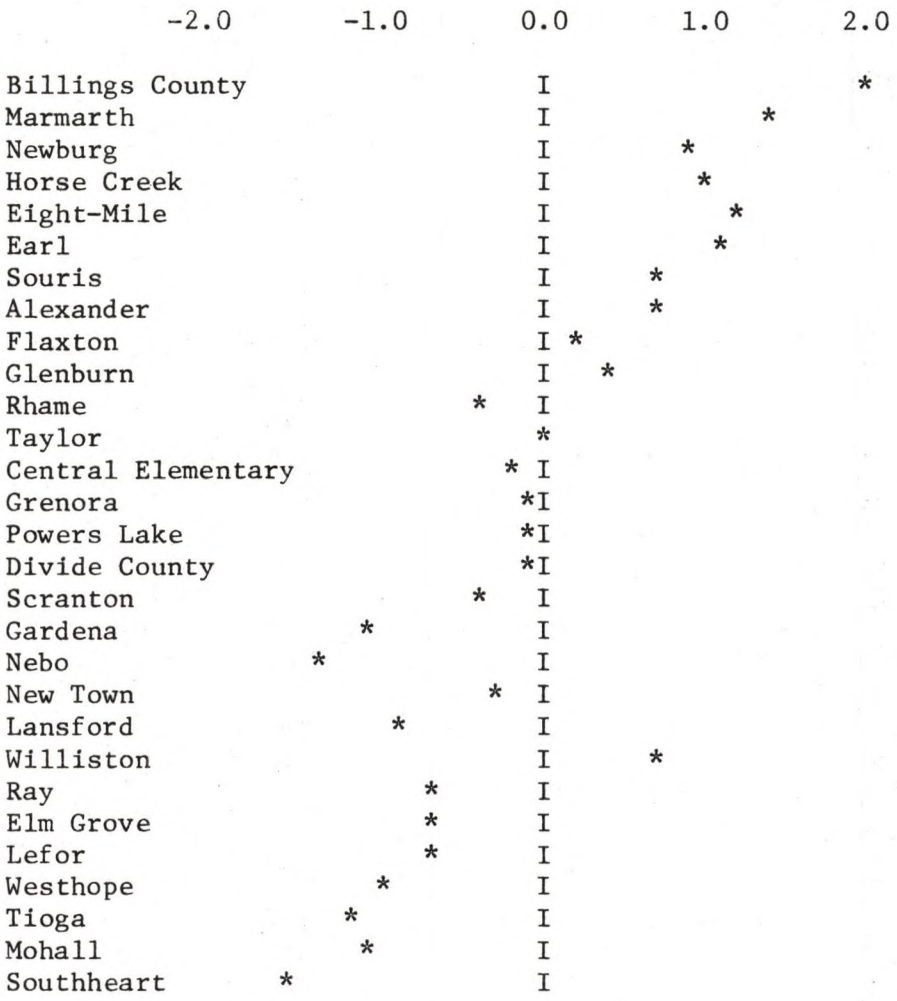


Figure 5. Plot of standardized residuals against twenty-nine school districts in rank order from highest to lowest average per pupil cost (Plan D).

correlation was run. Table 35 shows the correlation coefficients and significance values between the dependent variable, average district per pupil cost and the three independent variables. Table 36 shows the partial correlation when controlling for individual independent variables and groups of independent variables.

Partial correlations were calculated excluding one, then two, and finally three variables from the calculation. This procedure provided an opportunity to analyze all correlations and significance levels of the dependent variable with each independent variable while controlling for each variable separately. The following analysis describes the changes that took place in correlation coefficients and significance levels as independent variables were partialled out or controlled.

Table 35 shows that there were no significant correlations at the .05 level between the dependent variable, average district per pupil cost and the three independent variables. There were also no significant correlations between any of the independent variables.

Table 36 shows that when partialling out individual or groups of independent variables, the correlation was not significant at the .05 level between the dependent variable and any of the three independent variables.

After descriptive statistics were used to analyze four alternative plans of generation and distribution of oil and gas tax revenue, an attempt was make to determine commonalities in sample school districts relative to their residual.

Research Question

3. Is there an eclectic model of generation and distribution of oil and gas tax that would be more equitable than the present system?

TABLE 35

COEFFICIENTS AND SIGNIFICANCE VALUES FOR
DEPENDENT AND INDEPENDENT VARIABLES
PLAN D

| | AVDIPC | PPUVAL | LOCMIL | ADMEMB |
|---|---|---|---|---|
| Average District Per Pupil Cost | 1.0000<br>( 0)<br>S=0.001 | | | |
| Per Pupil Valuation | 0.2522<br>( 27)<br>S=0.093 | 1.0000<br>( 0)<br>S=0.001 | | |
| Local Mill Levy | 0.1409<br>( 27)<br>S=0.233 | -0.2247<br>( 27)<br>S=0.121 | 1.0000<br>( 0)<br>S=0.001 | |
| Average Daily Membership | -0.3191<br>( 27)<br>S=0.046 | -0.3348<br>( 27)<br>S=0.038 | -0.0034<br>( 27)<br>S=0.493 | 1.0000<br>( 0)<br>S=0.001 |

TABLE 36

PARTIAL CORRELATIONS CONTROLLING FOR CERTAIN INDEPENDENT VARIABLES
WITH DEPENDENT VARIABLE -- AVERAGE DISTRICT PER PUPIL COST
PLAN D

| Independent Variables | Variables Controlled for | Partial Correlations | Significance |
|---|---|---|---|
| Per Pupil Valuation | Local Mill Levy | .29 | >.05 |
| | Average Daily Membership | .16 | >.05 |
| | Local Mill Levy and Average Daily Membership | .21 | >.05 |
| Local Mill Levy | Per Pupil Valuation | .21 | >.05 |
| | Average Daily Membership | .15 | >.05 |
| | Per Pupil Valuation and Average Daily Membership | .19 | >.05 |
| Average Daily Membership | Per Pupil Valuation | -.26 | >.05 |
| | Per Pupil Valuation and Local Mill Levy | -.25 | >.05 |
| | Local Mill Levy | -.32 | >.05 |

The following tables present comparative data for residual analysis for four alternative plans from selected districts. Table 37 presents data for five independent variables for the five school districts that had residuals nearest to zero, the five districts with residuals closest to the median, and the five districts with residuals farthest from zero. Table 38 presents the variable data for the same groups for Plan B. Table 39 presents variable data for Plan C, while table 40 presents the variable data for Plan D.

A further attempt was made to determine whether there were commonalities in variable data in groups of school districts that had similarities in the residual figure. Table 41 presents the comparative data for analyzing the variable data of the five districts that had a residual figure nearest to zero. Variable data for the five districts which had a residual figure farthest from zero is presented in table 42. The variable data for four alternative plans is presented in the same table. In order to compare the means with the variable data for the selected districts in four alternative plans, table 43 presents the means for the dependent variable and the eight independent variables used in this study.

TABLE 37

COMPARATIVE DATA FOR RESIDUAL ANALYSIS
FROM SELECTED DISTRICTS
PLAN A

| Districts Having Residuals Near Zero | Residual | ADATEN | PPUVAL | PPUOIL | LOCMIL | TOTVAL |
|---|---|---|---|---|---|---|
| Grenora | +15 | 197.20 | $12,928.00 | $64.00 | -19 | $2,625,897.00 |
| Divide County | +2 | 643.79 | 8,427.00 | 33.00 | -08 | 5,556,259.00 |
| Taylor | +10 | 114.91 | 8,762.00 | 37.00 | -02 | 1,037,366.00 |
| Powers Lake | -21 | 238.30 | 6,034.00 | 94.00 | -16 | 1,511,656.00 |
| Billings County | -33 | 119.29 | 19,991.00 | 976.00 | -44 | 2,466,561.00 |
| **Districts Having Residuals Near The Median** | | | | | | |
| Central Elementary | +44 | 33.16 | 28,132.00 | 46.00 | -46 | 2,466,561.00 |
| Rhame | -44 | 125.63 | 7,266.00 | 112.00 | +6 | 944,771.00 |
| New Town | -45 | 604.03 | 2,315.00 | 42.00 | -5 | 1,618,460.00 |
| Scranton | -86 | 243.26 | 8,361.00 | 119.00 | -14 | 2,134,011.00 |
| Elm Grove | -72 | 331.51 | 3,451.00 | 46.00 | -34 | 1,183,254.00 |
| **Districts Having Residuals Farthest From Zero** | | | | | | |
| Marmarth | +328 | 27.55 | 13,396.00 | 28.00 | +18 | 390,374.00 |
| Earl | +334 | 20.72 | 11,677.00 | 204.00 | -88 | 253,742.00 |
| Southheart | -317 | 375.32 | 4,372.00 | 37.00 | -38 | 1,689,409.00 |
| Westhope | -291 | 314.35 | 4,653.00 | 64.00 | -04 | 1,511,848.00 |
| Eight-Mile | +228 | 162.80 | 3,433.00 | 49.00 | -2 | 572,166.00 |

TABLE 38

COMPARATIVE DATA FOR RESIDUAL ANALYSIS
FROM SELECTED DISTRICTS
PLAN B

| Districts Closest To Zero | Residual | PPUVAL | LOCMIL | AVDIPC | ADATEN | TOTVAL |
|---|---|---|---|---|---|---|
| Taylor | -5 | $ 8,762.00 | -02 | $1,502.00 | 114.91 | $1,037,366.00 |
| Glenburn | +14 | 7,267.00 | -06 | 1,513.00 | 125.63 | 2,183,561.00 |
| Central Elementary | -23 | 28,132.00 | -46 | 1,499.00 | 33.16 | 984,648.00 |
| Divide County | -18 | 8,795.00 | -08 | 1,410.00 | 643.79 | 5,795,638.00 |
| Grenora | -20 | 13,568.00 | -19 | 1,471.00 | 197.20 | 2,754,302.00 |
| **Districts Having Residuals Near The Median** | | | | | | |
| Rhame | +80 | 7,254.00 | -34 | 1,531.00 | 290.78 | 944,771.00 |
| Powers Lake | -34 | 6,750.00 | -16 | 1,438.00 | 238.30 | 1,694,300.00 |
| Flaxton | +32 | 11,664.00 | -08 | 1,546.00 | 79.18 | 968,093.00 |
| Gardena | -72 | 17,398.00 | +15 | 1,405.00 | 243.26 | 487,673.00 |
| New Town | -66 | 2,315.00 | -05 | 1,355.00 | 604.03 | 1,618,460.00 |
| **Districts Having Residuals Farthest From Zero** | | | | | | |
| Billings County | +478 | 26,795.00 | -44 | 1,987.00 | 119.29 | 3,295,765.00 |
| Southheart | -420 | 7,425.00 | -02 | 1,015.00 | 375.32 | 2,865,890.00 |
| Marmarth | +356 | 13,396.00 | +18 | 1,905.00 | 27.55 | 390,374.00 |
| Newburg | +340 | 13,621.00 | -31 | 1,835.00 | 97.74 | 1,375,723.00 |
| Lefor | -300 | 5,476.00 | -04 | 1,170.00 | 314.35 | 529,236.00 |

TABLE 39

COMPARATIVE DATA FOR RESIDUAL ANALYSIS
FROM SELECTED DISTRICTS
PLAN C

| Districts Having Residuals Near Zero | Residual | PPUVAL | AVDIPC | ADATEN | LOCMIL | TOTVAL |
|---|---|---|---|---|---|---|
| Flaxton | -2 | $17,277.00 | $1,546.00 | 79.18 | -9 | $1,433,957.00 |
| Rhame | -16 | 7,267.00 | 1,513.00 | 125.63 | -6 | 944,771.00 |
| Grenora | -14 | 11,028.00 | 1,471.00 | 197.20 | -19 | 2,697,147.00 |
| Taylor | -19 | 8,762.00 | 1,502.00 | 114.91 | -2 | 1,037,366.00 |
| Central Elementary | -23 | 28,132.00 | 1,499.00 | 33.16 | -46 | 984,648.00 |
| **Districts Having Residuals Near The Median** | | | | | | |
| New Town | -67 | 2,315.00 | 1,355.00 | 604.03 | -5 | 1,618,460.00 |
| Scranton | -73 | 8,369.00 | 1,405.00 | 243.26 | -14 | 2,134,011.00 |
| Glenburn | +102 | 7,438.00 | 1,531.00 | 290.78 | -34 | 2,238,710.00 |
| Newburg | +165 | 12,651.00 | 1,676.00 | 112.79 | -15 | 1,129,061.00 |
| Williston | +162 | 3,387.00 | 1,311.00 | 2,662.46 | -5 | 9,396,933.00 |
| **Districts Having Residuals Farthest From Zero** | | | | | | |
| Billings County | +504 | 22,518.00 | 1,987.00 | 119.29 | -44 | 2,769,674.00 |
| Southheart | -384 | 4,978.00 | 1,015.00 | 375.32 | -38 | 1,921,609.00 |
| Marmarth | -313 | 13,396.00 | 1,905.00 | 27.55 | +18 | 390,374.00 |
| Souris | -317 | 12,547.00 | 1,695.00 | 20.72 | -88 | 1,425,000.00 |
| Westhope | -307 | 5,602.00 | 1,170.00 | 314.35 | -4 | 1,820,623.00 |

TABLE 40

COMPARATIVE DATA FOR RESIDUAL ANALYSIS
FROM SELECTED DISTRICTS
PLAN D

| Districts Having Residuals Near Zero | Residual | ADMEMB | AVDIPC | PPUVAL | LOCMIL | TOTVAL |
|---|---|---|---|---|---|---|
| Taylor | -9 | 118 | $1,502.00 | $ 8,762.00 | -2 | $1,037,366.00 |
| Grenora | -16 | 203 | 1,471.00 | 12,928.00 | -19 | 2,625,897.00 |
| Powers Lake | -13 | 251 | 1,438.00 | 6,034.00 | -16 | 1,511,656.00 |
| Divide County | -13 | 659 | 1,410.00 | 8,427.00 | -8 | 5,556,259.00 |
| New Town | -42 | 699 | 1,355.00 | 2,315.00 | -5 | 1,618,460.00 |
| **Districts Having Residuals Near The Median** | | | | | | |
| Flaxton | +57 | 83 | 1,546.00 | 8,245.00 | -8 | 681,857.00 |
| Rhame | -67 | 130 | 1,513.00 | 7,266.00 | +06 | 944,771.00 |
| Glenburn | +99 | 301 | 1,531.00 | 6,326.00 | -34 | 1,705,260.00 |
| Scranton | -59 | 255 | 1,405.00 | 8,361.00 | -14 | 2,134,011.00 |
| Elm Grove | -133 | 343 | 1,279.00 | 3,451.00 | -34 | 1,183,254.00 |
| **Districts Having Residuals Farthest From Zero** | | | | | | |
| Billings County | +479 | 123 | 1,987.00 | 19,991.00 | -44 | 2,466,561.00 |
| Southheart | -394 | 386 | 1,015.00 | 4,372.00 | -38 | 1,689,409.00 |
| Marmarth | +363 | 29 | 1,905.00 | 13,396.00 | +18 | 390,374.00 |
| Westhope | -277 | 325 | 1,170.00 | 4,653.00 | -4 | 1,511,848.00 |
| Eight-Mile | +298 | 167 | 1,760.00 | 3,433.00 | 0 | 572,166.00 |

TABLE 41

COMPARATIVE DATA FROM FOUR ALTERNATIVE PLANS FOR ANALYSIS OF VARIABLES FROM FIVE DISTRICTS HAVING THE RESIDUAL SCORES CLOSEST TO ZERO

| District | AVDIPC | TOTVAL | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | PPUOIL | ADMEMB |
|---|---|---|---|---|---|---|---|---|---|
| Central Elementary | | | | | | | | | |
| Plan A | $1,499.00 | $ 984,648.00 | $28,132.00 | 0 | $242.77 | -46 | 33.16 | $46.00 | 35 |
| Plan B | 1,499.00 | 984,648.00 | 28,132.00 | 0 | 242.77 | -46 | 33.16 | 00.00 | 35 |
| Plan C | 1,499.00 | 984,648.00 | 28,132.00 | 0 | 242.77 | -46 | 33.16 | 00.00 | 35 |
| Plan D | 1,499.00 | 984,648.00 | 28,132.00 | 0 | 242.77 | -46 | 33.16 | 00.00 | 35 |
| Grenora | | | | | | | | | |
| Plan A | 1,471.00 | 2,625,897.00 | 12,928.00 | 22 | 611.75 | -19 | 197.20 | 64.00 | 203 |
| Plan B | 1,471.00 | 2,754,302.00 | 13,568.00 | 22 | 599.70 | -19 | 197.20 | 00.00 | 203 |
| Plan C | 1,471.00 | 2,697,147.00 | 11,028.00 | 22 | 605.33 | -19 | 197.20 | 00.00 | 203 |
| Plan D | 1,471.00 | 2,625,897.00 | 12,928.00 | 22 | 598.49 | -19 | 197.20 | 00.00 | 203 |
| Powers Lake | | | | | | | | | |
| Plan A | 1,438.00 | 1,511,656.00 | 6,034.00 | 43 | 668.11 | -16 | 238.30 | 94.00 | 251 |
| Plan B | 1,438.00 | 1,694,300.00 | 6,750.00 | 43 | 663.49 | -16 | 238.30 | 00.00 | 251 |
| Plan C | 1,438.00 | 1,433,957.00 | 7,232.00 | 43 | 723.54 | -16 | 238.30 | 00.00 | 251 |
| Plan D | 1,438.00 | 1,511,656.00 | 6,034.00 | 43 | 661.51 | -16 | 238.30 | 00.00 | 251 |
| Divide County | | | | | | | | | |
| Plan A | 1,410.00 | 5,556,259.00 | 8,427.00 | 9 | 629.08 | -8 | 643.79 | 33.00 | 659 |
| Plan B | 1,410.00 | 5,795,638.00 | 8,795.00 | 9 | 643.79 | -8 | 643.79 | 00.00 | 659 |
| Plan C | 1,410.00 | 5,801,884.00 | 8,804.00 | 9 | 627.28 | -8 | 643.79 | 00.00 | 659 |
| Plan D | 1,410.00 | 5,556,259.00 | 8,427.00 | 9 | 643.79 | -8 | 643.79 | 00.00 | 659 |
| Taylor | | | | | | | | | |
| Plan A | 1,502.00 | 1,037,366.00 | 8,762.00 | 3 | 798.71 | -2 | 114.91 | 37.00 | 118 |
| Plan B | 1,502.00 | 1,037,366.00 | 8,762.00 | 3 | 798.71 | -2 | 114.91 | 00.00 | 118 |
| Plan C | 1,502.00 | 1,037,366.00 | 8,762.00 | 3 | 798.71 | -2 | 114.91 | 00.00 | 118 |
| Plan D | 1,502.00 | 1,037,366.00 | 8,762.00 | 3 | 794.65 | -2 | 114.91 | 00.00 | 118 |

TABLE 42

COMPARATIVE DATA FROM FOUR ALTERNATIVE PLANS FOR ANALYSIS OF VARIABLES FROM FIVE DISTRICTS HAVING THE RESIDUAL SCORES FARTHEST FROM ZERO

| District | AVDIPC | TOTVAL | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | PPUOIL | ADMEMB |
|---|---|---|---|---|---|---|---|---|---|
| Marmarth | | | | | | | | | |
| Plan A | $1,905.00 | $ 390,374.00 | $13,396.00 | 0 | $480.92 | +18 | 27.55 | $28.00 | 29 |
| Plan B | 1,905.00 | 390,374.00 | 13,396.00 | 0 | 480.92 | +18 | 27.55 | 00.00 | 29 |
| Plan C | 1,905.00 | 390,374.00 | 13,396.00 | 0 | 480.92 | +18 | 27.55 | 00.00 | 29 |
| Plan D | 1,905.00 | 390,374.00 | 13,396.00 | 0 | 480.92 | +18 | 27.55 | 00.00 | 29 |
| Southheart | | | | | | | | | |
| Plan A | 1,015.00 | 1,689,409.00 | 4,372.00 | 37 | 689.75 | -38 | 375.32 | 37.00 | 386 |
| Plan B | 1,015.00 | 2,865,890.00 | 7,425.00 | 37 | 627.40 | -38 | 375.32 | 00.00 | 386 |
| Plan C | 1,015.00 | 1,921,609.00 | 4,978.00 | 37 | 676.33 | -38 | 375.32 | 00.00 | 386 |
| Plan D | 1,015.00 | 1,689,409.00 | 4,372.00 | 37 | 687.60 | -38 | 375.32 | 00.00 | 386 |
| Westhope | | | | | | | | | |
| Plan A | 1,170.00 | 1,511,848.00 | 4,653.00 | 107 | 629.29 | -4 | 314.35 | 64.00 | 325 |
| Plan B | 1,170.00 | 1,779,807.00 | 5,476.00 | 107 | 612.53 | -4 | 314.35 | 00.00 | 325 |
| Plan C | 1,170.00 | 1,820,623.00 | 5,602.00 | 107 | 610.02 | -4 | 314.35 | 00.00 | 325 |
| Plan D | 1,170.00 | 1,511,848.00 | 4,653.00 | 107 | 670.73 | -4 | 314.35 | 00.00 | 325 |
| Lansford | | | | | | | | | |
| Plan A | 1,312.00 | 1,261,027.00 | 8,072.00 | 8 | 735.99 | -7 | 143.69 | 88.00 | 150 |
| Plan B | 1,312.00 | 1,265,398.00 | 8,436.00 | 8 | 732.37 | -7 | 143.69 | 00.00 | 150 |
| Plan C | 1,312.00 | 1,205,055.00 | 8,034.00 | 8 | 740.42 | -7 | 143.69 | 00.00 | 150 |
| Plan D | 1,312.00 | 1,201,027.00 | 8,072.00 | 8 | 728.14 | -7 | 143.69 | 00.00 | 150 |
| Billings County | | | | | | | | | |
| Plan A | 1,987.00 | 2,466,561.00 | 19,991.00 | 19 | 424.06 | -44 | 119.29 | 976.00 | 123 |
| Plan B | 1,987.00 | 3,295,765.00 | 26,795.00 | 19 | 290.54 | -44 | 119.29 | 00.00 | 123 |
| Plan C | 1,987.00 | 2,769,674.00 | 22,518.00 | 19 | 376.08 | -44 | 119.29 | 00.00 | 123 |
| Plan D | 1,987.00 | 2,466,561.00 | 19,991.00 | 19 | 410.96 | -44 | 119.29 | 00.00 | 123 |

TABLE 43

MEAN SCORES FOR DEPENDENT AND INDEPENDENT VARIABLES IN FOUR ALTERNATIVE PLANS

| | ADMEMB | AVDIPC | PPUVAL | LOCMIL | ADATEN | TOTVAL | PPUOIL | STAFOU | IMPSTU |
|---|---|---|---|---|---|---|---|---|---|
| Plan A | 299.07 | $1,478.82 | $11,676.59 | -20.17 | 285.76 | $1,765,126.52 | 122.50 | 620.24 | 44.90 |
| Plan B | 299.07 | 1,478.82 | 14,982.41 | -20.17 | 285.76 | 2,003,362.00 | 00.00 | 451.24 | 44.90 |
| Plan C | 299.07 | 1,478.82 | 12,999.38 | -20.17 | 285.76 | 1,899,847.00 | 00.00 | 585.36 | 44.90 |
| Plan D | 299.07 | 1,478.82 | 11,676.59 | -20.17 | 285.76 | 1,765,126.00 | 00.00 | 295.88 | 44.90 |

NOTE: ADMEMB = Average Daily Membership
AVDIPC = Average District Per Pupil Cost
PPUVAL = Per Pupil Valuation
LOCMIL = Local Mill Levy
ADATEN = Average Daily Attendance
TOTVAL = Total Valuation
PPUOIL = Per Pupil Oil Revenue
STAFOU = State Foundation Payment
IMPSTU = Impact Students

TABLE 44

COMPARISON OF THE OBSERVED AND PREDICTED
AVERAGE DISTRICT PER PUPIL COST

| | High Observed | High Predicted | Low Observed | Low Predicted |
|---|---|---|---|---|
| Plan A | $1,987.00 | $2,020.24 | $1,015.00 | $1,332.30 |
| Plan B | 1,987.00 | 1,658.75 | 1,015.00 | 1,138.45 |
| Plan C | 1,987.00 | 1,676.32 | 1,015.00 | 1,371.31 |
| Plan D | 1,987.00 | 1,666.89 | 1,015.00 | 1,162.53 |

TABLE 45

COMPARISON OF THE RESIDUALS

| | High Residual + | Low Residual - | Closest To Zero |
|---|---|---|---|
| Plan A | $+334.64 | $-317.30 | $+2.74 |
| Plan B | +477.53 | -420.72 | -5.29 |
| Plan C | +493.93 | -379.42 | -3.87 |
| Plan D | +479.25 | -393.72 | 9.38 |

When analyzing the multiple regression, the following summaries show the comparisons in the four alternative models. Table 44 compares the observed average district per pupil cost and the expected per pupil cost. Table 45 compares the residuals in the four alternative models.

Table 46 provides a comparison of the four models relative to residuals, which is the difference between predicted and observed dependent variable, average district per pupil cost.

In analyzing the data from the four alternative plans of generation and distribution of oil and gas revenue, the writer was unable to determine any characteristics of any of the four plans that seemed to be consistent. Since no apparent commonality was identified in any of the variables in any of the four plans an eclectic model is not presented.

The standard errors for each model were examined to determine differences in "relative equity" in the four models of generation and distribution of oil and gas tax revenue. In table 12, Plan A shows a standard error of 200.74. In table 19, Plan B shows a standard error of 232.71. In table 26, Plan C shows a standard error of 228.27. In table 33, Plan D shows a standard error of 228.20.

By comparing the standard error scores in the four models it was noted that these scores were very near to one another. This similarity in scores denoted minimal differences in the four models regarding their degree of "relative equity". The relative equity for individual districts would be changed from one model to another but the cumulative effect of each model would be approximately the same for each of the four models.

TABLE 46

CONTRASTING RESIDUALS ON FOUR ALTERNATIVE PLANS

| Sample School District | Plan A | Plan B | Plan C | Plan D |
|---|---|---|---|---|
| Billings | $ -10.11 | $+477.53 | $+504.89 | $+479.25 |
| Marmarth | +359.52 | +356.77 | +313.47 | +362.55 |
| Newburg | +202.62 | +340.44 | +164.84 | +219.88 |
| Horse Creek | +294.02 | +198.07 | +235.74 | +223.66 |
| Eight-Mile | +222.85 | +271.52 | +237.10 | +298.68 |
| Earl | +253.35 | +237.38 | +226.96 | +254.87 |
| Souris | +211.64 | +190.73 | +317.40 | +195.44 |
| Alexander | +87.48 | +171.42 | +192.40 | +176.64 |
| Flaxton | -48.82 | +32.61 | -2.37 | +57.55 |
| Glenburn | +128.34 | +14.26 | +102.92 | +99.73 |
| Rhame | -62.42 | +80.78 | -16.54 | -67.51 |
| Taylor | -33.51 | -5.29 | -19.07 | 9.68 |
| Central Elementary | +102.46 | -23.65 | -23.70 | -55.80 |
| Grenora | +42.90 | -20.30 | -14.19 | -16.34 |
| Powers Lake | -8.81 | -34.79 | -32.26 | -13.67 |
| Divide County | +42.91 | -18.43 | -27.66 | -13.95 |
| Scranton | -65.12 | -149.65 | -73.17 | -59.11 |
| Gardena | -227.01 | -72.61 | -196.76 | -243.51 |
| Nebo | -285.49 | -228.75 | -291.51 | -296.88 |
| New Town | -36.82 | -66.91 | -67.79 | -42.40 |
| Lansford | -213.74 | -185.98 | -192.26 | -168.92 |
| Williston | +97.50 | 172.55 | +162.60 | -148.48 |
| Ray | -130.60 | -164.64 | -167.87 | -148.76 |
| Elm Grove | -114.96 | -157.20 | -127.75 | -133.78 |
| Lefor | -34.79 | -215.77 | -171.75 | -209.04 |
| Westhope | -248.70 | -300.27 | -307.30 | -277.42 |
| Tioga | -17.96 | -255.79 | -225.38 | -236.47 |
| Mohall | -160.40 | -163.79 | -157.26 | -149.11 |
| Southheart | -346.31 | -420.22 | -383.71 | -393.72 |

# CHAPTER V

## SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

### Summary

The purpose of this study was to identify an equitable existing model of generation and distribution of oil and gas tax revenue or to propose one. A set of hypotheses and research questions were stated to give direction to that effort.

The first hypothesis to be tested was stated as follows: Twenty-nine school districts that received oil and gas tax revenue in North Dakota were compensated appropriately for the dollars lost in the ability to tax oil and gas businesses as real property. Research question one was stated as follows: Were sample school districts being compensated above, below, or within the hypothetical equity range for additional students generated by oil and gas activity?

Arguments by individuals throughout the state showed concern about the present formula of distribution of oil and gas tax revenues. An attempt was made to use suggestions from informed individuals in identifying a range that would be used as a measure in determining whether school districts in oil and gas activity areas were receiving sufficient, insufficient, or excessive oil and gas tax revenue.

Most of the dissatisfaction centered around two types of arguments. The first argument was that the ability to tax oil and gas production equipment was taken away from schools by the state in 1953. The second argument

was that school districts had students enrolled whose parents were employed in businesses that were exempt from the property tax paid by other businesses.

With these two arguments in mind, a range was established which would be a reasonable indicator of whether the oil and gas tax revenue that school districts were receiving from the present system, was insufficient, sufficient, or excessive. The range was established by calculating the amount of dollars that districts were losing by not being able to tax oil and gas industries as local property at one end of the range. The other end of the range was established by calculating the number of dollars that a school district was losing as a result of not being able to tax the businesses where the impact student's parents were employed. Using this range as the indicator it was found that there were school districts which received insufficient amounts of oil and gas tax revenue. There were also districts receiving sufficient amounts while others were receiving excessive amounts under the present model of generation and the present formula for distribution of these revenues.

The school district that received the highest excessive amount received $103,636 or $851 per student in excess of the amount determined to be sufficient by the hypothetical equity range. The district that received the most insufficient amount received $5,049 or $16 per student less than the amount determined to sufficient by the hypothetical equity range. Only five of the twenty-one school districts studied were in the sufficient tax revenue category according to the hypothetical range.

Hypothesis number two was stated as follows: There was no significant difference in "relative equity" using four alternative plans of generation and distribution of gas and oil tax revenue. The research

question was as follows: What features of alternative systems of generation and distribution of oil and gas taxes provided more "relative equity" than the present system?

Multiple linear regression was the statistical technique used in this study. Comparisons were made by analyzing the present North Dakota model and three alternative models. These comparisons were made to determine which elements within each model contributed most significantly to an equitable distribution of the severed resources. An equitable distribution was a distribution where the average district per pupil cost was equal to the per pupil revenue generated from local, county, and state revenue. After determining the effect of elements within the present North Dakota model and three alternative models, a composite model for distribution of oil and gas was to be suggested that was more equitable than the present model.

A systematic sample was taken of all school districts in North Dakota which receive oil and gas tax revenue. A visual examination of the districts did not suggest the introduction of any systematic error. A nonstratified sample of twenty-nine school districts supplied the data for the various descriptive statistics.

Model A, which was the present North Dakota model, utilized a percentage gross production tax and was distributed according to an established formula. This model was tested for "relative equity". Alternative Model B was patterned after a capitalization of income model. Model C was patterned after a property tax model, and Model D was patterned after an impact model.

The eight selected independent variables used in this study were: (1) average daily membership, (2) per pupil valuation, (3) impact students,

(4) per pupil oil and gas revenue, (5) state foundation payment, (6) local mill levy, (7) average daily attendance, and (8) total property valuation. Because of interrelatedness among the correlation coefficients in the eight independent variables, a factor analysis was computed. As a result of the analysis, four different independent variables were retained which were (1) per pupil oil and gas, (2) per pupil valuation, (3) local mill levy, and (4) average daily attendance. The four retained variables were tested against the dependent variable, average district per pupil cost. The positive or negative residual was the determiner of "relative equity". It was found that there were wide differences in the residuals among the models.

In analyzing each model through a stepwise multiple regression, scattergram, partial correlation, and visual examination, the writer was not able to ascertain any significant patterns that would lead to the conclusion that any one model provided for more "relative equity" than any of the others. As a result of being unable to determine any pattern of variables contributing to a model of "relative equity", the writer was unable to construct an eclectic model.

Summarizing the four alternative models showed that the average per pupil cost in the twenty-nine sample school districts deviated from the state average. The state average was $1,295. Six school districts were below the state average. The range of average per pupil cost was from a low of $1,015 at Southheart School District to a high of $1,987 at Billings County School District. The mean average district per pupil cost was $1,478,828 with a standard deviation of 235.10. The mean of the local mill levy, as compared to the state average, was -20.17 mills in all four models.

In Plan A the mean for average daily attendance was 285.76 students. The mean score for per pupil valuation of $11,676.59 and the mean score for per pupil oil revenue was $114.76.

In Plan B the average daily attendance mean was the same as Plan A. The mean score for per pupil valuation was $14,982.41 or an increase of approximately $3,300 over Plan A. In Plan C the mean score for per pupil valuation was $12,999.38, thus down from Plan B but up from Plan A. In Plan D the mean per pupil valuation was $11,676.59 or exactly the same as Plan A.

Comparing the residuals from the four alternative models by districts it was noted that the residual for Billings County Public School District was -10.11 in Plan A and 477.53 in Plan B, 504.89 in Plan C, and 479.25 in Plan D. Conjectures of why there was such a large discrepancy between the residual in Plan A and the other three plans is that the variable per pupil oil is used in Plan A while it is not a variable in the other three plans. The high per pupil cost seems to be covered by the per pupil oil revenue in Plan A while it is not in the other three plans.

## Conclusions

### General

Drawing conclusions regarding the distribution from severed resources was difficult because the analysis of the data indicated that much of the variance was not accounted for using the variables selected. Furthermore, it did not suggest patterns from which a model might be drawn. Nevertheless, the data suggested a number of general conclusions and some specific conclusions which are discussed in the next section.

The present system of distribution in the case of school districts presents some problems which invite analysis and comment. The present system of distribution, in the case of oil and gas revenues, was related to average daily attendance in the county of extraction. At present 6 percent of the original tax goes to support schools. As a result of analyzing the data and utilizing a hypothetical equity range, it was found that for five districts this amount was within the range, for one district it was below, and for fifteen districts this amount was above the equity range. Using a range, between payment for impact students and money lost by the inability to tax oil and gas production equipment as real property, as an "adequacy measure" seems to be an appropriate measure of "relative equity".

The following general conclusions were the result of the work of this writer and other FESEND project members. These conclusions are paraphrased from the FESEND Study Monograph.

Many local district officials believe that some impacted districts have not yet recovered costs associated with the exploration, drilling of oil and operating impact, while others have benefitted generously. The research seems to bear this out. Five different problems can be anticipated given the present distribution system: (1) one school district could receive support but no impact, (2) another school district could receive both impact and support though they may be unrelated to each other, (3) another school district could receive impact but no support, (4) any school district could receive the support untimely, such as after the greatest impact has occurred, and (5) some school districts could lose federal revenue as a result of a lack of wealth neutrality in North Dakota under the present system.

If an impact system were developed, support would be channeled to the schools which have impact in proportion to that impact. It appears the amount should have some relationship of support to the state average local support from business and agricultural property. Local support from business and agriculture property, for each specific school district, could then be used as a guide in the amount of impact payment made.

There is an obvious relationship between the development of oil and gas and the development of coal. Coal, however, presents some unique problems, notably a prolonged construction phase preceding an operational phase. Attention to problems during the construction phase seem warranted. To an extent, some of the mistakes made in the oil and gas system were avoided in the coal system with the provision for facility-construction support where "extraordinary" impact could be demonstrated (Hill et al., 1978).

The state of North Dakota has operated since the early 1950's with a flawed oil and gas system for supporting education costs. The writer remains persuaded the flawed system could and should be restructured comparing the three alternatives investigated to the present plan of generation and distribution does not seem to provide any more appropriate means to "more equitably" distribute oil and gas tax revenue.

## More Specific Conclusions

The following conclusions were drawn from the analysis of the data collected and from the review of the literature.

1. There was a high correlation between the per pupil cost of education and the per pupil oil and gas tax revenue.

2. The utilization of a hypothetical equity range showed that certain school districts received sufficient revenue from oil and gas taxes, while others received excessive amounts, and one district received insufficient revenue under the present system of generation and distribution of oil and gas tax revenue.

3. The identified independent variables contributed a low percentage to the prediction of the dependent variable.

4. The size of a school district had a substantial effect on the "relative equity" of generation and distribution of oil and gas tax revenue.

5. The similarities in data that could have a causal effect on high or low residuals were not consistant. The writer could not determine the reason for this inconsistency other than conjecture that some other variable or variables that had not yet been identified were having an effect on the dependent variable.

6. The variables identified did not determine the "relative equity" of generation and distribution of oil and gas taxes.

7. The "relative equity" of the distribution of oil and gas tax revenue affected individual districts differently in four alternative plans.

8. The mean mill levy for school districts that received oil and gas taxes was -22 in comparison to the state average local mill levy.

## Limitations

The following were limitations of the study:

1. Exact data regarding the value of oil and gas equipment was not available.

2. Accurate assessment of the value of the oil reserves underground was impossible to obtain.

3. Systematic methodology for recording data relative to tax revenue or industry impact has not been developed due to the short history of oil and gas activity in the state.

4. Pertinent information relating to other variables such as excess transportation costs and inflated salaries in communities where oil and gas activity is taking place was not obtained.

5. Identified variables accounted for a low percentage of the variance.

## Recommendations

As a result of this study it is recommended that:

1. A further study should be made of the present form of generating and distributing oil and gas revenues in North Dakota in an attempt to better meet equity criteria.

2. A further search should be made to identify variables that affect the "relative equity" of the generation and distribution of oil and gas tax revenue.

3. A set of criteria should be established to separate "need to make capital expenditures" from "opportunity to make capital expenditures" as mineral resource activities occur in school districts.

4. A method should be established and mandated to facilitate the collection of data relative to the study of the equitable generation and distribution of tax revenue from mineral resources.

5. The appropriate decision-makers should look to the history of school district costs associated with oil and gas impacts if an

impact basis is adopted for the distribution of tax revenues from severed resources.

6. The coal, oil and gas tax revenue distributions should be systemized in such a way that distribution schedules are maintained similarly across the state and that revenue projections are known by school administrators.

7. A wider sample should be used in a study to determine whether different results would occur.

8. A comparison should be made between states to determine whether the generation and distribution of coal, oil and gas tax revenue is more equitable in other states.

9. An interested individual or group should conduct further study using data gathered for this study supplemented with additional data which would include factors not included in this study.

The following recommendations are the result of group consensus during a research project dealing with school finance.

10. A system should be developed for the distribution of coal severance revenues to schools impacted in proportion to their impact and should have a relationship which is analogous to revenue generation from property tax. Consideration should be given to the following points in moving toward the implementation of this recommendation.

a) Consider impact effects across county lines from extractive activity and develop some system for compensating extraordinary impact for students residing close to, but not in, counties of extraction.

b) Consider capping per pupil payments from severance taxes at some level which avoids the argument of nonuniform treatment, that is, where support is in some relationship to analogous support which

would have occurred had an increment in valuation been used.

c) Consider creation of a trust fund for compensation to the state and local subdivisions following depletion of mineral resources.

d) Consider developing a forward funding mechanism to permit revenue distribution for general operating purposes during construction phases of coal mineral activity (FESEND Project 1978).

# APPENDICES

# APPENDIX A

## RAW DATA FOR ONE DEPENDENT AND EIGHT INDEPENDENT VARIABLES FOR TWENTY-NINE SAMPLE SCHOOL DISTRICTS

## PLAN A

| District | County Number | District Number | AVDIPC | ADMEMB | PPUVAL | IMPSTU | PPUOIL | STAFOU | LOCMIL | ADATEN | TOTVAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Billings | 4 | 1 | $1,987.00 | 123 | $19,991.00 | 19 | $976.00 | $424.06 | -44 | 119.29 | $2,466,561.00 |
| Gardena | 5 | 4 | 1,405.00 | 28 | 17,398.00 | 2 | 93.00 | 538.28 | 15 | 27.32 | 487,673.00 |
| Westhope | 5 | 17 | 1,170.00 | 325 | 4,653.00 | 107 | 64.00 | 629.29 | -04 | 314.35 | 1,511,848.00 |
| Souris | 5 | 29 | 1,691.00 | 99 | 13,490.00 | 2 | 75.00 | 674.48 | -26 | 95.52 | 1,335,500.00 |
| Lansford | 5 | 35 | 1,312.00 | 150 | 8,072.00 | 8 | 88.00 | 735.99 | -07 | 143.69 | 1,201,027.00 |
| Newburg | 5 | 48 | 1,835.00 | 101 | 9,137.00 | 6 | 68.00 | 705.30 | 31 | 95.74 | 914,261.00 |
| Rhame | 6 | 17 | 1,513.00 | 130 | 7,266.00 | 6 | 112.00 | 709.46 | 6 | 125.63 | 944,771.00 |
| Nebo | 6 | 27 | 1,370.00 | 5 | 525.89 | 0 | 162.00 | 157.16 | -55 | 4.61 | 262,947.00 |
| Scranton | 6 | 33 | 1,405.00 | 255 | 8,361.00 | 0 | 119.00 | 600.16 | -14 | 243.26 | 2,134,011.00 |
| Powers Lake | 7 | 27 | 1,438.00 | 251 | 6,034.00 | 43 | 94.00 | 668.11 | -16 | 238.30 | 1,511,656.00 |
| Flaxton | 7 | 35 | 1,546.00 | 83 | 8,245.00 | 6 | 109.00 | 881.85 | -08 | 79.18 | 681,857.00 |
| Divide County | 12 | 1 | 1,410.00 | 659 | 8,427.00 | 9 | 33.00 | 629.08 | -08 | 643.79 | 5,556,259.00 |
| Alexander | 27 | 2 | 1,676.00 | 117 | 12,651.00 | 4 | 186.00 | 701.56 | -15 | 112.79 | 1,483,230.00 |
| Earl | 27 | 18 | 1,695.00 | 22 | 11,677.00 | 0 | 204.00 | 829.42 | -88 | 20.72 | 253,742.00 |
| Horse Creek | 27 | 32 | 1,790.00 | 10 | 31,081.00 | 0 | 137.00 | 268.83 | -52 | 9.59 | 310,812.00 |
| New Town | 31 | 1 | 1,355.00 | 699 | 2,315.00 | 77 | 42.00 | 617.49 | -05 | 604.03 | 1,618,460.00 |

| District | County Number | District Number | AVDIPC | ADMEMB | PPUVAL | IMPSTU | PPUOIL | STAFOU | LOCMIL | ADATEN | TOTVAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Williston | 53 | 1 | $1,311.00 | 2,774 | $ 3,387.00 | 508 | $ 49.00 | 679.02 | -05 | 2,662.46 | $9,396,983.00 |
| Eight-Mile | 53 | 6 | 1,760.00 | 167 | 3,433.00 | 28 | 49.00 | 862.11 | -02 | 162.80 | 572,166.00 |
| Tioga | 53 | 15 | 1,166.00 | 616 | 6,282.00 | 347 | 52.00 | 601.64 | -26 | 588.31 | 3,868,099.00 |
| Ray | 53 | 2 | 1,301.00 | 241 | 7,272.00 | 28 | 54.00 | 776.14 | -26 | 232.61 | 1,750,698.00 |
| Grenora | 53 | 99 | 1,471.00 | 203 | 12,928.00 | 22 | 64.00 | 611.75 | -19 | 197.20 | 2,625,897.00 |
| Mohall | 38 | 9 | 1,292.00 | 360 | 7,163.00 | 39 | 146.00 | 634.79 | -20 | 350.96 | 2,580,664.00 |
| Glenburn | 38 | 26 | 1,531.00 | 301 | 6,326.00 | 8 | 111.00 | 620.53 | -34 | 290.78 | 1,905,260.00 |
| Marmarth | 44 | 12 | 1,905.00 | 29 | 13,396.00 | 0 | 28.00 | 480.92 | -18 | 27.55 | 390,374.00 |
| Central Elem. | 44 | 32 | 1,499.00 | 35 | 28,132.00 | 0 | 46.00 | 242.77 | -46 | 33.16 | 984,648.00 |
| Taylor | 45 | 3 | 1,502.00 | 118 | 8,762.00 | 3 | 37.00 | 798.71 | -02 | 114.91 | 1,037,366.00 |
| Southheart | 45 | 9 | 1,015.00 | 386 | 4,372.00 | 6 | 37.00 | 689.75 | -38 | 375.32 | 1,689,409.00 |
| Elm Grove | 45 | 13 | 1,279.00 | 343 | 3,451.00 | 45 | 46.00 | 785.31 | -34 | 331.51 | 1,183,254.00 |
| Lefor | 45 | 27 | 1,256.00 | 43 | 12,330.00 | 0 | 47.00 | 432.90 | -61 | 41.56 | 529,236.00 |

NOTE: AVDIPC = Average District Per Pupil Cost
ADMEMB = Average Daily Membership
PPUVAL = Per Pupil Valuation
IMPSTU = Impact Students
PPUOIL = Per Pupil Oil Revenue
STAFOU = State Foundation Payment
LOCMIL = Local Mill Levy
ADATEN = Average Daily Attendance
TOTVAL = Total Valuation

# APPENDIX B

## RAW DATA FOR ONE DEPENDENT AND SEVEN INDEPENDENT VARIABLES FOR TWENTY-NINE SAMPLE SCHOOL DISTRICTS

## PLAN B

| District | County Number | District Number | AVDIPC | ADMEMB | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | TOTVAL |
|---|---|---|---|---|---|---|---|---|---|---|
| Billings | 4 | 1 | $1,987.00 | 123 | $26,795.00 | 19 | $290.54 | -44 | 119.29 | $3,295,765.00 |
| Gardena | 5 | 4 | 1,405.00 | 28 | 17,298.00 | 2 | 538.28 | 15 | 27.32 | 487,673.00 |
| Westhope | 5 | 17 | 1,170.00 | 325 | 5,476.00 | 107 | 612.53 | -04 | 314.35 | 1,779,807.00 |
| Souris | 5 | 29 | 1,691.00 | 99 | 14,107.00 | 2 | 662.75 | -26 | 95.52 | 1,396,544.00 |
| Lansford | 5 | 35 | 1,312.00 | 150 | 8,436.00 | 8 | 732.37 | -07 | 143.69 | 1,265,398.00 |
| Newburg | 5 | 48 | 1,835.00 | 101 | 13,621.00 | 6 | 614.33 | -31 | 95.74 | 1,375,723.00 |
| Rhame | 6 | 17 | 1,513.00 | 130 | 7,267.00 | 6 | 709.46 | -06 | 125.63 | 944,771.00 |
| Nebo | 6 | 27 | 1,370.00 | 5 | 89,686.00 | 0 | -2,800.00 | -55 | 4.61 | 448,430.00 |
| Scranton | 6 | 33 | 1,405.00 | 255 | 8,369.00 | 0 | 600.16 | -14 | 243.26 | 2,134.011.00 |
| Powers Lake | 7 | 27 | 1,438.00 | 251 | 6,750.00 | 43 | 663.49 | -16 | 238.30 | 1,694,300.00 |
| Flaxton | 7 | 35 | 1,546.00 | 83 | 11,664.00 | 6 | 814.11 | -08 | 79.18 | 968,093.00 |
| Divide County | 12 | 1 | 1,410.00 | 659 | 8,795.00 | 9 | 627.47 | -08 | 643.79 | 5,795,638.00 |
| Alexander | 27 | 2 | 1,676.00 | 117 | 12,651.00 | 4 | 112.79 | -15 | 112.79 | 1,483,230.00 |
| Earl | 27 | 18 | 1,695.00 | 22 | 15,659.00 | 0 | 746.91 | -88 | 20.72 | 344,501.00 |
| Horse Creek | 27 | 32 | 1,790.11 | 10 | 59,484.00 | 0 | -297.00 | -52 | 9.59 | 594,841.00 |
| New Town | 31 | 1 | 1,355.00 | 699 | 2,315.00 | 77 | 617.49 | -05 | 604.03 | 1,618,460.00 |

| District | County Number | District Number | AVDIPC | ADMEMB | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | TOTVAL |
|---|---|---|---|---|---|---|---|---|---|---|
| Williston | 53 | 1 | $1,311.00 | 2,774 | $ 3,387.00 | 508 | $679.02 | -05 | 2,662.46 | $9,396,983.00 |
| Eight-Mile | 53 | 6 | 1,760.00 | 167 | 3,433.00 | 28 | 862.11 | -02 | 162.80 | 572,166.00 |
| Tioga | 53 | 15 | 1,166.00 | 616 | 9,709.00 | 347 | 533.09 | -26 | 588.31 | 5,980,733.00 |
| Ray | 53 | 2 | 1,301.00 | 241 | 7,272.00 | 28 | 601.64 | -26 | 232.61 | 1,750,698.00 |
| Grenora | 53 | 99 | 1,471.00 | 203 | 13,568.00 | 22 | 599.70 | -19 | 197.20 | 2,754,302.00 |
| Mohall | 38 | 9 | 1,292.00 | 360 | 7,762.00 | 39 | 623.74 | -20 | 350.96 | 2,794,262.00 |
| Glenburn | 38 | 26 | 1,531.00 | 301 | 7,254.00 | 8 | 608.57 | -34 | 290.78 | 2,183,561.00 |
| Marmarth | 44 | 12 | 1,905.00 | 29 | 13,396.00 | 0 | 480.92 | 18 | 27.55 | 390,374.00 |
| Central Elementary | 44 | 32 | 1,499.00 | 35 | 28,132.00 | 0 | 242.71 | -46 | 33.16 | 984,648.00 |
| Taylor | 45 | 3 | 1,502.00 | 118 | 8,762.00 | 3 | 798.71 | -02 | 114.91 | 1,037,366.00 |
| Southheart | 45 | 9 | 1,015.00 | 386 | 7,425.00 | 6 | 627.40 | -38 | 375.32 | 2,865,890.00 |
| Elm Grove | 45 | 13 | 1,279.00 | 343 | 3,587.00 | 45 | 781.85 | -34 | 331.51 | 1,230,242.00 |
| Lefor | 45 | 27 | 1,256.00 | 43 | 12,330.00 | 0 | 432.90 | -61 | 41.56 | 529,236.00 |

NOTE: AVDIPC = Average District Per Pupil Cost
ADMEMB = Average Daily Membership
PPUVAL = Per Pupil Valuation
IMPSTU = Impact Students
STAFOU = State Foundation Payment
LOCMIL = Local Mill Levy
ADATEN = Average Daily Attendance
TOTVAL = Total Valuation

# APPENDIX C

## RAW DATA FOR ONE DEPENDENT AND SEVEN INDEPENDENT VARIABLES FOR TWENTY-NINE SAMPLE SCHOOL DISTRICTS

## PLAN C

| District | County Number | District Number | AVDIPC | ADMEMB | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | TOTVAL |
|---|---|---|---|---|---|---|---|---|---|---|
| Billings | 4 | 1 | $1,987.00 | 123 | $22,518.00 | 19 | $376.08 | -44 | 119.29 | $2,769,674.00 |
| Gardena | 5 | 4 | 1,405.00 | 28 | 17,398.00 | | 538.28 | 15 | 27.32 | 487,673.00 |
| Westhope | 5 | 17 | 1,170.00 | 325 | 5,602.00 | | 610.02 | -4 | 314.35 | 1,820,623.00 |
| Souris | 5 | 29 | 1,691.00 | 99 | 14,394.00 | 2 | 657.00 | -26 | 95.52 | 1,425,000.00 |
| Lansford | 5 | 35 | 1,312.00 | 150 | 8,034.00 | 8 | 740.42 | -7 | 143.69 | 1,205,055.00 |
| Newburg | 5 | 48 | 1,835.00 | 101 | 11,179.00 | 6 | 663.18 | 31 | 95.74 | 1,129,061.00 |
| Rhame | 6 | 17 | 1,513.00 | 130 | 7,267.00 | 6 | 709.46 | 6 | 125.63 | 944,771.00 |
| Nebo | 6 | 27 | 1,370.00 | 5 | 65,947.00 | 0 | -426.00 | -55 | 4.61 | 329,735.00 |
| Scranton | 6 | 33 | 1,405.00 | 255 | 8,369.00 | 0 | 600.16 | -14 | 243.26 | 2,134,011.00 |
| Powers Lake | 7 | 27 | 1,438.00 | 251 | 7,232.00 | 43 | 723.54 | -16 | 238.30 | 1,815,256.00 |
| Flaxton | 7 | 35 | 1,546.00 | 83 | 17,277.00 | 6 | 701.86 | -8 | 79.18 | 1,433,957.00 |
| Divide County | 12 | 1 | 1,410.00 | 659 | 8,804.00 | 9 | 627.28 | -8 | 643.79 | 5,801,884.00 |
| Alexander | 27 | 2 | 1,676.00 | 117 | 12,651.00 | 4 | 701.56 | -15 | 112.79 | 1,483,230.00 |
| Earl | 27 | 18 | 1,695.00 | 22 | 12,547.00 | 0 | 809.14 | -88 | 20.72 | 276,042.00 |
| Horse Creek | 27 | 32 | 1,790.00 | 10 | 37,771.00 | 0 | 141.60 | -52 | 9.59 | 377,712.00 |
| New Town | 31 | 1 | 1,355.00 | 699 | 2,315.00 | | 617.49 | -05 | 604.03 | 1,618,460.00 |

| District | County Number | District Number | AVDIPC | ADMEMB | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | TOTVAL |
|---|---|---|---|---|---|---|---|---|---|---|
| Williston | 53 | 1 | $1,311.00 | 2,774 | $ 3,387.00 | 508 | $679.02 | -05 | 2,662.46 | $9,396,983.00 |
| Eight-Mile | 53 | 6 | 1,760.00 | 167 | 3,433.00 | 28 | 862.11 | -02 | 162.80 | 572,166.00 |
| Tioga | 53 | 15 | 1,166.00 | 616 | 4,378.00 | 347 | 570.91 | -26 | 588.31 | 4,815,724.00 |
| Ray | 53 | 2 | 1,301.00 | 241 | 11,631.00 | 28 | 776.14 | -26 | 232.61 | 1,750,698.00 |
| Grenora | 53 | 99 | 1,471.00 | 203 | 11,028.00 | 22 | 605.33 | -19 | 197.20 | 2,697,147.00 |
| Mohall | 38 | 9 | 1,292.00 | 360 | 7,786.00 | | 623.25 | -20 | 350.96 | 2,802,964.00 |
| Glenburn | 38 | 26 | 1,531.00 | 301 | 7,438.00 | 8 | 604.91 | -34 | 290.78 | 2,238,710.00 |
| Marmarth | 44 | 12 | 1,905.00 | 29 | 13,396.00 | 0 | 480.92 | 18 | 27.55 | 390,374.00 |
| Central Elementary | 44 | 32 | 1,499.00 | 35 | 28,132.00 | 0 | 242.77 | -46 | 33.16 | 984,648.00 |
| Taylor | 45 | 3 | 1,502.00 | 118 | 8,762.00 | 3 | 798.71 | -2 | 114.91 | 1,037,366.00 |
| Southheart | 45 | 9 | 1,015.00 | 386 | 4,978.00 | 6 | 676.33 | -38 | 375.32 | 1,921,609.00 |
| Elm Grove | 45 | 13 | 1,279.00 | 343 | 3,525.00 | 45 | 783.09 | -34 | 331.51 | 1,209,054.00 |
| Lefor | 45 | 27 | 1,256.00 | 43 | 12,330.00 | 0 | 432.90 | -61 | 41.56 | 529,236.00 |

NOTE: AVDIPC = Average District Per Pupil Cost
ADMEMB = Average Daily Membership
PPUVAL = Per Pupil Valuation
IMPSTU = Impact Students
STAFOU = State Foundation Payment
LOCMIL = Local Mill Levy
ADATEN = Average Daily Attendance
TOTVAL = Total Valuation

# APPENDIX D

## RAW DATA FOR ONE DEPENDENT AND SEVEN INDEPENDENT VARIABLES FOR TWENTY-NINE SAMPLE SCHOOL DISTRICTS

## PLAN D

| District | County Number | District Number | AVDIPC | ADMEMB | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | IMPPAY | TOTVAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Billings | 4 | 1 | $1,987.00 | 123 | $19,991.00 | 19 | $410.96 | -44 | 119.29 | $ 7,125.00 | $2,466,561.00 |
| Gardena | 5 | 4 | 1,405.00 | 28 | 17,398.00 | 2 | 602.02 | 15 | 27.32 | 00.00 | 487,673.00 |
| Westhope | 5 | 17 | 1,170.00 | 325 | 4,653.00 | 107 | 670.73 | -04 | 314.35 | 40,125.00 | 1,511.848.00 |
| Souris | 5 | 29 | 1,691.00 | 99 | 13,490.00 | 2 | 671.75 | -26 | 95.52 | 750.00 | 1,335,500.00 |
| Lansford | 5 | 35 | 1,312.00 | 150 | 8,072.00 | 8 | 728.14 | -7 | 143.69 | 3,000.00 | 1,201,027.00 |
| Newburg | 5 | 48 | 1,835.00 | 101 | 9,137.00 | 6 | 696.92 | 31 | 95.74 | 2,250.00 | 914,261.00 |
| Rhame | 6 | 17 | 1,513.00 | 130 | 7,266.00 | 6 | 703.18 | 6 | 125.63 | 2,250.00 | 944,771.00 |
| Nebo | 6 | 27 | 1,370.00 | 5 | 52,589.00 | 0 | 157.16 | -55 | 4.61 | 00.00 | 262,947.00 |
| Scranton | 6 | 33 | 1,405.00 | 255 | 8,361.00 | 0 | 600.16 | -14 | 243.26 | 00.00 | 2,134,011.00 |
| Powers Lake | 7 | 27 | 1,438.00 | 251 | 6,034.00 | 43 | 661.51 | -16 | 238.30 | 16,125.00 | 1,511,656.00 |
| Flaxton | 7 | 35 | 1,546.00 | 83 | 8,245.00 | 6 | 869.11 | -8 | 79.18 | 2,250.00 | 681,857.00 |
| Divide County | 12 | 1 | 1,410.00 | 659 | 8,427.00 | 9 | 627.37 | -8 | 643.79 | 3,375.00 | 5,556,259.00 |
| Alexander | 27 | 2 | 1,676.00 | 117 | 12,651.00 | 4 | 696.77 | -15 | 112.79 | 1,500.00 | 1,483,230.00 |
| Earl | 27 | 18 | 1,695.00 | 22 | 11,677.00 | 0 | 829.42 | -88 | 20.72 | 00.00 | 253,742.00 |
| Horse Creek | 27 | 32 | 1,790.00 | 10 | 31,081.00 | 0 | 268.83 | -52 | 9.59 | 00.00 | 310,812.00 |
| New Town | 31 | 1 | 1,355.00 | 699 | 2,315.00 | 77 | 603.89 | -5 | 604.03 | 28,875.00 | 1,618,460.00 |

| District | County Number | District Number | AVDIPC | ADMEMB | PPUVAL | IMPSTU | STAFOU | LOCMIL | ADATEN | IMPPAY | TOTVAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Williston | 53 | 1 | $1,311.00 | 2,774 | $ 3,387.00 | 508 | $654.15 | -5 | 2,662.46 | $190,500.00 | $9,396,983.00 |
| Eight-Mile | 53 | 6 | 1,760.00 | 167 | 3,433.00 | 28 | 854.87 | -2 | 162.80 | 00.00 | 572,166.00 |
| Tioga | 53 | 15 | 1,166.00 | 616 | 6,282.00 | 347 | 533.86 | -26 | 588.31 | 133,875.00 | 3,868,099.00 |
| Ray | 53 | 2 | 1,301.00 | 241 | 7,272.00 | 28 | 758.11 | -26 | 232.61 | 10,500.00 | 1,750,698.00 |
| Grenora | 53 | 99 | 1,471.00 | 203 | 12,928.00 | 22 | 598.49 | -19 | 197.20 | 8,250.00 | 2,625,897.00 |
| Mohall | 38 | 9 | 1,292.00 | 360 | 7,163.00 | 39 | 648.54 | -20 | 350.96 | 14,625.00 | 2,580,664.00 |
| Glenburn | 38 | 26 | 1,531.00 | 301 | 6,326.00 | 8 | 617.23 | -34 | 290.78 | 3,000.00 | 1,905,260.00 |
| Marmarth | 44 | 12 | 1,905.00 | 29 | 13,396.00 | 0 | 480.92 | 18 | 27.55 | 00.00 | 390,374.00 |
| Central Elem. | 44 | 32 | 1,499.00 | 35 | 28,132.00 | 0 | 242.77 | -46 | 33.16 | 00.00 | 984,648.00 |
| Taylor | 45 | 3 | 1,502.00 | 118 | 8,762.00 | 3 | 794.65 | -2 | 114.91 | 1,125.00 | 1,037,366.00 |
| Southheart | 45 | 9 | 1,015.00 | 386 | 4,372.00 | 6 | 687.60 | -38 | 375.32 | 2,250.00 | 1,689,409.00 |
| Elm Grove | 45 | 13 | 1,279.00 | 343 | 3,451.00 | 45 | 783.02 | -34 | 331.51 | 16,875.00 | 1,183,254.00 |
| Lefor | 45 | 27 | 1,256.00 | 43 | 12,330.00 | 0 | 432.90 | -61 | 41.56 | 00.00 | 529,236.00 |

NOTE: AVDIPC = Average District Per Pupil Cost
ADMEMB = Average Daily Membership
PPUVAL = Per Pupil Valuation
IMPSTU = Impact Students
STAFOU = State Foundation Payment
LOCMIL = Local Mill Levy
ADATEN = Average Daily Attendance
IMPPAY = Impact Payment
TOTVAL = Total Valuation

# APPENDIX E

NUMBER OF IMPACT STUDENTS MULTIPLIED

TIMES $375.00 TO OBTAIN IMPACT PAYMENT

FOR PLAN D

AND PERCENTAGE OF TOTAL STUDENTS

| Sample School Districts | Impact Students | Total Students | Percentage of Impact Students | Impact Students X $375.00 |
|---|---|---|---|---|
| Billings County #1 | 19 | 123 | 15% | $ 7,125.00 |
| Gardena #4 | 2 | 28 | 7% | 750.00 |
| Westhope #17 | 107 | 325 | 33% | 40,125.00 |
| Souris #29 | 2 | 99 | 2% | 750.00 |
| Lansford #35 | 8 | 149 | 5% | 3,000.00 |
| Newburg #48 | 6 | 101 | 6% | 2,250.00 |
| Rhame #17 | 6 | 130 | 5% | 2,250.00 |
| Nebo #27 | 0 | 5 | 0 | 00.00 |
| Scranton #33 | 0 | 255 | 0 | 00.00 |
| Powers Lake #27 | 43 | 251 | 17% | 16,125.00 |
| Flaxton #35 | 6 | 83 | 7% | 2,250.00 |
| Divide Co. #1 | 9 | 659 | 1% | 3,375.00 |
| Alexander #2 | 4 | 117 | 3% | 1,500.00 |
| Earl #18 | 0 | 22 | 0 | 00.00 |
| Horse Creek #32 | 0 | 10 | 0 | 00.00 |
| New Town #1 | 77 | 699 | 11% | 28,875.00 |
| Williston #1 | 508 | 2,774 | 18% | 190,500.00 |
| Eight-Mile #6 | 7 | 167 | 4% | 133,875.00 |
| Tioga #15 | 347 | 616 | 56% | 45,153,375.00 |
| Ray #2 | 28 | 241 | 12% | 10,500.00 |
| Grenora #99 | 22 | 203 | 11% | 8,250.00 |
| Mohall #9 | 39 | 360 | 11% | 14,625.00 |
| Glenburn #26 | 8 | 301 | 3% | 3,000.00 |
| Marmarth #12 | 0 | 29 | 0 | 00.00 |
| Central Elementary | 0 | 35 | 0 | 00.00 |
| Taylor #3 | 3 | 118 | 3% | 1,125.00 |
| Southheart #9 | 6 | 386 | 2% | 2,250.00 |
| Elm Grove #13 | 45 | 343 | 13% | 16,875.00 |
| Lefor #27 | 0 | 43 | 0 | 00.00 |

# APPENDIX F

## LIST OF OIL WELLS BY SCHOOL DISTRICT

## AND

## BARRELS PRODUCED JULY 1, 1976-JUNE 30, 1977

Tioga School District (Williams County)

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 946 | 958 | 2,622 |
| 507 | 523 | 2,081 |
| 257 | 273 | 3,001 |
| 565 | 578 | 8,847 |
| 1,103 | 1,115 | 4,433 |
| 913 | 925 | 4,765 |
| 1,027 | 1,039 | 5,459 |
| 1,116 | 1,128 | 3,515 |
| 1,043 | 1,055 | 5,945 |
| 979 | 991 | 3,879 |
| 1,093 | 1,105 | 2,661 |
| 1,012 | 1,024 | 1,791 |
| 944 | 956 | 16,427 |
| 1,177 | 1,189 | 2,110 |
| 1,224 | 1,236 | 4,987 |
| 243 | 259 | 1,951 |
| 210 | 226 | 7,239 |
| 379 | 395 | 2,876 |
| 500 | 516 | 5,356 |
| 296 | 312 | 13,003 |
| 443 | 459 | 9,142 |
| 675 | 689 | 3,106 |
| 790 | 803 | 8,585 |
| 42 | 58 | 19,966 |
| 53 | 69 | 6,257 |
| 1,075 | 1,087 | 13,264 |
| 788 | 801 | 4,447 |
| 5,408 | 5,420 | 42,286 |
| 5,069 | 5,081 | 85,357 |
| 1,768 | 1,780 | 7,900 |
| 55 | 71 | 4,673 |
| 331 | 347 | 7,112 |
| 5,429 | 5,441 | 88,581 |
| 1,937 | 1,949 | 41,060 |
| 497 | 513 | 1,510 |
| 5,427 | 5,439 | 40,084 |
| 323 | 339 | 1,775 |
| 2,173 | 2,185 | 45,723 |
| 169 | 185 | 2,615 |
| 690 | 704 | 61,333 |
| 3,901 | 3,913 | 14,806 |
| 163 | 179 | 7,778 |
| 181 | 197 | 9,896 |
| 1,039 | 1,051 | 2,544 |
| 405 | 421 | 18,322 |

Tioga School District (Williams County) - Continued

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 317 | 333 | 1,571 |
| 131 | 147 | 17,493 |
| 429 | 445 | 1,919 |
| 153 | 169 | 148 |
| 2,344 | 2,356 | 21,306 |
| 102 | 118 | 12,569 |
| 2,583 | 2,595 | 34,132 |
| 444 | 460 | 14,080 |
| 289 | 305 | 5,682 |
| 137 | 153 | 11,704 |
| 183 | 199 | 4,181 |
| 414 | 430 | 7,880 |
| 218 | 234 | 21,215 |
| 2,091 | 2,103 | 42,367 |
| 5,315 | 5,327 | 69,315 |
| 1,998 | 2,010 | 891,658 |
| 718 | 731 | 53,314 |
| 2,501 | 2,513 | 90,739 |
| 812 | 825 | 1,222 |
| 2,197 | 2,209 | 7,906 |
| 2,103 | 2,115 | 4,873 |
| 2,280 | 2,292 | 4,177 |
| 1,923 | 1,935 | 7,889 |
| 2,083 | 2,095 | 13,799 |
| 1,883 | 1,895 | 5,776 |
| 2,295 | 2,307 | 8,896 |
| 1,690 | 1,702 | 3,652 |
| 2,077 | 2,089 | 3,202 |
| 1,387 | 1,399 | 5,635 |
| 1,449 | 1,461 | 2,295 |
| 597 | 609 | 1,965 |
| 726 | 739 | 2,725 |
| 627 | 641 | 2,144 |
| 339 | 355 | 8,277 |
| 905 | 917 | 2,377 |
| 1,016 | 1,028 | 4,998 |
| 714 | 727 | 3,058 |
| 431 | 447 | 14,618 |
| 5,350 | 5,362 | 14,346 |
| 292 | 308 | 35,752 |
| 238 | 254 | 12,243 |
| 345 | 361 | 36,629 |
| 158 | 174 | 10,564 |
| 326 | 342 | 15,084 |
| 509 | 524 | 11,347 |
| 276 | 292 | 9,913 |
| 215 | 231 | 4,349 |

Tioga School District (Williams County) - Continued

| Oil Well Number | | Barrels of Oil |
|---|---|---|
| 285 | 301 | 4,134 |
| 374 | 390 | 15,372 |
| 195 | 211 | 10,555 |
| 148 | 164 | 7,693 |
| 252 | 268 | 2,070 |
| 250 | 266 | 2,587 |
| 581 | 595 | 3,984 |
| 253 | 269 | 2,869 |
| 314 | 330 | 3,478 |
| 233 | 249 | 4,681 |
| 667 | 681 | 2,283 |
| 423 | 439 | 8,569 |
| 266 | 282 | 5,246 |
| 537 | 550 | 83,837 |
| 4,519 | 4,531 | 86,428 |
| 466 | 482 | 4,708 |
| 906 | 917 | 2,377 |
| 453 | 469 | 3,202 |
| 213 | 229 | 4,128 |
| 498 | 514 | 3,538 |
| 729 | 742 | 3,368 |
| 265 | 281 | 1,330 |
| 135 | 151 | 4,894 |
| 368 | 384 | 5,707 |
| 4,321 | 4,333 | 82,549 |
| 127 | 143 | 7,996 |
| 487 | 503 | 2,631 |
| 713 | 726 | 4,320 |
| 256 | 273 | 3,001 |
| 554 | 567 | 3,634 |
| 855 | 868 | 4,951 |
| 350 | 366 | 4,464 |
| 220 | 236 | 4,385 |
| 1,060 | 1,072 | 2,068 |
| 493 | 509 | 3,020 |
| 1,062 | 1,074 | 4,205 |
| 419 | 435 | 4,286 |
| 335 | 351 | 5,714 |
| 245 | 261 | 2,108 |
| 260 | 275 | 14,753 |
| 263 | 276 | 4,611 |

Powers Lake School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 363 | 379 | 1,105 |
| 312 | 328 | 6,471 |
| 339 | 356 | 1,813 |
| 441 | 457 | 3,122 |
| 628 | 642 | 1,119 |
| 510 | 525 | 1,642 |
| 597 | 611 | 1,965 |
| 1,275 | 1,287 | 7,981 |
| 1,449 | 1,461 | 2,295 |
| 796 | 808 | 3,629 |
| 1,452 | 1,464 | 5,563 |
| 1,479 | 1,491 | 2,784 |
| 1,483 | 1,495 | 4,965 |
| 2,107 | 2,119 | 3,894 |
| 2,406 | 2,418 | 4,099 |
| 2,276 | 2,288 | 2,881 |
| 1,901 | 2,913 | 3,371 |
| 1,806 | 1,818 | 2,945 |
| 1,618 | 1,630 | 3,700 |
| 1,690 | 1,702 | 3,652 |
| 1,467 | 1,479 | 2,160 |
| 1,625 | 1,637 | 2,736 |
| 1,921 | 1,933 | 3,300 |
| 2,242 | 2,254 | 5,995 |
| 1,691 | 1,703 | 1,980 |
| 5,411 | 5,423 | 5,861 |
| 2,495 | 2,507 | 6,200 |
| 2,065 | 2,077 | 12,386 |
| 1,833 | 1,845 | 7,435 |
| 1,873 | 1,885 | 3,114 |
| 2,066 | 2,078 | 1,286 |
| 2,208 | 2,220 | 7,464 |
| 2,033 | 2,045 | 6,045 |
| 1,883 | 1,895 | 5,776 |
| 2,083 | 2,095 | 13,799 |
| 2,280 | 2,292 | 4,177 |
| 1,923 | 1,935 | 4,889 |
| 2,543 | 2,555 | 11,964 |
| 2,307 | 2,319 | 15,634 |
| 1,884 | 1,896 | 13,271 |
| 1,981 | 1,993 | 10,641 |
| 2,103 | 2,115 | 6,873 |
| 2,197 | 2,209 | 7,906 |
| 2,100 | 2,112 | 3,452 |

Southheart School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 4,524 | 4,536 | 13,639 |
| 4,826 | 4,838 | 38,795 |
| 4,993 | 5,005 | 5,786 |
| 4,975 | 4,987 | 9,971 |
| 5,629 | 5,641 | 18,279 |
| 5,416 | 5,428 | 84,802 |
| 4,842 | 4,854 | 16,230 |
| 4,762 | 4,774 | 38,448 |
| 4,326 | 4,338 | 39,839 |
| 4,672 | 4,684 | 96,612 |
| 5,525 | 5,537 | 148,432 |
| 5,606 | 5,618 | 6,047 |
| 5,476 | 5,488 | 7,811 |
| 5,500 | 5,512 | 68,681 |
| 5,533 | 5,545 | 18,054 |
| 4,653 | 4,665 | 63,818 |
| 5,599 | 5,611 | 3,122 |
| 4,307 | 4,319 | 78,769 |
| 4,299 | 4,311 | 682 |
| 4,284 | 4,296 | 40,000 |
| 4,266 | 4,278 | 68,309 |
| 5,600 | 5,612 | 11,735 |
| 3,700 | 3,712 | 34,471 |
| 4,345 | 4,357 | 23,687 |
| 4,217 | 4,229 | 3,969 |
| 4,332 | 4,344 | 57,369 |
| 4,770 | 4,782 | 149,641 |
| 4,287 | 4,299 | 215,001 |
| 4,247 | 4,259 | 13,062 |
| 4,227 | 4,239 | 71,389 |
| 5,434 | 5,446 | 39,439 |
| 4,848 | 4,860 | 19,059 |
| 5,548 | 5,560 | 18,655 |
| 5,330 | 5,342 | 3,108 |
| 4,353 | 4,365 | 92,713 |
| 4,228 | 4,240 | 9,148 |

Newburg School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 1,778 | 1,790 | 14,620 |
| 2,302 | 2,314 | 41,368 |
| 2,712 | 2,724 | 10,685 |
| 1,685 | 1,697 | 17,983 |
| 1,654 | 1,666 | 25,947 |
| 1,566 | 1,578 | 38,853 |
| 2,079 | 2,091 | 25,647 |
| 1,656 | 1,668 | 22,707 |
| 1,676 | 1,688 | 20,632 |
| 1,655 | 1,667 | 24,326 |
| 1,943 | 1,956 | 1,050 |
| 3,856 | 3,868 | 10,796 |
| 2,003 | 2,015 | 16,889 |
| 5,213 | 5,225 | 11,526 |
| 4,948 | 4,960 | 20,596 |
| 3,294 | 3,306 | 20,067 |
| 1,755 | 1,767 | 10,869 |
| 1,911 | 1,923 | 2,092 |
| 1,991 | 2,003 | 2,259 |
| 2,282 | 2,294 | 4,728 |
| 2,219 | 2,231 | 27,756 |
| 1,853 | 1,865 | 19,245 |
| 2,064 | 2,076 | 5,881 |
| 2,036 | 2,048 | 2,746 |
| 1,945 | 1,957 | 705 |
| 1,984 | 1,996 | 8,265 |
| 1,997 | 2,009 | 6,104 |
| 1,924 | 1,936 | 4,239 |
| 1,978 | 1,990 | 9,054 |
| 1,865 | 1,877 | 6,114 |
| 1,866 | 1,878 | 12,854 |
| 893 | 905 | 6,936 |
| 1,877 | 1,889 | 21,718 |
| 2,020 | 2,032 | 9,305 |
| 1,675 | 1,687 | 5,821 |
| 1,983 | 1,995 | 17,188 |
| 2,019 | 2,031 | 8,077 |
| 2,041 | 2,053 | 2,185 |
| 2,086 | 2,098 | 8,571 |
| 2,130 | 2,142 | 12,264 |
| 2,139 | 2,151 | 11,026 |
| 5,175 | 5,187 | 30,307 |
| 5,172 | 5,184 | 11,709 |
| 2,090 | 2,101 | 2,417 |
| 6,133 | 6,145 | 240 |
| 5,790 | 5,802 | 7,449 |
| 3,433 | 3,445 | 7,166 |
| 3,512 | 3,524 | 4,827 |

Grenora School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 2,824 | 2,836 | 6,091 |
| 2,864 | 2,876 | 5,426 |
| 3,062 | 3,074 | 3,634 |
| 3,029 | 3,041 | 30,829 |
| 3,082 | 3,094 | 25,942 |
| 3,090 | 3,102 | 10,724 |
| 3,109 | 3,121 | 2,198 |
| 3,093 | 3,005 | 60,064 |
| 5,054 | 5,066 | 10,745 |
| 4,909 | 4,921 | 5,256 |

Maxbass School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 1,413 | 1,425 | |

Lansford School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 2,984 | 2,995 | 14,055 |
| 2,738 | 2,750 | 7,941 |
| 2,716 | 2,728 | 7,471 |
| 2,744 | 2,756 | 7,873 |
| 2,687 | 2,699 | 4,505 |
| 2,591 | 2,603 | 18,945 |
| 2,997 | 3,009 | 9,735 |
| 2,767 | 2,779 | 6,145 |
| 3,138 | 3,150 | 8,953 |

Glenburn School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 2,997 | 3,009 | 8,935 |
| 2,984 | 2,996 | 14,055 |
| 5,905 | 5,917 | 4,860 |
| 2,738 | 2,750 | 7,941 |
| 2,767 | 2,779 | 6,145 |
| 2,716 | 2,728 | 7,471 |
| 2,744 | 2,756 | 7,873 |
| 2,687 | 2,699 | 4,505 |
| 2,591 | 2,603 | 18,945 |
| 3,138 | 3,150 | 8,953 |
| 2,648 | 2,660 | 14,290 |
| 2,568 | 2,580 | 14,842 |
| 3,117 | 3,129 | 8,033 |
| 2,662 | 2,674 | 5,864 |
| 2,554 | 2,566 | 9,305 |
| 2,559 | 2,571 | 7,134 |
| 2,204 | 2,216 | 3,487 |
| 2,513 | 2,526 | 8,338 |
| 2,453 | 2,466 | 4,464 |
| 1,689 | 1,701 | 7,565 |
| 3,935 | 3,947 | 7,552 |
| 3,778 | 3,790 | 6,424 |
| 3,863 | 3,875 | 7,961 |
| 3,148 | 3,160 | 6,679 |
| 2,680 | 2,692 | 4,567 |
| 2,627 | 2,639 | 5,288 |
| 2,663 | 2,675 | 4,315 |
| 3,941 | 3,953 | 5,788 |
| 3,930 | 3,942 | 6,357 |
| 3,839 | 3,851 | 2,107 |
| 3,630 | 3,642 | 2,624 |
| 5,178 | 5,190 | 5,953 |
| 2,604 | 2,616 | 10,292 |
| 2,619 | 2,631 | 1,943 |
| 2,590 | 2,802 | 12,643 |
| 2,660 | 2,672 | 9,089 |
| 2,576 | 2,588 | 25,104 |
| 2,647 | 2,659 | 18,917 |
| 2,686 | 2,698 | 4,624 |
| 3,417 | 3,429 | 3,032 |
| 3,873 | 3,885 | 8,943 |
| 5,264 | 5,276 | 5,130 |
| 4,181 | 4,193 | 6,286 |
| 4,410 | 4,422 | 4,689 |
| 4,278 | 4,290 | 2,566 |

Glenburn School District - Continued

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 4,398 | 4,410 | 15,940 |
| 4,405 | 4,417 | 3,718 |
| 4,354 | 4,366 | 9,729 |
| 4,393 | 4,405 | 3,287 |
| 4,412 | 4,424 | 10,344 |
| 5,915 | 5,927 | 10,690 |
| 2,670 | 2,682 | 1,445 |
| 3,251 | 3,263 | 4,242 |
| 3,396 | 3,408 | 4,780 |
| 3,584 | 3,596 | 1,567 |
| 3,315 | 3,327 | 3,481 |
| 3,696 | 3,708 | 3,656 |

Nebo School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 5,456 | 5,468 | 21,689 |
| 5,458 | 5,470 | 15,900 |
| 5,278 | 5,290 | 41,855 |
| 5,829 | 5,841 | 21,133 |
| 5,804 | 5,816 | 11,492 |
| 5,530 | 5,542 | 9,090 |
| 5,749 | 5,761 | 21,711 |
| 4,538 | 4,550 | 21,275 |
| 5,892 | 5,904 | 7,705 |
| 5,045 | 5,057 | 25,700 |
| 5,061 | 5,073 | 6,786 |
| 4,932 | 4,944 | 60,963 |
| 4,832 | 4,844 | 57,055 |

Westhope School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 896 | 908 | 92 |
| 577 | 591 | 1,068 |
| 2,766 | 2,778 | 1,861 |
| 3,275 | 3,287 | 2,184 |
| 835 | 848 | 444 |
| 3,738 | 3,750 | 1,813 |
| 3,857 | 3,869 | 2,270 |
| 1,230 | 1,242 | 2,297 |
| 3,965 | 3,977 | 8,400 |
| 4,051 | 4,063 | 2,642 |
| 4,178 | 4,190 | 2,344 |
| 3,888 | 3,901 | 2,027 |
| 5,134 | 5,146 | 737 |
| 3,346 | 3,358 | 960 |
| 6,058 | 6,070 | 2,680 |
| 5,812 | 5,824 | 2,076 |
| 4,622 | 4,634 | 1,850 |
| 4,566 | 4,578 | 11,969 |
| 4,650 | 4,662 | 3,626 |
| 4,614 | 4,626 | 5,869 |
| 4,623 | 4,635 | 1,793 |
| 4,659 | 4,671 | 973 |
| 4,590 | 4,602 | 5,330 |
| 4,679 | 4,691 | 2,250 |
| 2,880 | 2,092 | 3,204 |
| 1,841 | 1,853 | 5,130 |
| 2,416 | 2,428 | 1,653 |
| 2,898 | 2,910 | 4,037 |
| 3,047 | 3,059 | 3,165 |
| 2,758 | 2,770 | 3,655 |
| 2,833 | 2,845 | 5,289 |
| 2,868 | 2,880 | 8,545 |
| 3,326 | 3,338 | 874 |
| 2,876 | 2,888 | 9,498 |
| 2,919 | 2,931 | 6,205 |
| 5,480 | 5,492 | 3,513 |
| 5,478 | 5,490 | 7,297 |
| 1,929 | 1,941 | 4,446 |
| 5,479 | 5,491 | 3,993 |
| 3,684 | 3,696 | 3,428 |
| 2,769 | 2,781 | 13,693 |
| 2,822 | 2,834 | 3,459 |
| 2,335 | 2,347 | 1,158 |
| 1,818 | 1,830 | 3,569 |
| 1,475 | 1,487 | 9,282 |
| 1,547 | 1,559 | 2,588 |

Westhope School District - Continued

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 1,615 | 1,627 | 3,719 |
| 1,975 | 1,987 | 7,534 |
| 1,819 | 1,831 | 7,575 |
| 2,027 | 2,039 | 3,480 |
| 2,809 | 2,821 | 3,887 |
| 2,799 | 2,811 | 4,987 |
| 2,814 | 2,826 | 22,789 |
| 2,760 | 2,772 | 22,327 |
| 2,709 | 2,721 | 10,998 |
| 5,922 | 5,934 | 6,985 |
| 5,997 | 6,009 | 4,446 |
| 2,069 | 2,081 | 6,355 |
| 2,049 | 2,061 | 3,970 |
| 2,180 | 2,192 | 6,544 |
| 2,998 | 3,010 | 3,442 |
| 2,111 | 2,123 | 7,578 |
| 2,774 | 2,786 | 19,376 |
| 2,819 | 2,831 | 2,054 |
| 2,222 | 2,234 | 14,428 |
| 2,558 | 2,870 | 8,123 |
| 2,807 | 2,819 | 3,033 |
| 3,014 | 3,026 | 2,158 |
| 2,547 | 2,559 | 3,441 |
| 2,089 | 2,101 | 1,958 |

Billings County School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 6,095 | 6,107 | 9,485 |
| 3,928 | 3,940 | 18,387 |
| 4,025 | 4,037 | 27,524 |
| 3,657 | 3,669 | 20,265 |
| 3,709 | 3,721 | 67,816 |
| 3,938 | 3,950 | 1,801 |
| 3,790 | 3,802 | 16,559 |
| 3,573 | 3,585 | 135,168 |
| 3,939 | 3,951 | 197,974 |
| 3,797 | 3,809 | 47,136 |

Billings County School District - Continued

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 4,024 | 4,036 | 7,257 |
| 4,012 | 4,024 | 552 |
| 3,921 | 3,933 | 185 |
| 3,867 | 3,879 | 37,145 |
| 3,966 | 3,978 | 27,062 |
| 4,079 | 4,091 | 18,167 |
| 5,446 | 5,458 | 17,986 |
| 5,590 | 5,602 | 43,574 |
| 5,585 | 5,597 | 40,400 |
| 5,564 | 5,576 | 54,702 |
| 4,325 | 4,337 | 17,200 |
| 5,432 | 5,444 | 16,830 |
| 1,678 | 1,690 | 4,453 |
| 3,619 | 3,631 | 33,378 |
| 5,436 | 5,448 | 50 |
| 3,959 | 3,971 | 213,234 |
| 4,008 | 4,020 | 842 |
| 5,342 | 5,354 | 117,957 |
| 2,395 | 2,407 | 3,451 |
| 3,918 | 3,930 | 4,614 |
| 3,502 | 3,514 | 13,457 |
| 375 | 391 | 1,693 |
| 2,577 | 2,589 | 3,633 |
| 3,957 | 3,969 | 16,439 |
| 3,885 | 3,897 | 9,639 |
| 2,725 | 2,737 | 7,696 |
| 5,437 | 5,449 | 3,558 |
| 1,741 | 1,753 | 28,159 |
| 4,320 | 4,332 | 20,049 |
| 3,643 | 3,655 | 369 |
| 3,457 | 3,469 | 26,036 |
| 3,435 | 3,447 | 9,678 |
| 2,486 | 2,498 | 21,508 |
| 5,343 | 5,355 | 11,132 |
| 4,306 | 4,318 | 4,074 |
| 1,587 | 1,599 | 8,864 |
| 4,009 | 4,021 | 24,802 |
| 3,927 | 3,939 | 6,132 |
| 795 | 808 | 9,453 |
| 558 | 571 | 6,710 |
| 738 | 750 | 2,899 |
| 5,819 | 5,831 | 571 |
| 5,148 | 5,160 | 1,844 |
| 2,923 | 2,935 | 1,542 |
| 3,896 | 3,908 | 35,525 |

Billings County School District - Continued

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 4,063 | 4,075 | 5,569 |
| 4,892 | 4,904 | 8,908 |
| 4,789 | 4,801 | 10,601 |
| 5,769 | 5,781 | 4,500 |

Divide County School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 2,083 | 2,095 | 13,799 |
| 1,883 | 1,895 | 5,776 |
| 1,923 | 1,935 | 7,889 |
| 2,280 | 2,292 | 4,177 |
| 2,103 | 2,115 | 4,873 |
| 2,197 | 2,307 | 8,896 |
| 2,571 | 2,583 | 4,722 |
| 2,823 | 2,835 | 4,932 |
| 2,514 | 2,526 | 28,868 |
| 2,637 | 2,649 | 7,458 |
| 2,598 | 2,610 | 12,064 |
| 2,706 | 2,718 | 1,964 |
| 5,192 | 5,931 | 1,372 |
| 2,419 | 2,431 | 4,601 |
| 2,552 | 2,564 | 5,524 |
| 5,667 | 5,679 | 17,147 |
| 5,628 | 5,640 | 26,197 |
| 5,610 | 5,622 | 8,712 |
| 5,925 | 5,937 | 4,529 |
| 5,535 | 5,547 | 28,242 |
| 4,074 | 4,086 | 5,401 |
| 1,429 | 1,441 | 2,438 |
| 2,154 | 2,166 | 1,094 |
| 2,061 | 2,073 | 1,064 |
| 4,391 | 4,403 | 5,799 |

Earl School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 5,597 | 4,987 | 27,861 |
| 5,909 | 5,921 | 69,042 |

Horse Creek School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 6,072 | 6,084 | 7,154 |
| 5,847 | 5,859 | 24,911 |
| 6,049 | 6,061 | 55,639 |
| 5,748 | 5,760 | 56,739 |
| 5,846 | 5,858 | 91,175 |
| 5,836 | 5,848 | 67,637 |

Mohall School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 5,107 | 5,119 | 9,734 |
| 5,186 | 5,198 | 3,460 |
| 5,784 | 5,796 | 16,268 |
| 5,569 | 5,581 | 97,281 |
| 5,247 | 5,259 | 3,415 |
| 3,849 | 3,861 | 5,074 |
| 3,838 | 3,860 | 2,855 |
| 5,854 | 5,866 | 2,110 |
| 5,325 | 5,337 | 7,161 |
| 3,913 | 3,925 | 5,792 |
| 3,828 | 3,840 | 3,914 |
| 3,561 | 3,573 | 2,168 |
| 3,874 | 3,886 | 16,010 |
| 3,784 | 3,796 | 8,955 |
| 3,875 | 3,887 | 11,657 |

Mohall School District - Continued

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 3,714 | 3,726 | 12,827 |
| 3,890 | 3,902 | 4,562 |
| 3,756 | 3,768 | 3,724 |
| 3,757 | 3,769 | 12,784 |
| 3,996 | 4,008 | 6,967 |
| 4,014 | 4,026 | 4,885 |
| 4,180 | 4,192 | 2,128 |
| 4,282 | 4,294 | 3,402 |
| 4,257 | 4,269 | 1,684 |
| 4,086 | 4,098 | 3,503 |
| 4,291 | 4,303 | 3,184 |
| 4,258 | 4,270 | 4,663 |
| 5,737 | 5,749 | 1,191 |
| 5,669 | 5,681 | 13,937 |
| 3,095 | 3,107 | 2,919 |
| 2,782 | 2,794 | 5,469 |
| 3,042 | 3,054 | 4,363 |
| 5,316 | 5,328 | 4,541 |
| 4,912 | 4,924 | 6,704 |
| 5,294 | 5,306 | 13,858 |
| 2,669 | 2,681 | 3,185 |
| 5,318 | 5,330 | 5,137 |
| 3,130 | 3,142 | 4,534 |

Flaxton School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 2,362 | 2,374 | 5,804 |
| 2,548 | 2,560 | 295 |
| 2,586 | 2,598 | 1,896 |
| 2,478 | 2,490 | 1,622 |
| 2,710 | 2,722 | 1,824 |
| 2,580 | 2,592 | 1,242 |
| 2,550 | 2,562 | 323 |
| 2,200 | 2,212 | 429 |
| 2,199 | 2,211 | 590 |
| 2,212 | 2,124 | 504 |
| 2,096 | 3,108 | 1,272 |
| 3,040 | 3,052 | 818 |

Flaxton School District - Continued

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 5,950 | 5,962 | 1,602 |
| 1,887 | 1,899 | 13,456 |
| 1,793 | 1,805 | 1,773 |
| 2,166 | 2,178 | 2,275 |
| 2,264 | 2,276 | 1,708 |
| 3,998 | 4,010 | 1,873 |
| 2,916 | 2,928 | 832 |
| 2,802 | 2,814 | 1,489 |
| 2,700 | 2,712 | 597 |
| 2,954 | 2,966 | 573 |
| 3,450 | 3,462 | 911 |
| 3,397 | 3,409 | 1,982 |
| 2,177 | 2,189 | 10,741 |
| 2,275 | 2,287 | 6,086 |
| 2,193 | 2,205 | 14,603 |
| 2,811 | 2,823 | 903 |
| 2,935 | 2,947 | 1,590 |
| 3,174 | 3,186 | 1,509 |
| 3,231 | 3,243 | 912 |
| 4,003 | 4,015 | 759 |
| 5,973 | 5,985 | 10,096 |
| 2,189 | 2,201 | 2,627 |
| 2,238 | 2,250 | 10,475 |
| 2,243 | 2,255 | 6,756 |
| 2,310 | 2,322 | 10,158 |
| 2,613 | 2,625 | 11,242 |
| 1,752 | 1,764 | 898 |
| 3,028 | 3,040 | 698 |
| 2,129 | 2,141 | 1,530 |
| 2,888 | 2,900 | 1,703 |
| 2,353 | 2,365 | 1,511 |
| 2,227 | 2,239 | 1,168 |
| 5,176 | 5,188 | 13,630 |
| 5,202 | 5,214 | 3,542 |
| 2,549 | 2,561 | 763 |
| 1,580 | 1,592 | 646 |
| 1,569 | 1,581 | 1,415 |
| 1,664 | 1,676 | 354 |
| 1,717 | 1,729 | 526 |
| 1,511 | 1,523 | 301 |
| 1,461 | 1,473 | 1,006 |
| 1,485 | 1,497 | 1,433 |
| 1,663 | 1,675 | 267 |
| 2,414 | 2,426 | 1,927 |

Flaxton School District - Continued

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 2,474 | 2,486 | 3,090 |
| 2,360 | 2,372 | 1,624 |
| 2,206 | 2,218 | 640 |
| 3,758 | 3,770 | 74 |
| 1,639 | 1,651 | 952 |
| 1,500 | 1,512 | 298 |
| 2,377 | 2,389 | 2,782 |
| 3,135 | 3,147 | 5,420 |
| 2,891 | 2,903 | 4,495 |
| 3,301 | 3,313 | 3,884 |
| 3,356 | 3,368 | 2,625 |
| 2,212 | 2,224 | 915 |
| 2,986 | 2,998 | 3,884 |
| 3,612 | 3,624 | 7,805 |
| 3,547 | 3,559 | 2,153 |
| 6,080 | 6,092 | 1,668 |
| 3,505 | 3,517 | 5,247 |
| 3,132 | 3,147 | 5,420 |
| 2,972 | 2,984 | 1,791 |
| 3,163 | 3,175 | 1,838 |
| 3,649 | 3,661 | 1,977 |
| 3,100 | 3,112 | 5,376 |
| 2,773 | 2,785 | 7,635 |
| 3,378 | 3,390 | 6,183 |
| 3,002 | 3,014 | 2,835 |
| 3,066 | 3,078 | 1,213 |
| 3,236 | 3,248 | 4,852 |
| 4,163 | 4,175 | 11,132 |
| 4,049 | 4,061 | 8,826 |
| 3,866 | 3,878 | 6,281 |
| 3,937 | 3,949 | 17,505 |
| 4,069 | 4,081 | 2,853 |
| 3,814 | 3,826 | 4,961 |
| 3,648 | 3,660 | 1,845 |
| 3,636 | 3,658 | 3,890 |
| 3,805 | 3,817 | 8,430 |
| 3,559 | 3,571 | 4,974 |
| 3,455 | 3,467 | 3,199 |
| 1,520 | 1,532 | 2,164 |
| 2,356 | 2,368 | 1,678 |
| 5,776 | 5,788 | 4,498 |
| 5,884 | 5,896 | 2,219 |
| 3,019 | 3,031 | 2,346 |
| 2,315 | 2,327 | 715 |
| 2,221 | 2,233 | 3,822 |
| 2,284 | 2,296 | 2,916 |

Flaxton School District - Continued

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 2,333 | 2,345 | 5,660 |
| 2,237 | 2,249 | 1,820 |
| 2,126 | 2,138 | 834 |
| 3,361 | 3,373 | 2,483 |
| 3,431 | 3,443 | 3,282 |
| 3,977 | 3,989 | 1,979 |
| 3,976 | 3,988 | 3,650 |
| 2,363 | 2,375 | 3,085 |

Souris School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 829 | 842 | 3,610 |
| 816 | 829 | 3,318 |
| 3,549 | 3,561 | 830 |
| 4,103 | 4,115 | 1,780 |
| 3,483 | 3,495 | 3,715 |
| 3,562 | 3,574 | 3,880 |
| 3,033 | 3,045 | 2,355 |
| 3,627 | 3,639 | 4,265 |
| 4,109 | 4,121 | 2,650 |
| 4,838 | 4,850 | 2,551 |
| 4,816 | 4,828 | 5,305 |
| 884 | 896 | 4,294 |
| 968 | 980 | 2,751 |
| 1,038 | 1,050 | 2,609 |
| 4,819 | 4,831 | 3,053 |
| 2,114 | 2,126 | 10,624 |
| 2,902 | 2,914 | 4,394 |
| 5,697 | 5,709 | 714 |
| 1,871 | 1,883 | 3,472 |
| 5,698 | 5,710 | 1,774 |

Elm Grove School District

| Oil Well Number | Permit Number | Barrels of Oil |
|---|---|---|
| 5,442 | 5,454 | 28,124 |
| 5,027 | 5,039 | 18,130 |
| 4,963 | 4,975 | 14,886 |
| 4,737 | 4,749 | 3,904 |

# APPENDIX G

# DATA FOR CAPITOLIZATION OF INCOME FROM GROSS PRODUCTION OF OIL

| District | Present Tax Valuation | Valuation of Barrels of Oil | Total Valuation | Valuation of Oil Wells | Total Valuation | Weighted Pupil Units X $690 X ADM | Plan B Per Pupil Foundation | Plan C Per Pupil Foundation | Local Revenues | Local Revenues |
|---|---|---|---|---|---|---|---|---|---|---|
| Billings | $2,466,561.00 | $ 829,204.00 | $3,295,765.00 | $303,113.00 | $2,769,674.00 | $101,651.00 | $ 290.54 | $ 376.08 | $65,915.00 | $ 55,393.00 |
| Gardena | 487,673.00 | 00.00 | 487,673.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |
| Westhope | 1,511,848.00 | 267,959.00 | 1,779,807.00 | 308,775.00 | 1,820,623.00 | 234,699.00 | 612.53 | 610.02 | 35,596.00 | 36,412.00 |
| Souris | 1,335,500.00 | 61,044.00 | 1,396,544.00 | 89,500.00 | 1,425,000.00 | 93,543.00 | 662.75 | 657.00 | 27,931.00 | 28,500.00 |
| Lansford | 1,201,027.00 | 64,371.00 | 1,265,398.00 | 4,028.00 | 1,205,055.00 | 135,164.00 | 732.37 | 740.42 | 25,308.00 | 24,101.00 |
| Newburg | 914,261.00 | 461,462.00 | 1,375,723.00 | 214,800.00 | 1,129,061.00 | 89,562.00 | 614.33 | 663.18 | 27,514.00 | 22,581.00 |
| Rhame | 944,771.00 | 00.00 | 944,771.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |
| Nebo | 262,947.00 | 185,483.00 | 448,430.00 | 66,788.00 | 329,735.00 | 6,169.00 | -2,800.00 | -426.00 | 8,969.00 | 6,595.00 |
| Scranton | 2,134.011.00 | 00.00 | 2,134,011.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |
| Powers Lake | 511,656.00 | 182,644.00 | 1,694,300.00 | 303,600.00 | 1,815,256.00 | 197,913.00 | 663.49 | 723.56 | 33,886.00 | 16,305.00 |
| Flaxton | 681,857.00 | 286,236.00 | 968,093.00 | 752,100.00 | 1,433,957.00 | 86,933.00 | 814.11 | 701.86 | 19,362.00 | 28,679.00 |
| Divide County | 5,556,259.00 | 239,379.00 | 5,795,638.00 | 245,625.00 | 5,801,884.00 | 529,416.00 | 627.47 | 627.28 | 115,913.00 | 116,038.00 |
| Alexander | 1,483,230.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | . 00.00 | 00.00 | 00.00 |
| Earl | 253,742.00 | 90,759.00 | 344,501.00 | 22,300.00 | 276,042.00 | 23,322.00 | 746.91 | 809.14 | 6,890.00 | 5,521.00 |
| Horse Creek | 310,812.00 | 284,029.00 | 594,841.00 | 66,900.00 | 377,712.00 | 8,970.00 | -291.00 | 141.60 | 11,897.00 | 7,554.00 |
| New Town | 1,618,460.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |
| Williston | 9,396,983.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |
| Eight-Mile | 572,166.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |
| Tioga | 3,868,099.00 | 2,112,634.00 | 5,980,733.00 | 947,625.00 | 4,815,724.00 | 447,996.00 | 533.09 | 570.91 | 119,615.00 | 96,314.00 |
| Ray | 1,750,698.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |
| Grenora | 2,625,897.00 | 128,405.00 | 2,754,302.00 | 71,250.00 | 2,697,147.00 | 176,826.00 | 599.70 | 605.33 | 55,086.00 | 53,943.00 |
| Mohall | 2,580,664.00 | 213,598.00 | 2,794,262.00 | 222,300.00 | 2,802,964.00 | 280,430.00 | 623.74 | 623.25 | 55,885.00 | 56,059.00 |
| Glenburn | 1,905,260.00 | 278,301.00 | 2,183,561.00 | 333,450.00 | 2,238,710.00 | 226,851.00 | 608.57 | 604.91 | 43,671.00 | 44,774.00 |
| Marmarth | 390,374.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |
| Central Elementary | 984,648.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |
| Taylor | 1,037,366.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |
| Southheart | 1,689,409.00 | 1,176,481.00 | 2,865,890.00 | 232,200.00 | 1,921,609.00 | 299,495.00 | 627.40 | 676.33 | 57,318.00 | 38,432.00 |
| Elm Grove | 1,183,254.00 | 46,988.00 | 1,230,242.00 | 25,800.00 | 1,209,054.00 | 292,781.00 | 781.85 | 783.09 | 24,605.00 | 24,181.00 |
| Lefor | 529,236.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 | 00.00 |

# APPENDIX H

# FOUNDATION AID CALCULATIONS FACTORING ADDITIONAL VALUATION FROM BARRELS OF OIL: PLAN B

| Sample School District | Number of Barrels of Oil | Barrels Multiplied Times $8.40 | Assessed Valuation | Taxable Valuation |
|---|---|---|---|---|
| Billings #1 | $1,441,091.00 | $12,105,164.00 | $1,658,407.00 | $ 829,204.00 |
| Westhope #17 | 356,423.00 | 2,993,953,00 | 535,918.00 | 267,959.00 |
| Souris #29 | 81,197.00 | 682,054.00 | 112,088.00 | 61,044.00 |
| Lansford #35 | 85,623.00 | 719,233.00 | 128,743.00 | 64,371.00 |
| Newburg #48 | 613,809.00 | 5,155,995.60 | 922,923.00 | 461,462.00 |
| Rhame #17 | 00.00 | 00.00 | 00.00 | 00.00 |
| Nebo #27 | 322,354.00 | 2,707,773.00 | 370,963.00 | 185,483.00 |
| Scranton #33 | 00.00 | 00.00 | 00.00 | 00.00 |
| Powers Lake #27 | 236,340.00 | 1,985,256.00 | 365,287.00 | 182,644.00 |
| Flaxton #35 | 370,388.00 | 3,111,259.00 | 572,472.00 | 286,236.00 |
| Divide Co. #1 | 217,538.00 | 1,827,319.00 | 478,758.00 | 239,379.00 |
| Alexander #2 | 00.00 | 00.00 | 00.00 | 00.00 |
| Earl #18 | 96,903.00 | 813,985.00 | 181,519.00 | 90,759.00 |
| Horse Creek #32 | 303,255.00 | 2,547,342.00 | 568,057.00 | 284,029.00 |
| New Town #1 | 00.00 | 00.00 | 00.00 | 00.00 |
| Williston #1 | 00.00 | 00.00 | 00.00 | 00.00 |
| Eight-Mile #6 | 00.00 | 00.00 | 00.00 | 00.00 |
| Tioga #15 | 2,647,411.00 | 22,238,252.00 | 4,225,268.00 | 2,112,634.00 |
| Ray #2 | 00.00 | 00.00 | 00.00 | 00.00 |
| Grenora #99 | 160,909.00 | 1,351,635.00 | 256,811.00 | 128,405.00 |
| Mohall #9 | 326,005.00 | 2,738,442.00 | 427,197.00 | 213,598.00 |
| Glenburn #26 | 424,757.00 | 3,567,958.00 | 556,602.00 | 278,301.00 |
| Marmarth #12 | 00.00 | 00.00 | 00.00 | 00.00 |
| Central Elementary | 00.00 | 00.00 | 00.00 | 00.00 |
| Taylor #3 | 00.00 | 00.00 | 00.00 | 00.00 |
| Southheart #9 | 1,628,572.00 | 13,680,000.00 | 2,352,961.00 | 1,176,481.00 |
| Elm Crove #13 | 65,044.00 | 546,369.00 | 93,975.00 | 46,988.00 |
| Lefor #27 | 00.00 | 00.00 | 00.00 | 00.00 |

# APPENDIX I

## FOUNDATION AID CALCULATIONS

## FACTORING ADDITIONAL VALUATIONS

## FROM OIL WELLS: PLAN C

| Sample School Districts | Percentage of Assessed Valuation | Number of Producing Wells | Value Per Well | Total Value | Assessed Valuation | Taxable Valuation |
|---|---|---|---|---|---|---|
| Billings County #1 | 13.7 | 59 | $ 75,000.00 | $4,425,000.00 | $ 606,225.00 | $303,113.00 |
| Gardena #4 | 17.9 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Westhope #17 | 17.9 | 69 | 50,000.00 | 3,450,000.00 | 617,550.00 | 308,775.00 |
| Souris #29 | 17.9 | 20 | 50,000.00 | 1,000,000.00 | 179,000.00 | 89,500.00 |
| Lansford #35 | 17.9 | 9 | 50,000.00 | 450,000.00 | 8,055.00 | 4,028.00 |
| Newburg #48 | 17.9 | 48 | 50,000.00 | 2,400,000.00 | 429,600.00 | 214,800.00 |
| Rhame #17 | 13.7 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Nebo #27 | 13.7 | 13 | 75,000.00 | 975,000.00 | 133,575.00 | 66,788.00 |
| Scranton #33 | 13.7 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Powers Lake #27 | 18.4 | 44 | 75,000.00 | 3,300,000.00 | 607,200.00 | 303,600.00 |
| Flaxton #35 | 18.4 | 109 | 75,000.00 | 8,175,000.00 | 1,504,200.00 | 752,100.00 |
| Divide Co. #1 | 26.2 | 25 | 75,000.00 | 1,875,000.00 | 491,250.00 | 245,625.00 |
| Alexander #2 | 22.3 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Earl #18 | 22.3 | 2 | 100,000.00 | 200,000.00 | 44,600.00 | 22,300.00 |
| Horse Creek #32 | 22.3 | 6 | 100,000.00 | 600,000.00 | 133,800.00 | 66,900.00 |

| Sample School Districts | Percentage of Assessed Valuation | Number of Producing Wells | Value Per Well | Total Value | Assessed Valuation | Taxable Valuation |
|---|---|---|---|---|---|---|
| New Town #1 | 23.2 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Williston #1 | 19.0 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Eight-Mile #6 | 19.0 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Tioga #15 | 19.0 | 133 | $75,000.00 | $9,975,000.00 | $1,895,250.00 | $947,625.00 |
| Ray #2 | 19.0 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Grenora #99 | 19.0 | 10 | 75,000.00 | 750,000.00 | 142,500.00 | 71,250.00 |
| Mohall #9 | 15.6 | 38 | 75,000.00 | 2,850,000.00 | 444,600.00 | 222,300.00 |
| Glenburn #26 | 15.6 | 57 | 75,000.00 | 4,275,000.00 | 666,900.00 | 333,450.00 |
| Marmarth #12 | 14.4 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Central Elementary | 14.4 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Taylor #3 | 17.2 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |
| Southheart #9 | 17.2 | 36 | 75,000.00 | 2,700,000.00 | 464,400.00 | 232,200.00 |
| Elm Grove #13 | 17.2 | 4 | 75,000.00 | 300,000.00 | 51,600.00 | 25,800.00 |
| Lefor #27 | 17.2 | 0 | 00.00 | 00.00 | 00.00 | 00.00 |

# APPENDIX J

# FOUNDATION AID CALCULATIONS

# REDUCED BY IMPACT PAYMENT

# FOR PLAN D

| School District | Present State Per Pupil Foundation Aid | Impact Students | Impact Payment | New State Per Pupil Foundation Aid | ADM | Present Total State Foundation Aid |
|---|---|---|---|---|---|---|
| 04001 | $424.06 | 19 | $ 1,611.48 | $410.96 | 123 | $ 52,159.00 |
| 05004 | 538.28 | 2 | 215.31 | 602.02 | 28 | 17,072.00 |
| 05017 | 629.29 | 107 | 13,466.81 | 670.73 | 325 | 204,519.00 |
| 05029 | 675.48 | 2 | 269.79 | 671.75 | 99 | 66,773.00 |
| 05035 | 735.99 | 8 | 1,177.58 | 728.14 | 150 | 110,398.00 |
| 05048 | 705.30 | 6 | 846.36 | 696.92 | 101 | 71,235.00 |
| 06017 | 709.46 | 6 | 815.35 | 703.18 | 130 | 92,229.00 |
| 06027 | 157.16 | 0 | 00.00 | 00.00 | 5 | 786.00 |
| 06033 | 600.16 | 0 | 00.00 | 00.00 | 255 | 153,040.00 |
| 07027 | 668.11 | 3 | 400.87 | 666.51 | 251 | 167,696.00 |
| 07035 | 881.85 | 6 | 1,058.22 | 869.11 | 83 | 73,194.00 |
| 12001 | 629.08 | 9 | 1,132.34 | 627.37 | 659 | 414,565.00 |
| 27002 | 701.56 | 4 | 561.25 | 696.77 | 117 | 82,083.00 |
| 27018 | 829.42 | 0 | 00.00 | 00.00 | 22 | 18,247.00 |
| 27032 | 268.83 | 0 | 00.00 | 00.00 | 10 | 2,688.00 |
| 31001 | 617.49 | 77 | 9,509.35 | 603.89 | 699 | 431,625.00 |
| 53001 | 679.02 | 508 | 68,988.43 | 654.15 | 2,774 | 1,883,598.00 |
| 53006 | 862.11 | 7 | 1,206.95 | 854.87 | 167 | 143,971.00 |
| 53015 | 601.64 | 347 | 41,753.82 | 533.86 | 616 | 370,611.00 |
| 53002 | 776.14 | 28 | 4,346.38 | 758.11 | 241 | 187,050.00 |
| 53099 | 611.75 | 22 | 2,691.70 | 598.49 | 203 | 124,185.00 |
| 38009 | 634.79 | 39 | 4,951.36 | 648.54 | 360 | 28,523.00 |
| 38026 | 620.53 | 8 | 992.85 | 617.23 | 301 | 186,779.00 |
| 44012 | 480.92 | 0 | 00.00 | 00.00 | 29 | 13,947.00 |
| 44032 | 242.77 | 0 | 00.00 | 00.00 | 35 | 8,497.00 |
| 45003 | 798.71 | 3 | 479.23 | 794.65 | 118 | 94,248.00 |
| 45009 | 689.75 | 6 | 827.70 | 687.60 | 386 | 266,243.00 |
| 45013 | 785.31 | 5 | 785.31 | 783.02 | 343 | 269,360.00 |
| 45027 | 432.90 | 0 | 00.00 | 00.00 | 43 | 18,615.00 |

Formula: (Step 1) Present per pupil state foundation aid X impact students X .20 = A
(Step 2) Total present state aid -A = new total state foundation aid ÷ ADM = new per pupil state foundation aid

# APPENDIX K

# COVER LETTER SENT TO

# SAMPLE SCHOOL DISTRICTS

Financing Elementary & Secondary Education in North Dakota
A Research Project of the Bureau of Educational Research & Services
Educational Administration, CTL
University of North Dakota 58202
701/777-4255



As part of a study on North Dakota Educational Finance, we are collecting data related to oil and gas activity in North Dakota. We are trying to ascertain whether oil and gas revenues are adequately funding student impact (students resulting from oil and gas activity.)

It would be helpful to us if you could determine or estimate the number of students whose parents are employed in oil and gas related occupations.

The attached form is enclosed for the purpose of recording the above information.

In visiting with a few administrators, we found that a variety of ways could be used to gather this data. Some of them are: 1) school personnel knowledge of parent's occupation, 2) checking student records where this information is contained, 3) classroom teachers asking students for this information, or 4) whatever method is least time consuming.

We would also like to get a sense of the building projects that were necessary as a result of oil and gas activity during the past twenty-five years. A portion of the questionnaire asks you to respond to a question dealing with this area.

If you have any problems, please contact us.

We would appreciate it if you could return this information to us in the self-addressed stamped envelope by September 15.

Thank you.

Sincerely yours,

Richard L. Hill, Director

Harry Weisenberger

RLH:mkb

# APPENDIX L

## IMPACT STUDENT QUESTIONNAIRE

## SENT TO SAMPLE SCHOOL DISTRICTS

SCHOOL NAME _____ COUNTY _____

SCHOOL SYSTEM NUMBER _____ COUNTY NUMBER _____

PERSON PROVIDING DATA _____

METHOD USED TO COLLECT DATA _____

_____

_____

Estimate of number of students enrolled during the 1976-77 school term whose parents were working in oil and gas related occupations:

K-6 _____

7-8 _____

9-12 _____

Total

Additional comments regarding abnormal impact from oil and gas related activity:

Did your school district need to build additional facilities as a result of oil and gas activity? YES ____NO____(Check one). If the answer is YES, briefly describe the nature of your building projects and the approximate year.

Signed _____

Title _____

# APPENDIX M

## BUSINESS AND AGRICULTURE

## PROPERTY TAX VALUATION

## FOR RESPONDING SAMPLE DISTRICTS

| School District | ADM | Total Business and Agriculture Taxable Valuation | Per Pupil Business and Agriculture Taxable Valuation | Impact Students | Total Oil & Gas Revenue | Per Pupil Oil & Gas Revenue |
|---|---|---|---|---|---|---|
| Billings County | 123 | $2,262,404.00 | $18,394.00 | 19 | $120,013.00 | $1,006.00 |
| Gardena | 28 | 00.00 | 00.00 | 0 | 2,604.00 | 95.00 |
| Westhope | 325 | 00.00 | 00.00 | 0 | 20,888.00 | 66.00 |
| Souris | 99 | 00.00 | 00.00 | 2 | 7,434.00 | 78.00 |
| Lansford | 149 | 00.00 | 00.00 | 8 | 13,112.00 | 91.00 |
| Newburg | 101 | 00.00 | 00.00 | 6 | 6,874.00 | 72.00 |
| Rhame | 130 | 706,477.00 | 5,434.00 | 6 | 14,569.00 | 116.00 |
| Nebo | 5 | 184,257.00 | 36,851.00 | 0 | 809.00 | 175.00 |
| Scranton | 255 | 1,451,594.00 | 5,693.00 | 0 | 30,471.00 | 125.00 |
| Powers Lake | 251 | 1,310,281.00 | 5,220.00 | 43 | 23,512.00 | 99.00 |
| Flaxton | 83 | 532,449.00 | 6,415.00 | 6 | 9,014.00 | 114.00 |
| Divide County | 659 | 4,376,161.00 | 6,641.00 | 9 | 21,546.00 | 33.00 |
| Alexander | 117 | 1,290,776.00 | 11,032.00 | 4 | 21,722.00 | 193.00 |
| Earl | 22 | 253,742.00 | 11,534.00 | 0 | 4,487.00 | 217.00 |
| Horse Creek | 10 | 278,053.00 | 27,805.00 | 0 | 1,366.00 | 142.00 |
| New Town | 699 | 1,315,948.00 | 00.00 | 0 | 29,151.00 | 48.00 |
| Williston | 2,774 | 3,769,161.00 | 00.00 | 508 | 135,496.00 | 51.00 |
| Eight-Mile | 167 | 00.00 | 00.00 | 0 | 8,189.00 | 50.00 |
| Tioga | 616 | 00.00 | 00.00 | 347 | 32,019.00 | 54.00 |
| Ray | 241 | 00.00 | 00.00 | 28 | 13,050.00 | 56.00 |
| Grenora | 203 | 00.00 | 00.00 | 22 | 12,901.00 | 65.00 |
| Mohall | 360 | 00.00 | 00.00 | 0 | 52,710.00 | 150.00 |
| Glenburn | 301 | 00.00 | 00.00 | 8 | 33,322.00 | 115.00 |
| Marmarth | 29 | 368,567.00 | 12,709.00 | 0 | 813.00 | 30.00 |
| Central Elementary | 35 | 976,906.00 | 27,912.00 | 0 | 1,612.00 | 49.00 |
| Taylor | 118 | 908,573.00 | 7,700.00 | 3 | 4,356.00 | 38.00 |
| Southheart | 386 | 1,390,154.00 | 3,601.00 | 6 | 14,303.00 | 38.00 |
| Elm Grove | 343 | 763,559.00 | 2,226.00 | 45 | 15,627.00 | 47.00 |
| Lefor | 43 | 495,234.00 | 11,517.00 | 0 | 2,028.00 | 49.00 |

Formula: Total business and agriculture divided by average daily membership equals per pupil business and agriculture times number of impact students equals revenue lost compared to per pupil oil and gas tax times impact.

# APPENDIX N

## COUNTY ARRAYMENT OF WEIGHTED ASSESSMENT SALES RATIOS FROM HIGH TO LOW

1976

COUNTY ARRAYMENT OF WEIGHTED ASSESSMENT SALES RATIOS FROM HIGH TO LOW

| | | |
|---|---|---|
| 1. | Adams | 17.4% |
| 2. | Divide | 16.5% |
| 3. | Grant | 15.6% |
| 4. | Williams | 15.5% |
| 5. | Burleigh | 14.8% |
| 6. | Emmons | 14.6% |
| 7. | Slope | 14.4% |
| 8. | Stark | 14.4% |
| 9. | Eddy | 14.1% |
| 10. | Logan | 14.1% |
| 11. | Cass | 13.8% |
| 12. | Billings | 13.7% |
| 13. | Morton | 13.7% |
| 14. | Grand Forks | 13.3% |
| 15. | Foster | 13.2% |
| 16. | Kidder | 13.2% |
| 17. | McIntosh | 13.2% |
| 18. | Mountrail | 13.2% |
| 19. | Ward | 13.2% |
| 20. | Renville | 12.8% |
| 21. | Pembina | 12.5% |
| 22. | Burke | 12.4% |
| | STATE AVERAGE | 12.3% |
| 23. | Rolette | 12.3% |
| 24. | Sioux | 12.3% |
| 25. | Benson | 12.1% |
| 26. | Nelson | 12.1% |
| 27. | Sargent | 12.1% |
| 28. | Stutsman | 12.1% |
| 29. | Walsh | 11.9% |
| 30. | Golden Valley | 11.8% |
| 31. | Dunn | 11.7% |
| 32. | Bottineau | 11.3% |
| 33. | McHenry | 11.3% |
| 34. | Ramsey | 11.2% |
| 35. | Richland | 11.1% |
| 36. | Traill | 11.1% |
| 37. | Bowman | 11.0% |
| 38. | Pierce | 11.0% |
| 39. | Cavalier | 10.9% |
| 40. | Griggs | 10.8% |
| 41. | Barnes | 10.6% |
| 42. | LaMoure | 10.5% |
| 43. | Dickey | 10.4% |
| 44. | Towner | 10.4% |
| 45. | Steele | 10.3% |
| 46. | McLean | 10.2% |
| 47. | Hettinger | 9.9% |
| 48. | Oliver | 9.9% |
| 49. | McKenzie | 9.8% |
| 50. | Sheridan | 9.1% |
| 51. | Wells | 9.1% |
| 52. | Mercer | 8.9% |
| 53. | Ransom | 8.5% |

1976 North Dakota Sales Ratio Study
North Dakota Tax Department

# APPENDIX O

## MILL LEVIES COMPARED TO STATE AVERAGE

## (MINUS SINKING AND INTEREST FUND, KINDERGARTEN, AND JUNIOR COLLEGE LEVY)

| School District | Total Mill Levy Minus Sinking & Interest Fund | State Average | School District Plus or Minus Compared To State Average |
|---|---|---|---|
| Billings County | 44 | 88 | -44 |
| Gardena | 103 | 88 | +15 |
| Westhope | 84 | 88 | -4 |
| Souris | 62 | 88 | -26 |
| Lansford | 81 | 88 | -7 |
| Newburg | 119 | 88 | +31 |
| Rhame | 94 | 88 | +6 |
| Nebo | 33 | 88 | -55 |
| Scranton | 74 | 88 | -14 |
| Powers Lake | 72 | 88 | -16 |
| Flaxton | 80 | 88 | -8 |
| Divide County | 96 | 88 | +8 |
| Alexander | 73 | 88 | -15 |
| Earl | 0 | 88 | -88 |
| Horse Creek | 36 | 88 | -52 |
| New Town | 83 | 88 | -5 |
| Williston | 83 | 88 | -5 |
| Eight-Mile | 86 | 88 | -2 |
| Tioga | 62 | 88 | -26 |
| Ray | 62 | 88 | -26 |
| Grenora | 69 | 88 | -19 |
| Mohall | 68 | 88 | -20 |
| Glenburn | 54 | 88 | -34 |
| Marmarth | 106 | 88 | +18 |
| Central Elementary | 42 | 88 | -46 |
| Taylor | 86 | 88 | -2 |
| Southheart | 50 | 88 | -38 |
| Elm Grove | 54 | 88 | -34 |
| Lefor | 27 | 88 | -61 |

# APPENDIX P

# ENERGY IMPACT FORM

## ENERGY IMPACT FORM

Dickinson Public School District No. 1
Dickinson, ND 58601

*This form is designed to assist the Dickinson School District in providing statistical data essential to apply for coal impact or other special funds that may be available due to school enrollment growth based upon energy exploration and development.*

*The information is purely voluntary on the part of parents and the school stresses this point. It is appreciated as a help to us and will be used only for documentation of statistical information; the end result would provide better educational services. It will not be used in any way to solicit parents personally or to pass privileged information to others for personal or business gain. Only one form need be completed for all children in the family, at any building of the parent's choice when registering children.*

*Gordon L. Paulsen*
*Assistant Superintendent*

**********

DATE _____

NAME OF PARENT (S) _____

CURRENT ADDRESS _____ PHONE NO. _____

LENGTH OF TIME AS DICKINSON SCHOOL DIST. RESIDENT _____

LAST RESIDENCE PREVIOUS TO DICKINSON _____

CHILDREN:

| Name | Age | School Enrolled | Grade |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ANTICIPATED LENGTH OF STAY IN DICKINSON (if known) _____

MAJOR EMPLOYMENT OF PARENT (S) - Check one:

_____ COAL INDUSTRY EMPLOYMENT - Example: miner; heavy equipment operator; managers; office personnel, etc.
Job Title _____
Company _____

_____ OIL AND GAS INDUSTRY EMPLOYMENT - Example: driller; exploration and survey crewman; oil and gas lease/minerals purchase representatives, etc.
Job Title _____
Company _____

_____ OTHER ENERGY INDUSTRIES EMPLOYMENT - Example: Uranium; Solar; Federal Employment - directly related to planning, environment, leasing; Other.
Job Title _____
Company _____

COMMENTS: _____

_____ _____
Parent Signature (optional) Building Principal (completed by)

DPS No. 196

# APPENDIX Q

# DISCUSSION OF POTENTIAL AGGREGATION AND DISAGGREGATION PROBLEMS WITH ANALYSIS OF DATA

The researcher recognized that there are flaws with the data collected. Of the potential problems that Hannon (1970) listed, the following were considered crucial:

1. Measurement errors: Some of the measurement concerns would be the accuracy of the data. The fact that some of the data are not always recorded in an identical manner across school district lines may cause some inconsistency. Another possible problem is that individuals that record data may interpret guidelines differently. The question of validity and reliability were recognized but could not be checked. The value of oil wells were estimated, therefore, the accuracy could be questioned.

2. Introduction of unmeasured variables: In any research one of the problems is the influence of extraneous unconsidered variables. Such variables may have influences on the relationships studied or may be important causal variables themselves. In fact this appears to be the case since much of the variance was unexplained by these models.

3. Changes in units of analysis: One concern was that introducing different units of analysis such as per pupil costs and total districts costs. In most cases these variables were highly interrelated and not used conjointly in prediction equations.

The researcher recognized the potential problem arising from these factors and in each case tried to minimize these. Some measurement error exists in all research and no better means were available from existing sources.

It was apparent from the analysis that important causal variables were omitted. The strategy of research is to gradually increase our knowledge of which variables are important.

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